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**Environment
2010:
Action
Agenda:**

**Compilation
of Background
Analyses
for Action
Strategies**

Ecology Publication: 90-01-002



Prepared by
the Environment 2010 Action
Strategies Analysis Committee

July 1990

Washington Environment 2010
Action Agenda
Action Strategies Background Analysis

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INTRODUCTION

Washington Environment 2010 is a two-year planning exercise jointly sponsored by the U.S. Environmental Protection Agency and the Washington Department of Ecology. Governor Booth Gardner formally authorized the project by Executive Order on December 15, 1988 (EO 88-09). The first year of the project was devoted to characterizing the current condition of the state's environmental resources, and culminated in the production of the State of the Environment Report. That report briefly described the process and results of the Washington Environment 2010 research effort, including evaluations of the condition of the state's major environmental resources, and an assessment of the major threats to those resources, and preliminary environmental priorities for the state.

The second year was devoted to developing an agenda for action to mitigate the risks to human health and the environment posed by those threats. It involved a public outreach process for learning what measures the public believed should be taken to protect the state's environmental quality, and who should take them, and the drafting of an environmental action agenda to guide the energy and effort of the state's agencies in protecting and improving environmental quality through the year 2010 and beyond.

The Governor's Executive Order authorized a Steering Committee of state agency directors and established a Public Advisory Committee consisting of individuals representing diverse interest groups and governments. The analyses contained in this volume played a critical role in the deliberations of these two groups in determining the final content of the action agenda.

The ideas and proposals which make up the action agenda originated with the public. Many hundreds of action ideas were received from the public through an elaborate public outreach process. Of that number, only a few were considered on their face to be clearly inappropriate for implementation. It was the task of the Action Strategies Analysis Committee (ASAC) to discriminate and prioritize among these ideas, and identify the ones with the most promise for improving environmental quality over the next two decades to recommend to the Public Advisory and Steering Committees for implementation.

Given the large number of excellent ideas, this was a difficult task. The ASAC began by looking for key elements and reoccurring themes in the list of ideas, and recombining and restating them to shorten the list. The ASAC then developed a set of scoring criteria, which addressed such questions as the political, technical, and institutional feasibility of an idea, its risk reduction and resource enhancement potential, and less obvious considerations, such as its potential to build public awareness and responsibility or whether an idea was preventative or mitigative in its approach to managing a problem.

The ideas that remained after preliminary screening logically fit into 12 categories that revolved around what resource the idea addressed or what type of action was proposed. The ASAC divided into 12 subteams, and each subteam was responsible for developing recommendations concerning the overall potential of each of the ideas in its subject area to improve environmental quality in the state. To aid this

process, a standard outline for assessment was developed which considered each of the above criteria in more depth. Each of the ideas that survived the preliminary screening was subjected to the more rigorous analysis that was called for in the standard outline. The end product of that process of analysis are the papers which comprise this volume.

It was the task of each group to develop recommendations to the Steering and Public Advisory Committee concerning which ideas should be included in the draft action agenda. The findings in the papers in this volume were the basis for those recommendations.

Although each subteam followed a standard outline in completing their analyses, there is significant variation in each of the finished products. Some of the analyses, such as those prepared by the conservation and air quality subteams, are more quantitative than those completed by, for example, the education subteam. This is largely due to two factors. Given the time and resource constraints of the project, it was not possible to do original research in completing the analyses, and therefore each of the subteams was forced to rely on the information readily available to them. The volume and quality of research data accessible to each of the subteams varied greatly, and this affected the end product. The second factor was the type of idea being analyzed. Some of the ideas analyzed do not lend themselves well to the type of rigorous quantitative analysis that was striven for throughout the process. Particularly problematic in this regard are the ideas in the education package, and the cooperation package. A lack of quantitative data should in no way be construed to imply that an idea lacks potential to significantly improve environmental quality and reduce risks to human health. Committee members generally agreed, for example, that ideas relating to public education had some of the greatest potential to improve environmental quality, and yet it is extremely difficult to assess them based on quantitative data.

For some of the ideas that appear in the final action agenda, there is no corresponding analysis in this document, and few of the ideas in the final agenda are stated in precisely the same form as they appear here. For example, the waste reduction proposals assessed by the conservation subteam have been moved to the waste management section of the final action agenda. These discrepancies are due to the extensive process of public comment and review that the recommendations were subjected to after their initial presentation to the Steering and Public Advisory committees, and to differences in judgment and perspective between the committees. The recommendations as they are stated here were at the beginning of the process of refining the action agenda, and have undergone many iterations of scrutiny and modification before appearing in their final form in the action agenda. In addition, new ideas were received from the public later in the process which were ultimately included in the final action agenda.

Included in the appendices is a paper on environmental economics. It reviews the literature on the subject, and serves as excellent background on environmental and resource economics. It discusses some of the special difficulties and challenges encountered when attempting to estimate the economic value and cost of taking actions to protect natural resources and improve environmental quality. The paper



**Environment
2010
Action
Agenda:**

**Action
Strategies
Background
Analyses**

Package
One:

**Environmental
Education**



State of Washington
July, 1990

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INTRODUCTION

Environmental education -- formal and informal learning about the natural environment and the relationship between humans and the natural environment* -- is widely perceived as the key to preserving and enhancing the quality of Washington State's diverse natural resources and rich quality of life. Better environmental education -- both within and outside of the school system -- was the environmental policy need most frequently cited by citizens in a series of 12 public meetings held throughout the state by Washington Environment 2010 in January 1990.

At the Washington Environment 2010 Summit in November 1989, public participants added two items to the list of major threats to the state's natural environment: environmental ignorance (i.e., a lack of environmental awareness and responsibility), and overly consumptive lifestyles (i.e., a wasteful disregard for conservation). These issues were consistently ranked by participants at subsequent public meetings around the state as relatively high priorities for environmental policy-makers in the state. Both problems are linked to a need for better environmental education. A more pervasive and effective effort to educate the citizenry about environmental issues must be an essential component to any long-term strategy to preserve and enhance Washington's environmental heritage for future generations.

According to the Washington Environment 2010 Vision Statement, a heightened sense of environmental awareness and responsibility will be deeply ingrained into the culture and the psyche of the state. Education must play a prominent role if this revolutionary vision is to become reality.

This is not a new idea. In 1976, the Washington State Office of Environmental Education stated in its A State of the Art Report that:

"Given the prevailing feelings of both the general public and private industry that environmental problems are indeed serious, and the agreement that education must play a critical role in resolving these problems, our task seems

*Environmental education can be defined in a number of ways. These two definitions, which appear in a book titled, Environmental Education: A Manual for Elementary Educators, are particularly useful:

"Environmental education is aimed at producing citizens who are: 1) knowledgeable concerning their biophysical environment and its associated problems; 2) aware of how to help solve these problems; and 3) motivated to work toward their solution."

"Environmental education is an integrated process which deals with man's interrelationships between his natural and man-made surroundings. It is intended to promote among citizens the awareness and understanding of the environment and our relation to it, and the concern and responsible action necessary to assure our survival and to improve the quality of life.

obvious. Developing, broadening, and properly managing objective environmental education for the common schools is, to a large extent, the single most important part of the formula for the quality of life we seek."

The task seems even more obvious, and more urgent, as we approach the turn of the century. In a preface to Environmental Guidelines for Washington Schools, published by the state's Office of the Superintendent of Public Instruction, Paul Ehrlich wrote: "In my view, there is nothing more important for the future of our children than integrating environmental education into every level of our school system."

Despite the long-standing and steadily growing recognition of the importance of effective environmental education, the state of Washington still lacks a comprehensive, coordinated, consistent program. This action package addresses that problem. The overriding goal of the strategies described here is to improve environmental education in the state -- that is, to improve the ways in which Washingtonians both within and outside of the school system learn about the environment, their relationship to the environment, and specifically, the impacts of their individual and collective activities on the condition, quality, and long-term sustainability of the environment.

BACKGROUND

There is a lot of interesting, innovative, and effective environmental education going on in the state of Washington, to be sure. State agencies such as the Department of Ecology and the Department of Natural Resources, and other private and public organizations such as the Washington Forest Protection Association, are developing environmental curriculum materials, and working with teachers around the state to incorporate environmental issues into both classroom and out-of-school learning. Various local radio stations, television stations, and newspapers are covering environmental issues more extensively, and with a more educational orientation. Private companies such as Fred Meyer are initiating programs aimed at educating the public about environmental concerns. An Environmental Education Task Force has been formed to discuss ways to improve environmental education in the state. The state's Office of Environmental Education is very active in, among other things, accumulating and disseminating educational materials to local school districts and other interested parties. And the list continues.

Ongoing efforts, however, are not sufficient. They are usually voluntary, often poorly funded, and therefore limited in scope, so that students are exposed to environmental education in public schools only on a "catch-as-catch-can" basis, and even teachers and citizens who are actively looking for information on environmental issues often have great difficulty finding it. In addition, environmental education in the state is uncoordinated, so that efforts often are duplicated.

The public -- at least that segment of the population that attended Washington Environment 2010 public meetings -- clearly sees the status quo for environmental education in the state as inadequate. In 1986, a needs assessment conducted at the behest of the state legislature by the Environmental Education Task Force, indicated the need for increased efforts in environmental education. In his transmittal letter to the legislature, the state Superintendent of Public Instruction wrote: "The

message they (the Environmental Education Task Force) have formulated is that we need a continued and enhanced collaborative investment in environmental education. The message continues, and indicates that this collaborative support is needed for reasons related to economic good sense and continued environmental quality."

OVERVIEW OF THE PACKAGE

The strategies described and assessed in the following pages constitute the substantially enhanced investment in environmental education in the state of Washington. They have been culled from a longer list of ideas submitted by citizens attending various Washington Environment 2010 public meetings, and government people serving on various Washington Environment 2010 committees. The nine ideas (some of which are actually groups of ideas) described here are those that the Environmental Education Subteam of the Action Strategies Analysis Committee, the Steering Committee, and the Public Advisory Committee believes offer the most promise for achieving the goals for environmental education, and for the state's environmental future, articulated above.

The ideas fall into three categories:

- Better coordination of environmental activities: This category includes two ideas:
 - Expanding the membership and functions of the Environmental Education Task Force.
 - Establishing an Environmental Education Clearinghouse at the Department of Ecology.
- Improved environmental education of the general public. This category includes a number of ideas:
 - Updating and expanding environmental materials in public libraries.
 - Identifying important segments of the populations and developing and administering environmental education programs (e.g., handbooks, workshops, etc.) targeted at each group.
 - Using the popular media more effectively to deliver environmental messages.
 - Supporting environmental rating and labeling of consumer products.
 - Printing targeted environmental messages/slogans/lessons on widely distributed items such as grocery bags, water, sewer, garbage, and electricity bills, etc.
 - Increasing and enhancing adult environmental education programs.
- Making environmental education a stronger component of basic public education in the state.

- Building environmental education into student learning objectives.
- Infusing environmental education into existing disciplinary curricula through political mandates and support, and an extensive outreach and training program.
- Developing a teaching corps that is familiar with and capable of delivering effective environmental education, through teacher certification requirements, enhanced teacher training, and incentives.

ACTION #1: Coordinate environmental activities around the state.

I. The Problem

There are lots of small-scale environmental education activities going on within and under the auspices of various government agencies and private institutions. The Department of Ecology, for example, has a long-range environmental education strategy in place, and a full-time education coordinator to manage it. The Department of Parks and Recreation is embarking on an ambitious effort to increase the delivery of interpretive and educational programs at its facilities. Outdoor activity organizations like the Mountaineers and REI, Inc. are constantly holding environmental seminars and leading interpretive hikes and outings. And the list goes on.

These activities, while often very effective, are currently not well coordinated. There is a great deal of duplication, and reinvention of the proverbial wheel. In short, these activities are happening in the absence of a cohesive, coordinating vision.

II. Proposed Action

We recommend two actions to address these problems:

1. Create an Environmental Education Clearinghouse at the Department of Ecology.
2. Expand and continue the Environmental Education Task Force.

The Environmental Education Clearinghouse would have four basic functions:

- It would accumulate, maintain, and disseminate up-to-date environmental education materials that are produced by government agencies and other private and public entities in Washington, elsewhere in the country, and around the world.
- It would keep abreast of who is doing what vis-a-vis environmental education, and help to coordinate those efforts. The Clearinghouse might, for example, produce an environmental education newsletter, highlighting the latest in environmental education materials, programs, and innovative ideas.
- It would provide technical assistance to groups starting new environmental education programs, linking them with experts in

the field and with others considering or already administering similar programs.

- It would coordinate the development of new environmental education materials by teams of teachers and subject matter experts.

The expanded Environmental Education Task Force would consist of the directors of federal and state resource agencies (e.g., EPA, Ecology, Natural Resources, Agriculture, Fisheries, Wildlife, Parks and Recreation) or their designees, four legislators (a minority and a majority member of the House and Senate), and representatives from business, the environmental and conservation community, agriculture, the timber industry, and the academic community. The EETF would: symbolize the importance of environmental education in the state, set the broad policy goals for environmental education (e.g., identify the most urgent gaps that need attention), give direction to the Environmental Education Clearinghouse, and foster communication between and coordination and cooperation among the groups represented on the committee.

III. Benefits

The benefits of these proposed actions include:

- Environmental education activities will be better coordinated, so that duplication of effort and reinvention of wheels will be minimized.
- Environmental education will become easier to administer since the clearinghouse will provide technical assistance and access to up-to-date materials.
- More people will be exposed to environmental education.
- Gaps in environmental education materials will be identified and filled.
- Different groups with different views on environmental education will be brought together.
- The citizens of the state will, over time, become more environmentally knowledgeable, aware, and responsible.

The Environmental Education Clearinghouse would require the following:

- A full-time director to convene and facilitate meetings of the EETF, to serve as a liaison with the public, and to manage the other functions of the clearinghouse, as outlined above. (\$40,000)
- A full-time administrative support person to disseminate information, maintain files, respond to requests, etc. (\$25,000)
- Part-time research assistants (possibly student interns) to gather environmental education materials, and conduct research in support of the development of new materials. (\$20,000)

- Funding for a regular newsletter. (\$50,000)

V. Discussion

The clearinghouse could be an effective solution to an obvious problem. Obtaining funding could meet with the same problems as those discussed earlier, however. Also, there are some institutional issues. Should the clearinghouse be located at the Department of Ecology, or OSPI, or somewhere else? We recommend Ecology since OSPI focuses strictly on K-12, whereas the clearinghouse would serve all interested environmental educators, with a special focus on noncurriculum materials, and non-K through 12 activities (e.g., activities within and among state agencies). Ecology is perhaps the most neutral home for such an activity.

ACTION #2: Update environmental education materials in libraries.

The Problem

Up-to-date and usable environmental materials - and specifically environmental education or curriculum materials - are not readily available to the publics who need them (i.e. students, teachers, general public).

The problem has several parts:

1. New environmental materials are not getting to libraries.
2. Users do not know materials are in libraries for their use.
3. Users cannot easily access materials they need.

2010 recognizes that enforcement and regulation alone cannot resolve Washington's environmental problems. Education will be a critical factor. And that education, in turn, relies on the availability of information to potential users: students doing research projects, teachers looking for curriculum materials, a member of a neighborhood group looking for information for a talk on local pollution problems.

Without readily available, useful, and current information, the education effort put into place through other 2010 action strategies will be less effective than it could be.

On the other hand, having useful, current, easy to read materials readily available will greatly enhance all other education efforts and the entire 2010 process.

Education efforts are not readily measurable in the short run. Some indicators of usefulness might be increased library usage, numbers of subscribers to on-line systems and comments from the public at future 2010 public meetings.

A specific pre and post test could be set up, but should be undertaken as part of a larger measuring project, not just to test this action strategy.

Libraries and organizations housing them (cooperative extension, local library systems, state agencies, Scout councils) would become more

viable - and therefore more useful as educators. Their increased usefulness to the public might also be reflected in their increased ability to organize and lead community action.

Proposed Actions

Several action options exist:

To increase library holdings and availability

1. Agencies and others responsible for curriculum development provide regular updates for curriculum materials

Costs - \$ and FTE to SDI or Coordinating Group to monitor and request annual review and updates
\$ and FTEs to agencies to review annually, update, reprint and distribute when necessary
\$ costs to private groups like WFPA for review, update, distribution

2. Agencies provide sufficient copies of all reports and brochures to Washington library network and other key information systems such as ESDs, WSU Cooperative Extension, KCTS 9's Learning Link, the Northwestern Curriculum Coordination Center through Saint Martin's College, or EcoNet.

Costs - \$ for additional copies and distribution
FTE to coordinating group to develop list of key systems to receive materials
\$ to purchase input to key library systems (it would cost about \$500 to develop an environmental branch for Learning Link).

3. Schools and small libraries funded to purchase annual subscriptions to information bases and equipment necessary to use those information systems they need. For some systems, subscribers provide materials in their holdings as part of the system base, thereby increasing the materials available to all subscribers.

Costs - Learning Link (KCTS 9) - a live, interactive system for teachers and libraries; provides lesson plans and idea swaps: \$300 per year for unlimited access; requires pc, modem, dedicated telephone line (approximately \$3,000); contact Sharon Babcock, 728-6463.

Initial target one per district @ 296 districts = roughly \$100,000 first year, \$10,000 future years.

LaserCat (Washington Library Network) - disc system coupled with phone orders for mail or fax, bibliographic, appropriate for high school and college as well as public libraries; annual subscription \$1,300 - also requires pc workstation with two cdrom disc drives and printer (\$3,000 to \$5,000).

4. Master libraries (colleges and universities, major library systems, state library) funded to purchase environmental materials which would then be available to all subscribers as well as local users.

Costs - Any amount dedicated specifically to environmental materials will dramatically increase holdings in this area. Suggest additional \$5,000 to each state college, university, ecology library.

5. Agencies, through a coordinated effort, through WSU Cooperative Extension, or perhaps through grants to local groups, produce and distribute to all high schools and other key public sites publications suitable for high school and public research projects - quick text, highly readable and for immediate on-site use.

Costs - \$ and FTEs for writing, printing, distribution to about 2,000 buildings; add another 600 buildings to reach all public libraries.

6. Rural libraries funded to purchase fax equipment, pay postage, or subscribe to courier service to receive text material housed in clearinghouses.

Costs - \$2,000 per year x 30 libraries in need = \$60,000 year

7. SPI update guidelines to call for more attention to environmental materials in school libraries.

Costs -

To make public more aware of library holdings

1. Washington State Library, with input from local library systems and the public, provide an annual model plan or guidelines for marketing library services - with particular emphasis on environmental topics.

Costs - \$ and FTE to Washington Library to develop, advertise through workshops - some demonstration projects already are available.

2. Public libraries develop and implement local marketing plans to draw new library users into the library, make them aware of library capabilities, and particularly of environmental holdings.

Costs - \$ to local libraries to develop and implement with displays, exhibits, projects like job info center that bring people into libraries

Funding

Increase grant budgets through SPI, state library, federal government, centennial grants, waste grants

Donations from private business

A statewide project for chamber of commerce, Lions, Rotary, Kiwanis, and other groups

Local fund raising for local library projects

Washington State Library offers grants for cooperative collection development through federal Department of Education; \$ available for

grants to purchase materials, work stations, and subscriptions to services - \$350,000 year. Models exist in consumer health, technology, and legal projects. Works best when all libraries in geographic region come together to plan purchases and purchase materials cooperatively.

ACTION #3: Identify Important Segments of the Population and Develop Environmental Education Programs Targeted at Each Group.

Goal:

Enhance each subgroup's awareness of, and sense of responsibility for, their environment, the impacts of their activities on the environment, and the things that they could do to better protect the environment.

PROPOSAL:

- Produce and widely distribute manuals on "how to do the right thing" environmentally.
- Develop and hold workshops on "how to do the right thing" environmentally.
- Target these educational materials to specific groups, such as homeowners, different types of businesses, gardeners, and do-it-yourselfers.

I. Introduction

Peer education about environmental concerns is often one of the most effective ways to change personal behavior. Sound environmental practices can be developed and disseminated by organizations for their own members, as well as the general public.

Public workshops are another method of disseminating information from environmental programs. Workshops are easily added to group or club programs with a minimum of funding. In return citizens groups, clubs, and environmental organizations can be encouraged to expand their own information booths at fairs, and conduct workshops to inform members on environmental choices.

II. Gains and Costs of Taking the Action

A. RISK REDUCTION AND RESOURCE ENHANCEMENT

1. Education about environmental risks from specific behaviors can lead to changes which will benefit the environment. An example of peer education is a manual oriented toward a specific group, produced and distributed by an organization that represents the group.

The Washington State Dairy Federation produced a manual and a video on animal waste management and water quality for dairy farmers. The Washington State Horse Council has a similar waste management video and manual for horse owners, and a number of cooperative extension programs promote good environmental practices. Washington State Parks, in conjunction with

the established boating organizations, produces a guidebook on proper handling of boat wastes.

The cost of not taking steps to educate target groups is continued accidental pollution or degradation of land resources due to lack of information or sense of personal responsibility.

2. Program evaluation could focus on establishing whether habits and practices improve after exposure to educational materials. The potential for resource enhancement is high if these programs are effective.
3. Additional benefits from the action: Environmental information can be included in existing brochures that are already being produced for informational purposes. (For instance, water quality and boat waste information has been included in tide table booklets.) Practical guides, maps, and other informational sources can be other, existing vehicles for environmental ideas, benefiting those who may otherwise not get the message.

Limitations and adverse implications: workshops, manuals, and brochures should not be limited to a one-time-only grant to a sponsoring organization. Long-term programs should be established with ties to natural resource agencies and industry. Ongoing programs provide continuity and can serve the entire state.

B. COSTS

Estimate costs: current programs offer an example of costs that may be expected. The cost of developing, printing, and distributing a brochure for dairy farmers on animal waste management was at least \$5,000. The total grant, including funds to produce a video, was \$30,000. The range of cost to produce the brochure could be estimated at \$5,000 to \$10,000. Fifteen hundred copies of the eight-page brochure were sent out; public demand for the brochure was so high that when extra copies were requested by farmers, none were available.

The 89-91 biennial cost for the Boater Environmental Education Program at state parks was \$350,000. However, this covered all program costs (salaries, benefits, travel, printing). At least 70 percent of these funds were spent on publications, workshops, and presentation. This funding was adequate to start a new environmental education program for a targeted population.

Workshop costs will vary depending on the instructor's fee, length of class, materials used, and other variables. An example of workshop costs, from the Washington Sea Grant program, is taken from fees paid by workshop participants. The average cost is about \$10 for a three-hour workshop, and this covers all costs other than the program coordinator's salary. By coordinating an environmental message with another educational program that people are willing to pay for, costs have been minimized.

C. SUMMARY OF COSTS AND BENEFITS

Manuals and workshops on "How to do the Right Thing Environmentally" are extremely effective, especially if they are designed by peer groups, clubs, or citizen organizations. Costs are covered through grants, user fees, workshop participant's fees, and fees for informational material. This is a practical way that specific environmental information can be made available to interest groups.

III. Other Factors

A. NO TECHNICAL FACTORS

When citizen groups are writing their brochures or workshop information they must be given accurate data. Occasionally, one group may not want to put all available information in a brochure for political reasons. They should be encouraged to use defensible, accurate data and statements.

B. INSTITUTIONAL CONSTRAINTS

Agency education programs that are high profile and regularly funded may eclipse the smaller, locally initiated projects. Large programs might lack the flexibility and accessibility of peer group education programs.

C. POLITICAL FACTORS

(See III, A. above.)

VI. Roles and Responsibilities

A. IMPLEMENTATION RESPONSIBILITIES

The environmental education task force at SPI should have a subcommittee for non-formal education (i.e. not K-12). This group should decide which subgroups should be targeted for environmental education. Appropriate state agencies would work with formal representatives of the subgroup to design, fund, produce, and disseminate the materials. For example, the departments of Ecology and Agriculture could work with a local gardener's association to produce materials _____. The PSWQA's plan already did much of this "targeting"; their recommendations should be put into place and the programs they already created should be continued.

B. ACCOUNTABILITY

Environmental Education Subcommittee of 2010.

C. SCHEDULE

Subgroups should be targeted by Summer 1991
Legislative request for funding by Summer of 1992
Submit legislative request to the 1993 legislative session

ACTION #4:

Establish a mobile environmental education program, like D.A.R.E., to visit schools, parks or other public places to deliver environmental message.

I. Introduction

A mobile van focused on the pollution to Puget Sound already exists. The Seattle Aquarium is also starting a mobile environmental education program in Summer 1990.

II. Gains and Costs of Taking this Action

- A. A mobile van is highly visible at schools or parks. Many individuals, both young and old, could gain valuable information about the environment and our activities which pollute it. Costs to local governments, school districts, and parks would be cut by having one or two vans available to visit target sites.
- B. Environmental degradation would be reduced as more people come in contact with the van and learn how to take care of their wastes, purchase nonpolluting consumer items, and realize how much it costs to clean up the environment.
- C. Further benefits are the opportunities to take the van into remote areas of the state where existing environmental education booths, displays or information are not often found.

COSTS

The Seattle-Aquarium's van had these costs:

Purchase and retrofit truck:	\$48,000
Salaries:	\$30,000 (i.e. 1.0 FTE)
Printing, materials, gas, supplies:	\$10,000
Curriculum development:	\$11,000
TOTAL:	\$99,000

Other vans may have more or less costs, but these are the best estimates for an environmental education van.

III. Other Factors

A. TECHNICAL

Retrofitting a van would take expertise and clever adaptation of displays to a moving vehicle. The van(s) would have to have a clear message targeted at a particular audience. The Aquarium's van is oriented toward Puget Sound. An eastern Washington van could be built around water resource allocations, ground water, and the many users of water in that region.

B. INSTITUTIONAL

There are no legal or administrative problems with building such a van. One full time staff person would have to be dedicated to drive it around and present the information to groups. Agencies, such as state parks and school districts, would have to coordinate with the van driver to reserve parking and times for presentations.

C. POLITICAL

None. Local governments would be happy to have a free, inexpensive environmental van attend their festivals and fairs in the summer.

IV. Roles and Responsibilities

A. IMPLEMENTATION

The agency most involved with the target group should construct and operate the van. For example, Agriculture could do the Eastern Washington van, whereas, Ecology could do an urban van about pollution from cities and suburbs.

B. ACCOUNTABILITY

Environmental Education subcommittee of 2010.

C. SCHEDULE

Target groups identified by Summer of 1991
Legislative proposal for a budget finished by Summer of 1992
Send budget request to 1993 Legislature.

ACTION #5: Use media more effectively

1. Produce more and better PSAs and market them effectively as a group through a coordinated effort to deliver environmental messages to avoid mixed messages, competition for very limited slots).

Limited effectiveness. Blanketing of media and repeated play or targeted play at prime time cannot be guaranteed.

Costs - \$ for contract production. FTE for coordination, distribution.

2. Produce quality materials and purchase advertising time - this is what METRO is doing with current messages.

Very effective - first two weeks METRO received 600 calls
Three ads running nearly 1,100 times in 12 weeks on 12 stations both am and fm big and little.

Costs \$10,000 for producing three ads \$106,000 for station time

Funding could be from a joint agency fund for environmental ads - would increase cooperation and targeting of messages

Dollars to produce and pay for space could be part of permit fees -
British Columbia requires liquor companies to pay province for
advertising against alcohol
Violators pay for ad space

3. Develop partnerships to get messages out

State patrol campaign - used federal \$ to produce a series of ads for radio, television, and newspaper (\$20,000); created a media advisory committee of radio, cable, and newspaper advertising directors; offered quality ads to media so that they could sell space to advertisers. Tested in Thurston County and highly successful. Radio stations use in drive time and made it their own campaign.

Work intensively with radio and television stations and newspapers to develop campaigns of interest to their listeners/readers; KJR< KING< KIRO< KCTS are all currently involved in environmentally related activities in which they are taking lead on actions such as video contests, prime time, in-depth environmental broadcasts, cooperative advertising programs between local stores, agencies, and major product line distributors.

4. Get environmental issues/messages into popular programming

- Develop and implement campaign to inform the viewing public, network writers, producers and set designers; target specific series (ALF and 30-Something already are keying on environmental messages).
- Target entertainers already interested in environment (EarthFair 90 has list to start with).
- Target local stations for local broadcasts.
- Write articles for inclusion in professional newsletters - i.e. TV directors' union.
- Could be a grant project or a public service project for groups with environmental agendas, like Lions, League of Women Voters, Scouts.

Limited Costs - Time consuming

ACTION #6: Environmental Rating and Labeling of Consumer Products

Labeling of "environmentally friendly" consumer products is becoming popular with industry as a marketing tool. Producers are and will want to take advantage of the public's new environmental awareness. Canada and West Germany are the two most cited examples in the literature on the subject.

Canada is systematically developing criteria for consumer products, the first include zinc-air batteries, water based paints, fine paper from recycled paper, craft and hobby papers, newsprint from recycled paper, heat recovery ventilators, and cloth diapers. Other products are under consideration. The Canadian Standards Association also distributes a newsletter that tracks the progress of products under application.

The Standards Association studies each product then proposes guidelines to a panel made up of representatives from government, industry, environmental groups, and the general public. That is where the label passes or fails.

Washington's first responsibility is to protect the consumer from false claims and then attempt to formulate accurate criteria. Some of the issues that face the state are:

- Regulated labeling of consumer products may be forced on the state in response to multiple criteria used by industry.
- Standardization of criteria will be necessary to ensure that labeling is consistent.
- Public education about intelligent purchasing of "environmentally friendly" products will be a necessary whether labeling is regulated or not.
- Labeling of "environmentally friendly" products is a logical extension of food inspection programs or classification of chemicals potentially harmful to humans and the environment.
- How will this program be funded?
- Should Washington work with another state or should this be a national program?

Washington will have to take action on the subject in the near future. Fred Meyer has already instituted its own "earth friendly" program. Some have already questioned the criteria that Fred Meyer used to arrive at "friendly" labeling. The acrimony will get worse as other manufacturers institute their own labeling programs to take advantage of marketing opportunities.

ACTION #7:

Print message about how to do the right thing environmentally on grocery bags, water and sewer bills, electricity bills, etc. Target the appropriate message to the appropriate audience, e.g., water conservation tips on water bills, energy conservation tips on electricity bills.

A. Risk Reduction/Resource Enhancement Potential

1. Risks to human health and to the environment could be reduced by taking this action. For instance, message on grocery bags could speak to the proper handling and disposal of commonly-purchased household toxic products; electricity, sewer, and water bill inserts (or messages printed directly on the bills) could speak to harmful practices which pollute water (such as the dumping of used oil into the garbage), or to safe handling of pesticides and other toxic chemicals in the home.

Economic risks could be reduced by the action, if money-saving tips for energy conservation are printed, or if suggestions are made for alternative purchases in less bulk, or for substitution of products already at home instead of new purchases (the "safer alternatives" approach).

In terms of resource enhancement potential, the connection could be suggested that an overall demand for energy would in turn reduce the overall demand for hydroelectric power facilities and dams, reducing the ecological threats associated with such construction.

2. The likely effectiveness of the proposed action in reducing risk could be quite substantial, because educational messages of warning, or specific instruction about household products and practices could be pinpointed to consumers in materials they would carry with them, not scattered into the media where absorption by the right persons is iffy.

Regarding the data to measure this likely effectiveness (and justify use of the measure) -- such data is currently available. Research on consumer response to inserts in bills, and to grocery bag reprints, along with similar promotional techniques -- shelf hangers, grocery bag inserts, et al. -- is readily available, and is used every day by marketing and advertising agencies in choosing "media" which will best deliver a client's message to its intended audience.

3. Other benefits: the support of utilities and businesses that would agree to print and distribute the messages -- especially if they did so as a public service -- would enhance their public relations and give them a readily-identifiable sponsorship, such as Puget Sound Bank's sponsorship of beach cleanups.

- B. Which 2010 Steering Committee agency would have accountability for ensuring implementation: The Environmental Education Subcommittee should work jointly on this action, with Ecology as the lead 2010 agency.
- C. Schedule and general time frame. This action could begin immediately, and some printed materials could be prepared in a three-month period. Printing of the materials could occur within another month. In terms of consumers actually reading the information, obviously the mailing of utility bill inserts would ensure exposure to thousands of consumers within a one or two-month time frame. Exposure to messages on grocery bags would occur over a longer period.

In general, the action should be blocked into a one-year time frame, then evaluated for its effectiveness and altered as necessary before second-year projects begin.

ACTION #8: Increase and enhance adult environmental education programs

The adult EE programs emphasis is in post-secondary education, continuing education, special EE workshops, and institutes. Another aspect of the program falls in special programs for employees of agencies and companies directly managing the resources of Washington State. The State Environmental Education Task Force and such groups as Olympic Peninsula Information Network (OPIN), Olympic Experimental State Forest, North Cascade Institute, Huxley College, and others will work with the EE Task Force to identify programs needing development.

Once the needs are identified, the program ideas can be shared with others to begin the enhancing process of current EE programs. The network loop will continue to gain momentum and build. Draw upon volunteers from the senior community to serve as mentors.

The work to accomplish the enhancement work will be contributed by participants on the task force. A coordinator should be hired to keep the work on schedule and to summarize and give a consistent direction to the work. Budget \$35,000.

Work should get underway by March 1991.

ACTION #9: Make environmental education a strong component of the learning objectives and curricula in all public schools in the state.

I. The Problem

Local school districts establish the learning goals and objectives for the public schools within their boundaries, under the auspices of the State Board of Education, and with guidance from the Office of the Superintendent of Public Instruction (OSPI). The goals and objectives - which define the main concepts and topics students at each level of schooling will be taught -- are developed by committees of local parents, teachers, and school administrators, and adopted by local school boards. They are updated every three to five years.

Packages of curriculum materials for each discipline at different educational levels are developed by various sources (e.g., OSPI, textbook companies), and adopted by local school districts as well.

Environmental education is not consistently incorporated into either the learning goals and objectives, or the curriculum packages, developed by local school districts around the state. Innovative and effective environmental education programs exist in various school systems around the state, where local teachers and/or school administrators are environmentally oriented. But such programs are not generally available.

In 1988, the OSPI produced Environmental Education Guidelines for Washington Schools. This document, which articulated an environmental education philosophy, and laid out a framework for incorporating environmental education into learning objectives and curricula in public schools, was sent to educators around the state. Despite those efforts, environmental education is rarely included explicitly in these learning objectives, for a variety of reasons:

- The State Board of Education and the OSPI do not require that local school districts include environmental education in their learning objectives and curricula.
- In general, the people at the local level who develop and adopt learning objectives and the curricula to achieve them still do not have a high level of understanding and awareness of what environmental education is, why it is important, and how it could be incorporated into learning objectives and curricula.

- There is some resistance to including environmental education explicitly into local learning objectives and curricula because: 1) environmental education is generally perceived as another separate demand on an already overburdened public school system; and 2) environmental education is considered by many to be too value-laden to be taught in an objective way in the public schools.
- Not everyone is convinced that environmental education ought to be an integral part of public education, or that it is as urgent as other items on the educational agenda. (For example, environmental education is not considered necessary to prepare students for their careers, like math and science are.)
- The resources currently available for developing and disseminating environmental education curricula materials, and offering technical assistance in how to use them, are very limited. Currently, two people within OSPI are responsible for providing technical assistance throughout the entire state.

Consequently, a state expert estimates that only about 10 percent of the public school teachers in the state are doing environmental education, and only 10 percent of those (i.e. about 1 percent of all teachers) are actually using the environmental education guidelines produced by the OSPI. As a result, only a small fraction of students in the state -- those who happen to cross paths with one of the 10 percent of teachers in the state who do environmental education -- are receiving any kind of environmental education before graduating from high school. Our public schools are graduating students with a wide range of environmental knowledge and awareness -- ranging from virtually none to quite a lot. The school system is graduating large numbers of environmental illiterates -- students who lack a solid understanding of environmental issues.

II. Proposed Action

We propose a two-tiered approach to this problem -- a "bottom-up" approach and a "top-down" approach.

The bottom-up approach consists of an extensive program to educate key educators at the local level (school administrators as well as teachers) about environmental education -- what it is, why it is important, and how it can be infused into the public school system in an effective and palatable way. The simplest and most cost-effective way to accomplish this would be to rely upon an expanded version of the existing environmental education infrastructure. Specifically, this would involve an expansion of efforts already underway in the Office of Environmental Education within OSPI. These expanded efforts would include coordinating the development of a series of handbooks describing how to incorporate environmental lessons in each discipline taught at each level of education, e.g., how to teach about the environment in kindergarten, how to teach about the environment in elementary school, in junior high school, and in high school. Each handbook would include an annotated bibliography of the resource materials available at the new Environmental Education Clearinghouse within the Department of Ecology (see description of that idea for details).

The handbooks would be developed by selected teams of teachers and environmental and natural resource managers. These handbooks would then be disseminated to local teachers and school administrators throughout the state. In addition, the Office of Environmental Education would develop and coordinate a series of workshops throughout the state to present and explain the handbooks to local educators.

The top-down approach involves establishing a statewide policy for the inclusion of environmental education in learning goals and objectives and curricula in public school programs. We recommend that the OSPI draft a statewide policy and submit that recommendation to the State Board of Education for adoption. The policy would not place specific and onerous environmental education requirements on local school districts, but it would mandate that each district include some form of environmental education, according to the guidelines established by the OSPI's Office of Environmental Education.

Specific implementation would be left to the discretion of the local districts. This mandate would be coupled with an incentives program sponsored by OSPI (e.g., an Environmental Education of the Year award).

III. Benefits

The ultimate benefit of both the top-down and the bottom-up approaches is a more comprehensive and consistent approach to environmental education in the state's public school system, which translates over the long-term into a more environmentally literate, aware, and responsible population. This benefit can be measured in specific and general ways. Specifically, using surveys like that conducted for OSPI's 1986 Status and Needs Assessment of Environmental Education in Washington, we can measure the differences in the number of schools incorporating environmental education, and the types of programs being offered, and the number of students being exposed to those programs. Over time, we can also look at changes in environmental and quality-of-life conditions and trends (as measured and described in subsequent State-of-the-Environment reports) as indirect indicators of progress in environmental education.

These benefits are not limited to students; they will be shared by everyone in the state.

IV. Costs

While implementation of the top-down approach would be essentially cost-free, the bottom-down approach would require substantial investments of time and money. A full-time project manager within OSPI's Office of Environmental Education would be needed to coordinate the development of the teacher training handbooks -- that is, to pull together teams of teachers and resource people to develop the substance, to manage the production, printing, and dissemination of the handbooks, and to organize the teacher training workshops. The production, printing, and mailing of the handbooks, and the series of teacher workshops, would require a good size budget as well. Rough estimates of costs are as follows:

- One full-time project manager \$40,000 (salary and benefits)

- Production and printing of four teacher handbooks (one each for kindergarten, elementary school, junior high, and high school) \$100,000 (\$25,000 each)
 - Expenses for eight workshops across state (e.g., facilitator, meeting rooms, training material) \$60,000
- Total \$200,000

These funds would augment OSPI's budget and would be borne by the state's taxpayers. Another possibility would be to seek corporate sponsorship of either the handbooks, the workshops, or both, which would bring down the cost to state government. A third possibility would be to produce a prototype handbook and convince a publisher to publish it, and others like it, for profit.

V. Discussion

There are no technical, legal, or institutional problems with either the top-down or the bottom-up approach. Everything proposed is technically feasible, and legal authority for environmental education exists in the state (under RCW 28A.05.010). No new institutions would be required to implement the idea. Rather, the actions described above could be implemented by expanding an existing institution, namely the Office of Environmental Education within OSPI.

There are a couple of noted political issues to consider. First, local school districts cherish and carefully guard their autonomy from the state. They will fight statewide attempts to regulate what goes on in the public schools. Therefore, the top-down approach will have to set a broad policy and encourage support for that policy through funding support and incentives, rather than impose specific requirements on local school districts. The delicacy of this issue may explain, at least in part, why such a policy has not been clearly set already.

Second, the bottoms-up approach, while perhaps more politically sensitive and sensible, is also much more costly, which is likely to make it controversial. The Governor balked this year at raising teacher salaries -- a much more basic concern for most teachers than whether or not new environmental education initiatives are funded. Also, without a mandate from the OSPI, the State Board of Education, the Governor, or the Legislature, there is no guarantee that the handbooks or the workshops will be heeded by teachers and local school administrators.

Ultimately, movement will have to come from the local districts, since that is where most of the funding comes from, and where most of the control over the school system lies. Government's role ultimately will be to support local environmental efforts with funding, technical assistance, and political support.

The bottom-up approach could be very effective, is adequately funded and well designed. This program would build upon a growing sense of urgency about environmental education throughout the state, as illustrated at the 2010 public meetings. In addition, an expanded effort by OSPI would

symbolize for teachers and school administrators government's commitment to environmental education.

Both approaches are probably necessary to achieve success. The extensive effort to provide public educators with the necessary tools for environmental education will have to be coupled with some strong direction and encouragement from the top to use them.

One key to success will be to infuse environmental education into all existing disciplinary curricula (e.g., science, math, art, civics) rather than adding it as a separate curriculum requirement. There is no room for such additions. A comprehensive infusion of environmental education - as outlined in the existing OSPI guidelines - would be a more effective approach, and would more accurately reflect the interrelatedness of environmental, scientific, economic, cultural, and social issues.

ACTION #10: Develop a teaching corps that is familiar with, and capable of delivering, effective environmental education.

I. The Problem

Only a small percentage of teachers in the state's public schools have a background in environmental education, and are themselves familiar with environmental issues. The vast majority of teachers in the state's public school system do not, and cannot, educate their students on environmental issues. Environmental education is not a part of the training that teachers typically receive before they become teachers (i.e., pre-service training) or after they become teachers (i.e., in-service training). The Huxley College of Environmental Studies, for examples, offers an environmental education course to Western Washington University students studying to become teachers. But only about 1 percent of those students take the class, largely because they are neither required nor encouraged to do so, because they do not recognize its importance, and because they have many competing training demands they must meet.

Training in environmental education is not required in the state's teacher certification standards, which are set by the OSPI and the State Board of Education. A background in environmental issues and/or environmental education is taken into account informally and inconsistently in the hiring processes of local school districts across the state.

The result is a teaching corps that, with many notable exceptions, is not well equipped to teach students about the environment. There is a wide variation in teachers' levels of understanding of, and competency in, environmental education.

II. Proposed Action

Again, we propose a two-tiered approach to dealing with this problem --a top-down and a bottom-up approach.

The top-down approach involves a requirement that teachers receive a minimal level of both pre-service and in-service training in environmental education. This requirement would be built into teacher certification standards by the State Board of Education. It would require

those institutions that train teachers to offer courses in environmental education, and it would require teachers to take those courses as part of their certification requirements.

The minimal standards would be developed by the Environmental Education Task Force, and recommended for adoption by the State Board of Education.

The bottom-up approach is essentially the same as that described under Action #8 -- it involves developing and disseminating a series of handbooks teaching teachers how to teach about the environment, and a series of training workshops to bolster those handbooks.

III. Benefits

The primary benefit of these actions is that public school teachers will be more able to teach students about the environment, which will eventually raise the level of environmental literacy in the entire state. The long-term environmental and quality-of-life benefits of this improved education are the same as those described under Action #8.

IV. Costs

The costs of the bottom-up approach are as described under Action #8. That \$200,000 effort would serve this goal as well as the ones stated earlier.

The monetary costs of the top-down approach would be minimal. There would be some costs associated with convening the Task Force to discuss and develop teacher training standards. In addition, colleges and universities eventually would have to develop environmental education programs so that students could satisfy the new certification requirement.

V. Discussion

Again, the major problems with this proposal are likely to be political/institutional. To the extent that this proposal is construed as treading upon the autonomy of local school districts, it will be controversial. Also, there is likely to be resistance, most notably from teachers themselves, to adding to certification requirements that are already perceived as onerous.

Again, though, it seems that both approaches are necessary to bring about change. While many teachers and school districts will voluntarily incorporate environmental education into their training and hiring regimes, many will not, and the inconsistent and spotty level of environmental education in public schools will continue. A mandate from on high will ensure consistency across the state. Adding a broad requirement for environmental training to the certification standards, but maintaining flexibility in terms of how that requirement is met, might breed creativity on the part of training institutions and would-be teachers, and could be a very cost-effective approach to creating change.

Environment
2010
Action
Agenda:

Action
Strategies
Background
Analyses

Package
Two:

Conservation



State of Washington
July, 1999

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Introduction to the Conservation Package

Consider this excerpt from the Vision for 2010:

The new sense of environmental awareness, knowledge, and responsibility that has enveloped the state has resulted in a new approach to natural resource management. In managing our natural resources, our focus has shifted away from sustaining our use of natural resources, and toward sustaining the resources themselves. We are driven by a new sense of stewardship -- an understanding of our role as trustees, and not owners of our natural resources. We appreciate these gifts for their intrinsic, aesthetic, and spiritual value, not just for the personal and economic gains we can derive from them. Most of all, we are driven by a powerful desire to preserve the diversity and the long-term sustainability of those resources, and thereby our quality of life, and the quality of life for generations to come.

Awareness, knowledge, responsibility, stewardship -- these are the values behind the development of an action package devoted to conservation. The overall goal of the actions in this package is to promote wiser, more efficient use of our resources and to find ways to incorporate the social costs of resource use into the decisions we all make daily at home, on the road, and in the workplace.

The conservation package is divided into three parts. Energy conservation measures are the focus of the first part. The specific goal of the measures in this first section is to promote energy efficiency and the development of renewable energy sources. The second section in the package addresses water conservation action proposals. The goal of these proposals is to increase the awareness of Washington's residents of the value of water in alternative uses and to provide an effective means to reflect this awareness in individual and corporate decisions related to water use. The final section in this package is devoted to the important issue of waste disposal. The goal of the actions in this section is twofold: to find ways to reduce the amount of waste generated in the state and to promote the recycling of materials whenever possible.

Analysts for the Conservation Package

The State Energy Office is responsible for the analyses of the energy conservation measures presented in the first section of this package. Authors contributing to this effort are Dick Byers, Jon Lesser, Linda May, and Tony Usibelli. Questions or requests for additional information can be directed to Linda May at (206) 956-2085.

Analyses of the water conservation measures are the product of Ken Slattery and Jerry Parker of the Department of Ecology's Water Resources Program. Questions about this section can be directed to Ken Slattery at (206) 459-6114.

Staff in the Department of Ecology's Waste Reduction, Recycling and Litter Control Program assembled the analyses of actions encouraging waste reduction and recycling. Analysts contributing are Cheryl Clemens, Kitty Gillespie, Peggy Morgan, and Jay Shepard. Jay Shepard [(206) 459-6302] can respond to any questions about this section.

Energy Conservation Measures

Introduction to the Energy Conservation Section

All Washington residents rely on energy in their daily lives -- for heating, for lighting, to run industrial processes, for personal mobility, and for a myriad of other services. In the years to come, the demand for these energy services will continue to grow.

There are basically two paths which can be taken to meet current and future energy needs. One approach is to rely on non-renewable energy supplies such as petroleum, coal, natural gas, and nuclear power. This approach is clearly the most costly to the environment, in terms of

Air Pollution -- Gasoline combustion in Washington's vehicle fleet is the largest contributor of criteria air pollutants in the state (56 percent of nitrogen oxide emissions, 57 percent of volatile organic compounds, and 61 percent of carbon monoxide emissions). Gasoline use and refueling also releases toxic pollutants into the air such as benzene and toluene. Stationary energy sources contribute to the air pollution problem as well, from the sulfur dioxide produced by coal-fired electric plants to the particulate emissions from woodstoves. Human health effects associated with these emissions can be as mild as headaches and dizziness or as serious as cancer. Ozone concentrations can damage trees and other vegetation. Sulfur dioxide and nitrogen oxide emissions lead to the formation of acid precipitation which has both ecological and economic ill effects.

Global Warming -- Perhaps the most insidious air pollution emissions are the concentrations of carbon dioxide (CO₂) and other greenhouse gasses which may be leading to global climate change. Fossil fuel combustion is the leading source of CO₂ emissions, and use of natural gas contributes methane as well. We are only just beginning to understand the true magnitude of the ecological damages associated with the greenhouse effect. Probable impacts include global temperature increases and sea level rise. Because of the close ties between energy use and the greenhouse effect, reductions in CO₂ emissions receive special attention in this section.

Water Pollution -- Again transportation is the major culprit. More than 98 percent of Washington's petroleum supply is delivered by tankers to Puget Sound refineries. The extensive use of petroleum to fuel vehicles leaves the state vulnerable to a major oil spill in the Sound. A large spill could cause extensive ecological and economic damage. Further human health and ecological damage stems from water pollution due to runoff from the state's many streets and highways, and from leaking gasoline storage tanks. Contamination can reach surface waters, groundwater, and drinking water supplies.

Hazardous and Nonhazardous Wastes -- Use of nuclear power leads to serious hazardous waste disposal problems which have yet to be resolved. Other resources generate wastes which may not be toxic but which still present formidable land use and waste disposal problems. For example, the Northwest Power Planning Council estimates that a typical 500 megawatt coal plant produces some 176,000 tons of solid waste per year, or roughly 25 tons per hour of operation.

Choosing to meet all of Washington's future energy demands with non-renewable energy sources will have serious environmental impacts, leading to human health, ecological, and economic damages. But there is an alternative path. The state can aggressively pursue implementation of energy conservation measures and development of renewable energy sources: solar, wind, small-scale hydropower, biomass, and geothermal. This path is much more in line with the 2010 vision for the future. Implementing the actions analyzed in this section will help move Washington down this preferred path for the future.

Actions Proposed in the Energy Conservation Section

There are eight action proposals analyzed in the energy conservation sector. The first three proposals are targeted to the largest energy user in the state: the transportation sector. The three actions proposed are an increase in new vehicle fuel efficiency standards, an increase in the state gasoline tax, and implementation of a gas guzzler/gas sipper variable registration fee program.

The residential sector is the focus of the next two analyses. The first looks at the opportunities for increased energy efficiency in manufactured homes. The second examines the effects of using an increasing block rate pricing structure for natural gas companies and for publicly-owned electric utilities.

There are large potential energy savings in the state's commercial sector -- stores, offices, state facilities, etc. The next action proposal looks at the costs and benefits of adopting the revised Model Conservation Standards for commercial buildings.

The last two proposals are more general in nature, though no less important. The first examines the possibility of a state-funded revolving loan program which could be used by businesses, industry, and local and state government agencies to fund energy conservation or development of renewable resources. The final proposal discusses the need for a comprehensive energy planning effort in the state -- one which is capable of incorporating environmental costs and benefits directly into the planning process.

A Note On The Action Proposals, Synergy, and Education

Each of the energy conservation action proposals is analyzed independently. It is important to note that implementing one proposal does not preclude implementation of other energy conservation actions. In fact, the benefits resulting from an action are likely be enhanced if several proposals are implemented simultaneously. For example, a major goal of the variable registration fee program is to encourage drivers to purchase fuel efficient cars. This program would likely be even more successful if accompanied by an increase in the state gasoline tax. As a second example, one of the actions proposed here seeks to capitalize on the large energy efficiency gains available in the commercial sector. One of the impediments which currently keeps some businesses from investing in energy efficiency is the initial capital cost, even though the efficiency measures would pay for themselves in just a few years. The availability of low interest loans to businesses -- another action proposal -- would further encourage commercial sector conservation investments. Although the complementary nature of the energy conservation measures is not incorporated into the individual action proposal assessments, this feature should not be forgotten.

The Public Advisory Committee also highlighted the importance of education to the overall success of the energy and, in fact, all of the conservation action proposals. K-12 teachings will enlighten youngsters to the importance of resource conservation efforts in all fields. In the energy conservation arena, adult education is also extremely important. Individuals must have adequate information in order for the actions proposed here to be effective. Consumers need to be aware of the energy implications of their choices when selecting a home, appliances, a car or truck, and a number of other energy services. Information must also reach business owners, manufacturers, vehicle dealers, shopkeepers, builders, architects, and lenders. Many educational materials and training courses on energy conservation topics are already available through the Washington Energy Extension Service and other programs of the Washington State Energy Office. If one of the action proposals in a different 2010 "package" is pursued, material on energy and water conservation, waste reduction, and recycling will be available through a centralized environmental education clearinghouse.

Energy and Environmental Impacts Associated With Increasing New Vehicle Fuel Efficiency Standards

Proposed Action: Work towards mandating improved new vehicle fuel efficiency standards for Washington. Two approaches can be used to achieve this mandate. The Environment 2010 action plan can be used to encourage the Washington Congressional delegation to call for higher federal Corporate Average Fuel Economy (CAFE) standards for new cars and trucks. Members of Washington's state government can also lobby the federal government for an exemption which would allow Washington to set its own stricter fuel efficiency requirements. In addition to these measures, Washington state, county, and local governments are urged to adopt a policy of buying fuel efficient vehicles for their own vehicle fleets.

Background Information

When the OPEC oil cartel flexed its supply control muscles in the early 1970s, the industrialized nations realized how vulnerable their economies had become to disruptions in the supply of oil. One federal response in the United States came in 1975, when Congress established the targets of the CAFE standards. The mandatory fuel efficiency standards coupled with high gas prices and long lines at service stations spurred vehicle manufacturers to produce progressively more fuel efficient cars. Other nations followed the United States in adopting fuel efficiency standards, leading to greater fuel efficiency abroad as well as in this country. By the early 1980s, vehicle manufacturers had boosted new passenger car fuel efficiencies to 30 mpg, and new light truck mpg approached 20.

Unfortunately, the story of the considerable success of the U.S. in insulating itself from future oil supply disruptions comes to an end in the early 1980s. Gasoline prices dropped, and a new federal administration discouraged federal intervention in the marketplace. Federal funding for independent research and development was no longer available from the Department of Energy. Two major U.S. manufacturers lobbied successfully to not only avoid higher future CAFE standards but actually managed to have the standards rolled back to levels below their current fleet efficiencies. Without the incentives of high fuel prices and federal standards, the marketplace developed a much more short run perspective. U.S. automakers shifted their attention to the larger, luxury car market and pulled funding away from designing smaller, more fuel efficient cars. Some manufacturers in the import market also began producing larger sedans for the American market. Since 1985, fuel efficiency of domestic passenger cars has increased marginally; fuel efficiencies of import passenger cars have actually decreased, and ratings for light trucks have dipped in two of the last five years. Part of the blame for this situation must be put on the American car-buying public, which shifted its demand from small, fuel efficient cars to larger, less efficient vehicles.

On the brighter side, the situation need not remain this way. The technology exists to increase new car fuel efficiencies significantly. Bleviss (1988) discusses these technologies in some detail and also notes that several high fuel economy models are in production already. These vehicles achieve city driving mpg's ranging from 45 to 59, and highway efficiencies into the 60 mpg range. It is worthy of note that, of the sixteen high fuel efficiency vehicles in production, only two are made by U.S. manufacturers (the Chevy Chevette and the Ford Escort). Another eleven car models are in the prototype phase of development, achieving up to 70 mpg in the city and over 100 mpg on the highway. Again GM and Ford have one model each in this phase.

Analysis

The impacts to gasoline consumption and production of CO₂ associated with varying future fuel economy standards is analyzed using the same vehicle stock model discussed in the gas tax analysis. The model was developed by the Oregon Department of Transportation and recalibrated to reflect the characteristics of Washington's vehicle fleet. The stock model calculates an average fuel efficiency for the existing fleet of cars based on the number of cars left in the fleet from each model year and those cars' average fuel efficiencies. The model allows the analyst to impose new car fuel efficiencies in each year up to 2010 for domestic passenger cars, import passenger cars, and light trucks. The model is then used to estimate average fleet efficiencies in future years, as new cars join the fleet and older cars retire. Using the base case analysis designed for the gas tax assessment, changes in gasoline use can be calculated by dividing estimated vehicle miles traveled by the new average fleet fuel efficiencies. The change in gasoline use is then the basis for calculating changes in CO₂ emissions.

In order to gauge the effectiveness of new fuel economy standards, one needs to know how the standards being imposed compare to the fuel efficiencies that would occur in the future in the absence of new standards. Basing estimates of future fuel efficiency trends on the historical record leads to somewhat of a problem. Projecting a change in future fuel economy based on an average increase seen in the last ten years would lead to a very optimistic future scenario. This is because the ten year average would include the very progressive increases from the early 1980s. Basing future trends on events of the last five years would yield a very pessimistic scenario, with future fuel economies hardly changing at all from their current levels. Most experts predict that the future will be some middle ground between these two scenarios, with fuel economies continuing to increase, although not at the progressive rates seen in the early 1980s (barring some unforeseen oil supply disruption). For this analysis, the very optimistic and very pessimistic scenarios are used to establish upper and lower bounds on projected future fuel economies for new cars and trucks in the absence of any changes in fuel economy standards. Since actual future conditions will most likely fall in the middle of the bounds, mean values are used in the results table. The ranges formed by the two scenarios are given as well.

This analysis considers the impacts from three possible scenarios of new fuel economy standards. The first scenario calls for a very mild increase in the fuel economy standards: 30 mpg for new domestic passenger cars; 30 mpg for new import passenger cars, and 25 mpg for new light trucks. The standards are to be in place in the year 2000, with ramp-up rates in 1994 and 1997. Automakers would be able to meet these standards with little difficulty.

Scenario Two is slightly more rigorous. Standards again set for the year 2000 call for new domestic and import passenger cars to reach 40 mpg and light trucks to reach 30 mpg. Interim benchmarks in 1994 and 1997 retain automakers' attention to their fuel economy obligations. Reaching these standards should also be feasible technologically, though not as easily as the standards of Scenario One.

Scenario Three is based on a bill that was proposed in 1984 and 1985 in the U.S. House of Representatives. The Boxer Bill called for much stricter fuel economy standards and in a shorter timeframe. The standards for domestic and import passenger cars would be 32.5 mpg in 1990; 38.0 mpg in 1992, and 45.0 in 1995. Light trucks would be expected to reach 24.5 mpg in 1990; 29.0 mpg in 1992, and 35 mpg in 1995. These measures may seem extreme in comparison to the other scenarios, yet back in the early 1980s the federal Department of Energy and Congress' Office of Technology Assessment both concluded that these goals were technologically feasible. Since new technologies have been developed since that time, Scenario Three should not be thought of as an upper bound on technical potential but rather as a more aggressive implementation strategy.

For the reader's information, the results of the analysis by year for each of the three scenarios is attached to the end of this section.

Benefits of Increased Fuel Economy Standards

Table 1 displays the impacts to gasoline consumption and to emissions of CO₂ from the three fuel economy scenarios. Even the mild fuel economy standards could result in saving 112 million gallons of gasoline every year, a decrease of five percent. The more aggressive Scenario Three would result in a 24 percent decrease in the gasoline consumed each year. By the year 2010, improved vehicle efficiency standards in Washington alone could save over twelve billion gallons of gasoline. To give some perspective on the magnitude of these savings, this is the gasoline equivalent of 545 average oil tanker deliveries to Puget Sound. It is also 1.4 times the gasoline that could be refined from the crude oil reserves estimated to be off of Washington's coast.

Table 1 also shows the corresponding reduction in carbon dioxide emissions expected to follow from the improvements in fuel efficiency and the corresponding decrease in gasoline consumption. CO₂ emissions are expected to decrease by five percent, 12 percent, and 24 percent respectively with the three scenarios.

In addition to the array of environmental benefits stemming from reduction of CO₂ emissions and gasoline savings, other benefits would accrue to Washington and elsewhere due to this action. Washington drivers are beneficiaries of greater fuel efficiency. Since vehicles would be able to go the same distances on less fuel, drivers could lower their gasoline expenditures. This offers a savings over the operating life of the vehicle and can be thought of as an offset if it happens that greater fuel efficiency increases car prices. Tables 2 through 4 detail the impacts from the three scenarios, including the range in annual savings from fewer gasoline expenditures (1988\$). Greater fuel efficiency also leaves Washington's transportation sector less vulnerable to supply disruptions or gasoline price hikes, whether from political or accidental causes.

Surprisingly, an additional beneficiary in the long run would be U.S. automakers. With the emphasis American companies have chosen to give to larger, less fuel efficient cars, an oil supply disruption and a shift in demand for more fuel efficient cars could cost U.S. automakers a large piece of their market share. While fuel efficiency standards might be costly to U.S. car manufacturers in the short run, it may allow them to be more competitive in the long run with their Japanese and European counterparts, especially if a supply disruption occurs.

A benefit of a different kind would also stem from greater fuel economy in Washington cars. In the more distant future, Washington's transportation sector may be even less vulnerable and more environmentally sound if vehicles are running on alternative fuels. However, it will take time to establish alternatively-fueled vehicles as viable in Washington, including the infrastructure necessary such as fuel stations and in terms of consumer acceptance. Having gasoline-fueled cars with greater fuel efficiency will help buy some time for this transition to occur while still reducing gasoline consumption and related environmental damage.

Costs of Improving Vehicle Fuel Efficiency

Fuel efficiency improvements are brought about by improving engine efficiency, transmission efficiency, vehicle weight, vehicle aerodynamics, tire-rolling resistance, and/or accessory (e.g. air conditioning) efficiency. Bleviss' The New Oil Crisis and Fuel Economy Technologies (Quorum, 1988) explores a large number of new technologies available in each of these areas.

Table 1. Impacts Due To Increasing New Vehicle Fuel Efficiency Standards

Impacts in Washington State	Fuel Efficiency Standards		
	Scenario	Scenario	Scenario
	One(a)	Two(b)	Three(c)
<u>Reduction in Gasoline Consumption</u>			
Change in Average Annual Consumption [millions of gallons]	112	277	552
(percentage change from state total)	(5%)	(12%)	(24%)
Range [millions of gallons]	0-224	110-443	348-756
<u>Cumulative Change in Consumption by 2010 [millions of gallons]</u>			
(percentage change from state total)	2468	6082	12152
Range [millions of gallons]	(5%) 0-4936	(12%) 2424-9740	(24%) 7664-16640
<u>Reduction in CO₂ Emissions</u>			
Change in Average Annual Emissions [millions of pounds]	2174	5357	10702
(percentage change from state total)	(5%)	(12%)	(24%)
Range [millions of pounds]	0-4347	2135-8578	6749-14655
<u>Cumulative Change in Emissions by 2010 [millions of pounds]</u>			
(percentage change from state total)	47816	117834	235447
Range [millions of pounds]	(5%) 0-95632	(12%) 46960-188708	(24%) 148489-322404

(a) Mild fuel economy standards in place by the year 2000.

(b) Higher fuel economy standards in place by the year 2000

(c) Based on the Boxer bill, more rigorous standards in place by 1995

The new approaches employ new designs, new materials such as plastics and ceramics, or other innovations and are in various stages of research, testing and implementation. Most of the listings do not include an estimate of the cost of the improvements. Cost estimates are available for some features however. Of those, some cost estimates range from \$80 to \$300 per car. Others are expected to actually decrease or not affect the price of the car. Still other innovations have more expensive components (e.g. some of the plastics) but are less expensive to assemble. All in all, there seems little reason to assume that making cars more fuel efficient will necessarily make them much more expensive. The costs and effectiveness of specific individual technologies would need to be tested for their implementation in Washington.

There is no doubt that automakers would face some costs to retool their production lines and manufacture new automobiles. It should be noted that manufacturers undergo this exercise periodically anyway (yearly for some parts, less often for engines), so only those retooling costs attributable directly to fuel efficiency measures can be characterized as the costs of new standards. Two features of new standards can help to alleviate some of the costs to carmakers. First, experience with the rush to produce fuel efficient vehicles a decade ago yielded some valuable lessons. It is apparently better in terms of cost and effectiveness to design cars to be more fuel efficient from the early stages of development than it is to make existing models more efficient. Thus having a lead time of at least a few years on a new standard gives the industry some helpful flexibility. Second, it may be that the industry experiences some returns to scale, which would lower the cost of each more fuel efficient car the more cars were made. If automakers are going to have to alter their production of cars destined for California, it may be that marginal cost savings would be possible if those same cars were going to Washington and Oregon. Better still would be savings if those cars were distributed nationally.

While it is not a given, it may be the case that the price of new vehicles will increase in response to new fuel efficiency standards. If this is the case, the increased costs will more than likely be passed on to consumers through new car prices. Consumers will have to weigh any increased initial car cost with the lower fuel costs occurring over the life of the vehicle. A simple example can illustrate this tradeoff. Isuzu is beginning to market a vehicle (the Aska) featuring an automatic transmission with a synchromesh clutch. The new transmission costs roughly one hundred dollars extra and can improve the car's average (city and highway) fuel efficiency by up to twenty percent. If the car initially registered an average mpg of 35 mpg, the new feature could improve its fuel economy to 42 mpg. Assuming that the car is driven 10,000 miles a year, its owner could save up to 48 gallons of gas every year. With gasoline currently running about \$1.00 per gallon, the more expensive transmission would pay for itself in gasoline savings in a little over two years.

Bleviss also makes a point of illustrating that three areas often considered "costs" of greater fuel efficiency are not necessarily costs in today's and tomorrow's fuel efficient cars. An issue of particular concern to Environment 2010 is that of air emissions. Some of the new engine technologies used to create greater fuel economy also result in increased emission of air pollutants such as hydrocarbons and particulates. Fortunately, technological innovations are making emission levels compatible with higher mpg. Two European manufacturers have developed ceramics-based emission control devices which can meet even California's strict emission requirements. Another approach has been to increase fuel efficiency through more complete fuel combustion, which helps avoid creation of air pollutants. Finally, cars with less weight and less aerodynamic drag can use smaller engines, which emit fewer air pollutants per vehicle mile traveled. Careful selection of which technologies receive a green light in Washington can avoid having to choose between better fuel efficiency and better air quality.

Another issue which dampened the early enthusiasm for fuel efficient cars was the question of safety. The easiest way to improve fuel efficiency quickly was to simply make cars smaller without changing their basic structure. These quick fix approaches did indeed result in a loss of

crashworthiness, as measured by the National Highway Traffic Safety Administration. However, more recent developments indicate that crashworthiness may be as much a function of structural integrity and materials strength than it is vehicle weight, and fuel efficient cars can be designed with safety in mind. For example, Volvo is in the early production stages of a car which exceeds the U.S.'s safety standards for vehicles while achieving 63 mpg city and 81 mpg highway. Safety concerns are yet another reason to give auto companies some lead time in meeting higher fuel efficiency standards.

A final area where early, particularly domestic, fuel efficient vehicles performed poorly was in terms of comfort and performance. Improvements over time have been made in these areas as well. As with all of the above improvements, the leaders in R&D and implementation of these strategies have been European and Japanese manufacturers. In summary, many of the costs associated with early attempts by manufacturers to make fuel efficient cars have been reduced or eliminated.

Summarizing the Costs and Benefits of Improved Fuel Economy Standards

The benefits of imposing new fuel economy standards either nationally or in Washington are impressive. Environmental benefits accrue due to much lower fuel consumption and fewer CO₂ emissions. Drivers gain by reducing their gasoline expenditures without sacrificing travel. And the economy gains through less vulnerability to oil supply disruptions. The technology exists to make very large improvements in fuel efficiency, without having to give up comfort, safety, and air quality. Further, new standards will encourage the domestic auto industry to adopt a longer run perspective, perhaps making it a more competitive industry in the future.

These benefits do not, however, come without some costs. The costs would initially be borne by auto manufacturers, particularly domestic automakers since U.S. companies pulled out of most of their research efforts on fuel efficiency in the mid-1980s. If meeting improved fuel efficiency standards causes the prices of new cars to rise, car buyers will bear the higher costs. The higher initial costs will be balanced by lower gasoline expenditures over the operating life of the vehicle.

Other Factors

Fuel efficiency technologies abound. Some are being implemented today, while others are still in the prototype and research phases. The bulk of the work being done to build cars with better fuel economy is being conducted outside of the United States. One technical constraint may be in acquiring and adapting available new technologies to vehicles produced domestically. One way to ease this problem in the future is for the federal Department of Energy to resume funding research projects in the U.S.

A major institutional barrier prevents Washington from setting its own standards for new vehicle fuel efficiencies. Currently a state cannot pre-empt federal law in this area. However, this situation may be changing. California has long held its own set of vehicle emission standards which are more strict than federal standards. As states begin to request the authority to exceed federal standards, the federal government may eventually allow the states more power or may see this as a signal to improve federal standards. The institutional barrier blocks immediate implementation of state fuel efficiency standards, but fighting for those standards may remove the institutional barrier in the future. No legal impediment prevents state or local government entities from adopting strict fuel economy standards when purchasing vehicles for their own fleets.

U.S. automakers will object strenuously to higher federal CAFE standards and may lobby in-state if Washington attempts to implement stricter state standards. The gasoline industry may object as well. The environmental community would likely support this action. Consumer groups may have mixed feelings, depending on the magnitude of any increase in new car prices and on the potential savings in gasoline costs.

Responsibilities

The initial responsibility of this action lies with Washington's Congressional delegation and with the governor and state legislature. If Congress adopts improved federal CAFE standards, Washington will need only worry about implementation. If Washington attempts to set its own standards, responsibility would probably rest initially on the legislature, which might shift the responsibility to the state Department of Transportation. DOT and the Energy Office would both have interests in the impacts of higher fuel efficiency standards on gasoline use and travel. The state Department of Ecology would probably also have an interest from an air quality perspective, wanting to insure that fuel economy gains were not being achieved at the expense of air quality deterioration. Adopting fuel economy standards for their own vehicle fleets would be the responsibility of state and local governments.

Additional responsibility must rest on the Washington car buying public. The success of higher fuel efficiency standards depends ultimately on people selecting fuel efficient cars and trucks when choosing new vehicles. The demand for larger, more luxurious cars is responsible in part for the current market's movement away from fuel efficiency. Consumer demand for cars with good gas mileage will greatly enhance the success of federal or state fuel economy standards.

The timing of new fuel economy standards is almost as important as the setting of the standards themselves. If the new standards require a lot of innovation on the part of manufacturers, then history suggest a lead time of several years will result in more efficient, less costly, and safer cars than imposing high standards right away. However, required implementation must not be put off for too long, or automakers may delay production.

Table 2. Fuel Efficiency Scenario One
Imposition of new CAFE standards in the year 2000, with ramp-up rates in 1994 and 1997:
Domestic and import passenger cars: 30 mpg
Light trucks: 25 mpg

Year	New Fleet Efficiency [mpg]	Improvement In Fuel Efficiency* [mpg]	Reduction in Gasoline Consumption* [million gallons]	Reduction in Gasoline Expenditures* [million 1988\$]	Reduction in CO2 Emissions* [million pounds]
1989	19.673	0.00 to 0.00	0 to 0	0 to 0	0 to 0
1990	20.330	0.00 to 0.00	0 to 0	0 to 0	0 to 0
1991	20.778	0.00 to 0.00	0 to 0	0 to 0	0 to 0
1992	21.076	0.00 to 0.00	0 to 0	0 to 0	0 to 0
1993	21.366	0.00 to 0.00	0 to 0	0 to 0	0 to 0
1994	21.698	0.00 to 0.08	0 to 8	0 to 9	0 to 149
1995	22.251	0.00 to 0.36	0 to 36	0 to 44	0 to 707
1996	22.696	0.00 to 0.62	0 to 61	0 to 76	0 to 1185
1997	23.035	0.00 to 0.90	0 to 90	0 to 115	0 to 1735
1998	23.459	0.00 to 1.28	0 to 127	0 to 168	0 to 2467
1999	23.819	0.00 to 1.63	0 to 163	0 to 221	0 to 3158
2000	24.188	0.00 to 2.00	0 to 201	0 to 280	0 to 3889
2001	24.698	0.00 to 2.47	0 to 248	0 to 355	0 to 4809
2002	25.146	0.00 to 2.91	0 to 293	0 to 431	0 to 5674
2003	25.573	0.00 to 3.32	0 to 336	0 to 508	0 to 6503
2004	25.929	0.00 to 3.68	0 to 375	0 to 584	0 to 7272
2005	26.334	0.00 to 4.06	0 to 416	0 to 665	0 to 8053
2006	26.651	0.00 to 4.37	0 to 452	0 to 743	0 to 8756
2007	26.936	0.00 to 4.65	0 to 486	0 to 822	0 to 9423
2008	27.190	0.00 to 4.90	0 to 519	0 to 901	0 to 10055
2009	27.417	0.00 to 5.13	0 to 550	0 to 982	0 to 10656
2010	27.565	0.00 to 5.27	0 to 575	0 to 1055	0 to 11140

* Range is due to optimistic or pessimistic changes in fuel economy in the absence of new standards

Table 3. Fuel Efficiency Scenario Two
 Imposition of new CAFE standards in the year 2000, with ramp-up rates in 1994 and 1997:
 Domestic and import passenger cars: 40 mpg
 Light trucks: 30 mpg

Year	New Fleet Efficiency [mpg]	Improvement In Fuel Efficiency* [mpg]	Reduction in Gasoline Consumption* [million gallons]	Reduction in Gasoline Expenditures* [million 1988\$]	Reduction in CO2 Emissions* [million pounds]
1989	19.673	0.00 to 0.00	0 to 0	0 to 0	0 to 0
1990	20.330	0.00 to 0.00	0 to 0	0 to 0	0 to 0
1991	20.778	0.00 to 0.00	0 to 0	0 to 0	0 to 0
1992	21.076	0.00 to 0.00	0 to 0	0 to 0	0 to 0
1993	21.366	0.00 to 0.00	0 to 0	0 to 0	0 to 0
1994	21.784	0.00 to 0.16	0 to 16	0 to 19	0 to 317
1995	22.666	0.00 to 0.78	0 to 77	0 to 93	0 to 1492
1996	23.406	0.00 to 1.33	0 to 127	0 to 159	0 to 2466
1997	24.089	0.12 to 1.96	11 to 185	14 to 238	210 to 3593
1998	25.025	0.61 to 2.85	51 to 265	68 to 349	996 to 5133
1999	25.849	0.98 to 3.66	81 to 337	110 to 457	1567 to 6529
2000	26.727	1.39 to 4.54	111 to 412	154 to 575	2143 to 7991
2001	27.945	2.05 to 5.72	156 to 507	224 to 727	3029 to 9831
2002	29.037	2.58 to 6.80	189 to 593	279 to 873	3669 to 11486
2003	30.063	3.01 to 7.81	213 to 672	322 to 1017	4130 to 13020
2004	30.956	3.31 to 8.71	228 to 743	354 to 1157	4408 to 1E+05
2005	31.905	3.55 to 9.63	236 to 814	378 to 1302	4575 to 15777
2006	32.680	3.67 to 10.40	238 to 877	391 to 1442	4610 to 16996
2007	33.378	3.69 to 11.09	234 to 936	396 to 1582	4535 to 18139
2008	34.000	3.62 to 11.71	225 to 992	391 to 1722	4358 to 10211
2009	34.553	3.46 to 12.26	211 to 1044	377 to 1864	4088 to 20223
2010	35.925	4.09 to 13.63	240 to 1140	440 to 2094	4643 to 22096

* Range is due to optimistic or pessimistic changes in fuel economy in the absence of new standards

Table 4. Fuel Efficiency Scenario Three
Imposition of new CAFE standards based on the Boxer Bill, as introduced in the U.S. House of Representatives, 1984 and 1985:
Domestic and import passenger cars: 32.5 mpg in 1990; 38.0 mpg in 1992; 45.0 mpg in 1995
Light trucks: 24.5 mpg in 1990; 29.0 mpg in 1992; 35 mpg in 1995

Year	New Fleet Efficiency [mpg]	Improvement In Fuel Efficiency* [mpg]	Reduction in Gasoline Consumption* [million gallons]	Reduction in Gasoline Expenditures* [million 1988\$]	Reduction in CO2 Emissions* [million pounds]
1989	19.673	0.00 to 0.00	0 to 0	0 to 0	0 to 0
1990	20.527	0.12 to 0.20	13 to 21	13 to 22	243 to 400
1991	21.723	0.76 to 0.95	74 to 93	80 to 101	1434 to 1809
1992	22.845	1.42 to 1.77	133 to 168	148 to 188	2568 to 3255
1993	24.337	2.41 to 2.97	211 to 267	242 to 306	4093 to 5170
1994	25.699	3.27 to 4.08	269 to 349	318 to 412	5220 to 6763
1995	27.230	4.23 to 5.34	332 to 441	403 to 535	6434 to 8544
1996	29.126	5.59 to 7.05	403 to 542	503 to 676	7811 to 10503
1997	30.709	6.74 to 8.58	463 to 637	593 to 817	8966 to 12349
1998	32.145	7.73 to 9.97	508 to 722	670 to 951	9843 to 13980
1999	33.405	8.54 to 11.22	543 to 799	735 to 1082	10514 to 15476
2000	34.565	9.23 to 12.37	568 to 870	791 to 1212	11005 to 16854
2001	35.721	9.83 to 13.50	585 to 937	838 to 1341	11344 to 18146
2002	36.739	10.29 to 14.50	596 to 999	877 to 1471	11544 to 19361
2003	37.662	10.61 to 15.41	600 to 1059	907 to 1602	11619 to 20509
2004	38.433	10.79 to 16.19	597 to 1113	929 to 1732	11566 to 21563
2005	39.305	10.95 to 17.03	591 to 1169	945 to 1869	11449 to 22651
2006	39.780	10.77 to 17.50	573 to 1213	943 to 1993	11111 to 23497
2007	40.192	10.51 to 17.91	553 to 1255	934 to 2121	10714 to 24317
2008	40.447	10.07 to 18.16	526 to 1292	913 to 2245	10185 to 25039
2009	40.672	9.58 to 18.38	496 to 1329	886 to 2374	9618 to 25754
2010	40.867	9.03 to 18.58	465 to 1366	854 to 2508	9011 to 26465

* Range is due to optimistic or pessimistic changes in fuel economy in the absence of new standards

Energy and Environmental Impacts Associated With Increasing the State Gasoline Tax

Proposed Action: Increase the state gasoline tax.

Background

Washington drivers currently pay two fuel taxes when filling up their vehicles. The federal government assesses a 9.1 cent tax per gallon of gasoline; the state tax per gallon is 23 cents, including the recent five cent increase.

The rationale for the proposal of an increased gas tax rests on the proposition that drivers do not incorporate the true costs of their travel into their traveling decisions. For example, drivers may not consider the burden their additional vehicles place on the transportation infrastructure or the air pollution they are imposing on society by driving. One way to get drivers to give more consideration to the costs they impose on society by driving is to make driving more expensive. Increasing the gasoline tax is a way to increase the cost of each vehicle mile traveled, while at the same time generating revenue which can be used by the state to address some of these driving-related social costs.

Analysis

Assessing the impacts of an increase in the gas tax is a two-step process. First, a base case is established from which to gage changes due to the tax increases. The base case calculations include projections of fleet size, per capita income, and gasoline prices through the year 2010. Projections of fleet size are from the Washington State Department of Transportation. Gas price projections are based on the medium-high petroleum price forecast of the Northwest Power Planning Council. The Economic and Revenue Forecast Council for the State of Washington provides information on projected per capita income levels. Projected vehicle miles traveled (VMT) is then estimated for each year up to 2010 using a model which expresses VMT as a function of the price of gasoline, per capita income, and the size of Washington's fleet of passenger cars and light trucks.

Another important component of the base case analysis is estimation of the gasoline use associated with vehicle miles traveled. How much gasoline these vehicles burn depends on the fuel efficiency of the vehicles in the fleet. A stock model for Washington's fleet of vehicles was developed by recalibrating a model developed by the Oregon Department of Transportation. The model allows for the projection of the average fuel efficiencies of new model year passenger cars (domestics and imports) and light trucks for every new model year up to 2010. The model yields an estimate of fleet average fuel efficiency for every year based on the age mix of the vehicles left in the fleet. As a rule, average fleet efficiency tends to increase over time as older, heavier, less fuel efficient cars drop out of the fleet.

Average fuel efficiency of new passenger cars and trucks tended to increase in the late 1970s and early 1980s, largely in response to higher gasoline prices and mandatory federal fuel economy standards. However, with the rollback of the federal fuel economy standards in 1986, 1987 and 1988, and a decrease in gas prices, manufacturers and car buyers had less incentive to invest in highly fuel efficient vehicles. The average fuel efficiency of new import passenger cars peaked in 1983 and has declined or stayed roughly the same in the years since. New light trucks have

shown a decrease in average fuel efficiency in two of the last five years. This change in trend over the last decade makes it somewhat difficult to predict how new vehicle fuel efficiencies should be projected into the future. To be on the safe side, two scenarios are considered in the base case, resulting in a range of future gasoline use. The optimistic scenario is based on the possibility that new vehicle fuel efficiencies will continue to increase at the average annual rate of the last ten years. The more pessimistic scenario is that fuel efficiencies will remain at roughly their 1990 levels. The majority of projections for future fuel economies see a slight increase over current levels but not to the extent seen in the last decade, barring some unforeseen event such as another oil embargo. The bounds created by use of the optimistic and pessimistic scenarios should, then, contain accurate future values for quantities of gasoline consumed.

The final portion of the base case analysis is to establish a base level of environmental pollution associated with the model projections. It is not possible to quantify all of the environmental threats associated with the base case. For example, some unquantified risk is associated with the increasing deliveries of petroleum to Puget Sound refineries by tankers as gasoline demand increases over time. However, it is possible to estimate the quantities of some of the air pollutants associated with vehicle use, based on the estimates of vehicle miles traveled and gasoline consumption. The base case includes estimates of emission levels for the greenhouse gas carbon dioxide and the criteria air pollutants carbon monoxide, hydrocarbons, and nitrogen oxides. Carbon dioxide emissions are estimated as a function of gasoline use, while the criteria pollutant emissions estimates vary with the number of vehicle miles traveled. Estimates for the emissions of the criteria pollutants per VMT are from EPA's MOBILE4 model and assume that no vehicle inspection and monitoring program is in operation.

The second step of the process used to analyze the effects of increasing the gas tax is to introduce changes in the price of gasoline into the model used to estimate VMT. The changes in vehicle miles traveled lead to changes in gasoline use, and the two effects lead to changes in estimated air pollution emission levels. This analysis considers three possible increases in the Washington state gas tax: 25 cents per gallon, 50 cents per gallon, and one dollar per gallon.

One additional note should be made about the model used in this analysis. The purpose of using this model is to give some idea of the direction and the magnitude of the impacts associated with these gas tax increases. The results from the model are consistent with projections available from other sources for factors such as VMT, gasoline use, gasoline prices, etc., for the next few years. However, in the longer run, one would expect sustained higher gas prices to encourage people to buy more fuel efficient cars. While some of this effect is captured by the optimistic scenario for future fuel efficiencies, fleet fuel efficiency is not a separate variable in the estimation of VMT. In short, the accuracy of the results of the model probably decline for the years further in the future. Also, this analysis is not intended in any way to substitute for the fiscal analysis performed by the Department of Transportation for a gas tax proposal.

Benefits of Increasing the Gasoline Tax

An increase in the price of gasoline leads to a reduction in the number of vehicle miles traveled by Washington drivers. This in turn leads to conservation of gasoline and a host of environmental benefits.

Table 1 depicts the predicted changes in vehicle miles traveled and fuel consumption resulting from the new tax policies. The highest gas tax considered leads to a decrease in VMT of five percent annually, a reduction of over 59 billion miles traveled by 2010. This translates into a savings in gasoline use of 2.3 to 2.7 billion gallons by 2010, with the range defined by the optimistic and pessimistic assumptions concerning future fuel efficiencies. Even the smaller

Table 1. Predicted Impacts from Higher Gasoline Taxes: Changes to Vehicle Miles Traveled and Gasoline Consumption

	Size of Gasoline Tax Increase		
	\$0.25/gal	\$0.50/gal	\$1.00/gal
<u>Impacts due to Tax Increase</u>			
<u>Reduction in Vehicle Miles Traveled</u>			
Change in Average Annual VMT [millions of miles]	675	1351	2701
(percentage change from state total)	(1.2%)	(2.5%)	(5.0%)
Cumulative Change in VMT by 2010 [millions of miles]	14859	29717	59431
(percentage change from state total)	(1.2%)	(2.5%)	(5.0%)
<u>Reduction in Gasoline Consumption</u>			
Change in Average Annual Consumption [millions of gallons]	27 - 31	54 - 62	108 - 124
(percentage change from state total)	(1.2%)	(2.5%)	(5.1%)
Cumulative Change in Consumption by 2010 [millions of gallons]	596 - 682	1192 - 1363	2383 - 2726
(percentage change from state total)	(1.2%)	(2.5%)	(5.1%)

(\$.25/gal) tax level leads to an annual savings of 27 to 31 million gallons of gasoline. Again depending on future fuel efficiencies, this results in a cumulative savings of 596 to 682 million gallons of gasoline by 2010.

The reduction in vehicle miles traveled and gasoline use will mean less atmospheric contamination. Table 2 provides estimates of the reductions in emissions of three of the criteria air pollutants plus reductions in production of the greenhouse gas carbon dioxide resulting from the different gas tax levels. The \$.25/gallon tax yields a reduction of emissions in the various air pollutants of 1.0 to 1.3 percent. The percentage estimates hold for the average annual emission levels and for the cumulative total. At the \$1.00/gallon tax level, the magnitude of the percentage reduction increases to roughly five percent. In physical terms, the air pollution reductions seem even more impressive. For example, the \$1.00/gallon tax results in an average annual reduction of 2.1 to 2.4 billion pounds of CO₂.

Other environmental benefits would follow from the reduction in vehicle miles traveled and gasoline consumption. Pollutant loadings on streets and highways would be reduced, reducing the threat of water pollution from runoff. Cutbacks in petroleum demand also reduce the need for leaking gasoline storage tanks and deliveries of oil by tanker into Puget Sound. Further environmental benefits could arise from the pricing signals sent by the increased gasoline tax. Making it more expensive to operate a personal vehicle encourages ride-sharing and adoption of mass transit opportunities. And as was demonstrated in this country in the days of long gas lines, making gasoline more difficult to purchase is an excellent incentive for development of fuel efficient vehicles. It is not a coincidence that the leaders in designing and implementing new fuel efficiency technologies are in countries where the price of gasoline is several times the price paid by Washington drivers.

There are additional benefits beyond environmental risk reduction which would accompany an increase in the state gas tax. The most obvious one is the accrual of state revenues. The imposition of a higher gas tax is estimated to generate from \$537 to \$647 (1988\$) million annually in new state revenues, depending on the level of the tax increase and again on what happens to vehicle fuel efficiencies in the future. These new revenues would give the state an opportunity to invest in new environmental mitigation efforts or other worthy causes. The new tax revenues would also allow the state to address any equity problems stemming from the tax increase. A further benefit to the region as a whole is in terms of energy security. Less direct dependence on large quantities of gasoline leaves the area less vulnerable to oil supply disruptions and associated price shocks, be they from political actions from parties such as OPEC or from accidents such as the spill in Prince William Sound. This latter benefit is especially important to Washington since there is no oil production in the state; the state's entire oil supply is imported.

Costs from Increasing the Gasoline Tax

The costs of the gas tax are borne directly by the drivers of Washington's vehicle fleet. In 1990, Washington DOT expects the state's fleet of privately owned passenger cars, buses, and light trucks to number over four million. A proportionally larger share of the costs of a gas tax are borne by individuals whose vehicles consume more gasoline. Higher consumption rates may be due to an obligation or a preference to drive more miles. It may also be due to use of a vehicle with low gas mileage. Many of the cars with low gas mileage are older, heavier cars that can be purchased at a low price, perhaps the only cars that a person with a lower income can afford to buy. This raises important equity questions about unfairly burdening low income persons with higher gasoline prices. The state could use some of the revenues from the gas tax to address any inequities, such as providing inexpensive mass transit opportunities in low income

Table 2. Predicted Impacts From Higher Gasoline Taxes: Changes in CO2 and Criteria Air Pollutant Emissions

	Size of Gasoline Tax Increase		
	\$0.25/gal	\$0.50/gal	\$1.00/gal
<u>Impacts Due to Tax Increase</u>			
<u>Reduction in CO2 Emissions</u>			
Change in Average Annual Production [millions of pounds] (percentage change from state total)	525 - 600 (1.0%)	1049 - 1200 (2.5%)	2099 - 2401 (5.0%)
Cumulative Change in Emissions by 2010 [millions of pounds] (percentage change from state total)	11544 - 13206 (1.0%)	23807 - 26410 (2.5%)	46172 - 52817 (5.1%)
<u>Reduction in CO Emissions</u>			
Change in Average Annual Emissions [million grams] (percentage change from state total)	17738 (1.3%)	35473 (2.5%)	70943 (5.1%)
Cumulative Change in Emissions by 2010 [million grams] (percentage change from state total)	390227 (1.3%)	780401 (2.5%)	1560750 (5.1%)
<u>Reduction in Hydrocarbon Emissions</u>			
Change in Average Annual Emissions [million grams] (percentage change from state total)	2079 (1.3%)	4158 (2.5%)	8315 (5.1%)
Cumulative Change in Emissions by 2010 [million grams] (percentage change from state total)	45739 (1.3%)	91472 (2.5%)	182938 (5.1%)
<u>Reduction in NOx Emissions</u>			
Change in Average Annual Emissions [million grams] (percentage change from state total)	1357 (1.3%)	2749 (2.5%)	5498 (5.1%)
Cumulative Change in Emissions by 2010 [million grams] (percentage change from state total)	30241 (1.3%)	60478 (2.5%)	120952 (5.1%)

neighborhoods. However, the state would want to be careful to work towards finding less costly ways for low income persons to be mobile, rather than simply subsidizing use of cars with poor fuel efficiency.

The cost of a gas tax to an individual driver will depend on the number of miles the vehicle is driven and on the vehicle's fuel efficiency. Assuming that a car is driven an average of 10,000 miles per year, a car with a fuel efficiency of 25 mpg uses some 400 gallons of gasoline each year. The driver would pay \$100, \$200 or \$400 dollars annually in new gas taxes for the \$.25, \$.50 and \$1.00 per gallon tax increases, respectively. However, if the driver had a more fuel efficient vehicle that got 40 mpg, the annual tax payments reduce to \$62.50, \$125 and \$250 respectively for the three tax levels. The advantages of driving a more fuel efficient car are obvious.

Summarizing the Benefits and Costs of a Gas Tax

Increasing the state gasoline tax would achieve the desired goals of gasoline conservation, and a reduction in production of criteria air pollutants and of the greenhouse gas CO₂. Other benefits, both environmental and otherwise, would follow as well. The magnitude of the fuel use reduction, the environmental benefits, and the revenues raised by the state depend on the level of the tax increase imposed. The costs are borne by Washington drivers and are felt each time a driver buys a gallon of gas. Those whose vehicles use more gas pay more of the costs, which could place undue burden on low income persons who can only afford less fuel efficient cars. New state revenues from the gas tax could be used to ease any such equity problems as well as for new investments in environmental quality.

Other Factors

There are no technical or legal impediments to increasing the state gas tax, nor is there much doubt that increasing fuel prices leads to the effects described above. The question is almost wholly a political one. It has been an uphill, multi-year battle to get a gas tax increase passed at a level much lower than the levels analyzed here and for a much different purpose than to improve environmental quality. Those who bear the costs -- people who buy gas -- are also people who vote in elections and may be sensitive to another tax increase. On the other hand, the need for a higher gas tax as part of the solution to the state's air quality problems was an idea heard frequently at the 2010 town meetings.

Roles and Responsibilities

Mandating a gas tax increase would be the responsibility of state legislators and the governor. Other participants could bolster the beneficial effects of a gas tax, for example, communities could be on guard to identify any serious equity problems appearing in their areas, and individuals could lessen the costs they face per fill-up by choosing to use more fuel efficient cars.

Many agencies would have an interest in following this action, including the Department of Transportation, the Department of Ecology, and the Energy Office.

Gas Guzzler / Gas Sipper Variable Vehicle Registration Fees

Proposed Action: Establish a variable registration fee for passenger cars and light trucks based on a vehicle's relative fuel efficiency. A variable registration fee program such as this would reward consumers who choose to purchase relatively fuel efficient cars and charge consumers who buy gas guzzling cars for some of the additional costs their choices impose on society.

Background

A number of environmental and energy security benefits flow from substituting fuel efficient vehicles for inefficient, gas-guzzling cars and trucks. The energy security benefits were illustrated dramatically during the oil embargo of 1973 and 1974. Fuel scarcity, long gas lines, and high prices stimulated national interest in increasing the mpg performance of our country's vehicle fleet. Congress acted on this heightened concern in 1975 with the Energy Policy and Conservation Act. The Act called for establishment of national fuel economy standards for new cars and light trucks. Automakers responded to the economic and regulatory incentives by producing vehicles with significantly improved fuel efficiency.

Declining gasoline prices and changing administrations has since left a void in federal promotion of the importance of vehicle fuel efficiency. The national average fuel economy standards were relaxed in 1986, 1987, and 1988 and have only recently been boosted to their mid-1980s levels. At a time when the U.S. is returning to dependence on foreign oil supplies, states are seeing further air quality deterioration, receiving greater responsibility for transportation policy, and exploring strategies to reduce global climate change. In the absence of federal leadership, some states (notably Massachusetts and New York) are exploring the options for filling the void by aggressively promoting fuel efficiency improvements. States are preempted by federal law from setting their own average fuel economy standards and so must look to other creative options. The variable gas guzzler/gas sipper registration fee is one such option.

A fuel efficiency based registration fee program can be tailored to meet the individual needs of a state. A state may want to make the program revenue neutral, with the extra charges made to gas guzzler purchases paying for the bonuses received by buyers of fuel efficient cars. Alternatively, a state may want to use the program to generate revenue as well as to promote the purchase of fuel efficient cars. The new source of revenue could go towards a number of worthy causes, e.g. to fund other efforts to reduce transportation-related environmental threats.

In designing a variable fee program, state policy makers will need to determine which vehicle registrations are to be subject to the variable fee schedule. They may want to restrict the variable fee to first-time registrations of new vehicles. This would in essence add a form of sales tax (or possibly a rebate) to the purchase price of new cars in Washington. A modification of this proposal is to apply the variable fee schedule to new Washington registrations rather than only to new car purchases. Either way, the variable fee would be a one-time-only reminder of the costs and benefits of selecting a relatively fuel efficient car.

An alternative approach is to apply the variable fee schedule to Washington vehicle registrations each year as registrations come up for renewal. Such a program could begin with a given model year (e.g. 1992 cars) or could be applied retroactively. An obvious advantage in broadening the scope of the program is that the incentive to drive a fuel efficient car reaches more drivers, and, under one option, owners are reminded of the incentive with every registration renewal. The problem with applying the variable fee schedule to anything but new purchases is that it touches

owners who made model selections in the absence of the economic incentive. A program could also be designed to exempt certain vehicles, e.g. certain types of farm equipment.

The proposal currently under consideration in Massachusetts provides an illustration of how a variable fee program might work. The designers of the Massachusetts proposal wanted to establish both a penalty for those who buy gas guzzlers and a reward for consumers who buy relatively efficient cars. The target of the program is new car and truck purchasers. The Massachusetts program is designed to be revenue neutral.

Under the Massachusetts' proposal, passenger car and light truck models are sorted by EPA size class. In this way, vehicles only compete in terms of relative fuel efficiency within their own size class. Massachusetts' regular five percent sales tax is replaced with a sliding scale tax rate ranging from zero to ten percent. If a vehicle's fuel performance is worse than average in its class, the buyer pays a tax rate from six to ten percent. If a car has better than average mpg for its class, the buyer pays from zero to four percent -- less than the regular five percent sales tax. The program is designed to raise the same revenue as if each car were assessed a five percent sales tax. The program includes special provisions to account for vehicles operating on alternative fuels.

Benefits of a Variable Registration Fee Program

A variable registration fee program would produce a number of benefits. Total gasoline consumption and the many environmental threats associated with this fuel use could be reduced substantially under such a program. To see this, consider the following hypothetical example. Supposed that the proposal increased the overall fuel efficiency of the vehicle stock by one mile per gallon in the year 2010, from a fleet average of 25 mpg to 26 mpg. The state Department of Transportation estimates that there may be six million cars by the year 2010. Assuming that the average vehicle is driven 10,000 miles per year, even this relatively small improvement in fleet fuel economy could save over 90 millions gallons of gasoline in a single year. Since each gallon of gasoline used results in almost 20 pounds of CO₂ emitted to the atmosphere, this one mpg increase could result in some 1.8 billion fewer pounds of CO₂ emissions in the year 2010 alone. An aggressive variable fee program could probably yield greater fleet efficiency gains than one mile per gallon.

Consumers who choose fuel efficient cars are another set of beneficiaries of a variable fee program. In addition to receiving a gas sipper rebate or paying no additional fee, they also enjoy the lower costs which fuel efficiency offers over the life of the vehicle.

The state may be a third beneficiary of a variable fee program. Depending on the design of the fee schedules, the program may be a revenue-generator for the state. While the state has many worthy avenues for additional revenue, it may want to target this source to the transportation sector. In this way, individuals who choose to buy gas guzzling cars will help to mitigate some of the transportation-related environmental problems they are contributing to.

The effectiveness of a variable fee program will depend on a number of factors. One major factor will be the design of the program itself and the number of drivers it reaches. Other factors include the sensitivity of consumers to vehicle price differentials, the magnitude of the fees and rebates, the turnover rate in the vehicle fleet, and any impacts to the designs and/or markets for vehicles. The turnover rate in the vehicle fleet is important since the fuel efficiency benefits would accumulate gradually over time as the existing stock is replaced by more efficient vehicles. The effectiveness of the program will be reduced if drivers have a large economic incentive to hang on to older, less efficient cars. On the other hand, experience with the federal gas guzzler tax suggests that relatively small fees exert little influence on the purchase decision

of consumers. The federal gas guzzler tax has been applied primarily to a limited number of luxury and high performance automobiles. The tax increases to a maximum level of \$3,850. In the 1989 model year, the maximum fee was applied only to Aston-Martin and selected Rolls-Royce models. Since the prices of these vehicles are generally above \$100,000, it is doubtful that purchasers consider the gas guzzler tax in their model choice. Also, since the number of these vehicles purchased is extremely small, the overall impact on gasoline consumption has been negligible. Policy designers will need to be sensitive to a number of possible consumer reactions when tailoring a program to Washington's goals and conditions.

Costs of a Variable Fee Program

The direct costs of a variable fee program would be borne by consumers who choose to use gas guzzling vehicles. If the program is designed to be in effect retroactively, the fees would apply to some percentage of Washington's four million vehicle owners (perhaps six million by 2010). If the program is targeted to new car purchases only, increased fees would be paid by some percentage of Washington's 250,000 new car and light truck buyers. Only buyers who select relatively inefficient cars in their chosen size class would be assessed an additional fee.

The administrative costs associated with this proposal would probably be small. Information on vehicle fuel efficiencies and size class categorizations is already available from the EPA. Variable fee schedules for each class could be developed fairly easily by either the Department of Licensing, the Department of Transportation, or the Energy Office, once the goals and the targets of the program have been clearly defined. Additional effort would be required to convey information on the different fees to car buyers. One possible method for doing this would be to attach the variable fee rate to new cars and trucks in conjunction with the fuel economy information already required by the EPA.

Three concerns often arise as other potential costs of a variable registration fee program. Fortunately, careful program design can mitigate most of these concerns. One reservation expressed about such a program is that it may discriminate against those who, because of income constraints or family needs, need to buy large cars. This problem is largely alleviated by basing the fees on a car's efficiency performance relative to others in its same size class. By taking this approach, anyone who needs or wants a large car is not penalized so long as that person chooses a relatively efficient model from among the large size class. Further, if the program is restricted to new car purchases, those who would ordinarily be unable to purchase a new car due to income constraints would be insulated from the effects of the new registration fees. The variable fee program could, in fact, be designed to help alleviate the equity problem now faced by those whose income limitations force them to buy larger, gas guzzling cars. The variable fee program could make some fuel efficient cars more affordable (e.g. because of reduced registration fees or a rebate), offering individuals with lower incomes the benefit of a lower purchase price as well as the added savings from lower fuel costs over the lifetime of the vehicle.

A second concern sometimes expressed is that a variable fee program would encourage the purchase of foreign imports at the expense of domestically produced cars and trucks. Work done in preparation for the Massachusetts proposal indicates that this likely would not be the case, again because the fees are assigned within a specific vehicle size class. Massachusetts reports that, while foreign cars have better fuel efficiency than many American-made cars in the subcompact size class, the reverse is true in most of the larger size classes.

A final concern is that a higher registration fee on gas guzzlers would encourage consumers to buy these inefficient cars out of state to avoid the extra fee. Fortunately, Washington already has mechanisms in place to discourage such behavior since our neighboring states have lower sales tax rates. Currently, if a Washington resident buys a car out of state and attempts to register it in

Washington, the owner must pay a "use tax" of 2.54 percent of the purchase price of the car. Since the variable fee program proposed here is part of the registration fee itself, it is unlikely that consumers would be able to avoid it even if they purchased cars out of state.

Summarizing the Benefits and Costs of This Action

A variable registration fee program is a viable option in Washington to encourage residents to purchase fuel efficient cars and trucks. Benefits accrue to all the residents in the state in terms of reduced fuel consumption and a reduction in the energy security and environmental threats associated with that consumption. The latter includes air pollution, water pollution, risk of accidental oil spills, and global climate change. Consumers who choose fuel efficient cars benefit through lower registration fees and lower fuel costs over the life of the vehicle. State government may also benefit if the program is designed to generate revenue. The costs of such an action fall upon those who choose to buy gas guzzling cars. *Note that consumers are not prohibited from making this choice; they are merely expected to contribute additional fees to reflect the extra cost their choice imposes on others.*

Other Factors

There are no technical impediments to implementing a variable fee registration system. There may be opposition from those who sell vehicles (particularly gas guzzler vehicles) and from those who sell gasoline. On the other hand, dealers who offer relatively fuel efficient cars may actively support the proposal. Consumers may have mixed sentiments as well, depending on individual preferences for fuel efficient or gas guzzling cars and trucks.

Roles and Responsibilities

If the program is designed such that a new registration fee is considered a new tax, legislative action may be called for. Implementation of this proposal would likely be coordinated by the Department of Licensing and the Department of Transportation. The Department of Revenue may choose to be involved depending on the design of the program.

Implementation of this action could proceed as soon as the goals and the targets of the program are clearly identified. It might be best to start this action at the beginning of a new vehicle model year.

Environmental and Energy Benefits of Improved Insulation in Manufactured Homes

Proposed Action: Improve the energy efficiency of manufactured homes.

Improving the insulation in manufactured homes (mobile homes) sited in Washington offers an opportunity to achieve significant energy efficiency gains. Because the energy efficiency standards to which these homes are built fall under federal rather than state jurisdiction, achievement of these energy efficiency and related environmental benefits cannot be accomplished through simple state regulation. Strategies must rely on influencing the market place for these homes and exercising political influence over the federal rule-making which establishes federal manufactured housing energy efficiency levels.

The following actions will further the accomplishment of energy efficiency in new manufactured homes.

1. Provide marketplace incentives for the buyers of new manufactured homes to choose energy efficient models.
2. Work with the manufacturers and dealers of manufactured homes to incorporate energy efficiency into their sales and marketing strategies.
3. Encourage electric utilities to enact energy efficiency hook-up standards and charges for new manufactured homes
4. Participate actively in the review of federal Department of Housing and Urban Development rule-making on the establishment of nation-wide energy efficiency standards for manufactured housing.

Background

The Manufactured Housing Stock

Slightly more than 5000 new manufactured homes (mobile homes) were added to Washington's single family housing stock during 1988. This represents approximately 20 percent of the new single family homes added to the state during 1988 (if manufactured homes and site-built homes are combined) and nearly 37 percent of new electrically heated homes. During the decade of the 1980s the manufactured housing proportion of total single family housing stock grew from 7.5 percent to 10.2 percent. Since nearly all manufactured homes are electrically heated, their proportion of the electrically heated housing stock is growing at an even greater rate.

As the proportion of the housing stock these homes represent increases the additional load placed on Washington's electricity supply system will grow as well.

The manufactured housing industry is represented in Washington by three major manufacturers: Fleetwood, Moduline and Glen River. All three have manufacturing facilities within the state and market their units both inside Washington and in other states.

Status of Codes and Regulations

The energy efficiency standards (e.g. insulation levels) required of new manufactured homes do not fall under the jurisdiction of the state and consequently are not regulated by the state's

residential energy code. Rather, the standards are set by the federal Department of Housing and Urban Development (HUD). This is because units are not necessarily manufactured in the state in which they are eventually sited. Consequently, inter-state commerce is involved, and the federal government sets the standards.

In 1987 Congress directed HUD to review and revise the manufactured housing energy efficiency standards. HUD is currently involved in rule-making in response to this direction. A draft rule is expected to be released for public comment sometime during 1990.

Table 1 lists the nominal insulation levels for standard manufactured homes built under the current HUD regulations and the nominal levels for site-built electrically heated homes falling under the jurisdiction of the Washington State Energy Code (WSEC). The WSEC insulation levels are roughly equivalent to the Bonneville Power Administration's (BPA) Super Good Cents (SGC) insulation levels.

Table 1. Nominal insulation levels for standard manufactured homes and the 1990 Washington State Energy Code prescriptions for electric resistance heated site-built homes. (R-value)

<u>Building Component</u>	<u>Manufactured Home</u>	<u>WSEC(1)</u>
Ceilings	11 to 14	38
Walls	11	19(24)
Floors	11	30
Windows	1.1 to 1.3	2.5

1 - figures in () represent requirements for colder areas of Eastern Washington

Clearly, standard manufactured homes are poorly insulated when compared to site-built homes in Washington.

All three of the manufacturers in Washington offer homes that are substantially better insulated than the minimum HUD standards require. In fact, packages have recently become available insulated to levels roughly equivalent to the WSEC. These energy efficient models have been developed in response to the BPA's Super Good Cents program. In 1989, sales of these homes represented about six (6) percent of total units sold.

BPA support for energy efficiency in manufactured housing began in 1988. As a part of the SGC program, BPA's support consists of technical assistance to manufacturers in designing and constructing energy efficient models, purchase incentives of 2000 to 3000 dollars for buyers of models that meet SGC efficiency requirements, marketing assistance to dealers and manufacturers, and research to establish cost and performance for these models. This support is largely delivered through electric utilities and is limited to those who are eligible and choose to participate in BPA's SGC programs. Nearly all public utility districts (PUD) participate. The eligibility of the investor-owned utilities (Puget Power, Pacific Power and Light, Washington Water Power) depends on the degree to which they are customers for BPA wholesale electricity. The BPA program is slated to continue through the mid 1990's.

One PUD has recently enacted a utility hookup charge which depends on the energy efficiency of a new manufactured home. The utility charges \$2000 to hookup a home that does not meet the SGC efficiency standards. This amount is roughly equivalent to the cost the utility will have to bear to supply the electricity necessary to meet the needs of a poorly insulated home over its lifetime. Energy efficient manufactured homes are not charged this \$2000 fee for hook-up and, because the PUD receives BPA SGC support, the buyers of these homes receive a \$2000 grant.

Analysis

Energy savings potential is estimated from computer simulations of space heating performance under typical annual weather conditions. Computer programs used are the same as those used to assess the cost-effectiveness of the new state energy code and have been tested against monitored data by WSEO, BPA, the Northwest Power Planning Council and the University of Washington. In all cases they have been found to be adequate for estimating typical space heat performance. Estimates of average space heat savings for large sets of homes are accurate to within 10 percent.

Table 2 presents the estimated annual space heating energy use for manufactured homes insulated to HUD standards and for those insulated to levels equivalent to the new WSEC. These estimates assume that space heating is accomplished at 100 percent efficiency (pure electric resistance) and do not reflect the reduced efficiency of forced air furnaces typically installed in manufactured homes. Proper account of the heat delivery efficiency would increase the savings, but efficiency estimates would require data that are not yet available. As a conservatism, this analysis assumes 100 percent efficiency space heat delivery.

Table 2. Estimated annual space heat and savings for typical 56 foot, double-wide manufactured homes built to standard and WSEC equivalent insulation levels. 1493 square foot model. (kWh/year)

<u>Insulation</u>	<u>Western Washington</u>	<u>Eastern Washington</u>
HUD Standards	10,525	15,452
WSEC(1)	4,117	6,004

Savings	6,408	9,448

A statewide estimate of savings is obtained by averaging east and west figures under the assumption that 6 percent of housing starts occur in eastern Washington (based on 1988 housing starts). The statewide estimate of savings is 6,590 kWh per year, or 4.4 kWh/square foot/year.

Working together with the three manufacturers in Washington State, BPA and Battelle Pacific Northwest Laboratory and Ecotope Inc., WSEO has recently been able to establish the additional cost for building manufactured homes with insulation levels equivalent, or slightly greater than the WSEC. The added cost for the typical 56 foot double-wide unit amounts to \$3,940 (1989\$) including manufacturer and dealer mark-ups.

Benefits of the Proposed Action

The benefits these energy savings represent can be evaluated from three different perspectives:

Environmental

Power System

New Homebuyer

Environmental Benefits

All new homes add an energy load to the electricity supply system. These loads increase the demand for new and existing power generation. By improving the insulation in manufactured homes, the energy load placed on the system by each new home is reduced. Because the space heating load occurs in the winter, the energy savings occur at the margin of the state's electricity supply capacity (i.e. when the demand for electricity is greatest). The size of large winter electricity loads typically requires utilities to turn to natural gas combustion turbines or additional coal-fired electricity generation to meet increased electricity requirements. While combustion turbines burn relatively cleanly, they do contribute significant amounts of carbon dioxide (CO₂) to the atmosphere. Coal-fired generation contributes both CO₂ and other criteria air pollutants. By reducing the need for this additional electricity generation, well-insulated manufactured homes reduce emissions of both CO₂ and other criteria pollutants. Tables 3 and 4 present:

the annual rate of CO₂ savings attributable to individual well-insulated manufactured homes;

the annual rate of CO₂ savings for a typical cohort (annual set) of manufactured homes sited in one year, assuming all are well-insulated;

the annual rate of CO₂ savings for the total of manufactured homes expected to be sited between 1990 and 2010, again assuming all are well insulated, and;

the cumulative tons of CO₂ savings that could be accrued through 2010 for individual manufactured homes, a typical annual cohort of 5000 and all homes sited between 1990 and 2010, again assuming all are well insulated.

Table 3. Carbon dioxide savings from well insulated new manufactured homes. Electricity generation displaced from simple cycle combustion turbine(1). (metric tons)

<u>Case</u>	<u>Annual Rate (tons/yr)</u>	<u>Cumulative tons through 2010</u>
Individual	3.8	76.0
Annual Cohort	19,000.0	380,000.0
1990-2010	380,000.0	3,990,000.0

1 - heat rate 10,900 BTU/kWh, 118 lb CO₂/mmBTU of natural gas and 7.5 percent transmission losses.

Table 4. Carbon dioxide savings from well insulated new manufactured homes. Electricity generation displaced from pulverized coal steam turbine generation. (1) (metric tons)

<u>Case</u>	<u>Annual Rate (tons/yr)</u>	<u>Cumulative tons through 2010</u>
Individual	8.4	168.0
Annual Cohort	42,000.0	840,000.0
1990-2010	840,000.0	8,820,000.0

1 - heat rate 13,619 BTU/kWh, 210 lb CO₂/mmBTU of coal and 7.5 percent transmission losses.

The figures in tables 3 and 4 assume that all new manufactured homes will be well insulated and thus represent a "theoretical potential" for emission reductions. By aggressively pursuing the proposed actions, WSEO estimates that 85 to 100 percent of the annual rates presented in tables 3 and 4 could be achieved by the year 2000.

The estimates in tables 3 and 4 depend not only on energy savings estimates, but estimates of the heat rate of generating plants involved, estimates of the energy content of fuels, and estimates of energy losses due to transmission and distribution. Propagation of the uncertainties in each of these estimates leads WSEO to attach an error bound of 15 to 20 percent around the table 3 and 4 figures.

Power System Benefits

The power system also benefits from increased insulation in manufactured homes. Every kilowatt hour saved not only reduces the need for operation of a "dispatchable" (used only when needed) generator like a combustion turbine, but also offsets the need for utilities to invest in a new "base load" resource like a coal-fired generating plant. One way to look at the cost of saved energy is to levelize the initial costs over the life of the savings. The levelized annual payment is like an installment loan payment (e.g. mortgage, car payment) with the item purchased being annual energy savings. Assuming a society wide discount rate of 3 percent, the energy saved over the 33 year life of the well-insulated manufactured home costs about 2.9 cents/kWh (1989\$). At current natural gas rates, supplying a kilowatt hour generated with a gas combustion turbine costs between 4.5 and 5.0 cents, including transmission losses. Similarly, the cost to supply a kilowatt hour by constructing and operating a new coal-fired generating station is about 5.2 cents (based on Power Council estimates for Creston including transmission losses). In both cases it costs less to save the energy through improved manufactured home insulation than it does to generate the energy with existing resources, or those that might be constructed.

The energy savings potential in improved insulation of manufactured homes amounts to 75 average megawatts by the year 2010. This is roughly equivalent to the energy needs of a small city with a population of 30,000.

Home Buyer Benefits

Assuming a new manufactured home is financed at 10.5 percent over a thirty year period of time, and that savings accrue over a 33 year average lifetime, annual general inflation averages 5 percent, the home buyer's nominal discount rate is 10.5 percent and real electricity price escalation averages .20 percent, the present value of the energy savings to the manufactured home buyer is \$5,630 (1989\$). From the perspective of the new home buyer, the value of the energy savings exceed the \$3,940 (1989\$) additional cost. This means that the consumer is better off economically for purchasing the better insulated manufactured home.

Summary of Benefits

The benefits from improved insulation in manufactured homes can thus summarized as:

1. Substantial quantities of CO₂ and other pollutants are not emitted to the environment. If all manufactured homes sited between 1990 and 2010 were well insulated, the state's annual CO₂ contributions could be reduced by nearly 400,000 metric tons. This is comparable to the CO₂ emitted annually by about 50,000 of today's automobiles.

2. Society benefits because fewer financial resources will be diverted to generating electricity or to building new power plants. Existing generating resources can be spread farther to accommodate growth in the economy and population. The energy savings available through better insulating manufactured homes could, by the year 2010, amount to the energy used by a small city of 30,000.

3. The buyer of a new, well-insulated manufactured home will realize energy savings equal in value to nearly half again the original increase in the cost of the home, a benefit/cost ratio of 1.43.

Costs of the Proposed Action

The initial \$3940 cost of the additional insulation is borne by the manufacturer. Experience over the last year of the BPA program indicates that this cost can be passed on to the home buyer. Analysis in the preceding section shows that the accumulated energy savings benefits outweigh this initial increased cost over the lifetime of the home. Considering the current average price paid by homeowners for electricity in the winter (5.4 cents/kWh), and expected real escalation of .25 percent in that price, the buyer of a new well-insulated manufactured home in 1990 will see a positive cash-flow in the second year of ownership (i.e. annual energy savings exceed annual incremental mortgage payment). Based on this expected electricity price escalation, the initial cost is paid back in energy savings in eight to nine years.

Market incentives

BPA currently provides an incentive payment of \$2000 and \$2500 for purchasers of well-insulated manufactured homes in western and eastern Washington, respectively. BPA estimates administrative costs to operate this program to be about \$700 per house. Total program costs are thus payment plus administration, or \$2700 and \$3200 per home. If consumer energy savings benefits are ignored, the total cost per home is capital cost (\$3940) plus program cost, or \$6640 in western Washington and \$7140 in eastern Washington. Levelized over the 33 year average life of the manufactured home, this represents a cost for saved energy of 4.6 cents/kWh. Without consideration for the value of the reduced CO2 emissions, or the value of the homeowner's energy savings, this is still roughly equal to the cost of operating the gas combustion turbine. Consequently, the incentive payment and program cost levels in the BPA program are clearly justified.

The state should encourage all those utilities which qualify for participation in the BPA program to do so. Those utilities that do not qualify should be required by their state regulators to commit this level of support to encourage the purchase of well-insulated manufactured homes. This support should be at the level currently provided by BPA and should continue through the mid to late 1990's when "market penetration" of efficient models should have grown to a level no longer requiring market incentives.

Utility hook-up charges

Public utility districts purchase most of their electricity from BPA at the current wholesale rate of about 2.3 cents/kWh (an average of all energy available to BPA). Assuming that these utilities would be able to purchase energy at this rate for the life of a manufactured home, the present value of the additional energy the utility would need to buy to serve a poorly insulated home is more than \$3000 (3 percent discount rate assumed with no escalation in BPA wholesale rate). This is a very conservative estimate because it does not reflect the cost of new generation BPA will acquire in the next 30 years to meet growing loads. It does, however, provide strong justification for a \$2000 to \$3000 utility hook-up fee to be assessed of homes that do not meet

well-insulated standards. Investor-owned utilities have a different, regulated pricing framework, but their customers would also bear the costs of new resource acquisition associated with inefficient manufactured homes; there are economic justifications for a hook-up fee in these utilities' service areas as well.

Establishing standards and charges for utility hook-up permits consumers to choose to buy a poorly insulated home, so long as they are willing to foot the \$2000 to \$3000 bill for the energy and environmental cost the home will place on their neighbors and the rest of the state.

The cost for this action will be \$2000 to \$3000 per home, but will only be borne by those home buyers who choose to buy a poorly insulated manufactured home.

The establishment of such standards will entail legal costs of unknown magnitude because they will be undoubtedly be challenged.

Costs of Manufacturer Technical and Marketing Assistance and Review and Influence of HUD Standards.

All of these actions will entail administrative costs for the operation of a program.

How Benefits and Costs Compare

Actions which encourage the installation of energy efficiency measures in manufactured homes are clearly in the state's best interest. Building well insulated homes is somewhat more expensive for manufacturers, but the manufacturer can recapture his investment with a higher selling price. Buyers must bear this initial higher cost for a manufactured home. However this higher cost is more than offset over the life of the home through reduced energy costs. Not only is this a good idea from a consumer perspective, but from a social perspective as well. The other beneficiary of these energy efficiency measures is society through avoidance of the expense and the environmental degradation of building new, large-scale generating facilities.

Other Factors

Technical factors

No constraints. All three manufacturers in Washington are currently producing homes with the insulation levels targeted.

Institutional constraints, or implications

Need to encourage BPA to continue support of the manufactured home component of SGC. This should not pose a major problem.

Need to encourage Utility and Transportation Commission to include manufactured housing support in their consideration of utility least-cost plans and rate cases. This should not pose a major problem, but deserves attention.

Public utility authority to establish hook-up charges based on energy efficiency is untested. Legal challenges are likely. This may pose a major institutional and political problem. The legality of hook-up fees for investor-owned utilities is also untested and may not be legal under current statutes. If this is the case, legislative action may be required.

Manufactured housing efficiency levels are outside state jurisdiction. Attempting to influence the federal Department of Housing and Urban Development standards for these homes will require a coordinated effort by the northwest states.

Political factors, or implications

The utility hook-up standards are likely to entail controversy over public utility authority to impose such standards and the degree to which they may be inconsistent with federal jurisdiction over manufactured housing efficiency standards.

Roles and Responsibilities

Implementation responsibilities

Government will take a lead role in the coordination of technical assistance and marketing assistance to home manufacturers. Government will perform the lead role in reviewing and influencing HUD standards. WSEO and BPA will likely perform these functions along with the Northwest Power Planning Council and the other northwest states.

Utilities will provide incentive payment programs and develop hook-up fees and mechanisms.

The manufacturers will be called upon to assist by providing products that meet the energy efficiency standards targeted and by participating in the dealer and consumer marketing efforts.

Accountability

The Energy Office could take responsibility for monitoring and tracking the progress of these actions.

Schedule

The implementation schedule should use "market penetration" as an evaluation tool. Reasonable targets are 60 percent of manufactured homes sited by 1995 and 85 percent by the year 1997.

Increasing Block Rate Pricing Policies For Electricity and Natural Gas

Proposed Action: Establish increasing block rate pricing policies for electricity and natural gas in the residential sector.

The action proposed here is to promote the use of increasing block rate pricing policies by suppliers of electricity and natural gas. Implementation of this action could proceed as a recommendation to the Washington Utilities and Transportation Commission and individual consumer owned utilities, or could be mandated through legislative action.

Background

Residential consumers of electricity or natural gas pay a price for each unit of energy they consume. The cost per unit of electricity in areas serviced by public utility districts (PUDs) and other consumer owned utilities is determined by the individual districts. The cost per unit of electricity from investor-owned utilities and almost all natural gas is regulated by the Washington Utilities and Transportation Commission (UTC). (Several small municipalities also have consumer owned natural gas distribution companies.)

Consumer owned utilities and the UTC can choose from one of three different pricing policies when establishing the rates that consumers will pay for electricity and natural gas. One option is to charge the same price per unit (e.g. cents per kilowatt hour) regardless of how much electricity or gas a residential consumer uses. The second two choices involve what is called block rate pricing. Under such a scenario, a utility charges one price per unit for the first block of energy used, a different price for a second block of energy used, and so on. Under a decreasing block rate price structure, the customer actually pays a lower price per unit for succeeding units. A decreasing block rate pricing policy encourages and rewards those who use larger amounts of energy.

The action advocated here is to encourage or mandate that utilities operate under the third type of pricing policy: increasing block rate pricing. Under an increasing block rate pricing policy, consumers pay the lowest cost per unit for the first block of energy they consume. Subsequent blocks cost a higher rate per unit, with the cost per unit increasing with the number of blocks consumed. Puget Power's increasing block rate structure illustrates how such a pricing policy looks from an electricity supplier. Puget Power charges its residential customers approximately 4.7 cents/kilowatt-hour (kWh) for the first 600 kWh consumed, 5.3 cents for the next 400 kWh, and about 5.5 cents/kWh for all consumption over 1,000 kWh in each two month billing period. A similar differential pricing policy is practiced by the three largest consumer owned utilities in the state. These utilities charge a higher price per unit for electricity in winter months, and a lower rate in summer months. Ideally, end-block prices should be based on the marginal cost of new energy supply.

An increasing block rate structure reflects the higher costs utilities face when customers use larger and larger quantities of energy. This may be a relatively short term increased cost, such as a utility having to acquire additional peak load power in winter months, or it may be a long term increased cost if continuous high energy loads force the utility to acquire new base load plants. The pricing policy sends to consumers a clear price signal that the more electricity they consume, the higher the cost per unit the utility faces to deliver energy services. An increasing block rate structure rewards those who consume smaller amounts of electricity or natural gas with a lower

price per unit and encourages energy conservation. The effectiveness of an increasing block rate structure as a conservation incentive depends upon the price difference between blocks, the size of the blocks, and the degree to which higher prices stimulate consumers to conserve.

The proposed action would not cover commercial or industrial customers. There is a large diversity in the types and amount of service these customers require. The electricity needs of a hospital, for example, will differ significantly from those of a small bookstore, even though both will be classed as commercial customers. As a result, increasing block rate pricing would be difficult to implement for many of these customers on a statewide basis.

Currently all three of Washington's investor-owned electric utilities (Puget Power, Pacific Power and Light, and Washington Water Power) have in place an increasing block rate pricing structure. Seattle City Light, Tacoma City Light, and Snohomish County PUD, the state's three largest consumer owned utilities, charge higher rates in the winter months, when generating costs are greater. However, most of the remaining consumer owned utilities charge the same rate per unit of electricity regardless of the amount consumed or the time of year. Electricity sales from these remaining utilities accounted for some 30 percent of total utility sales in 1988.

None of the natural gas distribution companies in the state have increasing block rate pricing. In 1988 there were approximately 400,000 residential natural gas customers in the state, who purchased over 350 million therms of natural gas. There were also over 450,000 customers of consumer owned electric utilities who paid flat rates, out of a total of approximately 2 million electric customers. If growth trends in the 1980s continue, the number of natural gas customers could rise to well over 1 million, and electricity customers to over 2.5 million, by 2010.

Benefits from the Proposed Action

The benefits of this proposal would be in terms of quantities of energy conserved and the environmental improvement that would result. Energy conservation measures postpone or offset the need for new generating resources, and help to make the use of existing energy sources more efficient. The environmental benefits associated with energy conservation are discussed in some detail in the introduction of the energy conservation section.

The amount of energy saved by imposition of an increasing block rate pricing structure depends on the prices placed on the different blocks, the size of the blocks, and on the degree to which customers will reduce their energy use in response to a price increase. One measure of responsiveness is called the price elasticity of demand. Price elasticity measures the percentage change in consumption for a given percentage change in price. The higher the elasticity, the greater will be the impact from an increasing block rate schedule.

Additional benefits in an equity sense would accrue to the majority of electricity customers in the state. The three investor-owned electric utilities have by far the largest service territories in the state, and their customers already pay their electricity bills using increased block rate pricing. In one sense, these customers subsidize their counterparts who do not pay such prices. Adoption of this action would mean that all electricity and natural gas consumers face the same type of rate structure.

It is unclear whether utilities would be hurt or would benefit from the proposed action. They would be beneficiaries in the sense that their rate structures would better reflect the cost situation they face in meeting their customers' energy demands. The overall impact to utility revenue would depend on the combined effect of two factors: the reduction in the amount of energy sold, and the increase in the revenue received per unit. It would be possible to design a block rate structure that was revenue neutral.

Costs Associated with the Proposed Action

The direct costs of this action would fall on residential energy consumers who do not currently face an increasing block rate structure. Specifically, this cost would fall on the electricity and natural gas customers in the state serviced by consumer owned utilities which do not currently have increasing block rates. The other affected consumers would be all of the 400,000 customers of the natural gas distribution companies in the state.

Consumers could see increased utility bills if their reduction in energy use does not offset the new, higher prices per unit. Higher electricity or gas bills could present some hardship on lower income consumers. Some low income consumers may live in less energy efficient homes and may be unable to afford energy saving measures. As mentioned above, it is unclear whether individual utilities would gain or lose revenue from this action, though it would be possible to design a rate structure that was revenue neutral.

The costs of implementing the proposed action would be minimal. Establishing pricing schedules is a regular assignment for public utility districts and for the UTC.

How Benefit and Costs Compare

Implementation of this measure could potentially save electricity and natural gas. While energy consumers would pay more for electricity and natural gas, any extra revenues generated could be used to develop energy conservation programs, especially for lower income consumers. There would also be significant environmental benefits. If 10 million therms of natural gas were saved each year, for example, 120 million fewer pounds of CO₂ would be emitted into the atmosphere. Reducing electricity consumption by one billion kWh per year could reduce CO₂ emissions by over two billion pounds, if the electricity had been generated by coal-fired plants. Lastly, implementation of these measures would also send proper pricing signals to consumers, resulting in more efficient markets for energy.

Other Factors

There are no technological constraints to implementing this action.

The existing institutional structure lends itself nicely to changing the pricing policies of Washington's natural gas distribution companies. The companies' pricing policies periodically come up for review before the UTC anyway. The UTC's review process would provide a convenient forum for parties to speak out in favor of or against imposition of an increasing block rate price structure on natural gas. And, the UTC now requires all investor owned electric and gas companies to file least-cost plans every two years.

Nothing prohibits a public utility district from altering its rate structure. However, imposition of a new rate structure onto consumer owned utilities could easily generate political opposition. Most of these utilities are very protective of their authority to control rates and would undoubtedly be displeased at actions which usurped this authority.

An additional factor of concern would be the need for careful coordination of rates charged to electric and gas consumers so as not to encourage inefficient and environmentally degrading fuel switching. Extremely high block rates on natural gas, for example, would encourage gas customers to switch to electricity or wood. This could accelerate electric utilities' development

of new generating resources more degrading to the environment than natural gas. If consumers began to switch to wood as a primary heating fuel, significant increases in local air pollution levels could result. The net impact could be higher overall energy costs for all consumers and degradation of the environment.

Roles and Responsibilities

Responsibility for implementation of this action would rest with the Utilities and Transportation Commission and the governing boards of the PUDs in question. The Washington State Energy Office could track the rate of adoption of these new pricing structures and the energy conserved as a result. Additionally, WSEO could assess interactions between energy markets and act in an advisory role to prevent unwanted fuel switching from reducing the value of the measures.

Review of the block rate schedules could be done in conjunction with the biennial least-cost plan submittals of the investor owned utilities. A similar schedule could be used for consumer owned utilities.

Energy and Environmental Impacts From Improving Energy Efficiency in the Commercial Sector

Proposed action: Use a regulatory approach to increase the energy efficiency of commercial buildings.

There are many opportunities for energy efficiency improvements in office buildings, stores, public facilities and other non-residential structures. Strategies to take advantage of these opportunities differ if the issue is new construction rather than existing structures. New building codes and lighting efficiency standards would help capture energy efficiency savings in new buildings, while time-of-sale retrofit standards and mandatory retrofit standards for public facilities would save energy in existing structures.

Benefits of the Proposed Action

New Construction

Adopting the revised Model Conservation Standards for new non-residential construction combined with strict energy code enforcement can yield a ten percent across the board improvement in overall energy efficiency. Programs such as the Bonneville Power Administration's Energy Edge and Energy Smart Design have typically demonstrated savings in this range at simple paybacks of five to ten years. These estimates translate into annual energy savings of 500 billion BTU/year.

Approximately 30 percent of the energy savings would be in natural gas. Improved codes and standards for new construction would lead to a savings of 1.5 million therms of natural gas per year. The remaining savings would be in electricity. The improvements in energy efficiency in new construction would save twelve average megawatts per year. From these fuel savings, one can also calculate the reduction in CO₂ emissions attributable to better construction practices. Since new construction represents new load on the region's electricity system, electricity savings must be calculated at the margin. Assuming that the region's marginal resource is a 500-megawatt coal plant, the proposed conservation measure can reduce CO₂ emissions by some 115,000 metric tons per year. Adding to this the almost 7500 metric tons of CO₂ that would have been produced by burning the natural gas yields a total savings in CO₂ of 122,000 metric tons per year.

Improving Existing Structures

Two approaches can be used to generate energy efficiency improvements in existing commercial buildings. One is an energy conservation retrofit requirement at time of sale for any privately owned building. A second requirement is a mandatory retrofit program with public financing (e.g. lease-purchase) for all publicly owned facilities. Examples of the latter are buildings owned by state agencies or local government facilities. Energy savings of 15 percent to 20 percent are relatively easy to achieve in the current building stock. Assuming that all existing structures could be retrofit within five years of program implementation, energy savings would be three to five trillion BTU/year.

The fuel split from the energy savings of the retrofit program would be roughly 50 percent electricity, 35 percent natural gas, and 15 percent other fuels, such as petroleum or coal. Using

the total estimated energy BTU savings and the above fuel split, the retrofit program would save 67 average megawatts of electricity per year, 14 million therms of natural gas per year, and, assuming the remaining fuel is oil, 5.3 million gallons of petroleum each year. If one assumes that this conservation is offsetting the use of a simple cycle natural gas-fired combustion turbine, the total reduction in CO2 emissions from the savings in electricity, natural gas, and oil is 466,000 metric tons per year.

The environmental benefits associated with conservation of electricity, natural gas and petroleum are discussed in some detail at the beginning of the energy conservation section. In addition to the environmental benefits, the owners/tenants will also have lower fuel bills over the entire operating life of the building.

Costs of the Proposed Action

New Construction

Energy efficiency improvements of 10 percent in newly constructed buildings would add roughly \$30 million per year in additional construction costs. These costs would be borne initially by the owner/developer, though they could be passed along to the building's tenants. Conservation incentive programs available through the Bonneville Power Administration and utilities might pick up \$10 to \$15 million of the annual costs. Using simple payback calculations, the additional conservation measures pay for themselves in reduced energy costs in five to ten years.

A key to achieving the potential energy efficiency gains is strict enforcement of the new codes and standards. Costs of code enforcement include the hiring of new code officials plus specialized education and training. The costs for the enforcement component of this action are estimated to be \$2 million per year.

Existing Structures

Achieving energy savings of three to five trillion BTU/year in existing buildings would cost roughly \$360 to \$600 million dollars per year in additional construction costs. Again, these costs would be borne initially by the owner/developer.

Enforcement for the retrofit requirements is more complex than enforcement for new construction. Costs for specialized technical information and training, energy audits, education, and additional local enforcement are estimated at \$36 to \$60 million per year.

Other Factors

There are no significant technological constraints to the implementation of these conservation programs. All savings estimates are based on available, off-the-shelf, commercially proven technologies. There may be some short-term limitations in the supply of materials, but, if demand levels remain high, these shortages should not be significant.

These approaches would require changes in state law. For new construction, the Washington State Energy Code would have to be amended to increase its requirements to reflect 20 percent to 25 percent energy savings. For existing structures, the legislature would have to adopt new laws requiring energy efficiency improvements at time of transfer. The state would also have to institute mandatory requirements for retrofit in all public facilities.

Legislative action to improve the existing state energy code for commercial construction would generate some objections from builders, developers, and others involved in new construction. They would object to the additional first costs associated with more energy efficiency measures in the buildings. This is in spite of the fact that the measures save money in building operation costs over the life of the building.

Mandatory standards for improving energy efficiency at the time of sale would be a controversial approach to achieving energy efficiency gains. Strong objections might be raised by developers, the construction industry and others involved in the transfer of existing properties.

Roles and Responsibilities

A number of parties would be involved in implementing these actions. The state legislature would have the responsibility of adopting an improved commercial energy code and any other new regulations. The State Building Code Council would promulgate the building code. Local governments would be responsible for enforcement of the ordinances for new construction and retrofit. Individual state facilities would implement conservation measures in their buildings. The utilities and the Energy Office would be a source of technical assistance, information, energy audits, and perhaps some financial assistance for implementation of conservation measures. Finally, the Bonneville Power Administration could also provide some financial assistance.

Accountability for tracking the effects of these actions would lie with the Energy Office. The actions are suitable for proposal in the 1991 or 1992 legislative session.

A State-Funded Revolving Loan Program For Energy Conservation Projects and Renewable Resource Development

Proposed action: Use state or other monies to establish a self-supporting program which makes low-interest loans for energy conservation projects and development of renewable resources.

Background

Many businesses, industries, and state and local government entities sometimes find themselves in an energy quandary. An engineering analysis may reveal to them several opportunities where energy savings are available, from something as simple as new lighting to more complex changes in industrial processes. Yet even though the conservation measures may pay for themselves in a relatively short period of time, companies may forego the conservation opportunities because of high initial capital costs involved in installing the measures. Similarly, renewable resource developers may also find environmentally-sound renewable energy supply sources, yet be unable to find conventional financing for the projects. This situation can result in the passing over of renewable resource and energy conservation opportunities which could delay or remove the need for construction of more expensive and more environmentally damaging energy supplies.

The State of Oregon has created a program to address this dilemma. In 1981, Oregon launched a unique loan program to promote energy conservation and development of renewable resource energy projects. Loans for the Small Scale Energy Loan Program (SELP) are secured by the sale of state general obligation bonds. This marked the first time that a state used its own general obligation bonds to fund an energy loan program. Borrowers from the loan program pay for all of the program's costs; no tax dollars go to the program. This means that, once sufficient funding is available to start the revolving loan program, a project like this can be set up to be self-sustaining. Virtually any Oregonian can apply for a SELP loan, including businesses, state agencies, local governments, municipal corporations, non-profit groups, and individuals. The loans can be used to install energy conservation measures or for renewable resource development. The latter includes wind, hydropower, solar, waste heat, geothermal, biomass, and municipal waste.

Oregon's program has met with a great deal of success. Since the beginning of the program, the state has made 289 SELP loans for over \$148 million. Approximately two-thirds of the loans have financed projects under \$50,000; 24 percent have been for projects costing between \$50,000 and \$500,000. The remaining ten percent of the projects have been multi-million dollar ventures. Loan proposals undergo thorough scrutiny, and to date SELP has no delinquent loans. In a breakdown of the participants in the loan program, the largest share (67 percent) belongs to local governments. Twenty-five percent of the funds go to the commercial sector, and the next largest borrower (7 percent) is state agencies. A very small segment (<1 percent) goes to the residential sector.

The loans have sponsored renewable resource development and installation of energy conservation measures. The SELP Biennial Report for 1989 estimates that the energy being produced or saved from SELP projects is worth more than \$29 million annually. Oregon's Department of Energy estimates that local businesses save more than \$13 million annually; local

governments, more than \$14.4 million annually; state agencies, more than \$1.9 million annually, and \$176 annually from each home energy loan.

Benefits from a Loan Program in Washington

Offering a program in Washington similar to the one described above in Oregon would help businesses, local governments, state agencies and others to conserve energy and look for energy supply opportunities from renewable sources. The availability of low interest loans would encourage pursuit of these opportunities which might otherwise be overlooked because of high initial costs or an inability to get financing.

Washington's businesses could be a major beneficiary of a low interest loan program for energy efficiency improvements and for renewable resource development. Tremendous conservation potential exists in Washington's commercial and industrial sectors, plus many industrial processes could be modified in order to capture and re-use waste heat. The availability of low interest loans can act as an incentive for these companies to make the initial investments in energy conservation. The availability of low cost financing may also facilitate the success of any new regulatory restrictions put on commercial and industrial firms, e.g. a more strict commercial energy code.

A second set of beneficiaries would be state agencies and local governments. Again, many renewable resource and conservation opportunities are available to these entities, yet they are often dropped from consideration because of the limited capital budget under which most agencies operate. The low cost loans would make the initial costs of a conservation measure less daunting. Loans could be used for measures in government buildings, at the state's many universities and colleges, in Washington's K-12 schools, at prisons, and at a variety of other government facilities.

Since the loan program would encourage energy conservation and the use of renewable energy supplies, it would lead to the array of environmental benefits outlined in the introduction to the energy conservation section. The loan program also leads to lower energy bills for loan participants. If the pattern established in Oregon transferred to Washington, the loan program could see many participants from state agencies and local governments. The energy savings to these parties can be used for state or local programs, rather than for paying energy bills. Conservation efforts in the commercial and industrial sectors lead to lower operating costs in the long run. Businesses may choose to pass their savings on to their customers, leading to a consumer benefit as well.

Costs of a Loan Program

Development of a loan program would require a large initial investment from the state or some other source for the loan revolving fund, probably on the order of several million dollars. If Oregon's general approach were followed, loan program participants would bear the costs of running the loan program itself. The program can be designed to be self-supporting after the initial funding.

Other Factors

There are significant institutional impediments to establishing the initial pool of money for the revolving loan program. First is the constitutional limitation on the lending of the state's credit. Second, there is a limit to the amount of debt that the state can acquire, and Washington is

already bumping up against that limit. Legislative action may offer a way to get around the first barrier; legislation was passed that allows public utility districts and local governments to finance energy efficiency improvements. Getting around the second barrier could be complicated but may be possible. Possibilities include lease-purchase programs for state and local governments, and dedicated revenue bonds for commercial and industrial customers.

An interesting coalition could form in support of a program such as this. Business and industry have an opportunity to receive help in financing energy conservation measures. The environmental community has an opportunity to support a program with great potential for energy conservation savings and renewable resource development. Citizen groups have an opportunity to support responsible investment on the part of state agencies and local governments, freeing up funds formally devoted to paying the energy bills. There may be some political opposition to the use of state money for projects which may lower the costs of private businesses and utilities.

Roles and Responsibilities

Initial action on this proposal would have to come from the state legislature, both in terms of creating the loan program and in providing the initial funding appropriation. In Oregon, responsibility for the program lies with the state Department of Energy. Washington could follow this lead and put the state Energy Office in the position of responsibility for the loan program, or management could be a joint operation between the Energy Office and the Office of Financial Management.

Establishment of a loan program could be on the agenda for the next legislative session.

Incorporating Environmental Costs Into Energy Planning

Proposed Action: Urge the state legislature to request and fund a joint effort by the Energy Office, the Utilities and Transportation Commission, and the Northwest Power Planning Council to explore various ways to incorporate environmental costs into energy planning.

Background

A variety of energy planning efforts take place in Washington and in the Pacific Northwest as a whole. Environmental costs are considered in some fashion in each of these efforts, yet never to the degree where all environmental costs are actually worked into the planning process.

The central planning effort for the region in terms of electricity is the responsibility of the Northwest Power Planning Council. The Northwest Power Act (1980) directs the Power Council to develop a least cost plan for meeting the electricity needs of the region. Environmental considerations enter the planning effort in three ways. First, the costs to meet legal environmental requirements are included when the costs of new resources are calculated; for example, the costs of installing scrubbers are included when estimating the cost of a new coal plant. Second, the Power Council gives a cost advantage to energy conservation in the planning process, in part because conservation measures are environmentally benign. Third, in regard to development of new small-scale hydropower projects, the Power Council has established protected areas where stream development is prohibited in order to safeguard fish and wildlife resources. However, environmental considerations are still not incorporated adequately into the Power Council's planning process. Environmental damage occurs in spite of installation of pollution control technologies, and these costs are not incorporated when estimating resource costs. At the same time, some new generating resources do virtually no damage to the environment (e.g. solar, wind), and these environmental benefits are not attributed to renewable resources in the planning process. Also, its obligations to do planning for the electricity system limits the Power Council's ability to consider inter-fuel substitution. The Power Council is wrestling with the issue of how to better incorporate all environmental costs into electricity planning as it assembles its new regional power plan this summer and fall.

The Bonneville Power Administration also assembles a least cost plan and a resource program which describes the agency's plans for resource acquisition in the future. The costs of complying with environmental laws is factored into the cost estimates for new resources. Bonneville claims to include as a planning goal the minimization of short-term and long-term environmental damages associated with its resource program. Unfortunately there is no evidence in BPA's proposed resource program to indicate that environmental considerations actually played a part in the planning process. To its credit, the agency did take a special look at the carbon dioxide releases associated with different types of generation and offered the possible action of switching water heaters from electricity to natural gas. In general, however, environmental effects are given little more than lip service in BPA's planning process.

The Washington Utilities and Transportation Commission (UTC) reviews the least cost plans required of Washington's investor-owned electric utilities (Puget Power, Pacific Power and Light, Washington Water Power) and the state's natural gas companies (Cascade, Washington Water Power, Washington Natural Gas, and Northwest). The UTC has also developed guidelines for utilities to follow in competitive bidding resource acquisition proposals. In both

cases, environmental impacts are incorporated partially rather than completely into the planning process. For example, in its utility resource acquisition guidelines, the UTC requires project developers to include the costs of complying with environmental regulations in their bid price. In ranking project submittals, the UTC requires utilities to consider a set of non-price factors associated with a project proposal, including environmental effects. However, no specific guidelines are given as to exactly how the non-price factors are to enter the project ranking process. The UTC and the organization to which it belongs, the National Association of Regulatory Utility Commissioners (NARUC), are interested in incorporating environmental impacts in a more comprehensive manner as part of the regulatory review process.

In summary, the various energy planning bodies in the state are recognizing the importance of including environmental costs and benefits in the planning process. The Energy Office, the UTC, and the Northwest Power Planning Council are all very interested in determining the best ways to achieve this goal. The study suggested here would begin by looking at how energy planners in other states deal with these same issues, how successful their efforts have been, and how applicable the methods are to conditions in Washington. A second early step will be identifying the various environmental impacts associated with different generating resources. In some cases information is already available on these impacts, for example, on the quantities of different air pollutants associated with combustion of different fuels. In other cases such as global warming, even with accurate emissions information, the projected environmental impacts on the state remain highly speculative. The proposed study can identify different possible options for Washington and can explore the ramifications of making different selections. Another important topic to cover is enforcement and a host of complicated regulatory problems such as how to include environmental costs in rate making decisions.

Benefits of the Proposed Action

In a least cost planning framework, energy resources are acquired in a particular order, beginning with the least costly new supplies. Resources are added to the generation base up to the point where new energy demands are met. By beginning with the least expensive sources of energy supply and then progressing to more expensive sources, energy needs can be met at the lowest total cost to the system. The key to the order in which resources are developed is their cost. From the perspective of the market, the costs of an energy resource are primarily the costs to build it, the costs to finance construction, and the costs to maintain and operate it.

Experience dictates that costs in addition to those listed above accrue to society with some new generating resources. Examples are the air pollution emissions associated with coal plants and the long-term waste disposal difficulties posed by nuclear power. Other energy resources do little or no damage to the environment. Energy conservation is an excellent example, as are renewable energy sources such as solar, wind, small-scale hydropower, and geothermal. These resources impose fewer costs on society, yet their price in the marketplace does not reflect this. The result is that many generating resources are underpriced by the market from society's perspective while more environmentally benign resources are overpriced. Since market costs are the key in determining the order in which resources are developed, the least cost planning effort can result in rushing development of environmentally damaging resources, while passing over conservation and renewable resource development as being "too expensive."

By finding ways to incorporate environmental costs and benefits directly into the least cost planning framework, the above scenario can be avoided. Least cost planning can then be directed from the social perspective. The end result can be finding ways to deliver energy services at the lowest cost to society. This would represent a major improvement over current planning efforts where environmental effects are often included only superficially or not at all.

Costs of the Proposed Action

The effort to find ways to incorporate environmental costs would involve staff time by policy analysts at the Energy Office and the UTC. The effort would also require coordination with the Washington members and the central staff of the Northwest Power Planning Council.

The costs of this study can be held down by taking advantage of work that has gone on before or is going on now. The Power Council staff has collected a great deal of information detailing the environmental costs associated with new sources of electricity. The Energy Office is in the process of assembling information on CO₂ effects from energy use in all sectors and from all fuels. Additionally, the Energy Office is compiling information on competitive resource acquisition programs in other states, including information on the different approaches taken to incorporate environmental costs. NARUC, to which the UTC belongs, is sponsoring a meeting in the fall to discuss various ways to handle the many complicated regulatory problems which surface when trying to deal with environmental costs. The wealth of information and thinking being directed at this problem will probably make the proposed study less expensive than would have been possible in the past. Costs of implementing social least cost planning remain to be seen.

How Benefits and Costs Compare

While the exact costs of the study have not been estimated here, it is unlikely that they would be greater than the benefits of designing and implementing social least cost planning capabilities which incorporate environmental costs and benefits. The timing of this effort is also crucial in terms of maximizing the benefits of the new planning process (and minimizing the costs of not doing so). The region as a whole, including Washington utilities, is moving out of a period of electricity surplus and into a period where new energy supplies must be found to meet Washington's growing energy needs. It is critical that the choice of resources selected to meet future demand be based on relative social costs rather than strictly on market prices.

Other Factors

There are no technical constraints that would interfere with the completion of the study, other than perhaps some missing information and data problems.

The institutional structure lends itself nicely to implementing the findings of the study. The Northwest Power Planning Council has a mandate to do least cost electricity planning for the region and has stated its desire to incorporate environmental costs more fully. Though the agency often tests its bounds, the Bonneville Power Authority is obligated by the Northwest Power Act to listen to Power Council directives. Through Bonneville, the effects of the improved resource planning effort would reach the state's many public utility districts as well as the region's large industrial energy purchasers. The UTC sets the rules for conducting least cost planning for Washington's investor owned electric utilities and the natural gas companies, so the proposed approach would reach these energy suppliers as well.

Some recognition of the importance of this issue appeared in the most recent legislative session. Comprehensive energy planning was the subject of one bill originating in the Senate, including a call for a state energy plan which incorporates environmental costs. Another bill, this one originating in the House, focused on the connection between energy use and the greenhouse effect and called for a more detailed look at generating resources as producers of CO₂ emissions. These bills may be an indication that the legislature would look positively on the joint effort

proposed here. The electric utilities would not look positively on this effort. It is unclear what stance the natural gas companies would take. They may look on this as an opportunity to tout the environmental advantages of direct use of natural gas over new sources of electricity generation.

Roles and Responsibilities

Initially, the responsibility of this action would rest in the hands of the legislature. From there, responsibility would shift to the Energy Office and the UTC. The responsibility to incorporate environmental costs into energy planning would eventually rest with the energy planners themselves, under the watchful eyes of the Power Council and the UTC.

Given the region's position of needing to acquire new energy resources in the very near future, the sooner this action is taken, the better.

Water Resource Conservation Action Proposals

I. Introduction

A. Identification of the Package

The goal of the water conservation action proposals is the use of a mix of economic incentives, regulatory authority, and education to increase the awareness of the residents of Washington of the value of water in alternative uses and to provide an effective means to reflect this awareness in their individual and corporate decisions related to water use.

Existing water allocation procedures do not reflect the value of water in alternative uses and, in fact, actively discourage water conservation in some cases. As a result, water is used for activities where its value to society is below its value to society in alternative uses. Frequently, its value to the actual user is less than the value to that user of a more economically efficient use. As a consequence, conflicts among actual and potential users are increasing and uses or demands which could be met are not being met.

B. Relationship to 2010 Vision Statement

The 2010 Vision Statement identifies awareness and knowledge as common goals. All four of the action proposals for water resource conservation would meet these goals. In the case of the elimination of market barriers and pricing mechanisms, the creation of opportunities for persons with water rights to reduce costs and increase income as a result of water use efficiency would result in increased awareness and knowledge. Pricing mechanisms and the elimination of legal barriers to conservation also would meet the common goal of encouraging individual responsibility.

The common goal of creative leadership by institutions would be encouraged by the establishment of a water conservation coordination group. Finally, the broad goal of stewardship of water and the specific objective that water use be minimized would be met by all four action proposals.

C. Specific Action Proposals

1. Eliminate Legal Barriers to Water Conservation

Currently legal barriers in Washington prohibit conservation of water and the sale or expanded use of saved water. This discourages and may actually penalize water users who adopt conservation measures. This action proposals identifies legislative changes to remedy this situation.

2. Adopt Standards to Increase Water Use Efficiency

A variety of standards could be put in place or improved upon which would encourage more efficient use of water. These standards for comprehensive water plans, standards for water using appliances, labeling standards, and standards regarding water reuse and recycling.

3. Encourage Pricing Mechanisms to Encourage Water Conservation

Three different pricing policies in this action proposal exploit the ability of market mechanisms to provide powerful incentives to encourage more efficient use of water. One pricing policy is use of an inverted block rate pricing structure. Another is use of a sliding scale utility hookup fee. The third option in this action proposal is incorporation of an environmental cost factor in the pricing of water resources.

4. Establish a Water Conservation Coordination Group

Several parties are currently working autonomously to develop and implement water conservation/energy conservation ideas. Establishment of a coordinating group could allow for the sharing of information among these parties and could avoid duplication of effort.

The action proposals are coordinated in that each meets a separate need. Standards are important where pricing mechanisms are either not technically feasible or where pricing would be socially or politically inappropriate. Removal of legal barriers is most appropriate in the agricultural sector. By creating new markets for saved water, the action would, in effect, create opportunity costs for water use and have many of the same effects as overt pricing. Finally, coordination would be explicitly addressed by the action proposals for a coordination group.

Legal Barriers to Water Conservation

I. Description of the Action Proposal

Legal barriers exist as provisions in or interpretations of Washington constitutional, statutory and case law that prohibit or discourage private and governmental efforts to conserve water and improve the efficiency of water use. Legislation is needed to modify those provisions of law that now inhibit efforts to achieve improved efficiency of use.

Background

Constitutional Barriers - The State Constitution provides that the state and its subdivisions shall not give or loan money to private individuals, associations, or corporations. The Constitution was amended in 1979 to permit the use of public funds by sub-state public entities selling and distributing energy to assist owners of structures and equipment in the acquisition and installation of energy conservation improvements. In 1989, the voters extended this authorization to assistance for water conservation improvements. However, the state itself remains constrained from providing financial assistance for these purposes.

The state operates several programs that provide funds for infrastructure projects that either directly or indirectly result in water conservation. These programs are oriented toward improving water supply facilities or remedying water quality problems. These funding programs are available to public bodies such as irrigation and conservation districts but are not available to individual farmers or corporations because of the constitutional prohibition. The funds therefore generally go to projects to improve conveyance and distribution facilities, but are not available for on-farm application system and water management systems. Consequently, a major area of potential water conservation improvements and water quality improvements is barred from access to state funds.

The State Constitution could be amended to permit the expenditure of state funds for conservation improvements on privately owned land and equipment if greater than one-half of the resulting benefits accrue to the public in general. An appropriate level of cost sharing by the property or equipment owner could be required in proportion to the private benefits that would result.

Statutory Barriers - Under existing law, a water right may be changed as to the point of diversion, place of use, and purpose of use. (The water code also allows for public or private condemnation of existing water rights, but this has been rarely used.) Theoretically, this should allow scarce water to move toward the highest value uses. However, legal problems affect the utility of this provision relating to the need to avoid impairment of other water rights and the public interest. The existence of these requirements is not in itself an unreasonable barrier to transfers. However they do require that information be assembled upon which a decision can be made. This increases the transaction costs of making such a change. The burden of providing information needed to approve such changes and defending them against protests discourages use of transfer and change procedures.

Water rights exist on to the extent of "beneficial use." State water law contains numerous statements prohibiting the waste of water. However, no statutory criteria exists for what constitutes waste as opposed to beneficial use. The lack of such criteria hampers the ability of the state and water users to make necessary determinations of beneficial use and waste in regard to water conveyance losses and point of use efficiency. Very few water uses are perfectly efficient and some level of inefficiency is inevitable and reasonable. Courts in Washington and some other western states have utilized a test of "reasonable efficiency" in determining the boundary between waste and beneficial use. In assessing reasonable

efficiency, Courts generally consider the following criteria: customary water use and conveyance practices in the area now and when a use was established, the cost of improvements and financial capability of the user, changes in practices and technology, needs of other beneficial uses from the same source, and the effect of alternative water use practices on other water uses and the environment.

A 1988 report prepared by the state Water Use Efficiency Study Committee made extensive recommendations for statutory changes to allow for water use efficiency improvements. In 1989, the state Legislature passed water use efficiency legislation which contained numerous provisions to increase water use efficiency in Washington. This legislation did not address several significant needs relating to water right transfers, specifically the need to amend the water code's transfer provisions to lower the barriers to water right transfers. Needed changes include the following: 1) place an initial burden of providing information on the applicant; 2) require the department to make an initial determination based on available information; 3) thereafter place a burden of proof on persons claiming impairment; 4) authorize issuance of trial (three year) approvals of changes with authority to rescind the approval if third party effects are shown during that time; and 5) clarify the requirements related to water rights for municipal water interties.

In addition, the role of irrigation districts in influencing transfers from one district to another or from a district to an area not served by a district needs to be clarified in the law. Districts need to be provided with the authority to act on behalf of their members in transferring water savings out of the district. Legislation could authorize the Department of Ecology to maintain a register of water rights that are available for acquisition by interested parties. Finally, legislation could establish statutory criteria for evaluating "reasonable efficiency" by existing and new water uses. (These are all ideas that have been implemented by one or more other western states.)

Common Law Barriers - Presently, irrigators who invest in new facilities or adopt new practices that conserve water are prohibited from capturing the benefits of the water savings. Saved water goes to the next junior appropriator, and cannot be used on new land or sold by the saver. Several Pollution Control Hearings Board decisions and one Superior Court decision have ruled against expanding the acreage covered by an irrigation water right. In addition, the ground water code contains a provision prohibiting the expansion of a water right. This results in a significant disincentive to privately financed water conservation.

This prohibition against the acquisition and use of water savings is also applicable to the state and its subdivisions. The state needs to be authorized to negotiate for the provision of state funds for irrigation system improvements in exchange for the return of a portion of the saved water. This water could be reallocated for public benefit. A new law was passed in 1989 that provides for such transfers, but only in the Yakima River basin (Chapter 90.38 RCW).

The water code's transfer provisions to allow water savings (but not wasted water) to be retained or sold by the saver and applied to lands other than the land covered by the water right. The Yakima basin saved water provisions should be applied statewide. Private and public control and ownership of water savings should be in proportion to the investment each makes in creating the savings.

The changes recommended in this action package should enhance individual and public responsibility for water use efficiency and should enable better public/private cooperation. They would provide incentives for private investment in water conservation, result in greater economic efficiency in the allocation of water, and improve the flexibility of the water allocation system to respond to new uses. In overappropriated streams, these changes would permit water to be acquired to restore lost habitat and other instream values. Competition among uses may

not be eliminated, but a fair and reasonable process would be available to assure the movement of water to the most valued uses. Improved efficiency in irrigation should reduce erosion and deep percolation of agri-chemicals and improve surface and ground water quality.

II. Gains and Costs of Taking the Proposed Actions

A. Risk Reduction/Resource Enhancement Potential

1. The direct risks of not eliminating legal barriers to water conservation are primarily related to the Environment 2010 threat category of hydrologic disruptions. Effective water conservation can eliminate or delay the need to develop new water diversion and storage facilities or wells. Such facilities are a major cause of hydrologic disruptions discussed in the State of the Environment report. In addition, conservation could provide for partial restoration of streamflows and aquifer levels in depleted water sources.

The principal environmental effects of water developments include inundation of riverine, riparian, littoral and upland environments; dewatering streams or altering natural flow patterns; reduction or elimination of fish and wildlife species; and altering water quality and temperature. Water developments also affect wetlands through inundation, reduction of inflow, and lowering groundwater levels. Conversely, many existing irrigation developments have resulted in increased aquifer recharge that supports other water rights, higher water tables, permanent or seasonal flooding of formerly dry land, and creation of wetlands. For this reason, water conservation in irrigated areas must be approached carefully and with forethought in order to avoid negative consequences.

2. The suggested legislative changes should be increasingly effective as original water rights become more difficult to obtain and as competition for limited water resources increases. Some potential measures of effectiveness could include the number of water right transfers approved annually, the quantity of water saved by new conservation projects, and the extent to which overappropriated streams are restored to an acceptable level of streamflow. These are relatively straightforward measurements for which data is or could be made available.

3. Clearing the way for conservation and water right transfers should result in significant economic benefits to the state by allowing for the movement of water toward higher value uses. This should more closely achieve an economically efficient allocation of water than would otherwise be the case.

B. Costs

1. The capital costs associated with conservation and efficiency fall on the private and public sectors. Because this action idea is primarily enabling, the actual cost of financing conservation is a secondary result of the action package. Therefore no attempt will be made to quantify the costs of the almost unlimited range of projects that could be undertaken.

Conservation measures in irrigated agriculture and municipal uses are costly. They involve the expenditure of capital on physical improvements, training and management systems. State funds currently available for financing irrigation system improvements, most of which conserve water, total about \$38 million (Referendum 38). The amount of state funds for water quality improvements that result in water savings is variable year to year and such projects are subject to competition for funding with other types of projects. State funds for water supply infrastructure improvements is also variable and subject to competition.

The allocation of costs for projects funded by Referendum 38 is currently under review. Historically, most projects have been eligible for a maximum grant of 15 percent and maximum loans of 90 percent of eligible project costs. The department is now considering the possibility of using a sliding scale for the grant percentage depending upon the level of water conservation that would result.

The economics of water conservation is highly complex and beyond the scope of this report. Those desiring detailed information specific to Washington are urged to refer to a report completed in 1989 by the State of Washington Water Research Center entitled Potential for Improving Water Use Efficiency in Washington by Water R. Butcher, et. al., Report 71, Washington State University, Pullman, Washington 99164-3002.

2. Some people are concerned about the adverse social effects of water transfers. In the southwestern United States, it has become common for growing cities to purchase water rights in agricultural areas and transfer the water to urban areas for municipal use. This can have a negative effect on the local economy and social structure of the area of origin. Some of these states are considering the enactment of statutory protection the area of origin of water transfers. The situation in Washington is not analogous. Whereas most irrigation takes place east of the Cascade Mountains, rapid population growth is concentrated on the west side. No one has seriously suggested moving water across the mountains to date. Communities in eastern Washington appear to generally have adequate sources of local supply although some small scale conversions from agricultural to urban uses are likely to occur due to the lack of available water for new rights. Urban development occurs on agricultural lands and lessens the need for irrigation use in those areas.

3. Administrative costs associated with processing water right transfers would be incurred by the Department of Ecology. However, it is assumed that this would be routine work that will be added to other water rights workload in the future. Processing of transfers would probably increase but would be balanced by a commensurate decrease in work associated with the processing of new water right applications, so it is assumed to result in no net increase in administrative costs for the department. Administrative costs associated with providing financial assistance are generally provided for by existing law.

C. Summary of Benefits and Costs

The costs directly attributable to removing legal barriers to conservation appear to be relatively minor compared to the benefits that could result from greater water use efficiency and enhanced economic efficiency related to the distribution of water.

III. Other Factors

A. Technical factors

No technological constraints exist that would hamper implementation of this action idea because it is for the most part an institutional solution. Much technology now exists for the conservation of water in conveyance and distribution systems and for the point of use in both agricultural and urban water uses. Private sector and academic research is rapidly enhancing the available technology for water conservation. A more important issue is the cost-effectiveness of the technology.

B. Institutional constraints or implications

The recommendations expressed in this action proposal are for changes in existing law and regulations to remove existing institutional constraints. No changes would be necessary in organizational structure.

C. Political factors or implications

Any change in state water laws tend to raise suspicion regarding a governmental effort to take or unreasonably regulate water rights. However, the water right transfer provisions recommended herein should not raise that concern because implementation would be on a voluntary basis. Transfers can only occur between willing buyers and willing sellers. Although condemnation is allowed under existing law, it has been infrequently. Transfers can have third party effects on existing water rights, but the existing protection afforded existing rights would be retained. As noted previously, some concerns may be raised regarding the protection of areas of origin and original uses. In addition, some irrigation districts would like to exert a veto power over members' individual efforts to transfer water out of the district. Concerns may also be expressed by some environmental interests that fish and wildlife and other water uses that have intangible value will have difficulty bidding against municipal and energy uses for water savings that go on the market. (Other environmental groups are embracing market solutions to environmental problems.) Some environmental groups may also question why they or government should pay to reduce what they regard as wasteful practices by water users. Finally, statutory criteria for "reasonable efficiency" could be controversial due to the potential financial effects on existing water users. Objections would most likely be raised by holders of older irrigation water rights that have not been upgraded with new conveyance and application technology.

IV. Roles and Responsibilities

A. Implementation responsibilities

It is assumed that implementation would be primarily the responsibility of the Department of Ecology through its existing water rights process. Individuals, groups, communities and businesses would be involved by undertaking conservation projects and participating in transactions for the resulting water savings.

B. Accountability

Other than the passage of legislation, the Department of Ecology would play the key role in implementation. This would require only minor adjustments in Ecology's existing water rights processing functions.

C. Schedule

If legislation were passed in the 1991 legislative session, implementation would be initiated in fiscal year 1992 and would continue as a routine matter thereafter. A constitutional amendment, if approved by the Legislature in 1991, would go to the voters as a state ballot measure in November, 1991.

Standards To Increase Water Use Efficiency

I. Description of the Action Proposal

A variety of standards could be put in place or improved to encourage more efficient use of water. These include standards for comprehensive water plans, standards for water using appliances, labeling standards, and standards regarding water reuse and recycling.

II. Gains and Costs of Taking the Proposed Action

A. Risk Reduction/ Resource Enhancement Potential

1. The risks addressed by this action proposal are primarily related to the Environment 2010 threat category of hydrologic disruptions. Effective water conservation can eliminate or delay the need to develop new water diversion and storage facilities or wells. Such facilities are a major cause of hydrologic disruptions discussed in the State of the Environment report. In addition, conservation could provide some level of restoration of streamflows and aquifer levels in depleted water sources.

A failure to establish standards for water use efficiency would result in continued inefficiency of water use, particularly in the municipal and industrial sector. To a limited degree, standards for irrigation water use efficiency already exist in the form of water duties incorporated into water rights for irrigation. In setting water duties, in adjudication of contested water claims, in regulation of water transfers, and in administration of drought relief, the Department of Ecology can impose water use efficiency standards by reference to "reasonably efficient practices." These standards reflect provisions of common law in western states. They include:

- customary practices in an area;
- reasonableness of facilities at the time of installation;
- cost of improvements and impacts of the costs of upgrading facilities on the continued use of water by an appropriator;
- changes in water use practices and technology;
- needs of other beneficial uses for water from the same source; and
- impact of alternative water use practices on other water uses and the environment.

The separate action proposal to remove legal barriers to conservation will encourage irrigators to pursue water use efficiency without explicit standards.

Within the public water systems, sale of conserved water to potential users is not probable. The systems are more likely to retain rights to saved water to meet future needs. Current inefficiency is more likely to be viewed as insurance against continued growth.

2. At the present time the state lacks documented analysis of the amount of cost effective water conservation which could be realized in Washington. In part, this is because of the lack of agreement on how to value alternative uses of water, most specifically, the value of water which remains instream for fishing, recreation, and aesthetic enjoyment. Until these values are agreed to by interested parties, the value of conserved water and, therefore, the cost effective level of water conservation, is impossible to define. Since standards would need to operate within the limits of cost effectiveness, the upper limit of potential reductions in water use possible with standards cannot be defined at this time.

Water use efficiency Legislation passed in 1989 directed the Department of Ecology to work with irrigation interests throughout the state to identify potentials for water conservation and to develop a model plan for a specific area. This plan, when completed in June of 1991, will provide a model for conservation plans throughout the irrigated areas of Washington. Such plans will identify the potential for and cost of conservation in the irrigated sector.

Limited standards for municipal conservation were established by the 1989 Legislature which specified adoption of water efficient plumbing fixtures in the building code governing new construction and major renovation throughout the state. This legislation will, at the most, reduce the rate of increase in municipal water use, perhaps by 15% to 20%. Installation of water efficient plumbing fixtures in existing structures through retrofit programs could have a far greater impact on total municipal water use.

In view of the relatively limited water use by other domestic appliances not covered by plumbing codes and, consequently, the limited money savings in water bills as a result of more water efficient appliances, the direct effect of labeling requirements for water using appliances would be minimal. However, such labeling may contribute to increased public awareness of the need to conserve water.

Perhaps the most significant immediate reduction in water use due to standards can be expected in the area of water reuse. Here the need is for standards to govern water reuse rather than standards to mandate reuse. At this time the existing economic incentives for industrial reuse are unrealized because of a reluctance of the major industrial water users who might increase their use of recycled water to make the major investments required in the absence of clear standards governing reuse. Without such standards, unclear public health regulations could prevent recovery of such major investments in water reuse.

While the total potential for industrial reuse has not been systematically inventoried, the potential is suggested by a project being considered by the Simpson Tacoma Kraft Mill and the City of Tacoma. The mill is interested in purchasing treated effluent from the city to displace fresh water currently purchased from the city. At this time the mill has a contract for 30 million gallons a day (MGD) from the city's existing Green River pipeline. This use constitutes 40% of the 76 MGD capacity of the pipeline. Reuse of treated effluent could displace between 8 MGD and 12 MGD, freeing this amount of fresh water for additional domestic use and delaying the need for an expensive and controversial new pipeline.

The major obstacle to the project to date is the regulatory uncertainty surrounding reuse. Funds have been requested by the Governor to allow the Department of Health and the Department of Labor and Industries to set reuse standards.

Reuse standards for greywater (non toilet household waste water) would have a less dramatic effect on the conservation and reuse of existing supplies but would increase reuse in specific areas where supplies are limited and where opportunities exist for greywater reuse, e.g. in landscaping.

3. As noted above, increased water use efficiency due to standards should only occur when it is cost effective, that is, when the value of the water saved is greater than the cost of meeting such standards. Consequently, the reduction in water use should have the effect of reducing total expenditures for water. This assumption is not, however, true for each user. Those individuals who must pay to meet standards may be different from those individuals who will benefit by such standards. But from the perspective of the economy as a whole increased water use efficiency results in net economic benefits.

B. Costs

1. The cost to public water systems of meeting water conservation plans depends on the size of the system. Seattle and Tacoma maintain several staff to work on ongoing development, review, and implementation of water use efficiency. Smaller utilities may contract for development of conservation plans. Alternatively, the state might develop an assistance team. The total staff required by utilities to comply with conservation standards will depend on the number of public water systems which will be seeking new water rights.

The cost to local government of establishing standards for water conservation plans depends on the level of assistance provided to local government. In California, for example, detailed model plans will be prepared for public water systems by the state water agency. Workshops and conservation evaluation materials have been made available to public water systems to meet requirements for conservation plans. In Washington, draft standards have been developed for conservation plans. These standards will be applied to consideration of any water right or reservation for a public water system.

The cost to individual consumers as result of the standards for conservation plans may be significant in the short term but should reduce total water system expenditures and, therefore, costs to consumers over the longer term. The public education plans should represent a negligible portion of total water system costs. Installation of meters and adoption of conservation rates, on the other hand, can be a significant cost. Over the long term, however, metering and conservation rates should contribute to efficient water use and reduce the need for expensive system expansion. The plumbing standards for new construction represent a nominal increase in expenditures and should be repaid within a year in reduced water bills.

The most significant costs to business of the draft conservation standards for public water systems will result from the requirement for conservation rates. These may require water intensive businesses to invest in new water conserving equipment or processes. In addition, if reuse standards are adopted by the state, reuse may be required of industrial water users prior to the granting of additional water rights to the industry or to the public water system serving it. This may impose significant costs on water intensive industries. It is not possible to generalize on the net effects of conservation rates and reuse requirements on such businesses but it is likely that some individual firms may not fully recover the costs of water efficiency and water reuse equipment.

Requirements that irrigators adopt reasonably efficient practices should not impose significant burdens, given the definition of such practices by the Department of Ecology. If legal barriers to conservation are removed, the actual levels of water use efficiency achieved will likely exceed those required by any standards implied by the definition of reasonably efficient practices.

2. Water inefficiency in irrigation can be a source of aquifer and stream recharge and may result in major wetlands with significant public values. Standards to increase water use efficiency must take account of these major public benefits of existing inefficiencies.

3. At least one full time equivalent employee to be divided between the Department of Ecology and the Department of Health would be a reasonable initial staff level to develop public water system planning standards for water conservation. The number of systems requiring new water rights to meet demand would determine future staff needs.

Development of revised water duties and identification of reasonably efficient practices in specific irrigation management decisions may require at least one full time equivalent employee during the initial phase of efficiency implementation.

C. Summary

In summary, benefits of water use efficiency are assumed to exceed costs. Major policy questions remain to be resolved regarding who should pay the costs of increased water use efficiency. Resolution of this issue depends not on identification of beneficiaries but, rather, on assumptions regarding rights to the resource. If the right is assumed to be held by the public and is held for the water in its "natural" state, i.e. in streams, the costs of efficient use should be paid by the user. If, on the other hand, the public right is to the efficient use of water, regardless of whether it is instream or diverted, then those who benefit by increased water use efficiency can be expected to pay.

III. Other Factors

A. Technical

No technical constraints exist for implementation of this action idea.

B. and C. Institutional and Political

One major institutional or political constraint on the setting of water use efficiency standards is that the value of saved water is different for every location in the state. This means uniform water use efficiency standards will not provide a "best fit" for any single user. Based on cost effectiveness, the level of water use efficiency appropriate in a dry region without a major water source would differ significantly from the cost effective standards for a humid site. To some extent, this can be handled by development of standards for procedures and not for specific measures. Reuse standards, on the other hand, are based on public health and should be uniform statewide.

IV. Roles and Responsibilities

A. Implementation Responsibilities

Under provision of SHB 1397 responsibility for water planning standards has been assigned directly to the Department of Health. Under a range of statutes relating to water use efficiency and to the allocation of water, the Department of Ecology bears equal responsibility. The development of standards for water reuse is shared by two agencies. Department of Health is responsible for public health consequences of water reuse while the Department of Labor and Industries is responsible for worker protection.

B. Accountability

While a major portion of responsibility for standards for plans and for water reuse rests with the Department of Health, the Department of Ecology would be the agency on the Steering Committee with accountability for encouraging implementation of the action proposal.

C. Schedule

Under existing legislation, the Department of Health is to develop standards for conservation plans, contingent on the availability of funds. Despite the absence of funds for this purpose, the Department of Health and the Department of Ecology have worked with utilities to develop draft standards for plan development and review.

The standards for water reuse are not scheduled for full implementation until 1995.

Pricing Mechanisms

I. Description of the Action Proposal

Market mechanisms can provide powerful incentives to encourage more efficient use of water. Three different pricing policies will be explored in this action proposal to exploit this fact. One pricing policy is to use an inverted block rate pricing structure. Another is to use a sliding scale utility hookup fee. The third option to be considered in this action item is incorporation of an environmental cost factor into the pricing of water resources.

II. Gains and Costs of Taking the Proposed Action

A. Risk Reduction/ Resource Enhancement Potential

1. The risks addressed by this action proposal are primarily related to the Environment 2010 threat category of hydrologic disruptions. Effective water conservation can eliminate or delay the need to develop new water diversion and storage facilities or wells. Such facilities are a major cause of hydrologic disruptions discussed in the State of the Environment report. In addition, conservation could provide some level of restoration of streamflows and aquifer levels in depleted water sources.

The inefficient or inappropriate use of water is a direct result of the failure of prices to the user to reflect the true cost of water use. To some extent, inefficient water use results from the failure of prices to reflect the amount of water used or, most importantly, the incremental cost of meeting a specific demand, i.e. to reflect the actual costs imposed by a specific use. Rather, costs are shared among all users, regardless of the volume of water used, the amount of water available for use, or the relation between the amount of water used the long term cost of meeting demand. As a result, prices fail to ration limited water resources. Under these conditions, incentives to reduce individual use to a cost effective level are weak.

The failure of most public water systems to use prices to ration limited resources is compounded by the failure of all public water systems to reflect all costs of water use in the price charged for water. Because no efficient market exists for the right to use water, the costs of consumptive use on the environment, e.g. on the fishery, recreation, and aesthetic enjoyment, are not considered in individual decisions by water users. In other words, the opportunity costs of current uses are not considered. The inevitable result is that far more water is consumed than would be the case if all costs of water use were considered. In terms of conservation, the failure to price water at its true costs means that the market value of saved water is far below its actual value to society. Consequently, investment in water use efficiency is far below the amount society would invest, given a choice.

Consideration of the opportunity costs of consumptive use can occur in either of two ways, depending to some extent on how water allocation decisions are made. If a market is used, rights can be assigned to instream flows and holders, e.g. wildlife and recreation organizations, could sell such rights if the price covered all impacts. Alternatively, such right holders could buy rights if the price were less than the reduction in impacts on instream values associated with such a purchase. If the current allocation approach of planning and administrative decision were continued, consideration of opportunity costs could be included in all decisions. In theory, the current statute (RCW 90.54.020) requires this in the provision that allocation result in maximum net benefits. In fact, however, the opportunity costs of diversions have never been quantified and allocations have been based on qualitative

assessments. If quantitative estimates were made of the aggregate opportunity costs of diversion, such costs could actually be assessed and used for mitigation. Alternatively, the use of aggregate opportunity cost could be limited to the allocation decision.

From the perspective of the public water system and other consumptive users, leaving water instream has an associated opportunity cost. However, with a few notable exceptions, the Department of Ecology has granted water rights for consumptive use by public water systems at the expense of instream flows and their related values. Consequently, the dominant public perception is that environmental values have been paid for the urban needs and that conservation is necessary to reduce future and, if conservation is aggressively pursued, current impacts of urban growth. Public water systems, nonetheless, insist on the need to consider the opportunity costs of instream flow in all allocation decisions.

Failure to price water at its true cost has two concurrent consequences: waste (inefficient use); government programs to encourage water use efficiency in the face of such waste. If water use efficiency is a serious goal and prices are not adjusted to reflect true costs of water use, the administrative and political costs of water use efficiency programs will be excessive. Arbitrary regulations will be inevitable. Unnecessary resources will be consumed through frequent encouragement and cajoling, on the one hand, and in administration and enforcement, on the other. In the short term, such programs may alleviate shortages but it is unlikely that long term water use behavior will change. As a result, there will be pressure for still higher expenditures for regulation, enforcement, and encouragement.

2. A considerable body of literature exists relating water use efficiency to water prices. It is frequently argued that given the extremely low price of water in relation to other domestic utility costs, water rates have only a limited effect on domestic consumption. Their real impact is assumed to be on irrigation and on industrial consumption. The effect of water rates on municipal use is a complex issue which must consider a variety of factors, each unique to a given municipality. It is instructive to observe, however, that the mere installation of service meters to measure individual water use in the city of Leavenworth has resulted in a per capita reduction in residential use of 15% to 20%. The imposition of inverted block rates is expected to further reduce per capita water consumption an additional 15% to 20%.

To the extent that monthly charges are relatively insignificant and do not alter behavior or to the extent that installation of water efficient plumbing and appliances is determined by builders who do not face the higher monthly bills of inefficient water use, a sliding hook up fee based on the water use efficiency of a house can provide a strong incentive for installation of water efficient fixtures and appliances in a house. The scales should reflect the cost to the utility of meeting high per capita demand. For example, high per capita and, therefore, high total use, can mean that a utility must develop ever less accessible water rights and must, therefore, pay increasing costs for impoundment, pretreatment, transport, and limited mitigation and may be required to construct and operate unnecessarily large sewage treatment facilities.

Incorporation of the true environmental costs or, more broadly stated, inclusion of all opportunity costs in the price of water would inevitably increase investment in water use efficiency.

3. Increased water use efficiency means that least cost, or, at least, less costly approaches to meeting water needs will be implemented. In many cases this means that money and the real resources it represents which would otherwise be spent on expensive infrastructure - dams, pipelines, and treatment facilities - can be made available for other public or private goods and services. Charging users for the environmental opportunity costs of consumptive water use not only creates incentives for water use efficiency but can raise money to mitigate the impact of such consumption. If the consumptive use is able to fully mitigate impacts, then that use represents the most efficient use of water. In reality, it is impossible to

fully identify opportunity costs of water use and to distribute mitigation payment to all affected interests.

B. Costs

1. Development of inverted block rates to reflect costs of increased water use in a manner which assures all revenue needs will be met requires a data base which is currently lacking for most public water systems. Individual consumption under existing rates must be known and the cost of future water resources, also known as the avoided cost or the cost avoided by conservation, must be determined. This avoided cost is the cost of water resources which are not required if the price charged for the last unit of water consumed equals the cost of supplying the last unit of water consumed. Under these conditions incentives are created for lower cost conservation which allows the public water system to avoid the higher cost of new resources.

The cost of acquiring data on current use and on avoided costs may be significant. However, such data is imperative to cost effective water resource management. Data on the cost of future resources is also needed to calculate appropriate hook up fees.

Incorporation of an environmental cost factor in the pricing of water resources requires both a consensus on what the opportunity costs of consumptive water use are and on techniques to quantify such costs.

The cost of calculating the total opportunity costs of consumptive uses would depend on the level of sophistication and precision desired. At one extreme, highly complex models of all affected natural systems, e.g. the fishery, would be necessary to determine the value of a given quantity of water for a range of uses under a range of conditions. The costs would far exceed any potential benefits. It is not clear that consensus could be achieved on the use of less sophisticated, less expensive approaches. For this reason, creation of an actual market for instream flow rights appears to be a more feasible approach.

The cost of the efficient pricing of water will be borne by consumers in inverse relation to their ability to increase their water use efficiency. For those who can and do change their efficiency of water use, the higher rates can result in stable or, even, reduced total water costs with no change in the utility received from water use.

2. The efficient pricing of water could, under certain circumstances, impose unacceptable burdens on persons of limited income. This is not, however, an inevitable consequence of the efficient pricing of water. The problem is avoided or significantly reduced by adoption of lifeline rates, that is, the provision of a block of water for essential needs a very low cost. The same principle could be incorporated into hookup fees and environmental cost factors.

Pricing water at below its cost results in a waste of both water and money as less rather than more efficient water use measures are selected by users. It is usually more cost effective to charge the real cost of water and, if necessary, to subsidize people with money rather than to subsidize people with water.

3. While the state can assist in the pricing of water resources to reflect the incremental costs of meeting demand, i.e. the avoided costs, the major costs of revising rates and fees to reflect incremental costs will be borne by individual utilities. Under water use efficiency legislation passed in 1989, the Department of Health is, subject to the availability of funds, to provide assistance in the development of model rate setting formulas. To date, no funding has been appropriated to or by the Department for this effort.

The major cost of rate revision will be borne by individual utilities. The larger utilities of Seattle and Tacoma have considerable experience and sophistication in rate setting. Smaller utilities will likely contract for such capability. The city of Leavenworth recently adopted a very progressive rate structure which may serve a model for other smaller utilities.

The cost of calculating the opportunity cost of consumptive uses would likely fall upon the state since substantial reliance on public water systems would raise concerns of possible bias. Likewise, the cost of establishing a market for instream rights would demand considerable state resources to identify and assign instream rights and to administer their purchase and sale by state agencies.

C. Summary

Pricing water to reflect total costs of its use can result in benefits in excess of costs. Whether such pricing will, in fact, result in net benefits depends on the level of precision required in the quantification of impacts of diversions, i.e. the identification of opportunity costs, and on the extent of opportunity costs considered in such quantification.

III. Other Factors

A. Technical

The major constraint to the efficient pricing of water is actually more methodological than technical. It is the difficulty of achieving consensus on the non market value of instream flows or, in other words, on the opportunity costs of consumptive uses. Techniques abound but consensus is elusive.

B. and C. Institutional and Political

Existing statutes do not explicitly provide for state review or approval of rates for water use set by public water systems. However, numerous provisions of state water law direct the Department of Ecology to manage water resources of the state in a manner consistent with water use efficiency. The Department of Ecology recognizes pricing as a key factor in water use efficiency and while it will not review the actual rates set by utilities, it will require public water systems seeking additional water rights or reservations to address the effect of rates on water use efficiency.

Existing statutes do not permit the Department of Ecology to directly charge for water rights. Consequently, the Department cannot directly incorporate environmental values in the price of water. State law does, however, allocate water to uses based on considerations of efficient use and of maximum net benefits to the state. Such allocation necessarily reflects an implicit estimate of the environmental value of water. The Department has suspended major decisions on water allocation pending recommendations of a joint select committee of the Legislature on water resource policy.

Major problems might be expected in the imposition of an environmental cost factor. First, consensus on the total opportunity costs associated with a consumptive use is unlikely. Some cost factors set at the lower end of estimates of opportunity costs would get past some of these problems. However, the key institutional and policy obstacle is the implicit

assumption that consumptive uses should compensate non-consumptive uses, that non-consumptive or instream uses are in some sense superior or, at least, merit special protection and that, therefore, all diversions must compensate instream uses or users. In theory, this problem can be avoided by allocation of all water including instream flow based on a willingness of potential users to pay. However, this would give more votes to individuals and organizations with superior economic resources and violates the more equitable political base on which allocation is commonly assumed to be based. Moreover, historic treaties with Indian nations preclude total reliance on a market distribution of water. However, increased reliance could be placed on the market to distribute water in excess of some minimum instream flows.

IV. Roles and Responsibilities

A. Implementation Responsibilities

As indicated above under the discussion of costs, the responsibilities for efficient rates and fees is divided between the state and public water systems.

B. Accountability

The Department of Ecology is the Steering Committee agency with accountability for implementation of water use efficiency. The Department has already established preliminary draft standards requiring consideration of conservation rates as a condition for appropriation of water rights to public water systems.

C. Schedule

As indicated above, Ecology will review all requests by public water systems for water rights or reservation in relation to water use efficiency of current and projected use. This review will include a consideration of the rate structure as a conservation tool.

Incorporation of environmental values in the price of water can be achieved indirectly through the allocation procedures of the Department of Ecology and through the related planning activities. These procedures and activities are currently being reviewed and revised by the Joint Select Committee on Water Resource Policy of the Legislature.

Water Conservation Coordination Group

I. Description of the Action Proposal

Numerous state, federal and local entities are working autonomously on water conservation programs and projects. Many of these efforts have common objectives, but little has been done to coordinate projects and programs to achieve the maximum possible benefits and distribution of information. Uncoordinated efforts give the public the impression that no one really knows what is going on. The purpose of this action idea is to provide a forum for coordination and the exchange of information among entities involved in water conservation. This would be done by identifying all of the agencies, institutions and interests that are now or intend to become involved in water conservation. An organizational meeting would be held among these entities to determine whether sufficient interest exists to support an ongoing coordination group. Such a group would meet periodically, perhaps twice a year, to share ideas and review the results of water conservation projects. Cooperative projects could be formulated among the attending entities.

This action package relates most closely to the ideas expressed in the Environment 2010 Vision Statement regarding awareness, knowledge, cooperation, and leadership.

The idea of a water conservation task force was received from the public (idea number 22 in the conservation idea package) and led to this action idea.

II. Gains and Costs of Taking the Proposed Action

A. Risk Reduction/Resource Enhancement Potential

1. The risks addressed by this action idea are primarily related to the Environment 2010 threat category of hydrologic disruptions. Effective water conservation can eliminate or delay the need to develop new water diversion and storage facilities or wells. Such facilities are a major cause of hydrologic disruptions discussed in the State of the Environment report. In addition, conservation could provide some level of restoration of streamflows and aquifer levels in depleted water sources.

2. Coordination of efforts among entities involved in conservation should have a synergistic effect in building support for conservation and enhancing the effectiveness of presently uncoordinated efforts. It should also lead to cooperative projects that will promote efficiency by achieving more results without increased expenditure.

3. Other benefits include a reduction in turf consciousness and also promotion of public-private partnerships in some conservation projects.

B. Costs

1. The cost for semiannual meetings would consist of various organizations' staff time and travel and would be insignificant.

2. No adverse implications are foreseen if this action idea is implemented.

3. State government costs would be insignificant in terms of staff and travel time.

III. Other Factors

A. Technical factors - No technological constraints exist for implementation of this action idea.

B. Institutional constraints or implications - No statutory or regulatory changes appear to be necessary, nor are any organizational changes required to implement this idea.

C. Political factors of implications - This idea should not generate any controversy and should help reduce controversy among entities involved in water conservation.

IV. Roles and Responsibilities

A. Implementation responsibilities - Participants are likely to include the state departments of Ecology, Agriculture, Community Development and Health, the State Energy Office, the State Cooperative Extension Service, the State Conservation Commission, the Bureau of Reclamation, the Soil Conservation Service, local conservation districts, the state irrigation district association, the public utility district association, the water district association, municipal and county government associations, tribal governments, environmental groups, selected academic institutions, and others.

B. Accountability - The Department of Ecology could take the lead in organizing the forum. This would be consistent with Ecology's existing authorities and activities. Thereafter the lead could be assumed by an academic institution such as the Washington State Water Research Center, or alternatively by Ecology.

C. Schedule - Organization of the group and determination of interest could be initiated immediately.

Waste Reduction and Recycling

Five action proposals are analyzed under the general heading of waste reduction and recycling:

1. Encourage Waste Reduction
2. Improve the Collection of Recyclable Materials
3. Address Issues Related to Product Packaging
4. Explore the Use of Incentives for Recycling
5. Develop Markets for Recyclable Materials

Encourage Waste Reduction

I. Introduction

Substitute House Bill 1340 which was passed during the 1988 Legislative session established the Office of Waste Reduction within the Department of Ecology.

The Legislation directed the office to encourage waste reduction by:

- (a) providing for the rendering of advice and consultation to waste generators on waste reduction techniques;
- (b) sponsoring or cosponsoring with public or private organizations technical workshops and seminars on waste reduction;
- (c) administering a waste reduction data base and hotline providing comprehensive referral services to waste generators;
- (d) administering waste reduction research and development program;
- (e) coordinating a waste reduction public education program that includes the utilization of existing publications from public and private sources, as well as publishing necessary new materials on waste reduction; and
- (f) recommending to institutions of higher education in the state courses and curricula in areas relating to waste reduction.

The following action ideas relate directly to this mandate:

- Expand technical outreach programs to generators to assist them in their development of source reduction and better management practices.
- Promote alternatives to hazardous materials commonly found in the home.
- Promote appropriate homeowner pesticide application/use.
- Provide for public education on toxics use reduction.
- Conduct research and development on alternative materials.

Other action items that were recommended that do not relate directly to this mandate include:

- Require source reduction at generation points
- Study the feasibility of hazardous waste exchange/recycle programs
- Enact a very large tax on manufacture and marketing of toxic or hazardous chemicals including pesticides and household chemicals
- Tax products with long-term persistence in order to reduce pesticide usage.

The Office of Waste Reduction, which has since been expanded into the Waste Reduction, Recycling and Litter Control Program, carries out the functions required by Substitute House Bill 1340 (codified as RCW 70.95C).

A new piece of legislation, SHB 2390, if signed by the governor, would enhance the Program's ability to expand technical outreach programs to generators to assist them in their development of source reduction and better management practices. This measure will require certain hazardous substance users and hazardous waste generators to develop plans outlining the actions that they are going to implement to reduce, recycle and/or treat their wastes with first priority going to waste reduction actions.

II. Gains and Costs of Encouraging Waste Reduction

Waste reduction means not generating the waste in the first place. There are seven basic strategies to accomplish waste reduction:

- process modification
- product modification
- housekeeping
- waste stream segregation
- on-site, closed loop recycling
- material substitution
- material conservation

Any of these strategies, if implemented, will reduce the risks associated with hazardous waste. As described in the State of the Environment Report, humans may be exposed to health risks from active hazardous waste sites in the following ways:

- o Ingestion of contaminated surface water or ground water
- o Exposure to airborne vapors or particulates
- o Ingestion of contaminated crop or animal products (including seafood)
- o Dermal absorption through direct contact with contaminated soil or water
- o Ingestion of contaminated soil

Ecosystems may be damaged by:

- o Runoff, spills, or dumping to surface water
- o Leaching to ground water that discharges to surface water
- o Contaminated soil, air deposition
- o Harm to animals through ingestion of or direct contact with contaminated soil or waste, or through inhalation

Although the hazardous waste professionals involved in the State of the Environment Report agreed that state and federal regulations provide an effective system for controlling risks associated with treatment, storage, disposal facilities, one hazardous waste manager pointed out that in actuality hazardous waste generators pose greater risks than TSDFs because they are not nearly as well regulated.

The waste reduction action ideas included here focus on actions to be taken by waste generators (including the general public) and hazardous materials manufacturers.

By reducing the amount of hazardous waste generated, risks are reduced and resources, in the form of raw materials, are saved.

Many businesses and public entities have realized the benefits of waste reduction. Most often these are the facilities that have the resources to employ their own environmental specialists who can conduct needed research and cost/benefit analyses. However, some facilities will not explore other options unless there is some sort of financial incentive to encourage them to do so (e.g. taxes) and smaller businesses and individuals often need to be educated in order to realize the benefits of these types of activities.

These action ideas include both educational activities and financial incentives. Since consumer education action ideas are addressed in another "action idea package" this section will concentrate on technical assistance for businesses and public entities.

Measurement of waste reduction is an issue that is being grappled with across the nation. The Waste Reduction Recycling and Litter Control Program is the recent recipient of a grant from EPA to be used to develop a system for measuring multimedia waste reduction.

It has been estimated that the technical assistance and plan review called for in SHB 2390 will require a minimum of 8.0 FTEs. This calculation was made using the following assumptions:

- Of the estimated 1200 facilities that will need to develop plans, 750 will request technical assistance from the department. The technical assistance will take one week per facility. Since plans must be updated every five years, technical assistance will be an ongoing requirement.
- Twenty-five percent of the plans will be spot checked
- All of the executive summaries will be reviewed

The EPA grant for the measurement study is \$150,000, with an additional in kind contribution of \$15,000.

The costs of imposing a tax on certain hazardous substances and/or pesticides have not been calculated. However, the Hazardous Waste Investigations and Clean-up Program has spent a great deal of time implementing the hazardous substance tax called for in Initiative 97.

The mandate of SHB 1340 includes administering waste reduction research and development programs. Although this is being conducted currently through a Waste Reduction Innovative Technologies Evaluation (WRITE) grant from EPA, another source of funding will need to be found when the WRITE grant ends in 1991.

III. Other Factors

There are some technological constraints that prevent waste reduction from being implemented on a widescale basis. Alternative materials or processes have just not been developed in some cases. However, as the benefits of waste reduction, such as reduced costs and liability, become better known there will be a greater demand for products and processes that result in waste reduction.

In many cases, when a facility reduces the amount of waste that they generate, they also reduce the amount and complexity of the regulations that they need to comply with. On the other hand, there are regulations that inhibit some types of waste reduction/recycling activities.

The action ideas that involve taxing hazardous materials would probably be the most controversial.

Another potentially controversial idea is that of requiring waste reduction at generation points. SHB 2390 requires mandatory waste reduction planning, but not mandatory waste reduction. Although the legislation contains a goal of 50% waste reduction by 1995, there is no intention at this point to make that a mandatory goal. However, if industry's voluntary waste reduction efforts prove to be ineffective, there remains the possibility to go back to the legislature and request legislation that would include mandatory waste reduction.

IV. Roles and Responsibilities

All levels of government, as well as citizen groups, can be involved in the implementation of the action ideas that are education-oriented. The private sector should be included in implementing the research and development activities.

Ecology would be accountable for ensuring/encouraging implementation of the action.

The EPA grant project for measuring multimedia waste reduction is expected to be completed by June 1991.

Plans called for in SHB 2390 are due over a two year period beginning in 1992.

Improve the Collection of Recyclable Materials

I. Introduction

One way to encourage recycling is to make collection of recyclable materials as convenient as possible. The Department of Ecology is exploring with local governments different ways to improve the collection process for recyclable materials. There is a fair amount of empirical data on this subject, but HB 1671 was written to encourage local governments, waste haulers and recyclers to experiment to find more efficient systems than those now in place.

This approach is responsive to the following action ideas that were proposed:

- Provide more recycling barrels around town; put a recycling bin next to every trash can; make it easier to choose recycling.
- Work more closely with employers (private corporations, restaurants, grocery stores, other government agencies) to establish recycling programs in their workplaces.

II. Gains and Costs of Improving Collection of Recyclables

Traditional methods of disposing of solid wastes (i.e. landfilling, burning, open dumping) pollute land, air, and water resources damaging the overall quality of the environment. Disposal rather than recycling of solid waste leads to wasted energy and resources.

Collection of recyclable materials will be measured through an annual statewide recycling survey conducted by the Department of Ecology's Waste Reduction, Recycling, and Litter Control Program (WRRLC Program). Local governments will be among those surveyed. Some local governments will monitor commercial recycling collection. The survey results will indicate recycling rates by material for each county. An estimate of risk reduction and resource enhancement could be made using information regarding reduction in pollution, resource consumption, and energy use from manufacturing products from secondary rather than virgin materials.

Providing collection opportunities for source separated recyclable materials to residents of Washington will require extensive public information and education efforts. These education efforts are likely to lead to greater environmental awareness by Washington citizens.

In general the costs of providing convenient collection of recyclables will be passed on to rate payers. Residential solid waste collection rates have generally increased \$1 to \$2 per month when curbside recycling collection services have been added. However, because curbside programs lead to savings in landfill space, a local government may end up saving money in the long run because the siting of a disposal facility is delayed. Businesses are likely to save money by instituting recycling programs because commercial wastes streams are generally higher value and more homogeneous. Reduced disposal costs alone can frequently justify a commercial recycling program.

Local government will incur addition planning and administration costs when providing collection services. Staff in the WRRLC Program are allocated to provide technical assistance to local governments planning and implementing recycling programs.

Local government collection programs may negatively impact private buy back centers. However, some experts report that the increased publicity from local collection programs leads

to an increase in recycling in general including buy back recycling. Poor markets for recyclable materials are the primary negative influence on private recyclers. While increased collection of recyclable materials leads to oversupply and depressed markets, an assured, steady supply of materials will also lead to increased use of secondary materials in manufacturing.

Many WRRLC staff are currently involved in activities that enhance collection of recyclable materials by businesses and local governments. New staff are being hired in the regional offices to provide technical assistance in planning and implementing local collection programs. Utilities and Transportation Commission (UTC) staff will be required to review cost impacts of local government recycling programs.

After weighing the costs and benefits of providing collection services for source separated recyclable materials, the state legislature passed Engrossed Substitute House Bill 1671. The Bill stresses the importance of making recycling at least as affordable and convenient to the ratepayer as mixed waste disposal. Governmental entities are charged with implementing aggressive waste reduction and recycling programs at their workplaces. Local governments are given primary responsibility for developing and implementing effective waste reduction and source separation strategies. The state solid waste management planning guidelines and the UTC cost impact assessment guidelines will give direction to local government on establishing programs and assessing cost impacts of these programs.

III. Other Factors

There are technical constraints on implementation of collection programs for recyclable materials. For example, plastic collection is generally prohibitively expensive because of its low density. Separation systems for mixed plastic resins are not available.

Local government solid waste management planning requirements have been updated to include provision for collection of source separated materials from residents. The cost of implementing these programs at the local level will be the major constraint.

Not all local governments agree with the philosophy of ESHB 1671 in its focus on curbside collection and on source separated collection. These local governments will want to implement alternative programs that may not be as convenient to residents or lead to as much public participation as those recommended in the planning guidelines. Local governments do not have the authority to mandate collection of commercial recyclables.

IV. Roles and Responsibilities

Local governments are charged with planning and implementing collection programs for source separated recyclable materials from residential waste and with monitoring commercial collection where there is sufficient density to sustain a program. State government is responsible for writing guidelines and reviewing plans and providing technical assistance with plan writing and implementation. Businesses may choose to implement recycling collection program to reduce disposal costs. Citizens will be relied upon to separate recyclables from waste in their homes and workplaces.

Ecology has primary responsibility to review waste reduction and recycling elements of local solid waste management plans.

Waste Reduction and Recycling Elements must be submitted depending on location and population density.

Class I: counties of Spokane, Snohomish, King, Pierce, and Kitsap and all cities therein.

Class II: all other counties located west of the crest of the Cascade mountains and all the cities therein

Class III: counties east of the crest of the Cascade mountains and all the cities therein, except for Spokane County

Class I due July 1, 1991

Class II due July 1, 1992

Class III due July 1, 1994

Programs to collect source separated recyclables must begin to be implemented no later than one year following adoption and approval and be fully implemented within two years of approval.

Address Issues Related to Product Packaging

Actions regarding packaging proposed through the 2010 process will be discussed, following a brief description of the Packaging Task Force.

BACKGROUND AND STATUS OF THE PACKAGING TASK FORCE

STATUTORY AUTHORITY:

The Packaging Task Force was created by Section 48 of HB 1671, enacted by the 1989 Legislature, and is charged with evaluating methods to reduce the volume, weight and toxicity of packaging entering the waste stream, reduce reliance on single use and disposable packaging, increase recycling of packaging material, and increase the use of secondary material in manufacture.

MEMBERSHIP:

The Task Force is comprised of representatives of the Departments of Trade and Economic Development, Ecology, the public, local governments, environmental associations, and industry (including product and package manufacturers, retail businesses, solid waste collection companies, and recycling businesses).

TASK FORCE STRUCTURE:

For the purpose of writing the packaging plan, the Task Force has divided into the four following subcommittees: a) Waste Reduction and Single Use Packages; b) Recycling (including reuse); c) Toxicity; and d) Education. Preliminary findings and recommendations of each subcommittee are contained herein in unedited form. These will be presented to the entire Task Force and shared with interested representatives of industry, the environment and the public. Comments made to the Task Force will be directed by to the subcommittees for further development. Final reports of each subcommittee will be completed by August 31, 1990, and incorporated into an integrated final report.

AFFILIATIONS AND RELATED ACTIVITIES:

Manufacturers who market their products in several states frequently make packaging decisions on a regional or national basis. Because product packaging knows no state boundaries, the Task Force is working with other groups involved in finding ways to reduce packaging waste. It is hoped and anticipated that appropriate structures will emerge at the national, regional and state level to assist manufacturers in reducing packaging waste at the source.

The Coalition of Northeast Governors (CONEG) Source Reduction Council is working to develop an efficient strategy to reduce packaging used by manufacturers and to measure the outcome, to make recommendations for public and private sector cooperation and regulation, and to control toxicity in packaging. Several members of the Packaging Task Force also sit on the CONEG Source Reduction Council, enabling both formal and informal affiliation with that group.

Several members of the Packaging Task Force are members of the Institute of Packaging Professionals, a group which may be expected to play an increasing role in educating its

members of the importance of source reduction, as well as appropriate strategies for achieving reduction.

The Council of State Governments is conducting a cradle-to-grave study of major packaging materials to determine which are least costly to produce and dispose. Included for assessment will be all phases of production, including, but not limited to material extraction, energy use, environmental impacts of production. Disposal costs will also be assessed.

DUTIES:

The packaging Task Force is charged with the following two tasks:

1. By January 2, 1990, submit guidelines on product packaging to the environmental excellence product award subcommittee of the Solid Waste Advisory Committee (The SWAC will be responsible for advising the Department of Ecology in development of a package labeling program to inform the public of packages that minimize environmental damage.).
2. By January 2, 1991, submit a Packaging Action Plan to the Legislature, including short and long-range recommendations in order to achieve the above stated goals.

ACCOMPLISHMENTS:

Packaging Awards Guidelines were written (see item #1 of Duties, above) by the Task Force, and have been submitted to the SWAC.

What follows are pieces of a developing comprehensive plan which are similar to proposals made by the public during the 2010 process. Some of these may be adopted, and others not. In final analysis, the Packaging Task Force will adopt elements it deems appropriate. No single element can be judged alone. It should be noted that each piece of the puzzle fits with other pieces which complement it, and conversely.

3a. Resource depletion and disposal fees to be paid at the time of product purchase.

I. Introduction

To date, most product manufacturers have paid little attention to the resource depletion, pollution, disposal and other external costs of packaging which have traditionally been borne by society, in general. By internalizing these costs so that they are borne by manufacturers and/or consumers, and provided that consumers are informed at the time of purchase that they are paying a fee for package disposal, source reduction, reuse and recycling could be induced.

Two strategies have been proposed for internalizing these costs, packaging taxes and fees. Although taxes on packages have been proposed by state and federal jurisdictions, a cursory view of our collective experience on this matter indicates that taxes, because of their legal implications, are more difficult to implement than are disposal fees. The former is viewed by industry as a punitive measure while the latter is viewed as an equitable way to do business. Hence, this discussion will be confined to disposal fees.

The Council of State Governments, under contract with Energy Systems Resources Group, has undertaken a cradle-to-grave analysis of major packaging materials to identify their relative

environmental and economic costs. Resource depletion, energy requirements and pollution impacts associated with extraction and manufacture, the rates at which recovered content could be used in packaging, and the related impacts, and disposal costs and environmental impacts will all be identified. The relative economic and environmental costs of various packaging materials will be calculated. The information generated through this study will enable government to accurately assess packaging depletion, pollution and disposal fees and internalize the costs of packaging that are now borne by society in general. Packages which are reusable or which evidence high levels of post-consumer recycling, low toxicity, and high amounts of recovered material in manufacture would pay a lower fee than those which do not. It is anticipated by some policy makers that revenues would be used, as possible, to mitigate negative impacts.

This approach to paying for packaging is responsive to the following action ideas that were proposed:

- Devise strategies (e.g. financial pressure, consumer pressure, etc.) to effect changes in packaging of consumer products at the manufacturing level, such as biodegradable fast food containers or single metal and plastic containers that can be recycled;
- Source reduction (at generation points);
- Tax on packaging material and junk mail (junk mail is addressed separately).
- Impose a tax on products scaled to their environmental impacts and ability to be recycled;

II. Gains and Costs of Taking This Action

Packaging is about 27% of the waste generated in Washington State. Some of it is necessary to protect products. Without it, our level of waste generation would be much higher due to spoilage, contamination and other damage. However, excessive packaging that protects neither the product from the environment or the environment from the product must be reduced.

The Recycling Subcommittee of the Packaging Task Force has discussed packaging fees as a way to induce waste diversion or source reduction. Under such a system, fees are based on the performance of the package. While recognizing taxes and fees as possible strategies for achieving changes in manufacturer or consumer behavior, neither has been formally recommended by the Task Force as a preferred method. Although there is much theoretical literature on the subject, because actual experience with packaging taxes and disposal fees is virtually nonexistent, the impact on behavior is unknown. With that in mind, the following are examples of waste reduction/diversion that could occur as a result of a disposal fee on packaging. Percentages indicate weight:

Corrugated packaging is the largest single component of the packaging waste stream in Washington State, comprising 42.6% of all packaging generated, and 11.6% of all waste generated. Lightweighting of corrugated containers could result in a 10% reduction (4.2% of the packaging waste and 1.2% of all waste).

Glass packaging is 3% of all waste generated in Washington State, and 11.4% of packaging generated. By standardizing container glass, 70% of this waste stream (2.1% of Washington's waste stream, and 8% of packaging waste) could be reused. A fee might spur development of such a system.

Packaging taxes or fees are most efficiently imposed at the point of manufacture. Since many products are manufactured outside of Washington State, a system of identifying first possession in this state, and assessing a fee at that point would have to be developed. Such a system is possible, but recognizing that there are literally thousands of products that would be assessed at different rates, the collection system is not without its costs.

It is probably safe to say that the highest costs of the collection system would be incurred in its establishment, followed by a period during which the collection system would require high maintenance due to expected changes in packaging practices.

The anticipated reduction in the disposed waste stream would have to be weighed against program costs in determining its desirability. The Packaging Task Force is in process of developing much of the information needed to make this determination.

III. Other Factors

In addition to manufacturers who could pay a fee, product brokers (such as Associated Grocers) and retailers could incur the cost of collecting the fees. More research would be needed about this impact before proceeding.

In general, those who are now subject to the Litter Control fee would likely accept another fee if it supplanted the fee now being paid (See the discussion of the Litter Control Act below).

IV. Roles and Responsibilities

Florida is the first state in the country to impose a package disposal fee based solely on package recycling rates. While the law took effect in 1989, packages will not be subject to a fee until 1995. By having such a period, manufacturers are set on notice, giving them time to either switch to a more recyclable package type or take actions to enhance the collection system so that packages meet the minimum required recycling level to evade the fee. It is conceivable that any state imposing a package fee would have a similar implementation schedule.

In addition to the roles suggested above, a system involving a broad community of interests (state and local governments, waste haulers and recyclers, other businesses) would be needed to distribute revenues. It is likely that the broad parameters would be written into statute, but some direction would undoubtedly be needed.

3b. Package manufacturer waste reduction planning

I. Introduction

Washington State has a consumer driven packaging reduction system. Following implementation of the packaging awards system and use of a logo indicating that a package is environmentally benign, it is assumed that a strong public education system will induce consumers to purchase products which are packaged appropriately. As consumers make their will known at the checkout stand, it is anticipated that manufacturers will respond with more appropriate packaging.

It is absolutely critical that product manufacturers engage in waste reduction planning so that as consumers make their collective will known, manufacturers will respond with more efficient

packaging. The Waste Reduction Subcommittee of the Packaging Task Force is in process of writing a charter for an association of packaging professionals, along the lines of a Bar Association or Medical Association. Among the charges of this proposed professional association is waste reduction planning. By assessing the product and its packaging to make sure it is being delivered in the most efficient way, waste will be reduced at the source.

This approach is responsive to the following action ideas that were proposed:

- Source reduction [of packaging] (at generation points).
- Require manufacturers to document the benefits and impacts of their products [packages] prior to allowing production and sale.

II. Gains and Costs of Taking This Action

The cost to consumers and the environment of not taking this action can not be determined now. However, it is clear from discussions with Task Force members that the charter being drafted will incorporate ways of measuring success in terms of per capita package reduction.

The perceived economic burden for this program falls squarely on product and package manufacturers. However, many seem willing to take this responsibility because they perceive the alternative- government regulation- as more costly.

III. Other Factors

Like disposal fees, package manufacturer waste reduction planning is better done by federal legislation due to the fact that many products entering the state are produced elsewhere. It is hoped and anticipated that as the Packaging Task Force develops the charter for an association of packaging professionals, similar associations will evolve elsewhere. The Task Force is working with the Source Reduction Council of the Coalition of Northeast Governors, a group representing the interests of seven East coast states, to make sure that the professional organization being developed there is similar to Washington's.

IV. Roles and Responsibilities

The primary responsibility of the association will be that of private industry, although it has been suggested that government assist with the educational aspects that will be needed. In the same way that state governments provide law and medical schools, the group hopes that the state will provide education at a university in Washington to train packaging professionals, and to provide continuing education to practicing professionals. Details and costs have to be worked out.

3c. Require deposits on recyclable material

I. Introduction

Deposits are used to attribute worth to what would otherwise be considered garbage. By giving post-consumer waste a value upon its redemption, recycling is greatly increased. Oregon DEQ reports a 95% recovery rate on beverage containers covered by its program.

Washington has a deposit on lead acid batteries, but the program is too new to have a measurable impact.

If the recovered material is successfully recycled, increasing the recovery rate accomplishes the general objective of reducing the amount of disposed waste, as well as energy demands, resource depletion, and other undesirable impacts associated with manufacturing packages from virgin materials.

This approach is responsive to the following action idea that was proposed:

- Enact a "Bottle bill" regulation requiring the return of spent containers. Include reminders in garbage bills about safe disposal practices.

II. Gains and Costs of Taking This Action

When HB 1671 was written, a conscious choice was made not to implement a bottle bill. Given the fact that industry has historically opposed such measures coupled with the facts that not all post-consumer materials are susceptible to such a program, and people participate if the opportunity to recycle is convenient, the decision was made to develop curbside recycling programs. Having made that choice, it would be redundant and costly to have a universal deposit system that covered all materials. The public interest would not be served by government sponsorship of two programs.

There are, however, exceptions to this, especially for wastes which can not be safely accommodated by a curbside collection system. As noted above, lead acid batteries are now subject to a deposit because they fall into that category. The work that is now being done by the Department of Ecology on special wastes might result in other materials being added to the list.

Other factors, roles and responsibilities would depend on the material or product identified for deposit.

3d. Discourage the Use of Disposable Diapers

I. Introduction

Disposable diapers present a special problem for waste handlers. They are frequently disposed with fecal matter, although manufacturers instructions direct users to do otherwise. In spite of the fact that many local jurisdictions have ordinances to the contrary, soiled diapers make their way into landfills, creating a number of related health problems.

Typically, local utilities are operated as enterprise funds. This means that system users pay the actual cost of service. For example, sewage pre-treatment programs have been developed in response to groups of system users which inordinately burden sewer systems. For this class of users, an additional fee can be assessed to cover the cost of treatment. Similarly, local governments should be encouraged to provide separate collection and disposal systems for disposable diapers, and to assess users the cost of the program.

This approach is responsive to the following action idea that was proposed:

- Ban or strongly discourage through moral suasion the use of disposable diapers.

II. Gains and Costs of Taking This Action

Under current conditions, the cost of disposing of disposable diapers is borne by society in general whose members pay the cost of landfill enhancements necessary to avoid disease, for teams to safely dispose of diapers disposed as litter, and for other public health costs associated with inappropriately managed fecal matter. All of these could be avoided if disposable diapers were better managed, or eliminated.

The precise cost of collecting and recycling disposable diapers is known only for King, Pierce, Snohomish and Kitsap Counties where Anderson Diaper Service will collect diapers for \$18 a month. The Department of Ecology is in process of conducting a study to determine whether low cost composting systems can be established for use by small local governments throughout the state. The result of that study will, to a certain extent, determine the feasibility of statewide systems for separate collection of disposable diapers.

III. Other Factors

When the House Environmental Affairs Committee held hearings two years ago on the proposal to ban disposable diapers, there were two groups of dissenters: diaper manufacturers and people under forty. It is unlikely that disposable diapers will be altogether banned, but there is mounting evidence that society is no longer willing to bear the cost for parents and other care givers who wish to use them.

IV. Roles and Responsibilities

Under existing law, local governments could probably establish and charge users for separate collection systems. However, apart from generally granted health authority, they have restricted means of mandating compliance. If the authority were articulated in state law and penalties specified, local governments would be aided in their efforts.

A viable, inexpensive means of handling disposable diapers must be developed by the state. This is the hoped for result of the study which is now under way. Once the technology has been demonstrated, local governments will be in a better position to establish programs.

3e. Overhaul the Model Litter Control and Recycling Act

I. Introduction

When the Model Litter Control and Recycling Act was enacted in 1971, it was industry's response to a proposed bottle bill. In general, manufacturers, distributors and retailers of consumer goods are subject to an assessment of \$150 per million dollars of gross sales. Forty to fifty percent of program revenue is to be spent to employ youth to pick up litter. Twenty to thirty percent is dedicated to the purposes of recycling.

By mandating that youth be hired to pick up litter, the act reinforces the notion that littering is OK- even desirable. After all, it gives young people something to do. In the post-HB 1671 era, however, a new ethic is called for. Not only must the role of industry change, but that of citizens, as well. Recycling, a rather avant-garde notion in 1971, has become the third priority in the hierarchy of "Reduce, Reuse, Recycle," and littering is just plain unacceptable.

The new ethic requires that consumers take responsibility for waste reduction and reuse, and tailor their purchases accordingly. Industry and consumers must cooperate in developing and implementing systems of reduction and reuse. The Interim Report of The Recycling Subcommittee of the Packaging Task Force discusses the packaging waste stream, and indicates some of the problems that must be addressed (see attachment) with the participation of industry, retailers and consumers.

Producers of packaging are, in large part, the same group of manufacturers who now pay the litter assessment. To the extent that funds are necessary to pay for programs, we must find new ways of assessing fees which reward those who make capital investments in recycling systems or energy conservation measures. Those who use recycled content in manufacture should be rewarded with a lower assessment (Please see discussion of package disposal fee.).

The public education focus also must change. While maintaining public education programs on recycling, the consuming public needs to be informed of wise choices at the checkout stand, and household waste reduction strategies.

Against the backdrop suggested by this ethic, our litter problem could be addressed much more forcefully. To reiterate, we must begin with the ethics "Reduce, reuse, recycle," and "Littering is not acceptable." This must be the foundation of an effective anti-littering campaign. As long as eighteen to twenty-five year olds, the most littering segment of the population, look out their car windows on the highway and see their peers cleaning up after them, we are sending the wrong message.

Other states have been successful in reducing littering with a tougher message than the one we have sent, and this should be explored in Washington. Texas, for example, has an information campaign which is geared toward the 18 - 25 year old offenders. A program such as this should be explored in Washington.

This approach is responsive to the following action idea that was proposed:

- The so-called Model Litter control Act should be completely overhauled. It is very clear that it is not doing an adequate job. Oregon, British Columbia, Michigan and Florida have much more effective programs. Study and use their method.

II. Gains and Costs of Taking This Action

The Packaging Task Force is working hard to develop a comprehensive action plan. Where appropriate, program plans and budget items will be included.

III. Other Factors

On the whole, industry will be responsive to opportunities for waste reduction and reuse, especially given proper incentives or disincentives. If the public changes its purchasing patterns, industry will respond. Some of those involved in the authoring of the 1971 act may need time to respond to the changing times in which we live.

IV. Roles and Responsibilities

Implementation of this action would require involvement of industry, government and the public in developing a new ethic, and in designing programs and lifestyles consistent with that ethic.

3f. Levy a Tax on Junk Mail

I. Introduction

A tax on junk mail is a tempting policy option, but probably illegal. A suitable alternative might be media campaigns giving postal patrons the names and addresses of the companies which do mass mailings. If contacted, these companies will remove names voluntarily.

This approach was offered in the following:

- Tax on packaging material and junk mail (Tax on packaging material addressed above).

II. Gains and Costs of Taking This Action

Mixed waste paper is 10.4% of the disposed waste stream in Washington State. An unknown fraction of this, but probably a large part, is junk mail. The cost of a campaign to educate the public about removing their names from mass mailing lists should be weighed against the environmental and economic costs of landfilling unwanted paper. A cursory view indicates that the media campaign would be worthwhile, although precise cost figures have not been developed.

III. Other Factors

None.

IV. Roles and Responsibilities

The Department of Ecology will likely include this in the "tool kit" of education strategies being developed for use by local governments.

Explore the Use of Incentives for Recycling

I. Introduction

Incentives and disincentives have long been discussed as motivational tools to encourage the public to participate in recycling. Among them include increasing the cost of disposal and use of a graduated rate structure to promote waste reduction and recycling. ESHB 1671 Section 19 (6) directs the Utilities and Transportation Commission to require waste hauler to use a rate structure and billing system consistent with the solid waste priorities of Set in statute in order to offer an incentive to the rate payer. The Commission has yet to adopt rules to implement the section.

This action is responsive to the following proposed action:

- Use market incentives, such as a graduated rate structure for water and sewage bills to promote conservation and recycling.

II. Gains and Costs of Taking This Action

Use of financial incentives have worked to encourage waste reduction and recycling. For example, the City of Seattle increased its garbage collection rates and at the same time began offering curbside collection of recyclable materials. Sign up for the curbside programs and participation in them far exceeded the city's expectations. The citizens response to the curbside collection program can be partially attributed to cost of disposal.

This approach is perceived as an effective tool to encourage recycling. The Environmental Protection Agency has given the City a grant to evaluate the extent of the effectiveness of this approach.

This approach needs to be implemented by local governments or those responsible for collection and disposal of waste within a jurisdiction. This cost would be absorbed by the rate payer and should ultimately result is a reduction in the cost of overall waste management.

III. Other Factors

Technical factors lay in the area of economics assessment. An assessment needs to be made, case by case, based on costs to determine at what point will people choose recycling over disposal. This may vary dramatically from community to community. It also needs to be justifiable based on the cost of collection and disposal of mixed waste, with long term closure, post closure and liability costs factored in.

Institutional constraints lay with the local governments and their willingness to implement such a program.

Political factors play a major role here in that the action may be perceived as unpopular, causing local elected officials to back away from support.

IV. Roles and Responsibilities

This action needs to be implemented by local government. However, the legislature could encourage the implementation of such an action by funding necessary studies and encouraging

local governments to implement the action through state directives. The Department of Ecology could also encourage the action through technical assistance.

An important player in this is the Utilities and Transportation Commission whose responsibility is to regulate and set rate of the private waste management industry. This would be difficult to implement by the private sector without the Commission's support.

As mentioned, until there is legislative direction, this action would only be a suggestion to local governments, who are responsible for solid waste management in Washington. The Office of Waste Reduction, Recycling, and Litter Control with the Department of Ecology would have responsibility to provide this encouragement.

Develop Markets for Recyclable Materials

I. Introduction

In order to complete the recycling loop, strong markets for recyclable materials must be developed. The 1989 legislature recognized this need when hearing ESHB 1671, the Waste Not Washington Act. Among the bills 109 sections are two dealing directly with market development for recyclable materials. First, it established the Department of Trade and Economic Development as the lead agency for development of these markets, with assistance from the Department of Ecology. Secondly, it required the establishment of a Committee of Recycling Markets. The committee was directed to evaluate opportunities for improving the markets for low valued materials - mixed waste paper, composted organic wastes, plastics and other problem wastes such as waste oil and tires. The committee's work will be completed December, 1990, with a report to the legislature recommending actions to be taken.

Among the tools that can be employed to develop markets are subsidies, tax credits, and loans. There are barriers to these kinds of enhancements. First the state constitution prohibits the lending of state credit to private ventures. Consequently, direct subsidies and loans to private business from the states treasury is impossible. However, subsidizing collection of recyclable materials through funding capitalization of city collection programs, paying for collection with avoided disposal fees, and paying for long haul of recyclable materials, for example, to market are all indirect subsidies that will cause the final price to the consuming end user to be reduced, and consequently encourages the consumption of more secondary material. These forms of subsidy are beginning to be employed in varying degrees.

The City of Seattle pays for collection of recyclable materials through avoided disposal costs. The philosophy here is that the city can afford to spend up to the cost of disposal in order to avoid having to dispose of the material in the landfill. The City has made a decision to direct materials to recycling rather than disposal.

The Department of Ecology is offering grants to local governments through Referendums 26 and 39 for waste reduction and recycling programs. The grants will provide funds for capitalization of the collection infrastructure needed at the local level.

The Committee for Recycling Markets will be providing recommendations to the legislature during the 1991 session. Those recommendations may carry activities for the Department of Ecology as well as recommendations for other state agencies.

This action is responsive to the following proposal:

- Create markets for recyclables (included in item #9).

II. Gains and Costs of Taking This Action

The merits of recycling will not be debated here. The suggestions are to improve recycling opportunities and enhance the development of recycling within the state. The suggestions are broad in scope and do not get into specific detail about market development.

ESHB 1671 established a 50 percent recycling goal for the state by 1995. It requires that local governments write waste reduction and recycling plans designed to collectively meet the

recycling goal. Through implementing the plans, local governments recycling collection opportunities for citizens. Plan development is on a phased schedule, with the first due to be completed by July of 1991, the last by 1994. The material collected will need to be directed to an end use market.

Washington citizens recycled 1,491,400 tons of material in 1988. This represents a 28.6 percent recycling rate against a 5,219,122 ton waste stream. In order to achieve the 50 percent goal an additional 1,118,161 tons of material will have to be diverted. This is based on 1988 data. The waste stream is projected to increase, along with population and our booming economy to 5,812,011 in 1995 based on a constant generation rate of 1.15 tons per person per year. This estimate may be low due to estimations that the per capita generation rate will increase. At that time we should be diverting 2,906,005 tons of material from the waste stream for recycling, or 1,414,605 tons more than in 1988, a 95 percent increase in recycling activity.

In 2010, if the 50 percent recycling goal is achieved and sustained, with the same per capita generation rate of 1988, Washington will still need disposal capacity for 3,457,620 tons of waste. The increase in recycling tonnage will go from 1,491,400 to 3,457,520 as well.

This addition of material on the already strained marketplace points to the need to expand existing and develop additional markets, if recycling is to continue to be a viable waste management tool.

Costs cannot be estimated until the Committee For Recycling Markets has completed their work and submitted recommendations.

III. Other Factors

Again, the issue is so broad it is difficult to describe the technical constraints that will be faced. Each secondary material type will be faced with technical barriers to increased use. For example, the pulp and paper industry in Washington state has very little, if no experience with secondary fibers, therefore the technical learning curve is starting at near zero. The Department has just completed a study on the potential capacity of Washington's pulp and paper industry to use secondary feedstocks. The study also addresses barriers to increased use. Plastics have a variety of technical barriers from development of a cost effective collection system, to identifying and developing viable secondary use applications. Glass is constrained by capacity and cost competition with raw materials. Secondary metals, on the other hand, seems to have very few constraints other than issues related to hazardous waste generation from processing.

ESHB 1671 placed market development for recyclable materials squarely in the hands of the Department of Trade and Economic Development. Establishing compatible interagency priorities, coordination of programmatic activities, and assuring ongoing concerted efforts will be constantly constraining without organization, direction and commitment.

Without markets, collection of secondary materials for recycling will be a mute point. If a material is collected without a final market, the likely end point will be disposal. This would point to the ineffectiveness of recycling as a viable waste management method.

IV. Roles and Responsibilities

The Committee of Recycling Markets will recommend actions to be taken to address specific market issues. The recommendations will include identification of those responsible for

implementation. The Department of Trade and Economic Development will be responsible for the major efforts in market development.

The Office of Waste Reduction, Recycling and Litter Control is currently responsible to provide assistance to the Department of Trade and Economic Development, the Committee for Recycling Markets, and businesses and governments within the state interested in market development issues from Ecology's point of view. The Department of Trade and Economic Development is required to include development of recycling markets as part of their ongoing efforts in economic development.

The Committee for Recycling Markets will submit their report to the legislature at the beginning of the 1991 session. The implementation of recommendations within the report are contingent upon provision of legislative authority and funding. However, market development is an ongoing need that will be continually address by the two agencies.

Environment
2010
Action
Agenda:

Action
Strategies
Background
Analyses

Package
Three:

Cooperation



State of Washington
July, 1990

Washington Environment 2010 Action Agenda
Action Strategies Background Analyses
Cooperation Package

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I. Introduction

This package of action proposals for Washington Environment 2010 is focused on the concepts of responsibility and cooperation, two elements of the 2010 Vision Statement. As pointed out in the State of the Environment Report, many environmental issues can be traced to the choices that individuals make. These choices may be personal choices, or decisions made in our various capacities as participants in communities, government, or commerce. Our choices may effect only ourselves or our families or they may effect a wider public. Our choices may bring us into conflict with the choices of other people. Many such conflicts are the subject of laws and rules which delineate responsibilities for compliance and procedures to resolve disputes. However, compliance with current law and use of litigation to resolve disputes may not sufficiently demonstrate the responsibility and cooperation needed for stewardship of our environmental resources.

As outlined in the State of the Environment Report, Washington's environmental resources are finite and are undergoing increasing risk of harm and pressure to produce benefits from a variety of often competing human activities. As these risks and pressures increase, the potential for conflict and specific disputes escalates as does the need for environmentally responsible behavior above and beyond what may be legally required.

The vision statement for 2010 includes the following goals for responsibility and cooperation.

"A heightened sense of responsibility for environmental protection exists. All of the state's citizens, community groups, corporations, and other institutions are taking responsibility for environmental problems. All decisions reflect a bias for environmental protection. All Washingtonians are living environmentally conscientious lifestyles."

"Consultation and cooperation are the primary means of dealing with environmental issues in Washington State. Environmental management decisions are approached by all parties with a spirit of unity, cooperation, trust, and mutual respect. Litigation is a last resort for resolving environmental disputes. The barriers within and between government, business, and the citizenry have largely disappeared. The creative tension that is derived from divergent needs and viewpoints is harnessed and used to solve, rather than to prolong, difficult problems. Washingtonians believe in the common good strongly enough to sacrifice or compromise parochial concerns, when necessary, in pursuit of that common good."

To achieve these goals, creative approaches to building responsibility and cooperation are needed. The 2010 Summit in November 1989 identified the failure of environmental values or the lack of environmental responsibility as a priority issue. At the summit and subsequent town meetings, a number of approaches to address this issue and to build responsibility and cooperation were suggested. These are generally cross-cutting approaches that can

contribute to addressing many of the threats to environmental resources identified in the State of the Environment Report. These suggestions were initially combined and refined into seven action proposals. Two proposals related primarily to building cooperation: establishing an institute to foster consensus building and dispute resolution, and encouraging interagency and intergovernmental coordination through Memoranda of Understanding. Five proposals were aimed at encouraging environmental responsibility: supporting volunteer environmental service, developing a venture capital fund for environmental technologies, emphasizing institution's use of environmental audits and investment and purchasing power to promote responsible environmental behavior, improving the evaluation of environmental regulatory programs, and creating better citizen access to environmental programs.

For each of these ideas, the proposed action is described in greater detail, gains and costs of the proposal are identified, other technical, institutional, and political factors are characterized, and potential roles and responsibilities for implementing the proposal are outlined. This assessment and description of these proposals was prepared by a subteam of the 2010 Action Strategies Analysis Committee in support of the Environment 2010 Steering Committee and Public Advisory Committee.

On March 20, 1990, the Steering Committee and Public Advisory Committee discussed this package of seven action proposals related to cooperation and responsibility as derived from suggestions offered at the Environment 2010 Summit and town meetings. As a result of the Public Advisory and Steering Committee's discussion, the package of proposals was refocused and refined to identify the following key recommendations for action:

- a) Creating an ombudsman in resource agencies to act as a citizen's advocate and to improve citizen access to environmental management programs.
- b) Supporting broad-based citizen and community action groups in implementing 2010 actions at the local level.
- c) Improving environmental management program coordination and resolution of inconsistencies in resource agency's policies and regulations.

A brief description and discussion of these actions is contained in Sections IX through XI. These proposals were subject to further discussion and refinement as the Steering Committee, Public Advisory Committee, and general public review of the Draft 2010 Action Agenda proceeded.

II. Consensus Building and Dispute Resolution

A. Proposed Action

Establish the Washington Institute for Environmental Consensus to support consensus building and dispute resolution processes

to address environmental management issues. Such support would be provided through:

1. Serving as a clearinghouse for information on consensus building and alternative dispute resolution practices,
2. Advising interested persons, upon request, of dispute resolution options applicable to their specific issues or disputes.
3. Referring parties to available dispute resolution and facilitation services, and
4. Administering a small grant fund derived from both private and public funds, to provide critical financial support to initiate consensus building or dispute resolution processes.
5. Undertaking other educational activities to foster consensus building and alternative dispute resolution processes.

The institute would not directly provide dispute resolution services in competition with public or private providers of such services.

B. Risk Reduction/Resource Enhancement Potential

The Institute would not directly reduce any health or ecological risk nor enhance any environmental resources. Benefits would be indirectly derived from the Institute's contributions to the resolution of environmental disputes and issues. Opportunity and transaction costs of environmental disputes can be substantial. Outcomes to disputes that are not based on consensus often lead to protracted conflict with attendant costs. Adversarial conflict procedures often discourage creativity in resolving disputes. Consensus based procedures, on the other hand, can generate solutions that more often maximize the satisfaction of all parties' interests.

The effectiveness of the Institute could be indicated by the number of persons assisted with information, the parties to disputes or issues advised as to alternative dispute resolution options, the referrals to dispute resolution professionals, and the number of dispute resolution processes that are provided financial assistance. Ultimately the effect of the Institute would be reflected in benefits gained from successful resolution of issues of disputes pursuant to substantial support from the Institute.

A primary benefit of the Institute would be increasing public awareness of alternative approaches to dispute resolution and improving understanding of dispute resolutions options and access to dispute resolution professionals by parties to a

dispute. This could be of particular benefit to local government, small business, and private citizens.

C. Costs

The institute would not have adverse economic impacts. Use of the Institute's services would be voluntary. The costs of the Institute would include the direct cost of staff, overhead, and public funds provided for "seed" grants to support specific dispute resolution processes.

An estimate of costs on an annual basis assuming a staff level of 3 full-time equivalent is as follows:

Salaries and Benefits	\$132,500
Overhead (estimated at 30% of salaries and benefits)	39,750
Grant Funds*	<u>50,000</u>
Total	\$222,250

* Could be supplemented by private funds channelled to dispute resolution processes through the Institute.

D. Summary of Benefits and Costs

Although benefits are not easily quantified in a general sense, an investment of just over \$200,000/year can encourage and support alternative approaches to resolving environmental disputes and building consensus or environmental management issues. More detailed studies have shown benefits in terms of the costs of disputes in specific cases where alternative dispute resolution processes were used. The costs of environmental disputes and lack of consensus on environmental management issues may range from a few dollars to many millions of dollars (e.g. the value of a large timber sale).

The increasing and often competing demands placed upon limited environmental resources guarantee an escalating potential for conflict, both in terms of broad policy issues and site specific disputes. A modest investment in support of creative, consensus-based resolutions may pay handsome dividends.

E. Other Factors

There are no technological constraints on establishing an institute for consensus building and dispute resolution. Techniques, methods, and procedures for dispute resolution are well developed and have been extensively used in the areas of labor management relations, family and community disputes, civil complaints, and environmental disputes and policy dialogues.

The Institute could easily fit within the existing institutional framework, supplementing and supporting existing

approaches to consensus building and dispute resolution. Use of institute services would be voluntary and would support, not replace, the existing networks of persons and institutions active in consensus building and dispute resolution.

Both political support and opposition to an institutional mechanism for environmental consensus building and dispute resolution has been relatively low key in the past. As the frequency and intensity of environmental issues and disputes increases, political support for consensus building and dispute resolution options and methods can be expected to increase.

F. Roles and Responsibilities

Establishment of the Institute will require legislation to mandate its responsibilities, structure, location, funding, and accountability. The Institute would be an independent entity, accountable to the legislature and the Governor as mandated through its enabling statute. It should not be closely identified with any institution which has any specific environmental management mandate. The impartiality of the Institute is an essential asset and should not be jeopardized.

The Institute will be responsible for providing services supporting consensus building and dispute resolution. Primary responsibility for consensus building and dispute resolution, including use of the Institute's services remain, of course, with the interested parties to any given issue or dispute.

The requisite legislation could be prepared and submitted for legislative consideration in the 1991 session.

III. Interagency and Intergovernmental Coordination

A. Proposed Action

Establish and encourage procedures for interagency and intergovernmental coordination through an Executive Order providing for umbrella Memoranda of Understanding among resource agencies, governments, tribes, and other institutions. The umbrella MOU's and any subsequent specific agreements could proactively deal with coordination needs and environmental management issues and establish procedures to address environmental concerns during development of projects, including dispute resolution procedures.

B. Risk Reduction/Resource Enhancement Potential

An Executive Order encouraging umbrella MOU's to improve interagency and intergovernmental coordination related to environmental management would not directly reduce environmental risks or enhance environmental resources. However, the subsequent agreements between agencies, governments, and other institutions could improve the efficiency and effectiveness of

those programs charged with managing environmental resources and help reduce the adverse environmental effects of other programs or projects.

The Executive Order could encourage MOU's to supplement the work of the Advisory Commission on Intergovernmental Relations and to implement the Centennial Accord between the Indian Tribes in Washington and the State of Washington. MOUs are contemplated as an implementation mechanism in the Centennial Accord.

Lack of proactive coordination among governments and agencies can often result in untimely and costly disputes and inefficiencies in implementation of respective programs and projects. Proactive coordination through MOU's can clarify principles and procedures for communication and for resolving disputes and help insure that agencies and governments are being mutually supportive in reaching their social objectives.

The effectiveness of this action in reducing risk or enhancing resources could not be measured directly. Its usefulness in encouraging coordination would be measured by the number of MOU's developed and analysis of each MOU to determine what coordination benefits had been achieved. The Executive Order can provide for proactive analysis by environmental management agencies to consider those coordination situations where MOUs would be most useful.

Implementation of this proposal should result in other benefits in terms of interagency and intergovernmental communication and understanding with resulting reductions in duplication of effort and the time required to resolve disputes.

C. Costs

There are no direct economic impacts from this proposal. Costs of government activities to achieve environmental management objectives should be reduced, but such benefits cannot be easily quantified.

The primary cost of the proposal would be the staff time required to prepare the Executive Order and each MOU developed pursuant to the order. Assuming an average of three months staff time required to prepare the Executive Order and each MOU, the estimated cost would be approximately \$15,000 for each such document.

D. Summary of Costs and Benefits

The benefits of this proposal are potentially significant in terms of efficiency and effectiveness of government programs that have a relationship to achieving environmental management objectives. However, these benefits are not specifically identified or quantified in advance. This proposal would give

additional impetus and structure to existing intentions to manage and operate efficient and effective programs.

The initial costs of the proposal are quite small. Subsequent costs would be dictated by the usefulness and priority of developing specific MOU's.

E. Other Factors

This proposal is not constrained by any technical factors.

This proposal would complement existing laws and institutions. The Executive Order would acknowledge and build upon existing responsibilities and structures. The process of developing MOU's would occur within existing institutional structures and would relate to coordinating the implementation of existing mandates. Development of MOU's may facilitate identification of necessary and desirable increments of institutional change which would be implemented at the prerogative and with the mutual agreement of the responsible parties.

This proposal will not entail significant controversy. Political support or opposition is likely to be nominal. There is widespread, but mostly latent and diffuse, support for increased effectiveness and efficiency in government. Opposition will not be intense but will be derived from the inevitable inertia to be overcome in taking action and the lack of particular momentum for the proposal.

F. Roles and Responsibilities

The Governor's Office and other supporting agencies would be the focal point for developing an Executive Order. Upon signature of the Executive Order by the Governor, responsibility for development of specific MOUs would shift to the state's natural resource agencies who would work with other agencies, governments, and institutions as applicable.

An Executive Order could be developed by the end of 1990 and MOUs could be developed thereafter. It should be noted that MOUs between agencies, governments and other institutions can be and have been developed previously on an ad hoc basis.

IV. Volunteer Environmental Service

A. Proposed Action

The proposed action is an Interagency Council for Environmental Volunteers to enhance environmental volunteer programs. The key objectives of such an action are:

- enhancing environmental service delivery programs through use of volunteers;

- coordination and promotion of volunteer programs to support state agency activities;
- centralized administrative and/or pooling of common costs;
- support and coordination for community-based programs; and
- training and recognition of volunteers.

B. Risk Reduction/Resource Enhancement Potential

The gains for the environment from an enhanced volunteer program are threefold. First, there is additional direct assistance available for data gathering and analysis, monitoring of key environmental indicators, restoration and remediation work, and environmental education. These are hours of direct effort that would not otherwise occur--or would cost a good deal more if undertaken by fully-funded workers. Second, "hands on" involvement increases the knowledge and commitment of the volunteers. They are likely to become a better informed, more effective, and cohesive constituency for environmental protection and enhancement. Third, volunteers are visible symbols to the larger community, conveying the message that the environment is worth caring about and that individuals can make a difference.

Existing volunteer programs indicate something of the range of environmental concerns that may be addressed. Adopt-A-Stream, Adopt-A-Beach, Adopt-A-Park, and similar restoration, maintenance and enhancement programs are reasonably well developed. Bay Watch in Clallam County and Ecology's acid rain monitoring have utilized volunteers to monitor and report key water and air quality data. The Senior Environmental Corps (SEC), initiated by Governor Gardner in 1988, has supplied skilled professionals to assist with environmental education, wildlife tracking, policy analysis, laboratory accreditation, and hazardous spill response planning. Currently, the Department of Natural Resources, Department of Fisheries, and Parks and Recreation Commission have extensive volunteer programs.

It is difficult to quantify the contributions made by volunteers. One can estimate the value of the work, compared to costs of hiring people to do the same work. The SEC policy council has estimated that the value of work from its program is about \$3.80 for every dollar spent on the program, and projecting 4,200 hours of volunteer service by June 30, 1990. SEC work may have a higher-than-average value, since many participants are retired professionals. Nevertheless, there is likely to be measurable value added by volunteer assistance.

It is harder to value the contribution volunteers make through education, leadership and community participation. Again, SEC has emphasized placing its volunteers in visible, educational positions, and its recognition of their efforts comes in the form of visible items, such as hats, shirts, and shoulder patches with SEC logos. The Adopt-A- programs have capitalized on media coverage.

C. Costs

Effective volunteer programs do have costs. Recruitment, solicitation of appropriate projects, and recognition of volunteers all require resources. Staff coordination is needed. Volunteers' out-of-pocket costs, such as travel and long distance telephone calls, must be covered. Senior Environmental Corps estimates its costs for the coming fiscal year at \$30,000, which would cover 110 volunteers contributing approximately \$100,550 in assistance.

There are often other costs as well. For example, Bay Watch volunteers have been provided with training by resource agency personnel and County Extension programs. The free training opportunity may both increase the quality of volunteer assistance and serve as an incentive for people to volunteer. Clerical support, monitoring equipment, and other items having some value may be borrowed or "bootlegged" to support volunteer programs. These costs apparently are not regarded as significant problems by those utilizing volunteers.

Private industry and non-profit organizations support some volunteer programs, and could be encouraged to provide resources as a part of a coordinated effort to mobilize volunteers to work in environmental tasks. The private sector, of course, does and can do a good deal to provide recognition, training, and materials.

In the long run, the gains attributed to volunteerism will not be achieved if there is increasing reliance on volunteers to perform routine, basic tasks. This has been a problem in social and human service areas.

Washington State government presently has a rather narrowly based Senior Environmental Corps program, on the one hand, and a coordinator to support local volunteerism, on the other. The latter, located in the Department of Community Development (DCD), has not emphasized environmental projects. The 1990 legislative session has entertained various proposals to appropriate as much as \$300,000 to DCD to make grants to support local volunteer programs--again primarily in areas other than environment.

D. Summary

The costs for a broader-based program that would coordinate volunteers, including the SEC, in support of state resource

agency activities would range upward from the current level of \$60,000 per biennium. An expanded effort, both in scope and capability, could easily double or triple those current costs. An additional program to make grants to community volunteer programs, including emphasis on environmental volunteer projects, could range from \$100,000 to \$300,000 or more.

This proposal would create an environmental volunteer council, including representatives of state agencies, the private sector, local governments, educators and students, and community groups who could develop criteria for such grant-funded programs. Participation by these sectors could also result in non-state contributions to match state appropriations.

E. Other Factors

1. Technical factors

There are no technological factors that prevent moving ahead with this proposed action.

2. Institutional constraints or implications

The proposal does not raise major institutional problems. It does propose creating a separate environmental volunteer coordinating council, over and above the Council for Voluntary Action. However, staff support would come from the existing Center for Voluntary Action in the Department of Community Development and the Senior Environmental Corps, presently lodged in Ecology..

3. Political factors

Volunteerism is generally popular politically. However, proposals to expand volunteerism in the current legislature were not successful.

F. Roles and Responsibilities

1. Implementation responsibilities

The key addition to existing groups is a joint state government-private-community council focused on environmental volunteerism.

2. Accountability

The natural resource agencies presently have a group guiding the Senior Environmental Corps program, with a coordinator housed in Ecology. Community Development has the Center for Voluntary Action. These two should be able to establish an environmental volunteerism council and to manage development of volunteer opportunities, recruitment, recognition, and support to community-based groups through existing mechanisms.

V. Venture Capital Fund

A. Proposed Action

The proposed action idea coming from the public process is to develop a venture capital fund for development of new, environmentally sound technologies and alternatives to environmentally destructive products and practices.

Because of the constitutional constraint which prohibits government from being direct investors in such a fund, and the need for some incentive to attract potential private investors, the analysis to follow assumes that the proposed action will be to enact legislation to provide those incentives and create the climate for investment to occur. Specifically, legislation would be passed which would give state tax incentives (in the form of tax deductions or credits) for a portion of the amount individual firms invest in a venture capital fund. Furthermore, the fund could only be used to finance environmentally sound technologies or alternatives to environmentally destructive products or practices as defined in the enabling legislation.

B. Risk Reduction/Resource Enhancement Potential

The availability of funding that would not otherwise be accessible, for use by business to develop and market innovative technologies aimed at environmental problems, certainly has the potential to reduce risks to the environment and/or enhance resources.

The likely effectiveness of developing technologies through the use of such funds is dependent upon whether: 1) sufficient funds can be raised, 2) they are used to finance the kinds and numbers of firms (projects) necessary to maximize the probability that innovative technologies will result, and 3) the projects do in fact result in innovative technologies that are successfully marketed.

Given the relatively high risk nature of traditional venture capital fund projects, the declining returns on investment in recent years compared to experience in the late 1970s and early 1980s, it is almost imperative that government be a direct contributor and/or provide sufficient financial incentives to lessen the risk to potential investors from the private sector.

A fundamental assumption in this analysis is that government will not be an investor/contributor to the fund but will, instead, act as a facilitator and will provide financial incentives to make it attractive for private investors to participate in a venture capital fund. The reason for this assumption is the constitutional restriction under which state and local government operates in this regard, and the perceived difficulty of a successful amendment to the

constitution in the near future (explained in more detail in the next section).

The measure of success would be relatively easy to determine; it would be the observed development of technologies by businesses funded through venture capital fund monies that are demonstrated to reduce adverse environmental effects or as a replacement for less destructive technologies, practices, and products.

C. Costs

The initial costs of creating a venture capital fund would include, for private firms, the amount of investment by individual businesses and, for government (state), the amount of reduction in tax or other revenues due to the incentives provided to private investors.

The program that the legislature has enacted in the past that comes closest to this concept was in 1967 when a sales tax exemption was provided for construction of pollution control facilities (air or water) and a business and occupation/public utility tax credit given for up to 50 percent of the facility cost. These benefits were offered to make it financially easier for companies to meet state pollution standards, which at that time were tighter than the federal standards. Approximately 140 firms participated, involving more than 750 facilities or projects, at a cost to the state of about \$275 million. The incentive necessary to create the climate for investment in environmentally beneficial technology is not known, but is presumed to be only a fraction of this amount.

The long term net costs, or gains, for private investors would depend on the degree to which successfully marketed technology is realized and the return on investment that such technologies generate.

It is assumed that state government will incur a long term direct cost and will not be a participant in any gains that may be forthcoming from successfully marketed technologies.

D. Comparison of costs and gains.

For private investors and the businesses making use of venture capital fund monies there is the potential for a positive return on investment if new technologies result that are successfully marketed.

For state government there will be direct long term costs that are not offset by receipt of any monetary gains from the technology itself. Successful technologies would result in immeasurable societal benefits through a healthier environment, either in terms of monetary savings, such as cost avoidance, or nonmonetary benefits.

E. Other Factors

1. Technical factors

There are no technical constraints on implementing this proposed action.

2. Institutional constraints or implications

A major constraint exists in the form of Washington's constitution. Article 8, section 5, of our constitution states that "the credit of the state shall not, in any manner be given or loaned to, or in aid of, any individual, association, company or corporation". This language represents longstanding public policy, being included in the original constitution approved by the voters in 1889. Similar language in the constitution covers local governmental units.

This constitutional language severely restricts what the state can do compared to most other states. For example, the state cannot directly invest in, loan money or make gifts to, or guarantee loans of private businesses. It can and has taken action, or proposed legislation, to: 1) empower the creation of privately funded entities and provide tax or other incentives for investors, provided the funds are expended for specific purposes, 2) create public foundations or other public entities for designated purposes who are authorized to accept donations, gifts, participate in federal programs, etc. (Washington High Technology Center at the University of Washington and proposed creation of the Puget Sound Foundation), 3) make loans or grants to help finance construction of public projects (sewer, water, access roads, bridges, etc) for private sector development (Community Economic Revitalization Board), and 4) be a facilitator to help businesses find financing, develop sound business practices, provide training, education, planning and management advice, etc. (Washington Economic Development Finance Authority, and other agencies). The state also plays an indirect role through investment of part of the public pension funds in venture capital projects.

The constitution can only be changed if the legislature approves a ballot proposal by two-thirds vote and it is approved by a majority of the electorate. The state's role as a facilitator, however, can be enhanced and directed towards development of technology beneficial to the environment by statutory action, requiring a simple majority of the legislature.

A majority of the other states do not have the constitutional restriction that Washington does. State programs typically take one of the following forms:

1) direct investments, loans, or research grants of public funds to private businesses, 2) public/private partnerships where, in many cases, the fund is operated at arms length from the public sector, and 3) public policy, where states, such as Washington, provide tax or other incentives for creation of a fund that is privately operated and whose purpose is to further some public policy. Forty states allocate a portion of their economic development budget for direct business financing. In fiscal 1988, 11 states allocated monies to state-funded venture capital pools (which leverage private funds), 27 states contributed monies for loans to private firms, and 30 states made research and development grants.

None of these programs is directed specifically, or has a significant emphasis, to promote investment in environmental technology. A recent announcement by the State of Pennsylvania, however, is believed to be the first of its kind. That state has indicated establishment of a \$5 million environmental technology fund to encourage development of environmental industries, giving priority to recycling ventures.

The trend seems to be moving away from offering generous incentive packages to providing seed capital to fill the gap between the product development stage and a company's ability to raise money from private sector sources.

3. Political factors or implications

Because of the longstanding public policy in Washington that government should not have a direct financial involvement or interest in private business, a suggested change in the constitution is likely to be very controversial and difficult to achieve.

F. Roles and Responsibilities

1. This proposal would require action by the legislature to authorize formulation of the venture capital fund, specify the kinds of projects that the fund could be used for, define the tax or other incentives, and assign the state agency(s) responsible for administration.
2. Perhaps the Department of Ecology with assistance from the Department of Agriculture are the logical lead agencies for administering the fund itself and the Department of Revenue for administration of the tax incentives. These responsibilities are similar to ones these agencies presently have. At the very least, the departments of Ecology and Agriculture would be heavily involved in drafting the legislation in terms of defining the purposes for which the fund could be expended, and the criteria for reviewing potential investors and

companies wishing to use the funds for environmentally beneficial technology.

3. The action could be implemented in 1991 assuming that the legislature enacted the enabling statutory changes in the 1991 session. There should not be any specific milestones that need to be implemented by a specific date.

VI. Institutional Responsibility

A. Proposed Action

Publicly emphasize, through the 2010 Action Plan, the proactive environmental management responsibility of corporations, businesses, and government agencies. Encourage environmental auditing and the public availability of audit reports. Encourage institutional investors, purchasers, and contractors to orient investment, purchasing, and contracting toward companies that subscribe to principles of environmental responsibility, including auditing. Encourage state government leadership in incorporating environmental principles in investment, purchasing, and contracting decisions.

B. Risk Reduction/Resource Enhancement Potential

The potential for institutions of government and business to reduce environmental risk or enhance environmental resources is immense. This can be accomplished directly through routinely auditing the environmental management effects of current operations and taking steps to reduce risks identified in such audits. Risk reduction and/or resource enhancements can also be accomplished indirectly through the use of the economic leverage implied in all decisions to purchase, contract, or invest. Use of economic leverage can then positively influence the behavior of the institution responsible for creating environmental risks. Both individuals and institutions have such economic leverage, however, institutions that are major investors, purchasers, or contractors have much more concentrated leverage.

A number of organizations are attempting to mobilize individuals to use their economic leverage as consumers to support environmentally responsible products and companies. Handbooks, manuals, and catalogues that seek to guide consumer choices are proliferating.

An unique effort is also underway to mobilize the economic leverage of major institutions to encourage environmentally responsible behavior by corporations. The Coalition for Environmentally Responsible Economies (CERES) has published standards and principles for environmentally responsible behavior called the Valdez Principles. CERES is encouraging major institutions to orient their economic leverage (i.e.

investments, purchases, contracts) towards those companies that subscribe to the Valdez Principles. Conducting annual environmental audits is one of those principles.

The effectiveness of auditing or the use of economic leverage to encourage auditing and other environmentally responsible actions will not be easily measured. Numbers of companies or other institutions undertaking auditing could be used as a surrogate measure. Reductions in environmental impacts could be documented in specific cases where auditing or use of economic leverage has changed the environmental effects of corporate or other institutions' practices.

Encouraging audits and institutional use of economic leverage to positively influence environmental behavior will also have a beneficial effect on environmental awareness and the direct and indirect relationship of institutional choices to furthering environmental values.

C. Costs

The economic impacts to individual institutions could be significant but are difficult to assess or quantify. These effects would not be imposed by government mandate but could be incurred through the free exercise of choice in the economic market. Institutions undertaking audits would incur the cost of the audit and the expense of any measures undertaken to reduce environmental liabilities as a result of the audit. Offsetting these costs to some extent would be benefits in terms of reduced liability for environmental impacts and the goodwill created with consumers and investors as a result of environmentally responsible behavior. As one example the Weyerhaeuser Company has committed to an expenditures of \$300,000 for wastewater treatment related audits at its Longview facility over a period of five years.

Institutions exercising their economic leverage to influence corporate environmental behavior may also incur costs in the form of foregone or lowered returns on investments and potentially higher costs for purchases or contracts. Such costs cannot be meaningfully estimated in general but could be calculated for specific situations.

It is conceivable that use of economic leverage to obtain environmentally responsible behavior could have other adverse social consequences, particularly on employment. This should occur only when concentrated use of economic leverage is applied to a marginally profitable company that has no viable options to modify production processes or products that are the cause of its environmental impacts.

D. Summary of Benefits and Costs

Neither the benefits or costs of such a concept are quantifiable in general. The comparison and perception of

costs and benefits in specific situations will be a primary influence on the decisions made by the responsible institutions. The magnitude of costs and benefits will vary widely depending upon the specific circumstances of these institutional choices.

E. Other Factors

There are no technical constraints on this proposal. Environmental auditing principles, techniques, and procedures are established and undergoing continued refinement. A number of auditing services are available from management consulting firms and have been utilized by a significant number of major corporations in the United States. Technical constraints could be relevant when institutions are considering availability of technologies to address environmental management issues revealed by audits. Technical constraints are generally not a factor when considering use of economic leverage to influence behavior.

Voluntary implementation of environmental auditing and institutional use of economic leverage can fit within the current legal and institutional framework. Commitments to environmental auditing can also be incorporated into settlements of enforcement action where facilities have had chronic difficulty in complying with environmental requirements. Use of economic leverage by institutions may be complicated by legal requirements to obtain maximum return on investment or to pursue least cost purchases or contracts.

Encouraging voluntary auditing as opposed to requiring auditing should involve little controversy. A continuing controversial aspect of voluntary auditing is the public availability of audit results. On one hand, the credibility of audits where findings and results are kept private may be questioned. On the other hand, institutions are reluctant to release audit results that may subject them to increased legal liabilities even though good faith efforts are made to correct environmental management problems revealed by an audit.

The use of economic leverage to influence environmental behavior of corporations will generate controversy, but is apparently gaining more widespread support. Controversy may center around the standards used to evaluate environmental performance and the fairness with which investment, purchasing, or contracting leverage is applied.

F. Roles and Responsibilities

Implementation of environmental auditing is primarily the responsibility of the institutions that operate facilities that have an impact upon the environment. Environmental regulatory agencies including the Department of Ecology could also consider requiring audits in the context of enforcement action in appropriate cases.

Use of economic leverage would be the responsibility of each institution that invests, purchases, or contracts with corporations. One set of standards to evaluate environmentally responsible behavior, the Valdez Principles, has already been developed by CERES. Institutions of state government, such as the State Investment Board and the Department of General Administration, are major investors, purchasers, and contractors and could provide leadership in integrating consideration of responsible environmental management into their decision-making processes.

These ideas can be implemented at any time by the responsible institutions. Environmental auditing can be undertaken as soon as an adequate program can be designed and then can be performed on a regular basis. The use of economic leverage to influence behavior is dependent on the existence of standards to evaluate behavior and then acquiring information as to the adherence of given corporations to those standards. The Valdez Principles, as an example, have been adopted by CERES and are publicly available for use.

VII. Regulatory Responsiveness/Effectiveness

A. Proposed Action

Develop a mechanism for periodically evaluating the effectiveness of environmental regulations and regulatory programs. Incorporate a working role for the public in such a mechanism. The intent of such evaluation is to amend or "sunset" ineffective regulations or programs and to enhance regulations or programs that are effective but underdeveloped.

B. Risk Reduction/Resource Enhancement Potential

This action is designed to increase the effectiveness of regulations and programs designed to control threats and enhance resources in all areas. The intent is to capture that increased margin of success that comes from "working smart".

The increased effectiveness would come from four sources:

- Increased cooperation and agreement in implementing regulations;
- Establishment of measurable goals;
- Systematic internal reviews of program effectiveness; and
- Better transfer of experience and "lessons learned" among different programs and agencies.

The increased effectiveness and cooperation can be achieved through a process of regulatory program review that allows for

for public participation, promotes concrete goal setting, recognizes levels of significance, promotes 'cross-media' communication, and encourages innovation. Here is an approach that incorporates these elements:

1. Rationalize the structure of citizen advisory committees that review various state environmental regulatory programs, continuing or establishing standing committees along major program lines. Make sure all incorporate a balance of expertise and lay members, regulated communities, local governments, Indian Tribes, various economic and environmental interest groups. Establish a coordinating body made up of representatives from each of these advisory committees. Charge the coordinating body with tasks such as:
 - Sustain and periodically review the strategic focus of 2010, and advising on the update of the State of the Environment Report;
 - Recommend guidelines for procedures by which individual advisory committees can substantively review proposed regulations;
 - Provide a forum for cross-communication about experiences individual program areas;
 - Advise on questions of science that should have priority for review by the state's scientific community; and
 - Recommend thresholds or other distinguishing characteristics that give certain threats, resources, actions, permits, etc. "statewide significance".
2. Use the advisory committees to set questions, draw up agendas, review internally generated program evaluations, host public workshops or meetings, and otherwise help structure the public involvement activities that are in any case required by law and performed in the course of adopting regulations or taking major regulatory actions. This will provide some context and continuity, while highlighting significant issues.
3. Use the coordinating body and the advisory committees to foster regional and local communication with regulatory programs. Accomplish this by encouraging public meetings by the coordinating body and/or advisory committees at various locations in the state and by encouraging liaison with the regional managers and staff of the programs.
4. Consider establishing a Washington Academy of Sciences, or some similar structure, that allows questions of science to be referred to experts for independent

evaluation. Sometimes policy issues are not clearly identified because of unneeded controversy over 'facts'.

5. Encourage proposed regulations to incorporate performance goals and objectives, cast in as measurable terms as possible. "This regulation is intended to reduce emissions of x by y % in z years." "This action is intended to preserve m acres of viable habitat for species n, o and p, so that their population in the area is stable after q years." Use these performance goals as the primary basis for systematic internal evaluation of effectiveness. Encourage or schedule advisory committees to review performance against objectives.
6. Encourage state regulatory actions to focus on risks or resources of statewide significance, along the lines of the Shorelines Management Act. Use this as a tool to identify limited areas where an agency can undertake specific regulatory actions on a pilot basis. Encourage local innovation by leaving room for areas of local significance. Use the advisory structure to evaluate pilots and local innovations, and communicate the results through the coordinating body.

C. Costs

This action would add to the costs of the present advisory committees. In order to function effectively, this arrangement would require a full-time staff coordinator and at least a half-time administrative support person. In order to function effectively, the coordinating body of advisory committee representatives would need to meet at least bimonthly, and the costs of their travel and participation would need to be calculated. Use of an Academy of Sciences concept would require, at a minimum, some funding for a research agenda recommended by the coordinating body.

Many factors would affect the costs of implementing the proposed actions, including the size of the coordinating body, the location, frequency and duration of meetings, the desire for additional public information activities, and the extent to which scientific advice would be sought. The need for better data with which to evaluate regulatory effectiveness could also entail substantial costs. The following is a very rough estimate of the range of annual costs:

• Staff	\$100,000 - \$200,000
• Meetings	12,000 - 30,000
• Science research	50,000 - 150,000
	<hr/>
Total	\$162,000 - \$380,000

The costs of staffing should come from state general fund and grants or appropriate earmarked sources. Meeting costs could be borne by state funds, by the participants, or by a cost-sharing approach. The advantage of the first is that it makes participation possible on an equal footing for all groups. The advantage of the second is that it requires a genuine commitment to participate. It may be that an equitable arrangement can be found to subsidize the costs to those who would be prevented from participating otherwise, while not subsidizing those individuals or interests who would participate--and expend the resources to do so--in any case. An effort should be made to create a scientific body that is sufficiently respected that its work would attract both public and private funding.

D. Summary

The proposed action would build on existing practices, public involvement requirements, and advisory committees to enhance the effectiveness of environmental regulation. Public participation would be focused and informed. Goals and indicators would be clearer, enhancing accountability. A network would be sustained to enhance the sharing of experience and insight among environmental programs and between state, local and scientific areas of endeavor. Significant opportunities for public-private cooperation, with a consequent lowering of political temperature, would be provided.

Unfortunately, it is very hard to anticipate the net effectiveness in reducing threats or enhancing resources. As proposed, however, the steering group itself could set some performance goals and monitor its own progress. The costs would range from \$162,000 to \$380,000 per year above that presently spent on advisory groups and public involvement in developing regulations and major regulatory actions.

E. Other Factors

1. Technical Factors

There appear to be no technological constraints that would prevent implementing this action, although essential information with which to evaluate regulatory effectiveness may be lacking.

2. Institutional Constraints or Implications

The institutional constraints on this proposal depend primarily on its scope. If it is confined to Ecology programs, it is probably implementable with little legislative or regulatory change. However, it may be seen to supercede to Ecological Commission with a broader-based steering committee of advisory bodies. The relationship between the two would have to be worked out.

If the scope is conceived more broadly, so that it applies to environmental regulatory programs under agencies other than Ecology as well, then more serious obstacles may have to be overcome. Both regulation-making and advisory committee structures may vary among agencies, reflecting both statute and historic practice. The advisory functions of the steering committee may be constrained by the suspicion on the part of affected agencies that a majority of its participants are 'outsiders', giving the agency gratuitous advice.

On the other hand, a broader scope would enhance the ability of the proposed approach to link and transfer experiences and to give the public a sense that their participation is effective and not hamstrung by bureaucratic categories. If this is deemed worthwhile, then perhaps a legislative mandate for the system of advisory committees, the coordinating body to oversee update of the State-of-the-Environment report, and principles to guide and encourage public review of past and proposed environmental regulations should be adopted.

The independent Academy of Sciences concept could take a number of forms. It could be based on an expanded role for Ecology's current Science Advisory Committee, or it could be separately chartered by the legislature. The key requirement would be a mechanism to select researchers and support research that would, at the same time, be responsive to the needs of the advisory committees and the press of current issues while maintaining broad respect and credibility for its scientific work.

3. Political Factors

This proposed action may be viewed as affecting the balance of forces in some particular area of environmental regulation, therefore generating opposition. It may also be that the number and intensity of interests who would insist on participation in the coordinating body and advisory committees would grow to an unwieldy number.

In some cases, the enhanced advisory structure might identify conflicts with state or federal statutes that form the basis for regulatory actions. If so, the coordinating body might be pushed into battles over legislative policy. In establishing this review structure and mandate, care should be taken to avoid continuously revisiting special interest issues.

The proposed academy of sciences concept is likely to be controversial. Some are likely to argue that it is not possible to separate science and policy, and that scientists asked for an "independent" assessment of knowledge

would--or should--merely advocate their own or their mentors' policy preferences.

F. Roles and Responsibilities

1. Implementation responsibilities

This is primarily an action by government to make its regulatory decision-making more coordinated, informed, visible and open, and effective. Implementation, however, would require a willingness on the part of citizens and representatives of various interests to participate.

2. Accountability

A substantial portion of this action could be implemented by Ecology, acting with regard to its existing programs. However, a broader scope may be desired. If so, it should be undertaken by the same responsible agencies who have participated in 2010 and are given responsibility to participate in updates of the State-of-the-Environment report.

3. Schedule

It is recommended that every effort be made to institutionalize and fund this action in the 1991-93 budget.

VIII. Citizen Access to State Environmental Programs

A. Proposed Action

This proposal consists of three distinct elements, all intended to improve citizens' access to and influence over the environmentally-related decisions of government agencies. The elements are: 1) creation of a citizen's environmental advocate to assist citizens' access to environmental management decision processes at the local and state levels; 2) emphasizing local access to state employees of environmental management agencies through decentralization of staff; and 3) developing easier access by telephone through one overall 800 hotline for environmental issues.

B. Risk Reduction/Resource Enhancement

Improved citizen access to environmental decision-making is not in itself a risk reduction or resource enhancement technique. However, improved access may very well lead agency decision-makers to consider new information from new sources and alter decisions in a way that shows more responsiveness to citizen wishes. This could result in better environmental outcomes from those decisions. It could also lead to improved citizen understanding of the basis and intention of agency

decisions. This could in turn increase the efficiency of environmental programs in pursuing their objectives.

Environmental Advocate An environmental advocate within environmental management agencies would be a single, sympathetic contact point within an agency for citizens to address questions and concerns. The advocate would know the agency and where to go to pass on concerns or get questions answered most efficiently. This could save citizens the time needed to track down the appropriate staff themselves. In addition the advocate may be better able to interpret the citizen question or concern in a way that's meaningful to program staff. This may lead to clearer communication and better responses to the citizens.

Decentralized Staff If staff of environmental management agencies were located around the state, citizens would theoretically not have as far to go to find an agency representative with whom to register a concern or ask a question. Also, agency staff who live closer to the communities in which their programs are being implemented, would theoretically have more understanding of the special needs of those communities. Implementation would therefore be more efficient and tailored to the specific situation.

Centralized 1-800 Number There are a proliferation of 1-800 numbers in state environmental and resource management agencies. For example, the Department of Ecology operates 13 toll free lines and the Department of Natural Resources maintains 10 lines. The Department of Fisheries operates a touch tone voice-activated system, conceivably, the number of these lines may be near or over a threshold at which citizens can no longer locate or keep track of which number to call. If there were a single 1-800 number that would be an access route for all the others, it might make things simpler for citizens.

The effectiveness of any of these mechanisms in actually leading to improved or at least more responsive agency decisions, or more public understanding and acceptance of those decisions, will depend on the degree to which they actually improve communication between citizens and agency decision-makers. This will be largely determined by the technical and institutional factors discussed below. In all cases, however, the agency public information officers who were contacted in the preparation of this analysis had significant reservations about overall effectiveness and efficiency.

C. Costs

Environmental Advocate Establishing one additional information officer position within each of a number of environmental management agencies would cost about \$300,000-400,000 per year.

Decentralized Staff The cost of relocating significant numbers of agency staff could be considerable. Maintaining a decentralized staff is also quite expensive since the degree of decentralization is unclear, no estimate of total cost is made here.

Centralized 1-800 Number Costs for a centralized number can be understood in context of costs for existing agency systems. At DNR, the annual cost of the system is about \$100,000, including line charges, directory listings, and SCAN charges. This system handles an estimated 5,000 to 8,000 calls monthly and experienced a peak monthly load of 13,000 calls. Department of Fisheries' system cost about \$70,000 last year. These costs could incrementally increase with a centralized system to accommodate increased complexity of the network. There would also be increased costs for advertising the new 1-800 number. On the other hand, there would be cost savings if there were a reduction in multiple calls made trying to reach the correct office. There would also be cost savings if existing 1-800 numbers were abandoned in favor of the single centralized number.

D. Balance of Gains and Costs

In general, the costs for the citizens advocate and the centralized 1-800 number are not extremely high, and if these steps were indeed effective in improving citizen access and influence and causing better environmental decisions then the benefits would far exceed the costs. However, if the effectiveness is marginal it may not be worth the cost. In the case of agency decentralization, costs appear to be high, and it would be doubtful if the benefits of decentralization beyond that already in place exceeded those costs.

E. Other Factors

All of the public information officers contacted expressed doubts about the effectiveness of a separate environmental advocate system which would go beyond information referral to include discussion of both policy and program implementation.

The first concern was that persons outside of an agency would be attempting to speak for that agency. The basic question was who would speak for a resource department, the environmental advocate or the department management? Existing constituent advocates in state agencies may be dealing with only specific program areas and not be in the position of speaking for the entire agency.

A related concern was that a separate environmental advocate office would add another layer of information bureaucracy with no guarantee of improved communications to the public. The departments of fisheries and natural resources, for example, often must update regulatory information on a daily basis. A lack of knowledge of specific programs by environmental advo-

cate staff and normal communication barriers between offices simply could heighten existing public information problems.

It was suggested that the environmental advocate become a specific section of each resource agency. This would provide better coordination of information with existing public affairs offices, yet the agencies would have additional staff to handle citizen inquiries. This might be one of the most effective ways to improve resource agency decisions about state environmental issues.

F. Roles and Responsibilities

Each separate environmental/resource agency would have independent responsibility and 2010 accountability for implementing the citizens' environmental advocate and decentralized staff action ideas. Each agency would also have responsibility for implementing the centralized 1-800 number action idea, assisted by the Department of General Administration.

Given proper planning and adequate funding the environmental advocate and 1-800 number ideas could be implemented within one year. The decentralized staff idea would likely take a number of years to implement.

IX. Ombudsman/Citizen Access

Action

Establish in each environmental management agency an ombudsman position to serve as an advocate for citizens and to facilitate access by citizens to environmental management programs. Departments which would establish such positions include: Ecology, Natural Resources, Health, Agriculture, Fisheries, and Wildlife. The existence of such positions would be highly publicized. The positions would be a focal point for improving citizen access to programs, including analysis of options to improve telephone access (e.g. use of 800 numbers).

Discussion

This action will not directly reduce environmental risks or enhance resources, but would foster greater cooperation and coordination between environmental management agencies and the public. Program issues would be brought into focus from citizens' perspectives which could improve the effectiveness of the programs. Creation of such positions will also be supportive of ongoing community action groups to implement 2010 recommendations and of achieving improved cooperation and coordination among environmental management programs. Local community groups could utilize the ombudsman to both improve access to agency resources and to help identify and resolve issues that require improved cooperation and coordination. The ombudsman will be in a position to identify issues that require

improved coordination within and among the natural resource agencies.

The costs of this idea are essentially the salary and associated costs of each position. This is estimated at \$65,000 per year per position. If current staff and funding are assigned to these positions, they could be established in 1990. If the positions are created through the budget process, they could be established in the last half of 1991.

X. 2010 Community Action Groups

Action

Encourage and support the creation of broad-based community action groups at the local level to maintain a local forum for dialogue, consensus-building, and local actions to implement 2010 Action Plan recommendations. Such groups would be a primary mechanism for perpetuating implementation of the 2010 Action Plan at the local level. Once organized, these groups would be encouraged to utilize the existing structures of support for volunteer activities (e.g. Senior Environmental Corps, Center for Voluntary Action) and to interact with agencies and local institutions that have responsibilities and program resources for environmental management. In many cases, local action groups may be able to forge partnerships or to obtain sponsorship from local corporations or other institutions in order to undertake specific actions (e.g. adopt-a-stream, beach, park, trail, etc. or enhance local recycling options). These groups would complement and build upon the activities of existing community groups.

Discussion

Many types of environmental risk reduction and resource enhancement can be accomplished most directly and efficiently at the local level by citizens willing to take responsibility for the local environment. Environment 2010 is producing an action plan that includes challenges to communities and to individuals as well as to state government. The 2010 process will have initiated discussion of issues and necessary actions in localities throughout the state. Ongoing support will be needed for those communities that accept the challenge of 2010 and organize local groups to meet that challenge. In the spirit of 2010, such groups should be broad-based and represent the diverse interests of the community. A broad-based group can engage in dialogue and consensus building on the environmental issues facing that community, the responsibilities of the community vis-a-vis the 2010 Action Plan, and the options for local actions to meet the challenges of the 2010 plan. Local actions which emerge from such a dialogue can then be implemented in the community with the support of the community groups, other local institutions, and other support which may be provided from responsible state or federal agencies. Such efforts will complement and provide further impetus to current programs to support citizen volunteer activities.

The costs of this proposal include the support provided for initial startup, the local resources devoted to the efforts of the groups, and the additional support provided by responsible agencies for specific action proposals that emerge from the groups. Working with interested individuals and groups to initially organize local groups will be undertaken in conjunction with 2010 town meetings and publication of the final 2010 Action Plan.

XI. Coordination of Environmental Management Programs

Action

Establish a coordinating council of state environmental management agencies, consisting of the agency directors or their designees, to improve coordination of environmental management programs and to facilitate resolution of inconsistencies in agencies' policies and regulations. The council would be responsible for reporting periodically through the Natural Resources Cabinet to the Governor and the Commissioner of Public Lands on actions taken or recommended to eliminate inconsistencies or conflicts among environmental management programs. This coordinating council would be a focal point for recommending measures to address recurring issues identified by agency ombudsmen on behalf of citizens or for proactively identifying other coordination needs. The council could encourage or sponsor use of formal Memoranda of Agreement to address coordination issues and communicate the resolution of such issues. The council could also provide a forum for citizens or proponents of specific projects or positions to discuss the interagency aspects of their concerns and interests.

Discussion

Although risk reduction and resource enhancement are not directly effected by coordination of environmental management programs, improved coordination will often enhance the effectiveness of programs. In some cases inconsistencies or outright conflicts between program policies or regulations create confusion and delay implementation of program requirements. Coordination is an ever present but often elusive program objective. Lateral communication among programs and agencies is often limited. No formal mechanism for lateral communication among environmental management programs exists which could either react to specific coordination issues (i.e. inconsistencies in policy or regulations) or proactively identify and recommend resolution of coordination needs.

The costs of this activity would depend upon the measures undertaken to resolve coordination issues. The cost of the operation of the coordinating council would be dictated by the frequency of meetings and the amount of staff support required. If costs were allocated among all of the involved environmental management agencies, the cost to each agency would be small (estimated at \$5,000-\$10,000/year).

Environment
2010
Action
Agenda:

Action
Strategies
Background
Analyses

Package
Four:

**Air
Quality**



State of Washington
July, 1990

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WASHINGTON ENVIRONMENT 2010

Support Document for the
Action Plan for
Stewardship of the Air Resource

June 21, 1990

Air Resources Subteam
Action Strategies Analysis Committee
Washington Environment 2010

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EXECUTIVE SUMMARY

All of Washington's citizens have a profound responsibility to current and future generations as stewards of Washington's air resource, a responsibility that has never been more important nor more challenging.

Washington's air quality has begun to decline in the past few years after nearly twenty years of gradual improvement, especially around our growing urban areas. In this report, a number of action proposals are presented all of which are intended in one way or another to improve air quality.

To all there is a cost, whether to business or the consumer. Some proposals will impact the conduct of our daily lives.

Even if one could accept current conditions and felt there was nothing more to do to improve today's air quality, our projection for the future is grim. Population growth is inevitable. Just as inevitable is the air pollution that comes with growth. The simple act of recognizing where our air quality is heading is an essential first step in accepting our profoundly important responsibility as stewards of the air resource.

The public has consistently ranked threats to the air we all must breathe as their most urgent environmental health concern, and have given the authors of this report over ninety proposals to consider in the development of a comprehensive action plan. While virtually all of the ideas have merit, the number of proposals which could be retained for further assessment was limited to 15 due to time constraints. The ideas have been grouped into the following common themes:

- Ideas to reduce the air pollution threat from motor vehicles and related sources.
- Ideas to reduce the air pollution threats from point sources.
- Ideas to reduce air pollution threats from area sources.

Major new initiatives will be needed to solve existing problems so that an unacceptable air quality future can be prevented. We need to substantially reduce the miles we travel in our vehicles. Fuels that we use in our automobiles need to be cleaned up, as does the exhaust from those vehicles.

State-of-the-art controls on all industrial sources of air pollution are needed. And finally, we need to dramatically reduce pollution from indoor and outdoor burning of all types. It will not be easy or cheap, but if our goal is healthful levels of air quality by the year 2010, we think that these action proposals and others like them will be needed.

In order to increase the likelihood of creating our preferred future, many immediate steps should be taken. Broad interest based legislative or governor-appointed committees should be created to begin the process of developing comprehensive clean air legislation for the 1991 session. The legislation must provide the authority and the financial base where necessary to carry out this action plan. All levels of government, but state government

in particular, should lead by example, immediately and voluntarily instituting all available clean air actions. Air quality goals must be stressed in growth management processes. Coordination between Environment 2010 and the Governor's Growth Strategies Commission is particularly critical where air pollution is concerned. We must ensure that transportation goals and air quality goals are coordinated and complementary. And finally, increased public education is essential to build an understanding of the relationship between air pollution and the choices citizens make.

Now that this action plan has been completed, the hard part begins. Public policy is not made with the writing of a report -- it is made when ideas are turned into action, whether that means working as individuals to influence lawmakers or making conscious choices in the conduct of our daily lives. People act -- plans sit on shelves.

SUMMARY OF POTENTIAL RISK REDUCTION AND COSTS FOR ACTION PLANS

Proposal	Risk Reduction Potential ^a	Estimate of Total Costs ^b	Comments
Motor Vehicle Pollution			
<u>Reduce Vehicle Miles Traveled</u>			
• High capacity transit	1.3 million (tox)	\$5 billion	Costs are for implementation of a high capacity transit system. Cost based on accelerating implementation of HCT by 10 years.
• Trip reduction requirements	480,000 (CO)		
• Disincentives to single occupant vehicles	290,000 (O ₃)		
• No net degradation from land use decision		\$3.5 - \$4 million	
<u>Improved Vehicle Flow</u>			
• Reduce vehicle idling	No estimate	\$500,000 ^c	May be effective during periods of impaired air quality.
<u>Reduced Vehicle Fuel Emissions</u>			
• Gasoline marketing vapor control	1.6 million (tox) 400,000 (O ₃)	\$20-\$50 million ^d	RVP reductions most significant
• Clean fuels	100,000 (O ₃) 240,000 (CO)	\$15 million ^c	Based on 2% oxygenated fuel only.
<u>Improved Vehicle Performance</u>			
• Expand motor vehicle inspections	160,000 (tox) 220,000 (CO) 170,000 (O ₃)	\$10-18 million ^c	Based on doubling number of vehicles in I/M program.
• More fuel efficient cars	390,000 (tox) 420,000 (O ₃)	< \$5 million ^c	Assumes 25% increase in average fuel efficiency.
Point Sources			
• Use operating permits to require best controls for all pollutants	550,000 (tox) 380,000 (O ₃) 85,000 (PM-10) 17,000 (SO ₂)	\$200-\$500 million	Estimated reduction of 570 excess 70 year cancers. Contributes to an estimated 30 annual deaths from PM-10.
• Public access to source information	no estimate	< \$500,000	Cost of data system assumes base system installed for other purposes.
Area Sources			
• Outdoor burning phase out	120,000 (tox) 170,000 (O ₃) 40,000 (PM-10)	< \$1 million	Administrative costs. Estimated reduction of 204 excess 70 year cancers. Contributes to an estimated 15 annual from deaths PM-10.
• Alternatives to home wood burning	130,000 (tox) 240,000 (CO) 115,000 (PM-10)	no estimate	Estimated reduction of 210 excess 70 year cancers. Contributes to an estimated 100 annual deaths from PM-10.
• Reduction of ozone depleting chemical emissions	no estimate	< \$1 million	
• Visibility standards	N/A	no estimate	

^a Expressed as number of people avoiding unhealthful exposure in 2010 with implementation of strategy.

^b Costs do not include offsetting positive impacts such as reduced health care costs, fuel savings and environmental benefits.

^c Annualized costs.

^d One time capital plus annualized costs.

I. Introduction

A. The Threat from Air Pollution

Clean air is essential to the health and well-being of all living things -- from the people in bustling urban centers and rural farming communities, to the animals in the forest and the plants that thrive in the state's rain forests and high desert plains. While most of us can understand and appreciate the essential nature of our air resource, many "quality of life" issues also revolve around how clean our air is. How far should we be able to see on a clear day? What is an acceptable level of offensive odor, and to what degree will our citizens tolerate relatively minor health impacts?

Though many perceive Washington's air quality as pristine, such is not the case, especially in areas with dense population and near larger sources of air pollution. Today, millions of Washington's citizens live where outdoor air pollution levels exceed at least one of six health based air quality standards. As for the hundreds of remaining unregulated toxic air pollutants, virtually everyone is adversely affected to one degree or another. This is especially true for people living in the shadow of large air pollution sources and those in more densely populated areas where they are exposed to the cumulative impacts of many small sources such as cars and wood burning. Absent dramatic action by all of us, today's unacceptable situation will become much worse by the year 2010.

B. The Public's Vision of a Preferred Future

In a series of workshops throughout the state, citizens were asked to rank the relative importance of managing threats to our resources -- the land, the air, the water, and living organisms. Presented with an analysis of what the state of our outdoor air is likely to be in the year 2010 in the absence additional pollution controls, they were asked if this vision of the future was acceptable. Without exception, the message they gave us was clear - that our responsibility to future generations is to manage our air resource in such a way that it is significantly cleaner in the year 2010 than it is today. This "preferred future" is not just an admirable goal, it is, for the most part, achievable from a technical point of view. While air pollution levels in other states are severely impacted by their neighboring states, Washington's problems are largely homegrown. To achieve this preferred future, we are dependent on little more than our own resolve and commitment rather than on the actions of others to help us solve our air pollution problems.

C. Considerations for Creating a Preferred Future

The pressures of projected economic and population growth coupled with our present unacceptable and unhealthy air quality, are the catalysts producing the need for substantial and immediate action. A number of identified strategies will require changes in existing

state statutes, to provide authority and resources for the action to occur or to provide incentives to shift the public's choices toward more environmentally sound alternatives. To facilitate the expeditious development of legislation either the legislature or the governor should create a task force representing the major affected, influential, and competing interests and charge them with developing comprehensive clean air legislation for the 1991 session.

State and local governments should provide clean air leadership. Examples could be purchasing cleaner vehicles, cleaner fuels, and more fuel efficient vehicles, initiating pilot programs in telecommuting, developing innovating ride-share and transit incentives programs for employers.

Coordination between planning, transportation, and air pollution regulatory agencies must be improved. The critical synergies between growth, transportation, and air pollution decisions can be used to our advantage, once we recognize the connections and understand the broader implications of individual actions. In the near-term, close cooperation and information exchange between Environment 2010 and the Governor's Growth Strategies Commission is essential if we are to lay the foundation for intelligent growth decisions.

D. Selection of Action Proposals

The public provided no shortage of ideas to address the threat posed by air pollution. At the November, 1989 Environment 2010 symposium and subsequent workshops, 53 different action ideas were proposed. Another 40 were added by the Public Advisory Committee or received as written suggestions. A complete listing of ideas considered by the Action Strategies Analysis Committee is included in Appendix A.

While there was substantial variety among the roughly one hundred action ideas, three common themes emerged. We found it helpful to group the ideas by these themes - one relating to motor vehicles, one to larger commercial facilities, and the last having to do with smaller, more dispersed sources (e.g. wood stoves). With the number of action ideas targeting motor vehicles and related sources, this grouping was further broken into four subsets:

COMMON THEMES USED TO GROUP ACTION IDEAS

- I. Ideas to reduce the air pollution threat from motor vehicles and related sources
 - A. Reduce Vehicle Miles Traveled
 - B. Improve Traffic Flow
 - C. Reduce Vehicle Fuel Emissions
 - D. Improve Vehicle Performance

II. Ideas to reduce air pollution threats from point sources

III. Ideas to reduce air pollution threats from area sources

The Air Resource Subteam of the Action Strategies Analysis Committee was brought together to screen all of the ideas. All who participated felt that we had an excellent group of ideas from which to choose.

There was consensus on the 15 ideas retained for further analysis in this report. We did not use rigorous quantitative methods to screen and rank the proposals. Instead, we attempted to make what, in retrospect, appeared to be good decisions, and we think we did. The Public Advisory Committee concurred with our recommendations. A complete listing of action proposals can be found in Appendix A.

E. Summary of Action Proposals

A brief description of the major elements covered under each of these broad categories is given below. A more detailed description is provided in the discussion of each idea in Section II below.

1. Motor Vehicles and Related Sources

The operation of motor vehicles is the most dominant source of air pollution in the state, as measured by either total contaminants emitted or, more importantly, overall risk to human health. Gasoline vapors that escape during refueling and that are emitted from vehicle exhaust pipes are a major source of a number of pollutants, including volatile hydrocarbons, benzene, toluene and xylene and are an ingredient in the formation of ozone. Elevated levels of carbon monoxide, ozone and benzene are significant health related concerns throughout the state. In addition, ozone, at levels commonly found in Washington forests, is suspected to stunt the growth rate of important tree species.

Simply stated, the best way to reduce pollution is to eliminate the source. Failing that, the next best method is to modify the source so as to reduce emissions of air pollutants. For motor vehicles, we really must do both - reduce the amount of driving and reduce the emissions of our vehicles when we do drive.

As noted in the previous section, we separated the ideas related to motor vehicles into four categories. The first, reducing vehicle miles traveled, focuses on discouraging citizens from driving alone while the remaining three categories center on ways to reduce the impact of the driving we do.

The ideas retained for further analysis by the committee were as follows:

Reduce Vehicle Miles Traveled

- Encourage development of high capacity transit systems.
- Develop employer-based trip reduction regulations/ordinances.
- Create disincentives to transportation by single occupancy vehicles (SOV) (e.g. raise parking fees.) and incentives for high occupant vehicles and non-polluting transportation modes.
- Require no net air quality degradation from land use actions.

Improve Traffic Flow

- Require reductions in vehicle idling.

Reduce Vehicle Fuel Emissions

- Control gasoline vapor emissions from gasoline marketing.
- Encourage transition to and use of cleaner fuels.

Improve Vehicle Performance

- Expand and strengthen vehicle emission testing and repair programs.
- Encourage fuel-efficient and low polluting vehicles.

2. Point Sources

Traditionally the focus of the lion's share of our control efforts, larger air pollution sources (known as point sources) remain as a significant air pollution concern. This is especially true for those who live in close proximity to factories and mills throughout the state. We are just beginning to understand the nature of the threat from toxic air pollutants and lack the tools to effectively address their release from point sources. Similar constraints have hampered the speed with which older air pollution control technology is upgraded.

Enforcement, or the threat of enforcement, has played an important role in compelling sources to comply with air pollution emission limits. Yet there will probably never be sufficient field enforcement personnel to effectively ensure continuing compliance at all sources. Currently, the public has no accessible body of information to help in identifying

potential air pollution risks. It has been suggested were the community involved in a watchdog type role, many major sources would put an extra emphasis on voluntarily complying with air pollution limits.

The action ideas retained for further analysis concerning point sources of air pollution are as follows:

- Require best available controls to limit point and fugitive sources of emissions of all pollutants (including toxics) through the implementation of an operating permit program and increased penalty authority;
- Create a data collection and management system which citizens can access for community watchdog purposes. Use modeling to identify high risk point sources.

3. Area Sources

Area sources as used here generally refer to sources of air pollution that, by themselves, are relatively small but when considered in aggregate, are often the most significant air pollution concern within a given community (e.g. wood stoves). Common to virtually all of these sources is a traditional lack of control, reflecting to some extent the difficulty in regulating the practices of individuals. Also, there is an apparent reluctance to require changes in practices that have been a way of life for years, in spite of our knowledge of the sometimes severe air pollution consequences resulting from these practices. Increased public education efforts are an essential element of controlling these types of sources. As the public becomes aware of the negative consequences of certain choices they make, they will become part of the solution.

The action ideas considered in this group, including those that were ultimately screened out by the committee, reflect the strong public sentiment that individuals need to take more responsibility for their contribution to the state's air pollution problems. Another theme followed from this sentiment - that is, as individuals take more responsibility, favored status should not be given to selected groups (e.g. agriculture, forestry).

Finally, visibility degradation was a concern expressed at several workshops. Though sources of visibility degradation are by no means limited to the area source group, it was considered the most appropriate group of the three in which to place this action.

The ideas in the area source group retained by the committee for further analysis are as follows:

- Phase out slash, agricultural, yard debris and land clearing burning. Provide incentives for beneficial use of by-products.
- Further discourage home combustion of wood products.
- Reduce emissions of ozone depleting substances through recycling, product substitution and changes in manufacturing processes.
- Adopt standards to protect visibility.

II. Analysis of Action Ideas

In general, the analysis of each retained action idea follows the same format:

- 1) brief introduction;
- 2) estimate of potential to reduce unhealthful exposure;
- 3) discussion;
- 4) costs;
- 5) other factors;
- 6) roles and responsibilities.

Estimating the exposure reduction potential ties our estimates of control efficiencies in with the projected risks reported in the Environment 2010 comparative risk report. For example, a strategy might be 50 percent effective at reducing carbon monoxide (CO) from auto exhaust which contributes about 50 percent of the statewide total of CO emissions. In this example, the emission reduction would be 25 percent statewide. From here, we generally assumed that a 25 percent reduction in emissions would reduce exposure from this pollutant by a like amount.

A. Ideas to Reduce the Air Pollution Threat from Motor Vehicles and Related Sources

Strategies to reduce mobile source air pollution can be divided into four basic categories:

1. Reducing the number of miles driven in motor vehicles;
2. Improving traffic flow and reducing idling to make travel more efficient;
3. Changing motor vehicle fuel so that it produces less pollution;
4. Making vehicles themselves run more efficiently and emit fewer pollutants.

The Governor's Growth Strategies Commission should consider these proposals as part of their analysis of growth related issues, especially those action ideas related to reducing vehicle miles travelled. The action ideas addressing each of the four motor vehicle related pollution sources are discussed below.

1. Ideas to Reduce Vehicle Miles Traveled

Until recently, reductions in motor vehicle generated pollution have mostly been achieved through federal emission standards on new motor vehicles and implementation of vehicle exhaust inspection and maintenance programs in areas that fail to meet health-based air quality standards. Unfortunately, while cars have been getting cleaner, vehicle miles traveled (VMT) has been increasing at a rate far greater than the population growth rate. The Environment 2010 comparative risk analysis projects that increases in VMT will counteract emission controls and total motor vehicle emissions will begin increasing during the early 1990's, unless actions are taken to decrease motor vehicle use.

The following four action items to reduce VMT are presented below:

- Encourage the development of high capacity transit systems;
- Develop employer based trip reduction regulations or ordinances;
- Create disincentives to transportation by single occupancy vehicles (e.g. raise parking fees) and incentives for high occupancy vehicles and non-polluting transportation modes;
- Require no net air quality degradation from land use actions.

To be effective, measures to reduce vehicle miles travelled must be implemented in a comprehensive and integrated manner. No single measure by itself can achieve its full potential without other measures to support it. Working in concert with one another, the overall impact would be greater than the sum of the individual measures taken separately. Thus by providing an excellent transit system along with implementing employer based trip reduction ordinances and a tax on parking spaces and a significant increase in the tax on gasoline and land use controls that favor transit, we can achieve a greater reduction in VMT than expected based on simply adding the effects of individual actions. Though these ideas were analyzed separately, the ideas should be considered together as a comprehensive VMT reduction plan.

Risk Reduction Potential from Action Ideas to Reduce VMT

The following risk numbers are from the Environment 2010 Air Resource Characterization Report, 11/89 (also see Appendix B):

Table 1
ESTIMATE OF PEOPLE AT RISK PROJECTED TO THE YEAR 2010

Pollutant	# people ^b at risk (current)	est. % increase by 2010	est. # people at risk by 2010
Carbon Monoxide	1,600,000	51%	2,400,000
Ozone	3,200,000	30%	4,200,000
Benzene	1,900,000 (221 ^a)	51%	2,900,000 (333 ^a)
Toluene	2,600,000	51%	3,900,000
Xylene	1,300,000	51%	2,000,000

- ^{a.} Excess 70 year cancers. NOTE: Total excess cancers: 1134
^{b.} Population exposed to unhealthful levels of these pollutants. Benzene creates both carcinogenic and non-carcinogenic health effects.

Only a portion of the total statewide emissions of each of these pollutants comes from motor vehicle related sources - that is, even if VMT were reduced to zero, there would still be emissions of each of these pollutants. Motor vehicle sources are responsible either through operation or fuel distribution for the vast majority of emissions of the three toxics listed below in Figure 1. Therefore, risk reduction potential is not directly proportional to VMT reduction.

Given the conservatively projected 32 percent growth in population (64 percent increase in VMT) by 2010 and existing development patterns, keeping VMT at today's levels may seem unachievable even with the most aggressive package of measures. However, an aggressive approach should be able to significantly decrease the projected rate of VMT growth between now and 2010 (and beyond). If we succeed in keeping the rate of VMT growth in line with the rate of population growth, our plan would be considered a success from a transportation management point of view. From an air quality point of view, our goal is zero growth in VMT. The risk reductions that would result from achieving that goal are shown in the table below.

Table 2
 POTENTIAL COMBINED RISK REDUCTION FROM STRATEGIES
 TO REDUCE VEHICLE MILES TRAVELED (VMT)^a

Pollutant	Est. # people at risk in 2010 (X10 ⁶)	% Reduction ^b resulting from VMT Strategies	Reduction in #people at risk in 2010 with VMT Strategies
Carbon Monoxide	2.4	20%	480,000
Ozone	4.2	7%	294,000
Benzene	2.9 ^d (333 ^c)	34%	990,000 ^d (113 ^c)
Toluene	3.9	34%	1.3 million
Xylene	2.0	34%	680,000

- a. Assumes we achieve our goal of zero increase in VMT
- b. Reduction relative to 2010 projections
- c. Number of excess 70 year cancers
- d. Benzene is a carcinogen. Exposure to a level causing a cancer risk greater than 1 in 1 million was defined as an unacceptable risk.

In summary, virtually every person living in the state is at some risk from pollutants that come from motor vehicles and related sources. Significant reductions in the amount people drive will reduce the risk from these pollutants, especially in urban areas. However, such reductions will be difficult to achieve. No one strategy will work - a comprehensive package of incentives, disincentives and alternatives to single occupant vehicles and a comprehensive education program to help the public understand the relationship between automobile use and air pollution will be necessary before significant VMT reductions can be expected.

Action Item 1: Encourage Development of High Capacity Transit Systems.

High capacity transit systems include transit facilities and services which are provided on their own right of way, with express service. High capacity transit is aimed at providing transit service that is competitive with the private automobile, considering time and convenience. These facilities and services could include exclusive busways, heavy or light rail systems, high occupancy vehicle freeway lanes, high speed passenger-only ferry routes, and the necessary infrastructure to make these work, such as park and ride lots, freeway flyer stops, transfer stations, etc.

Risk Reduction Potential

The risk reduction potential of reducing VMT through the implementation of a high capacity transit system is dependent upon the extent to which people change from driving their car to utilizing mass transportation. Without viable alternatives to single occupancy vehicle trips, we can expect increasing

risks through the year 2010 from carbon monoxide, ozone, benzene, xylene and toluene, pollutants which are predominantly from motor vehicles. In combination with the other VMT reduction action items listed below, we could optimistically hope to sustain only small increases in VMT even while sustaining a 32% increase in population. The risk projected to be avoided between now and 2010 is summarized in table 2.

Meanwhile, if the rate of emissions from motor vehicles were to decrease through implementation of other action items listed in this plan, substantial risk reduction could be achieved. Refer to Appendix B for a summary of current risks from carbon monoxide, ozone, benzene and toluene.

While air pollution risk reduction alone would not and should not be used to justify the total cost of a high capacity transit system, such systems can provide the foundation upon which a comprehensive alternative to the single occupancy vehicle is built. Though air pollution concerns may not drive the decision, for the purpose of air pollution control, high capacity transit systems are strongly encouraged for Washington's urban areas.

Discussion

Vehicle miles of travel, and the air pollution resulting from the operation of motor vehicles, are not necessarily reduced simply by providing the alternative of a high capacity transit system. But the success of most other strategies to reduce VMT rely on having a viable alternative to the single occupant vehicle mode of transportation. The high capacity transit system must provide a clear advantage over the automobile for the traveller. For some types of commutes in some markets, notably trips to high density central business districts, the high capacity transit system has an advantage, especially when the single occupancy commuter trip is discouraged through higher parking costs or other pricing penalties (see action item 3 below). For example, with the existing bus system in the Seattle metropolitan area (which includes some express routes that use high occupancy vehicle lanes), 45 percent of downtown Seattle employees take transit to work.

High capacity transit systems do not compete well with the automobile on the suburb to suburb commute, where densities on both ends of the trip are relatively low. Unfortunately, the suburb to suburb commute has become the fastest growing commute pattern during the 1980's as employment has moved to the suburbs. In 1985 in the central Puget Sound area, 36 percent of commute trips were suburb to suburb; 30 percent were suburb to central cities (Seattle, Tacoma, Everett, Bremerton); 28 percent remain within central cities, and 6 percent are from central cities to suburbs. Commutes within central cities and from suburb to central cities are most amenable to fixed route transit service. It must also be recognized that high capacity

transit systems are probably not practical solutions in low density rural sections of the state.

In a planning study of high capacity transit in the Puget Sound region, the system did well in capturing trips oriented to downtown Seattle. However, given the relatively low number of suburb to downtown commutes, transit was projected to capture only 10% of all regional trips by the year 2020. This percentage is about the same as today. Continued low density suburban development erodes the market where high capacity transit can significantly reduce automobile trips.

Costs

The costs of high capacity transit systems range from expensive to very expensive, depending on the chosen technology; however, these costs are likely to be incurred for reasons other than air pollution control. Based on the Multi-Corridor Transit Study for the central Puget Sound region, development of a high capacity transit system for the remainder of the state is projected to cost 4 to 5 billion dollars. As the population gets more and more fed up with gridlock, support for alternatives is likely to grow - perhaps to the point of demanding alternatives.

Our method for estimating the cost of high capacity transit statewide is to assume that for reasons of air pollution abatement, a system would be implemented ten years in advance of what otherwise would have been the case. Cost increases for system improvements exclusively to address air pollution would not be expected, except for costs associated with this acceleration of transit system construction to achieve air quality objectives. Based on the time value of money, we estimate the cost of the air quality benefit of a high capacity transit system to be in excess of \$5 billion. For more information on the costs of implementing high capacity transit, see Appendix C.

Other Factors

Technical Constraints: Technology is advancing rapidly in transportation modes, including everything from relatively inexpensive separate busways and high occupancy vehicle lanes to magnetic levitation trains and other technologically advanced systems. However, technology cannot overcome the fixed route nature of high capacity transit which limits its ability to compete with the automobile.

Institutional Constraints: There appear to be no institutional constraints. A high capacity transit planning bill was considered by the 1990 Legislature which would provide funding and a process for high capacity transit system planning in Washington on the regional level. In the Puget Sound area, the on-going Multi-Corridor Transit Study is aimed at defining high

capacity transit corridors and choosing appropriate technology. A decision on the initial route and technology is scheduled for 1991. Metro and the Puget Sound Council of Governments are the primary sponsors.

Political Constraints: High capacity transit systems have traditionally been politically popular public investments, although the issue of who bears the cost of such a system is always problematic.

Roles and Responsibilities

A comprehensive high capacity transit system could only be effectively implemented on a regional basis in more urbanized areas of the state, probably by a regional transportation authority. The major urban regions are also the areas where motor vehicles create greater environmental risk.

The decision to develop such a system will be made by elected officials who recognize that bold, long term transportation decisions are not made in the context of a biennial budget, but instead serve the purpose of setting out a clear policy direction around which future short-term budget decisions are made. The commitment of elected officials at all levels - national, state, county and city - is essential to the successful implementation of a high capacity transit system.

The most likely choice of state agencies to oversee the development of a high capacity transit system is the Department of Transportation.

High capacity transit systems are not implemented overnight. For example, the first leg of the Puget Sound area transit project is planned for completion by 2000, based upon a decision on technology and corridor in 1991 and voter approval in 1992.

Action Item 2: Develop employer based trip reduction regulations/ordinances.

Early rideshare programs focused efforts on the home end of the commute, trying to market the concept of cost-sharing through carpooling. However, employer provided free parking has had more of an impact on commute choice than individual out-of-pocket costs. With growing traffic congestion in urban and suburban areas, more emphasis has been put on making employers responsible for reducing trips generated by their facilities.

In the Los Angeles basin, the South Coast Air Quality Management District's Regulation 15 is the leading example of a regulation mandating employer-based measures to reduce commute trips in single occupant vehicles (SOV). The regulation requires employers with more than 100 employees to submit trip reduction plans aimed at achieving an average ridership of 1.5

persons per vehicle (1.75 for employers downtown, 1.3 for employers in outlying areas). Employers can choose from a variety of ridesharing incentives (subsidies to carpoolers and bus riders, free parking for carpools/vanpools) and SOV disincentives (parking fees) along with promotional activities to encourage ridesharing. If ridesharing goals are not met, employers will be required to implement additional incentives and/or disincentives.

Risk Reduction Potential

Employer-based trip reduction ordinances have great potential for reducing vehicle miles travelled from commute trips, thereby reducing potential risks from air pollutants generated by motor vehicles. However, for maximum effectiveness, this measure must be combined with the other VMT reduction measures discussed in this section. For an estimate of the combined risk reduction from the proposed VMT reduction package, please refer to the discussion at the beginning of this section. See Table 2.

Discussion

Studies have shown that the percent of employees using transit is dramatically higher when the employer does not provide free parking. Monetary incentives to commute by alternative modes have resulted in reductions in single occupant vehicle use; but as long as parking is ample and free, it circumvents positive incentives. The most effective trip reduction programs combine parking charges for SOV's with reduced rate or free parking for carpools, and transit passes and other positive incentives for commuting by alternative modes.

Another benefit of trip reduction ordinances is that employers faced with a requirement to reduce trips may favor locations where alternatives to the automobile are available. This could provide a significant shift in market demand from sprawling suburban office parks surrounded by parking lots to downtown locations and other areas well served by transit.

Costs

Public costs to implement this strategy would include costs to administer a program of monitoring employers subject to the ordinance. Fees charged to employers to cover plan review and other administrative costs could make the program self-sustaining. (A penalty could be applied if employers fail to submit a trip reduction plan). Private employers will incur costs to administer the program to meet their trip reduction commitment. Employers would also be responsible for periodically surveying their employees to monitor program effectiveness.

There is a positive side to this proposal from a cost standpoint. Based on an average annual commute of 6450 miles, \$35 per month for parking and 25 cents per mile for vehicle operation, the yearly transport cost to the non-carpool, non-transit person, including maintenance fuel and parking, is approximately \$1,500. The cost to a three-person carpool member would be approximately \$675 and the cost to a transit rider would be \$300. Though carpooling clearly represents a substantial savings, people using transit or carpooling forego the benefits of freedom and mobility.

The employer could also benefit by buying or leasing less land, were he not required to provide employees with free parking. Some part of those savings could be passed along to the employee in the form of incentives while others could offset employer's costs to administer the program. In addition, land used for parking spaces has no secondary economic benefit as does office and retail space.

Other Factors

Technical Constraints: None.

Institutional Constraints: The employer-based trip reduction ordinance could be implemented by local governments along with other zoning/building code provisions. Local governments may be able to implement trip reduction requirements under existing laws in Washington; however, such requirements have thus far only been sparsely applied to new developments. To apply trip reduction requirements to an existing development, legislation may probably be required. The appropriate level to implement resulting regulations (state or local government, local air authority, local transit agency) has yet to be determined.

Political Constraints: When a positive benefit can be demonstrated, some private employers have been willing to participate in trip reduction programs. Public employers, particularly state agencies, have been especially slow in showing leadership in this area.

Roles and Responsibilities

The best chance for success would be if the entity which stands to gain the most from implementing trip reduction rules were to implement them. For example, if a community were fed up with traffic congestion, or were concerned with the safety aspects of excess traffic, a local ordinance would be appropriate. On the other hand, if the primary purpose of such a rule was to reduce VMT and thereby reduce air pollution, a local air pollution control authority or Department of Ecology would be the best choice. Finally, employers seeking relief from traffic around their facility or reducing their monthly lease payment on parking spaces for employees might voluntarily implement a trip reduction plan.

The Department of Ecology, the Washington Energy Office or the Department of Transportation would be good choices to track the implementation of this strategy.

Trip reduction plans are already being implemented in some limited parts of the state. Thus it is reasonable to suggest that such a strategy could be implemented very quickly.

Action Item 3: Create disincentives to transportation by single occupancy vehicles (SOV); e.g., raise parking fees, gas tax.

Providing an alternative to driving alone by developing a high capacity transit alternative is only half the problem, as noted in the discussion under action item number 1 above. The other half deals with the psychology of why we choose to drive our car. As long as parking is free and gasoline is cheap, people find it easy to ignore the real costs of using their car. This action item encourages the use of high capacity transit by increasing the cost of using single occupant vehicles. Both comprehensive public education programs explaining personal and environmental costs associated with single occupant vehicle use and economic incentives/disincentives to shift public driving habits are necessary.

Risk Reduction Potential

Several studies have been done to evaluate the effect of parking fees on commuter mode choice (how employees get to work). One such study compared federal and county employees in the same building (Los Angeles' Civic Center). Federal employees had to pay for their parking, whereas county employees had subsidized (free) parking. The resulting difference in the manner in which each group commuted to work (known as mode split) was as follows:

Mode	County (free parking)	Federal (paid parking)
Drive alone	72%	40%
Carpool	16%	27%
Transit	12%	33%

Of course, in order to achieve such significant results, particularly in transit ridership, transit has to be available and convenient. Other studies in areas that were less congested and less well served by transit than LA's Civic Center achieved less dramatic results. Therefore, the switch in mode choice from SOV's to transit or carpools/vanpools (and resulting decrease in vehicle miles traveled) will vary from place to place, depending on transit availability, actual commuter parking expense, traffic congestion and other factors.

The air pollution emissions reduction that can be achieved from such shifts in mode split are even harder to pin down. However, every SOV trip avoided cuts down on pollution. Two people in one car causes half the pollution of two people in two cars (one per car); eight people in a vanpool causes 1/8th the pollution of eight people in eight separate cars, and so on.

Increasing the tax on gasoline also makes driving more expensive. This increased expense would result in decreased gasoline consumption both due to the purchase of more efficient automobiles and reduced driving. Economists differ on the extent to which a given tax increase would reduce consumption. For further discussion, see Appendix C.

Discussion

Studies have shown that free (or subsidized) parking is the single greatest incentive for SOV trips. Conversely, parking fees are the greatest deterrent to driving alone. This is because as long as gasoline is relatively cheap, people tend to ignore the operating cost of driving their cars in figuring their commute costs. The main cost they consider is parking. When daily or monthly parking costs are significantly higher than the cost of bus fare, bus pass or vanpool fare, these alternative modes instantly become more attractive than when parking is free. A perfect example is downtown Seattle, where monthly parking averages \$125/month, bus passes cost \$24/month for one zone and \$42/month for two zones. Roughly 45 percent of downtown employees take the bus. Only 35 percent of downtown employees drive alone to work, with the remainder in carpools (11 percent), on ferries or on foot.

Traditionally, parking fees have been determined by market factors. Where parking is scarce relative to demand, as in Seattle, parking rates are high (with designated reduced rate parking for carpools). In the suburbs, where developers are often required by zoning to provide a high rate of parking per square foot, parking is usually abundant and free (and most people drive alone to work). Moderately congested urban areas usually have low or intermediately priced parking (e.g., Tacoma and Spokane).

Implementation of parking fees where parking has previously been free cannot effectively be done building by building, because people will seek out any free spaces nearby, if their building is the only one with a parking charge. This impacts adjacent businesses and neighborhoods. One way for government to cause parking fees to be charged is to tax parking spaces and encourage the expense to be passed on to those using the parking area. Discounted or free parking for carpools or vanpools should be encouraged.

Costs

The cost of gasoline becomes a consideration in our travel choice when the price is relatively high. During the gasoline shortages of the 1970's, people did change their driving habits. Due to high prices and restricted availability, gasoline consumption went down. At the same time, transit ridership increased. With the cheap gasoline during the 80's, these trends were reversed. We estimate that a progressively increasing tax on gasoline reaching 61 cents by the year 2010 could cause a decrease in demand for gasoline sufficient to offset the anticipated population caused increase in demand. Costs to the consumer would be nearly \$1 billion per year in 1990 dollars. Economists differ on their estimates of this cause and effect relationship. Please refer to Appendix C, and to the Conservation Action Plan for more details.

The premise of this action plan is that providing inexpensive or free parking encourages single occupant vehicle trips, and that by eliminating this incentive, VMT will be reduced. The basic question becomes, "Assuming transportation alternatives are available, at what point do parking fees become a sufficient disincentive to persuade people to get out of their cars and seek alternatives?"

We estimate that it would take a per stall tax rate of from \$1 to \$2 per day (weekdays) to achieve a 20 percent reduction in single occupant vehicles commuting to urban centers and suburban office parks. A \$2.80 to \$5.00 tax rate would translate into as much as a 50 percent reduction in SOVs. See Appendix C for details.

Government would have to set up a mechanism to collect parking taxes. Revenues could be used to support development of high capacity transit systems. Businesses would pay the tax, but would pass it on to their employees, in the form of parking fees.

Other Factors

Technical Constraints: None.

Institutional Constraints: Provisions of local zoning ordinances that require excessive parking and encourage sprawling development need to be changed.

Political Constraints: This action is likely to engage serious political opposition. For example, during the 1990 legislative session, parking lot owners lobbied (unsuccessfully) against a measure authorizing local governments to tax parking spaces. SOV commuters accustomed to free parking would not relish having to pay for parking. Malls, groceries, and places with large sales of bulky items will object if it affects consumer parking. To alleviate this concern, the tax could be applied only to non-retail parking.

Roles and Responsibilities

This type of action idea would only be suitable in urban and suburban areas, and should thus be implemented by regional governments. Counties or local air pollution control authorities are recommended. Revenues could be used to support the administration of the program.

While local governments would be best suited to implement this proposal, state oversight is strongly suggested to ensure that communities seeking to attract business are not tempted to do so at the expense of the environment - going back to the way things are today, in effect subsidizing the single occupant vehicle trip. The Department of Ecology is the recommended agency to oversee this effort.

An estimated two to three years would be needed to analyze which areas would most benefit from this approach, to craft appropriate rules, to ensure alternatives are available, and finally to implement this action idea.

Action Item 4: Require no net air quality degradation from land use actions.

Perhaps the largest single factor in the dramatic growth in VMT over the past ten to twenty years is urban sprawl. What used to be a five mile commute is now a 25 mile commute. Sprawling developments simply cannot be efficiently served by a high capacity transit system, and are even difficult to serve by bus routes feeding the high capacity system. This action item would factor mass transportation into land use decisions.

Air pollution control in areas not meeting ambient air quality standards (non-attainment areas) has traditionally applied the concept of off-sets for large point sources of air pollution. The off-set concept sets a baseline for emissions in areas that exceed health based air quality standards (non-attainment areas), and requires that any new, large source that would emit the pollutant of concern must obtain offsetting reductions in emissions from existing sources. This action item would apply a similar concept to indirect sources such as housing developments, shopping centers, and office buildings. Alternatively, or in addition, it could be applied to government projects that provide infrastructure to serve development, such as sewage treatment plants, roads and utilities. Development would, under this concept, require an estimate of air pollution increases to be created and a plan to offset those increases.

Risk Reduction Potential

This measure has the potential of significantly reducing the projected increases in VMT and associated motor vehicle

emissions in non-attainment areas. In growing metropolitan areas, however, the seemingly inexorable rise in VMT would probably not be eliminated because probably only larger development projects would be covered by the offset requirements. Small developments and subdivisions would probably not be covered due to time required to review, permit, and find offsets, but these small developments constitute a significant portion of growth. A clear cut-off in project size for applying offset requirements to various development categories would have to be established and would affect the emission reduction potential of this measure.

Discussion

Currently, analysis of the air quality impacts of major land use actions is included in the environmental impact statements on the projects. These analyses use projections of traffic generation to model emissions from motor vehicles and other air pollution sources created by the development and their resulting air quality impacts. Invariably, individual developments are not found to have significant air quality impacts; yet emissions from traffic generated by such developments cumulatively constitute a substantial threat to air quality.

Requiring major land use actions to result in no net air quality degradation would have two results. First, the developer would be encouraged to minimize vehicle trip generation and resulting emissions by locating near transit, providing a mixed land use pattern that encourages walking and bicycling, limiting parking availability, and providing incentives to travel by high occupancy vehicle modes. Second, the developer would be required to obtain offsets for the remaining carbon monoxide emissions (for example) projected to be generated by the project. Such offsets could be obtained by contributing to the cost of emissions controls on a nearby industrial source, providing trip reduction subsidies for small businesses not covered by a trip reduction ordinance, or other creative emission reduction measures.

The proposed offset requirement should be applied to entire counties with elevated pollution levels and/or high projected population growth rates. If applied to smaller areas, such a requirement could have the effect of encouraging sprawl.

Costs

Judging from the experience of the emissions off-set approach to air pollution control on point sources, the market will dictate the cost of providing sufficient control credits to allow approval of a given proposal. In some areas, there simply will not be enough credits available at a reasonable cost. Under these circumstances, the proposal would need to be scaled down, or would not be allowed to proceed. In essence,

we should not knowingly approve major developments in areas with air pollution problems unless the projected air pollution impacts are completely mitigated, regardless of the cost of the mitigation.

Though it is impossible to estimate the market price of future offsets, we can estimate various implementation costs (see Appendix C for details). Assuming only high density counties would be affected, state and local implementation would cost approximately \$1 million, while the administrative costs to the private sector might range between 2.5 and 3 million dollars.

Other Factors

Technical Constraints: Assessment of transportation and other air pollution emissions generated by development is a fairly routine part of environmental impact statements on large development projects. Identifying and implementing off-sets may be more difficult.

Institutional Constraints: There are many jurisdictions already involved with development decisions that would have to be involved in implementing this program and working toward regional land use and transportation objectives.

Political Constraints: Developers would be against this proposal. Jurisdictions and institutions involved may have competing objectives.

Roles and Responsibilities

While this strategy boils down to factoring air pollution concepts into land use decisions, leaving implementation of this program to local governments may not be appropriate. Local elected officials will always be pressured to provide a climate that encourages economic development, perhaps to the point of undermining the intent of this proposal. Legislators would need to form a state land use agency or give the Department of Ecology explicit authority for oversight over such actions for this proposal to work.

Tracking the progress of this proposal from an air pollution perspective would best be handled by the Department of Ecology.

Implementation of this proposal could only begin after the legislature provided the statutory authority to enforce the various provisions of such a plan. Developers would be impacted, and their concerns would need to be addressed before an action of this sort could begin. It is not likely that all the interests of affected parties could be worked out and a program implemented in the next five years.

2. Reduce Emissions Through Improved Traffic Flow and Reducing Vehicle Idling

Measures to improve traffic flow include traffic light synchronization, one way streets, left turn pockets, parking restrictions, etc. Such measures are considered to reduce air pollution because they increase speeds. These measures are being widely implemented in Washington for their transportation benefits, regardless of reductions in air pollution associated with increased speeds.

Action Item: Require reductions in vehicle idling.

Vehicles emit a number of pollutants, whether at a standstill idling or moving. The purpose of this action idea is to reduce the instances of discretionary vehicle idling. From both an air pollution and energy consumption point of view, it is better to park and turn off a car, leave it for 5 minutes while banking or buying fast food, and then restart the car, rather than allow it to idle for the same time period.

Specific strategies to reduce vehicle idling include: prohibition of new drive through windows (fast food, bank tellers), banning use of existing drive through windows either permanently or only during impaired air quality periods, and restrictions on idling in loading zones.

Risk Reduction Potential

Based on the ratio of 50 drive-up windows for a population of 75,000 in a Lafayette, Indiana study, the central Puget Sound region may have on the order of 1750 drive-up windows. Banning use of such windows during periods of impaired air quality (or outright) could reduce CO emissions by over 30 tons per day. The average daily mobile source emission rate in the Puget Sound area is currently hundreds of tons each day, so that the percent reduction from this measure alone would be quite small, and the overall potential risk reduction would be even smaller. As consciousness raising measures, however, idling controls have value beyond the actual reduction that can be attributed to them. People need to be made aware of the fact that their cars pollute whenever they are running. Leaving cars idling creates an unnecessary source of air pollution and can be eliminated with little inconvenience or lost time.

While not a dominant regional source of pollution, diesel fumes from idling trucks and buses can be an annoying and possibly unhealthy source of pollution for people walking, working or living in the immediate area. Reducing idling would effectively reduce the associated pollution.

Discussion

A recent study of drive up windows, energy and air quality found that there were extremely low emissions and fuel use during a "hot start", that is an engine restart within an hour after turnoff. Based on documented emissions and fuel

consumption during idle, move-up and restart modes, a car with a catalytic converter would idle only 9.4 seconds before exceeding the fuel needed to restart. For emissions, the breakeven points were 5.6 seconds for hydrocarbons and 61 seconds for CO. From timing cars at an actual drive in facility, the study also found that the average elapsed time between entering and leaving a drive-in facility was 3.73 minutes (Fricker and Tsay, Transportation Research Record 1092, 1988).

Diesel trucks and buses idling in loading zones are a particularly annoying source of pollution. RCW 46.61.600 bans motor vehicle idling while unattended, with a \$47 fine for violators. Enforcement of the existing law would help reduce violations. Additional restrictions on vehicle idling while attended could be enacted, with a time limit on idling based on the breakeven point between emissions and energy consumption while idling and while restarting.

Costs

Any regulation restricting vehicle idling could probably be adopted under the existing state air pollution control law. Once a regulation is adopted, government costs would be associated primarily with education and enforcement of the law. Education would be geared toward informing the public about the purpose and requirements of the law. Enforcement could be done through written warning and then tickets, like traffic tickets. A minimal statewide effort would be anticipated. Assuming 7 FTE's, \$73,000 salary plus overhead, the cost to administer such a program would be approximately \$500,000. One national chain indicated that for restaurants with drive-up windows, the window accounted for 50 percent of total sales. A portion of these sales may be lost if drive-up windows were banned.

Other Factors

Technical Constraints: None.

Institutional constraints: Simple provisions would be easy to administer (e.g. banning drive through windows). On the other hand, enforcing limits on the amount of time vehicles are allowed to idle would pose more of a problem. Traffic police are likely to feel that they have enough to do already without worrying about vehicle idling.

Political Constraints: Bans on drive through windows would be fought by development interests and business owners who would be affected. Permanent bans on existing drive through windows would face considerable opposition; however, one national restaurant chain indicated their willingness to comply with requirements to restrict the use of drive-up windows during periods of impaired air quality. Truckers may be against idling limitations.

Roles and Responsibilities

Whatever branch of state or local government adopted a rule banning drive through windows would enforce such a rule (probably county planning departments), while the State Department of Ecology or local air pollution control authorities might be responsible for public information aspects of educating the public on the air pollution impacts of unnecessary idling. Implementation of basic idling limitation rules would fall to traffic police.

Oversite of the effectiveness of this action idea should be accomplished by the Department of Ecology.

Rule adoption and implementation might take as little as one year.

3. Reduce Vehicle Fuel Emissions

Gasoline vapors emitted during transfers to storage tanks, tanker trucks, and while people refuel their cars, are a primary source of several pollutants that have known health effects - benzene, toluene and xylene, for example. In addition, they are precursors to the formation of ozone in the lower atmosphere, where even a fraction of a part per million can cause severe health consequences. While reducing VMT may in theory be the best way to reduce emissions of gasoline vapors (less VMT means less fuel used, resulting in a reduction in emissions), there are ways to substantially reduce the amount that is emitted during each transfer operation, and to reduce emissions while a vehicle is operating. This section will cover a number of action ideas to reduce emissions of gasoline vapors.

Action Item 1: Control gasoline vapor emissions from gasoline marketing

Two basic approaches are recommended to reduce emissions from gasoline marketing. The first is to require the sale of lower volatility gasoline within the state, especially in the summer months. The other approach is to require vapor recovery at all points in the marketing system. Each idea is discussed in detail below.

Risk Reduction Potential

In the absence of additional control measures to capture vapor at distribution points such as terminals, trucks, and service stations, a requirement to lower the volatility of gasoline (measured in pounds per square inch Reid Vapor Pressure, or RVP) from its current level of approximately 10.5 to 9.0 RVP would produce an overall 8 to 14 percent reduction in reactive hydrocarbon emissions that produce ozone. The reduction is based on studies by USEPA, the Office of Technology

Assessment's General Accounting Office (GAO) and the Motor Vehicle Manufacturer's Association. Therefore, this strategy should reduce ozone pollution levels by at least eight percent.

Assuming non-aromatic additives to gasoline would be used to achieve RVP reductions, benzene, xylene, toluene, and other toxic emissions directly associated with gasoline vapors would be reduced by at least 41 percent from refueling and vehicle operations (GAO). Since virtually all of these toxics are emitted from tailpipes and refueling operations, a 41 percent reduction in the risk associated with each of these pollutants would be expected.

Both stage 1 (the control of emissions resulting from gasoline transfers into tanker trucks and storage tanks) and stage 2 (control of emissions resulting from vehicle refueling) vapor recovery systems are expected to achieve 90 percent in-use control efficiencies. Since gasoline marketing operations account for 4.8 percent of the total statewide volatile organic hydrocarbon (VOC) emissions (see Figure 1), expanded stage 1 requirements, along with the adoption of stage 2 systems would reduce statewide total VOC emissions an estimated 3 to 4 percent (this agrees fairly well with national estimates of from 2 to 4 percent). With most of the benzene, xylene and toluene coming from tailpipes or evaporation from the vehicle rather than gasoline marketing emissions, stage 1 and 2 vapor recovery would only address slightly less than 8 percent of the total statewide emissions, and thus would be expected to reduce overall risk between 6 and 7 percent.

Summarizing, we estimate the following potential risk reductions resulting from requiring 9.0 RVP fuels and stage 1 and stage 2 vapor recovery:

Table 3
RISK REDUCTION FROM REQUIRING 9.0 RVP AND STAGE 1 AND 2 VAPOR RECOVERY

Pollutant	#people at risk (X106) 2010 est.	Est. percent Reduction		# people avoiding risk	
		<u>in emissions</u> RVP	Stagel,2	<u>in 2010^b</u> RVP	Stage 1,2
Ozone	4.2	8-14%	3-4%	400k	150k
Benzene	2.9 ^c (333 ^a)	41%	6-7%	1.2M ^c (136 ^a)	200k ^c (22 ^a)
Toluene	3.9	41%	6-7%	1.6M	250k
Xylene	2.0	41%	6-7%	820k	130k

^{a.} number of excess 70 year cancers

^{b.} k = thousands, M = millions

^{c.} Benzene is a carcinogen. Exposure to a level causing a cancer risk greater than 1 in 1 million was defined as an unacceptable risk.

Combining gasoline volatility limits and enhanced vapor recovery systems would substantially reduce ozone and toxics risks, though it would not be appropriate to simply add the two together (lower RVP would lower emissions which stage 1 and 2 control). In areas where there are currently significant impacts from these pollutants, those impacts would be reduced. Areas that are currently within standards, but that would be expected to exceed those standards sometime between now and 2010 would either delay or avoid all together such events.

Benefits that could be derived from statewide application of a 9.0 RVP standard and stage 1 and 2 vapor recovery in addition to reduced ozone levels and lower toxics risks include reductions in damage to materials, crops and forests, reduced particulate emissions, and reduced odors and soiling associated with releases of volatile hydrocarbons to the atmosphere.

Discussion

Stage 1 vapor control applies to all of the transfer operations up to delivery into the vehicle fuel tank - loading storage tanks, tanker trucks and underground storage tanks at service stations. Stage 2 vapor recovery is a control method designed to capture gasoline vapors which would otherwise escape from vehicle fuel tanks during refueling. In Washington, where self service is the method of choice for most, gasoline vapors typically are emitted in the breathing zone and little can be done to avoid inhaling the toxic fumes (the use of automatic filler nozzles, where available, and avoiding "topping off" can help).

Current federal rules require primary or Stage 1 vapor recovery systems to be in place in ozone nonattainment areas. Currently, these requirements are in place in King, Pierce, Snohomish, Kitsap and Clark Counties.

Stage 2 vapor recovery has been required in most of California since the 1970's and more recently in the District of Columbia, New Jersey and parts of New York and Missouri. The technology is known and demonstrated. Large oil companies know this is coming and have accepted it. Small independent gasoline distributors and retailers are concerned about costs.

Federal rules require gasoline volatility, measured as Reid Vapor Pressure (RVP), not to exceed 10.5 psi May through September for Washington State. Further reductions to at least 9.0 psi are readily obtainable by the petroleum industry since this was a typical RVP for most of the country in the 1970's and is required or still the norm for much of the country. EPA is developing rules that would potentially lower RVP to 9.0 for Washington State. At the writing of this report, it is not clear if or when these rules would become effective.

COSTS

A cost between 0.5 and 3.2 cents per gallon is estimated for a switch to 9.0 RVP. The cost ranges come from a number of studies with USEPA estimates the lowest and petroleum industry estimates the highest. 1988 gasoline consumption for May through September in Washington equalled nearly one billion gallons. This translates into a cost between \$5 and \$32 million for the motoring public, or from \$1.08 and \$6.89 per capita each year. The cost effectiveness of a 9.0 RVP strategy ranges from \$120 to \$770/ton of hydrocarbons removed from the air. This compares to other hydrocarbon control strategies that often range well above \$2000/ton of control.

In 1987, California estimated that Stage 2 vapor recovery would add 0.8 to 1.2 cent per gallon to the retail cost of gasoline at a typical suburban and rural station. Applying this figure statewide results in a total annual cost between \$18 and \$27 million to the motoring public in Washington based on 1988 sales of gasoline of 2.2 billion gallons, or from \$3.90 to \$5.85 per capita per year. Cost effectiveness of this strategy is \$1,000/ton of VOC removed.

Other Factors

Technical constraints: As noted above, 9.0 RVP gasoline was common in the marketplace in the 1970's. There should be no technical constraints to returning to this level. Both stage 1 and 2 technology have been proven over the past 20 years and appear to be sound control options.

Institutional and Political constraints: Legal constraints exist in application of state volatility controls unless needed to meet the ozone air quality standard as part of any EPA approved plan. This limited application would not be preventative for ozone or effectively control toxics releases and risks. The state would probably need broader preventative and toxics control authority to accomplish this and market incentives should be instituted that make cleaner fuels the fules of choice (see action item 2, below). Incentives should also extend to companies that move voluntarily and quickly to market and use this fuel. To prevent unfair competition, reduce unhealthful levels of air pollution, and provide preventative public health and environmental protection, statewide application of this action should occur.

There appear to be no institutional or political impediments to implementing Stage 1 and Stage 2 vapor recovery. Both could be defined as reasonably available control technology, especially in areas where pollution levels are high, and could be implemented by rule.

Roles and Responsibilities

No state agency is currently enforcing the federally required 10.5 summertime RVP limit. Either the Weights and Measures

Division of the Department of Agriculture could include this test as part of their inspection protocol, or this could be a special enforcement effort by the Department of Ecology. Oversight of this effort could also be performed by either of these 2010 steering committee agencies.

Stage 1 and 2 vapor recovery would be implemented by either statewide regulation or separate regulations by local air pollution control authorities. Oversight of the implementation of this strategy should be by the Department of Ecology.

Vapor recovery systems should be promoted on a phased-in schedule. First, secondary vapor recovery plumbing should be required statewide for all underground storage tanks (UST) being upgraded under the UST rules. The next step should be application of stage 2 vapor recovery in major urban areas and finally the use of these systems should be expanded statewide.

Action Item 2: Encourage transition to and use of cleaner fuels.

Clean fuel programs will provide an excellent opportunity for reductions in releases of reactive hydrocarbons, nitrogen oxides, carbon monoxide, particulates, air toxics, and greenhouse gases from motor vehicles. Clean fuels also represent a preventive approach because they reduce pollution capability for almost all vehicles no matter what type or level of control exists or what state of repair they are in. There were several strategies identified in the public action plan development process that were sub-elements of the broader concept of a comprehensive clean fuels program. They are: improving the quality of existing fuels (gasoline) by removing impurities or including additives to make them cleaner burning, replacing existing fuels with alternative cleaner burning fuels such as compressed natural gas, and finally, moving to substitute power sources for vehicles such as methanol, electricity, or hydrogen.

Risk Reduction Potential

The air pollution reductions from encouraging clean fuels are difficult to estimate because reductions will depend on the availability and market penetration of the various fuel options and vehicles that use them. Because of this difficulty, we have limited the risk reduction discussion to only one type of clean fuel - oxygenated fuels. This not meant to imply that other clean fuels are less desirable or more costly.

Based on a two year performance record in Denver, Colorado, 2 percent oxygenated fuels (fuel additives that effectively add oxygen to the fuel and allow combustion to proceed more completely) resulted in an 8-12 percent reduction in ambient carbon monoxide levels and therefore risk (EPA estimates a 9% reduction can be achieved with 2% oxygenated fuels). Carbon

monoxide was noted in the 2010 air pollution risk assessment report as creating some human health risk for over 1.6 million citizens of Washington which we predict will increase to 2.4 million by the year 2010. Thus, we estimate that from 200,000 to 250,000 less people would be at risk from elevated levels of carbon monoxide if this strategy were implemented.

Oxygenated fuels are estimated by EPA to reduce hydrocarbon emissions from cars by approximately 4 percent. Because vehicles contribute about 40 percent of the VOC releases, it is estimated that this strategy would reduce ozone levels, and therefore the risk from elevated ozone levels, by approximately 2 percent. We estimate that almost 100 thousand fewer people would be at risk with the implementation of an oxygenated fuels program.

Discussion

There are a number of ways to either reformulate gasoline in such a way that it burns cleaner or to substitute cleaner fuels. In this action proposal, we explore the potential benefits of operating our vehicles on cleaner fuels. The USEPA has required the maximum lead content in gasoline to be reduced from 1.25 gram/gallon in 1977 to 0.10 gram/gallon in 1986. EPA also instituted cleaner diesel motor vehicle fuels by requiring an 80 percent reduction of the sulfur content to a maximum of 0.05 percent in order to reduce vehicle particulate emissions. Other than fuel volatility limits addressed previously and EPA's initiatives, additional gasoline impurity reduction strategies have not been implemented, though several measures are being considered by Congress for inclusion in the federal Clean Air Act (the measures would generally be limited to areas with severe air pollution problems). However, fuel quality assessment should be made on a routine basis by both suppliers and government agencies to ensure those limits are obtained.

The first step in a conversion process would be to create graduated price or other economic incentives for all types of cleaner fuels based, we suggest, on the emission potential of the fuel. This is so that manufacturers will produce them and the public will use them. One recommended approach for public consumption is to use the tax structure to raise prices on dirtier fuels. These excess taxes should be classified as sales taxes or other non-gas tax revenues and directed into a dedicated air pollution control account. This account could be used to provide matching funds to convert government and public transit fleets to clean fuel vehicles, to provide additional funds for low income rebates to offset higher gasoline prices, to fund air pollution control activities, to provide low interest or interest-free loans to help private entities to produce, market, or use cleaner fuels, or to promote alternatives to single occupancy vehicle use.

Additional incentives for clean fuels could be provided through reduced vehicle license fees and excise taxes, sales tax waivers, or reductions on purchases of clean fuel vehicles. Another possible incentive is allowing preferential treatment of alternative fuel vehicles such as access to use HOV lanes, and other special treatment accorded carpool vehicles or buses (though it should be noted that this could work against efforts to promote transportation alternatives intended to solve traffic congestion problems).

Costs

As noted above, due to the variety of options for cleaner fuels and the limited information on them, we have had to limit our discussion on cost estimates to oxygenated fuels. Based on actual costs, the Colorado oxygenated fuels program added 1.5 cents per gallon to the retail cost of gasoline (during the program, the actual price at the pump actually decreased slightly due to market forces other than oxygenated fuels). Using Washington State's 1988 gasoline consumption rate for October through March of approximately 1 billion gallons, the annual cost to motorists would be nearly \$15 million, assuming all gasoline was replaced by oxygenated fuels and that the industry passed on their costs. These costs are probably high because the Colorado gasoline distributors used the most expensive oxygenate (MTBE) in 94 percent of their fuel. Cost effectiveness estimates of this strategy range from \$265 to \$882 per ton of carbon monoxide removed. We estimate that a 3 to 4 cent tax break for oxygenated fuels would provide adequate incentive for significant market penetration (see Appendix C).

Other Factors

Oxygenated fuel technology is readily known and the fuels are being distributed in Washington although not in large quantities. Production and distribution of these fuels would have to be greatly expanded. The legislature should explore the use of economic incentives to promote the use of all oxygenates (MTBE, ethanol, etc.) in gasoline.

For other clean fuels such as compressed natural gas, the major constraints are lack of availability in terms of production and distribution capability and lack of vehicles capable of using these fuels. There are political constraints to dedicated accounts and new taxes, and concerns about loss of transportation funding for roads if fuels other than gasoline are widely used and not taxed in the same manner as gasoline.

The state legislature will need to provide statutory authorization for economic and tax incentives for clean fuels in the early 1990's. Citizens and state government should lobby Congress in 1990 to provide strong clean fuels provisions in a revised federal Clean Air Act.

Roles and Responsibilities

Under the assumption that both an oxygenated fuels program and a broader clean fuels program would be driven by tax incentives, it may make some sense for the primary implementing authority to be the Department of Revenue. Alternatively, the Department of Agriculture, through their Weights and Measures Division, could provide testing and enforcement. Either could oversee the implementation of a fuels program for the 2010 steering committee.

Oxygenated fuels should be phased in as quickly as possible, during the winter months, especially in carbon monoxide problem areas. The recommended approach would start with mandated oxygenated fuel purchases for government and private fleets that have their own gasoline pumps. A second step would be to require large volume service stations in counties with carbon monoxide or ozone nonattainment problems to sell at least one grade of oxygenated fuel. Part three would be to develop market incentives for oxygenated fuels that allow it to be sold more cheaply than unleaded gasoline. Government and other public entities should voluntarily and expeditiously pursue the purchase and use of cleaner fuels and vehicles powered by such fuels to help create markets and availability.

4. Improve Vehicle Performance

The final group of strategies aimed at reducing the risks from air pollution caused by motor vehicles and related sources focuses on the performance of the vehicles. Actions can be taken to make vehicles operate more efficiently resulting in less emissions. If we are unable to reduce, or even hold the line in coming years on VMT, and if so-called clean fuels are not available in this market, our only line of defense against projected increases in vehicular pollutants is to ensure that the cars that are operating in the state are doing so as efficiently as possible from an air pollution standpoint. There has been significant improvement over the past two decades in the performance of new cars. Motor vehicle inspection programs are designed to identify those vehicles whose emission performance is unacceptable and to require appropriate repairs.

Action Item 1: Expand and Strengthen Vehicle Emission Testing and Repair Programs.

The motor vehicle emission inspection and maintenance (I/M) program is an effective strategy for reducing emissions from vehicles. It is also one of the most direct ways for people to get involved protecting air quality. While surveys indicate that people subject to the current program in Seattle and Spokane support the program, one of their chief complaints is that the program should be statewide.

Though affected citizens may support the program, their elected representatives generally do not. Short extensions have been granted by the legislature principally to avert threatened federal sanctions. The program needs to be continued so that substantial progress will continue to be made toward solving existing carbon monoxide problems in Seattle and Spokane. It needs to be expanded geographically to solve carbon monoxide problems in other major urban areas and prevent future carbon monoxide and ozone problems; more types of vehicles should be tested including but not limited to diesels; and complete inspections of the emission control systems should be incorporated as a condition of vehicle title transfer or sale. In Washington, the "people at risk" (virtually the entire state population) from carbon monoxide or ozone would benefit from an improved I/M program.

Risk Reduction Potential

I/M programs can reduce CO emissions from the fleet of vehicles covered by the requirement by about 25 percent and VOC emissions including toxics about 12 percent. An 8 to 15 percent reduction in carbon monoxide was found in a statistical analysis of the effect of Oregon's I/M program on air quality levels in Portland.

The current Seattle and Spokane programs apply to less than 25 percent of the registered vehicles in the state. Significant air quality improvements, and thus risk reduction, would be expected from expansion of the program to the remainder of the state.

EPA surveys have found that about 20 percent of vehicles have had at least one emission control system component tampered with and about 10 percent of the vehicles that require unleaded gasoline have been misfueled with leaded gasoline. In many cases the present owner has not done the tampering or misfueling and may even be unaware of the tampering. EPA estimates that including a visual inspection of emission control systems can increase the emission reduction achieved by the motor vehicle inspection program up to 20 percent. See Table 4.

Discussion

Gasoline powered motor vehicles are the prime emitter of carbon monoxide and volatile organic compounds (VOC) emissions. The VOC emissions include many toxic gases such as formaldehyde and benzene and other known or suspected carcinogens. Increasingly stringent Federal emission standards have been the major control strategy for these pollutants although no improvements have been mandated since 1981. Federal emission standards have also been set for diesel vehicles which can be a major source of fine particulates and air toxics in our congested commercial areas. However, as vehicles age their emissions increase for

several reasons: normal wear, improper or lack of maintenance, tampering with emission control systems, and component defects. Motor vehicle inspection and maintenance (I/M) programs help to identify and correct these problems.

Since currently there is not an obligation on the part of the seller to reveal tampered emission control equipment, a change of ownership emission test and emission control equipment inspection would be both a consumer protection measure and an emission reduction measure that would prevent the sale of tampered vehicles to residents of the test areas.

Statutory exemption of several classes of vehicles prevents their inclusion in the I/M program. All types of motor vehicles contribute to the problem and vehicle testing programs should be applied uniformly for fairness and emission reduction benefits. Those with vehicles within classes presently exempted would probably be reluctant to accept testing because of a lack of understanding of the extent to which they are a part of the problem.

Costs

The direct consumer cost of the present Washington I/M program ranges from \$10 to \$18 per applicable vehicle each year. This annual average is based on the present \$16 test fee every other year and from \$20 to \$100 of repairs for failed vehicles. An expansion to include all major urban areas would double the almost 500,000 vehicles now tested each year. Assuming one million vehicles tested, the total annual costs to consumers would range from 10 to 18 million. Most of the revenue (82 to 90 percent), goes into the economy to pay for private industry testing and repair services. The repair costs are to a great extent offset by the benefit the vehicle owner receives in improved vehicle economy performance, dependability and the delay of more serious repairs.

The EPA in 1981 determined that an I/M program was the most cost effective program for a typical urban area (covering the years 1983-1987). The projected cost effectiveness was \$581/ton of VOC and \$53/ton for CO. Because today's cars on average are cleaner than in 1981, we expect the cost per ton of pollutant removed to be higher. In 1987, Colorado estimated the cost effectiveness of the program to be \$780 per ton.

Other Factors

Technical constraints: There are no technical constraints to implementing a statewide I/M program, or to expanding the program to include comprehensive anti-tampering checks.

Institutional and Political constraints: The most serious constraint has been the reluctance of the legislature to impose additional requirements on vehicle owners. It has been

Table 4

RISK REDUCTION FROM STRATEGIES TO IMPROVE VEHICLE PERFORMANCE

<u>Pollutant</u>	<u># People at risk (x 10⁶) 2010 Est.</u>	<u>Est. % Reduction in Emissions</u>		<u>Reduction in the People at Risk from b</u>	
		<u>Expanded I/M</u>	<u>Fuel Efficiency</u>	<u>Expanded I/M</u>	<u>Fuel Efficiency</u>
Carbon Monoxide	2.4	5-9%	--	120-220,000	--
Ozone	4.2	4%	10%	170,000	420,000
Benzene	2.9 ^c (333 ^a)	4%	10%	120,000 ^c (13 ^a)	290,000 ^c (33 ^a)
Toluene	3.9	4%	10%	160,000	390,000
Xylene	2.0	4%	10%	80,000	200,000

^aExcess cancers

^bReduced exposure to unhealthful levels

^cBenzene is a carcinogen. Exposure to a level causing a cancer risk greater than 1 in 1 million was defined as an unacceptable risk.

speculated that this is due to the public love affair with the automobile and their lack of understanding of the air pollution and public health consequences of their use. It would be a challenge to implement an I/M program in rural counties. A centralized program consistent with that in the Seattle and Spokane areas probably would not work, whereas a decentralized program administered through service stations and repair shops might prove to be institutionally and political more viable for rural areas.

Statutory changes are needed to authorize an I/M program statewide or in all major urban areas for as long as it is necessary to attain, maintain or prevent future exceedences of the national air quality standards for carbon monoxide and ozone. In addition the statutory exemption of vehicle classes should be deleted and an emission/tampering inspection required before ownership change is authorized.

Roles and Responsibilities

The Department of Ecology is now, and should continue to be the agency responsible for implementing any new or expanded motor vehicle I/M program, and that responsibility should include tracking the progress of the program to ensure optimum effectiveness.

Expansion of the I/M program could be phased in over a relatively short period of time once legislative authority is granted (1 to 2 years).

Action Item 2: Encourage Fuel-Efficient & Low-Polluting Vehicles.

Vehicles differ in their performance from both a fuel economy and pollution control efficiency point of view. Automobile manufacturers are in business of selling cars, If the public demands a vehicle that gets poor mileage or is relatively high in emissions, then that is the type of car they will want to sell. The consumer, meanwhile, pays little attention to these important features and seeks instead to optimize his purchasing dollar in terms of style, power and comfort. The premise of this action item is that if we could effectively encourage the shift from relatively high polluting and fuel inefficient vehicles to low polluting, high mileage vehicles, air quality improvements would result.

Refer to the Conservation action plan for further discussion of related issues.

Risk Reduction Potential

The air pollution reductions from these actions are difficult to quantify because all vehicles in each vehicle class (car, light truck, heavy truck, etc.) are required to meet the same

emission standards regardless of fuel-economy. As people become more aware of the differences in emission standards between classes, and if they are persuaded to purchase the lower polluting class vehicles, automakers will respond by manufacturing more of these cleaner vehicles.

A shift to more fuel efficient vehicles will result in some reduction in toxic and gasoline vapor emissions due to the lower volume of gasoline handled. To the extent this action item further encourages alternative fuel and ultra-low pollution vehicles, reductions in CO, O₃, VOC, particulate and greenhouse gases will result. Assuming a 25 percent increase in average fleet fuel efficiency from today's level, toxics risks associated with gasoline vapors would be reduced by 25 percent and ozone risks would be reduced approximately ten percent. See Table 4.

Discussion

We propose that, to set a positive example, all state and local governments should be required to purchase vehicles that exceed the average federal fuel economy standards. As an encouragement to purchase these vehicles, a surcharge on the vehicle excise tax or sliding scale sales tax should be established in inverse proportion to federal fuel economy ratings. A portion of these funds should be made available to local government and state agencies to replace existing vehicles with vehicles that exceed the federal average new car corporate fuel economy standards, to convert or buy vehicles that operate on cleaner fuels, to purchase ultra low polluting vehicles operating on electricity or other alternative power sources, and to provide alternatives to single occupancy vehicles.

Currently, fuel-efficient vehicles are commercially available and ultra low-polluting vehicles may be commercially available in the near future. The average fuel-efficiency of new domestic manufactured vehicles doubled from 13 miles per gallon (mpg) to 26 mpg between 1973 and 1985. Between 1974 and 1983 the average import mpg increased from 22.2 mpg to 32.2 mpg. There has been a slow decline to about 30 mpg in import fuel economy as the foreign manufacturers moved into larger vehicles. In 1986, to assist domestic manufacturers the federal standard was relaxed from 27.5 mpg to 26 mpg, but it has recently been returned to 27.5 mpg for 1990 and later models passenger cars and 20.5 mpg for light trucks.

In concert with the concept of favoring low polluting and fuel efficient cars, the possibility of requiring new vehicles sold in Washington to meet more stringent California exhaust standards should be investigated. With the cooperation of Oregon, the California standards could apply to all new vehicles sold on the West Coast.

Costs

Limiting of the selection of vehicles available to government fleets could result in higher bid prices. However any increases in vehicle prices should be offset by fuel cost savings. A surcharge on the vehicle excise tax based on fuel economy rating could be used and if so, should be phased in. A ten percent average increase in vehicle registration fees would cost consumers about \$5 million. Another no net cost option would be a revenue neutral sliding scale sales tax making less efficient vehicles most costly to purchase.

Other Factors

Technical constraints: The possible higher initial price and limited selection for new vehicle purchases could slow the transition to these vehicles by government fleets. Washington already has higher registration fees than neighboring states. Increased registration fees could provide additional incentive for out-of-state license fraud. Ultra low-polluting vehicles such as electric vehicles are not yet practical. However, they may soon become practical for some applications, such as short distance travel.

Institutional and Political Constraints: Current Federal law does not allow states other than California to adopt new motor vehicle emission or fuel efficiency standards. (Exception: California must request a waiver from EPA and then can adopt new car emission standards.)

Roles and Responsibilities

A law requiring all governmental entities to purchase low polluting and/or fuel efficient vehicles could provide initial momentum to this sort of program. In lieu of a law requiring these actions, policies at all levels of government and in the private sector, driven perhaps by a public information campaign, could encourage an increase in these types of purchases. Tax incentives or disincentives properly applied could tip the balance in favor of such vehicles. An executive order could be used to prompt state agencies to move forward.

Any taxation program should be implemented either by the Department of Revenue or Licensing, either of which could also oversee implementation.

Voluntary aspects of such a plan could be implemented immediately - any mandatory provisions would require legislation but could be implemented fairly quickly.

B. Reduce Emissions from Point Sources

Unlike the variety of action ideas proposed for controlling motor vehicle related sources of air pollution, the action ideas

addressing point sources (typically larger sources of air pollution, often emitting pollutants from discrete points such as smokestacks) were limited to a few common themes. For the most part, the message we heard from the workshops can be summed up as follows: "Fine tune the control programs of the '70's and '80's to improve our control of point sources through the '90's and beyond and ensure that best available controls are applied."

The subcommittee working on this action plan has taken the liberty of mixing and matching a number of common themes into one comprehensive strategy. Though the first action idea may seem overly complicated, the ideas contained within complement one another to such a degree that discussing any of the individual ideas would be difficult outside of the context of the others. The two action items discussed in this section are as follows:

- Require best available controls to limit point and fugitive sources of emissions of all pollutants (including toxics) through the implementation of an operating permit program and increased penalty authority;
- Create a data collection and management system which citizens can access for community watchdog purposes. Use modeling to identify high risk point sources.

Action Item 1: Require best available controls to limit point and fugitive sources of emissions of all pollutants (including toxics) through the implementation of an operating permit program and increased penalty authority.

One of the more successful aspects of air pollution control programs has been the extent to which the regulatory framework has forced constant advancements in air pollution control technologies. As new sources entered the economy or old sources were upgraded, new technologies to control air pollution were required, sometimes representing a substantial improvement over the equipment being replaced. This "best available control" approach is still being used today, and continues to serve as a ratchet of sorts, constantly reducing emissions but only from new air pollution sources or major modifications to existing sources.

Some weaknesses in the "best available control" program are addressed by this action proposal. First, except under special circumstances, companies cannot be compelled to upgrade older technology to current standards - controls that have been shown to reduce emissions elsewhere are not required until the company decides it is time to upgrade equipment. This proposal would require a periodic assessment of control equipment relative to best available controls being demonstrated elsewhere through the administration of a renewable operating permit program. Phased-in upgrades would be required.

Second, the concept of best available controls currently is applied only to the emissions of a handful of pollutants - the so-called criteria pollutants - and has generally been applied to larger emission points (smokestacks, for example). This proposal expands the best available control requirement from the criteria pollutants to include non-criteria or, toxic pollutants. It would also require state-of-the-art controls on non-point, or fugitive emissions.

The term "point source" usually refers to industrial and manufacturing facilities while "area source" (discussed in the next section of this report) refers to smaller numerous industrial and people "point" sources such as dry cleaners and wood stoves. Since the smaller industry point sources can have significant emissions, particularly toxic air pollutant emissions, that are controllable using the above listed strategies, this point source action item discussion includes toxic air pollutants from smaller industrial and commercial sources.

Risk Reduction Potential

A simple and relatively straightforward method was used by the subcommittee to estimate the criteria pollutant risk reduction potential associated with a requirement to upgrade all facilities from current controls to best available controls. The effort focuses on those pollutants where most is known and that are emitted in significant quantities from point sources. They are fine particulates, sulfur dioxide (SO₂) and volatile organic hydrocarbons (VOC), which are precursors to ozone and are often rich in toxic constituents. A simple three step approach was used:

1. Determine the current emission rate of all point sources in the state.
2. Determine the highest level of control technology currently being used within each source category (wood-fired boilers, lime kiln, etc)
3. Apply this best control factor to all sources with the source category and calculate new emission rate for each source.

This is by no means a perfect analysis, but offers an indication of the level of control achievable by implementing such a strategy. Reductions in emissions are based on current emission rates, which are generally being reduced through the new and modified source requirements discussed above. Offsetting this gradual reduction, however, are increases resulting from aging emission control systems and growth in smaller sources. On balance, the potential gains from this proposal, in terms of percent reduction in current emissions, are likely to decrease through time.

Table 5
 MAXIMUM POTENTIAL EMISSION REDUCTIONS
 FROM BEST AVAILABLE CONTROLS ON ALL POINT SOURCES

Pollutants	Current Emissions (tons/yr)	Emissions w/ Best Controls	Percent Reduction
Fine Part.	20,308	7,580	63%
Total Part.	48,384	14,493	70%
VOC	39,974	26,994	32%
SO2	131,247	64,948	51%

Table 6
 RISK REDUCTION FROM STRATEGIES TO REDUCE
 POINT SOURCE EMISSION

Pollutant	Est. # people at risk in 2010 est. ($\times 10^{-6}$)	Est. % Reduction in Emissions	# people avoiding risk in 2010
Particulate	0.5	17%	85,000 ^b
Ozone	4.2	9%	380,000
Sulfur Dioxide	0.04	43%	17,000
Toxics	1.1	10-50%	100-550,000 (110-570 ^a)

^aExcess 70 year cancers

^bPlus approximately 30 fewer deaths/year

Since point sources contribute only a portion of the statewide total of each of these pollutants, the statewide risk reduction potential is significantly lower than the pollution reduction potential of this strategy. However, statewide totals and other such statistics mean little to those living in the plume of a large point source. To them, there is likely to be a significant risk reduction resulting from measures taken to reduce emissions from that one source.

Typical pollutants from point sources include volatile organic hydrocarbons (see Figure 1), in addition to sulfur dioxide (Figure 3) and particulate matter (Figure 4).

Assuming risk reduction is proportional to the percent of total statewide emissions reduced, particulate risk would be reduced 17 percent, SO2 43 percent and VOC 9 percent.

Reduction potential of toxic air pollutant through application of all known and reasonable technology to existing sources is very source dependent. Overall, however, the reduction potential is substantial for two reasons. Since the current construction permit system does not require progressive pollutant reductions, known, available and reasonable technology is not in place at many operating facilities.

Application of such technology is likely to reduce air toxics since the methods of control are similar. Thus estimates of 10 to 50 percent reductions for criteria pollutant control are applicable, on average, to toxic air pollutant reduction. Actual pollutant and health risk reductions are variable according to facility type, chemical, and control equipment. At one extreme, the risk from some toxic air pollutants, such as dioxins and polyaromatic hydrocarbons, could be virtually eliminated from combustion sources with appropriate combustion controls. This will also result in greater efficiency. The control of other toxics may prove to be more problematic.

Second, application of a permit program to toxic air pollutant sources will increase the number of sources subject to permitting and technology requirements. This would occur because many industries (e.g. fibreglassing operations) emit few criteria pollutants, but have large toxic air pollutant emissions. Since emission of air toxics has not been regulated, these sources often are not controlled. A minimum 30 percent increase in sources subject to permitting is likely, assuming that the increase in sources subject to permitting is similar to estimates made for the new source toxics program. The emission reduction potential from these sources is large: up to 80+% control. The risk reduction potential is also large since these sources tend to be located nearer residential areas (e.g. autobody refinishing, chrome platers, dry cleaners).

It is very difficult to quantify emission reductions which might result from increasing penalties. Increasing penalties has the potential for increasing compliance with air quality regulations. On a statewide basis, a strong enforcement program backed by adequate penalties establish credibility, fairness and a climate where "just paying the penalty" no longer works.

Discussion

Air quality permits take two forms: permits to establish or alter air contaminant sources (authorities to construct or prevention of significant deterioration -- PSD permits) and renewable permits establishing continuing conditions and limitations on emissions (certificates to operate or operating permits). Continuing requirements are part of an operating permit system as opposed to construction requirements in the authority to construct system.

Currently, regulatory control in Washington relies on the authority to construct or Notice of Construction (NOC). The NOC, a preconstruction permit, is required only for new sources or major modifications of existing sources. Although a source-specific evaluation of emission controls and technology is required within the NOC process, the authority to require continuing proper operation and maintenance of the process and control equipment is vague and cumbersome. Essentially,

sources are permitted for life under Washington's construction permit system. There is no mechanism for requiring specific improvements in control technology as technology progresses. Periodic reviews, equipment or process upgrades and operating parameters cannot be readily required.

An operating permit system would allow systematic review by air pollution control agencies of existing sources to ensure that all known, available and reasonable controls are used, and could identify certain operating parameters and practices that would ensure continuing air contaminant control. In addition, inspection efficiency would improve with an operating permit system. A permit would be issued with a set of easily identifiable operating parameters, such as combustion temperature. Well written and well thought-out permits would facilitate inspections. An inspection of operating parameters would provide a quick and efficient method of determining the compliance status of sources.

Presently, the inability to control toxic air emissions by monitoring operational and maintenance parameters of a facility is a serious problem. It is difficult if not impossible to set standards or emission limits for the hundreds of toxic air pollutants. Efficient control is only feasible through the implementation of an operating permit system. Most existing sources in Washington have never been reviewed for air toxics. Even if emission limits were set, compliance determination through source emission tests would be at best very expensive.

Finally, as air pollution control technology advances, the costs to purchase and operate such systems often increase. Trading the cost of paying enforcement penalties off against the substantial investment to upgrade control equipment is a problem that will only get worse as control costs increase. In addition, current air pollution penalties are very small relative to other environmental penalties (water pollution, hazardous waste, etc.), which could act as an incentive to choose improper disposal into the air over other options. Ensuring that enforcement authority is high enough to act as an effective deterrent against non-compliance is an important component of this proposal.

Costs

Implementation costs to affected industries would vary from facility to facility, pollutant to pollutant and even by geographical area. At best, we can only suggest an order of magnitude estimate of what it might cost to bring all sources statewide up to a best available control standard. We will estimate that to bring a source up to today's Best Available Control Technology (BACT) standard would cost between \$2000 and \$5000 per ton of control, a figure consistent with the cost of recent federal New Source Performance Standards. Without assuming potential co-control (control over a second pollutant

while controlling another) between the four pollutants listed above, but allowing for the probable significant toxic pollutant reductions that are likely (in other words, not factoring in a separate cost for toxics controls), the total cost for industry to implement this strategy would be on the order of \$200 to \$500 million.

While a comprehensive operating permit program would result in significant improvements in point source emission controls, implementation costs to regulatory authorities would be high. Operating permits can have short or long term renewal periods. Short term permits, less than five years, give the agencies the opportunity to review the operation of a facility frequently. Advancements in technology or improvements in operation can be quickly addressed and incorporated into the permits. Revising each permit on a timely and frequent basis and in a technically sound manner would require a corps of experienced personnel. These would include permit writers, engineers, hearing officers, and other administrative, technical and support personnel. Major changes in equipment are unlikely from one renewal to the next.

Long term operating permits, five years or longer, would require less administrative and support personnel, but would trade off this form of personnel need with the need for greater inspection and enforcement resources. Long term permits may be tied to the useful life of equipment. Hence as equipment ages, state-of-the-art replacements could be required. Long term permits also give the sources greater certainty over the requirements.

Either way, comprehensive, technically sound operating permits would need to be developed for a large number of sources statewide. Currently, compliance, enforcement and permitting account for about one third of the state's \$7 million air quality control budget, or roughly \$2 to \$3 million. An operating permit program would require two to three times this current level, or from \$5 to \$10 million annually. Lacking adequate resources, permitting delays will occur.

Other Factors

Conceptually, it is currently the obligation of the regulatory agency to show the need for upgrading controls on existing sources based on proving that there is a significant human health risk resulting from current emissions. As a result, attempts to evaluate and reduce toxic emissions from selected high risk point sources have generated endless debate over whether a emissions from a given source are "safe". An operating permit system, on the other hand, puts industry in the position of having to periodically secure permission from air agencies to continue using the air resource to dispose of pollutants. In addition, industry currently pays no fee for their use of the air resource and an operating permit program

would probably be supported by such fees or through emission taxes.

Industry arguments against operating permits and toxic controls claim: 1) It is unnecessary. Authority already exists to issue regulatory orders in lieu of permits. 2) Operating permits are just another scheme to collect fees. 3) Operating permits allow staff to set more restrictive emissions without public hearings. 4) Emission limits could be set for each pollutant. 5) Air toxics is an emotional issue and there is danger of regulatory overkill in dealing with this problem. 6) Risk assessment should be used to justify the needs for control.

Technical Constraints: Given the wording of this action item, there appear to be no technical constraints. This is not a technology forcing proposal. Instead it requires installation of control technology that is known and available.

Institutional Constraints: An operating permit system would require legislative authority. Implementation of a permit system requires adequate technical staff for timely permit review and adequate technical staff to educate and assist industry.

Political Constraints: Industry has historically strongly opposed operating permit systems and/or any control of toxic air pollutants from existing sources.

Roles and Responsibilities

Permitting, toxic air pollution control (such that it is) and compliance programs are currently being implemented by state and local air pollution control authorities. Implementation should follow along these lines, with a possible shift in the early phases toward Department of Ecology development of basic industry requirements or guidelines. Initially, the program would emphasize permitting, but would soon expand to include compliance and enforcement. As the permits are developed and program emphasis shifts more towards compliance and enforcement, resources should be shifted to implementing authorities. Oversight of the program could be through the Department of Ecology.

Any operating permit program should be implemented in phases and on an industry by industry basis. Implementation in this manner is important so that no company would have a big advantage over another in the same industry. It would also allow staff to develop expertise in that particular industry. It is estimated that it would take five or more years to phase in a comprehensive operating permit program.

Action Item 2: Create a data collection and management system which citizens can access for community

watchdog purposes. Use modeling to identify high risk point sources.

Currently there is no easy method for citizens to get up-to-date information on what a given facility emits into the air, on an industry's record of compliance with air pollution regulations, or status of regulatory action affecting individual industrial plants. Citizen awareness of compliance status is a concern to many industries and their desire to maintain a low profile can serve as a positive influence to maintain compliance. A user-friendly data management system could serve as a collection point for citizens to access this information. A similar SARA 313, citizen "right-to-know" program.

Risk Reduction Potential

The risk reduction potential from this type of an action idea is very difficult to quantify. It is likely to be fairly low since industries that consider corporate image in compliance decisions are already motivated by press accounts of enforcement issues. Easier citizen access of compliance information could provide an additional pressure point.

In combination with a periodic operating permit program as described above, citizen knowledge of plant emissions and pending permit review has the potential of influencing pollution control decisions in a positive way, and may even accelerate the installation of control equipment.

Discussion

The public has a right to know what decisions public servants are making, and to have access to the information upon which such decisions are made. In reality, however, though the data is technically available, it is of little use if the public cannot access it on a timely basis and in a form that can be understood.

The subcommittee proposes the development (software and hardware) of an on-line access system designed to walk the user through a series of simple questions to the information they are after. We suggest that terminals could be located at all public libraries, and that the service should be provided free of charge to the user. Information about emissions, on-site hazardous substances, pending permit actions, conditions of current permits, and the like would then be accessible to anyone interested. Informed citizens drive good public policy decisions, and this proposal could go a long ways toward keeping the public informed about environmental issues. To make this happen, an explicit appropriation from the legislature is needed.

Though there is consensus that this is a good idea, most agencies are so busy "putting out fires" that they find precious little time to pursue what otherwise might be considered good ideas.

Costs

While the risk reduction potential of this idea may be relatively small compared to other action proposals in this report, the cost of implementing this proposal is relatively small as well. Taking into account that such a system would provide information about all environmental media, and thus the costs would be shared among several environmental programs, a cost of \$3,000-\$5,000 per installation, plus \$50-\$75 in monthly fees for the system described in the discussion above seems quite reasonable.

Other Factors

Technical Constraints: Such systems are currently being used for a number of different applications. Computers and database development would be needed.

Institutional Constraints: There may be resistance to conform to consistent data requirements by some who have satisfactory systems.

Political Constraints: Such a system could increase political pressure on agencies with sources out of compliance. Industry may be reluctant to have their compliance status readily available for scrutiny and subject to misinterpretation, but the concept is not new. The SARA 313 program has broken ground by providing emission data. Based on the SARA 313 experience, citizen involvement may be minimal (which may have been the result of the design of the system more so than lack of interest). Typically, citizen interest is high only on sources "in their backyard" in situations where change, such as expansion, is occurring.

Roles and Responsibilities

System development would most likely fall to the Department of Information Services, with databases and other technical advice provided by environmental agencies. In addition, there are some comprehensive federal databases that could be used as the foundation of a state system.

While the actual implementation of the system would be a shared responsibility, oversight and management of what goes into the system should be the responsibility of the users - the citizens of the state, as represented by some form of steering committee.

Such a system could be developed and implemented within three years after funding is secured.

C. Reduce Emissions from Area Sources

Area sources, as used here, generally refer to smaller sources of air pollution that, in aggregate can represent a significant part of a region's air quality problems. The source categories considered in this section include wood stoves, slash and agricultural field burning, and small sources of chlorofluorocarbons (CFC's) such as automobile air conditioning. It is best to look at the difference between area and point sources as completely arbitrary - we just use these as convenient ways to group like categories of sources.

Four action items to reduce emissions from area sources were retained by the Subteam for further analysis:

- Phase out slash, agricultural, yard debris and land clearing burning. Provide incentives for beneficial use of by-products.
- Further discourage all home combustion of wood products.
- Reduce emissions of ozone depleting substances through recycling, product substitution and changes in manufacturing processes.
- Adopt standards to protect visibility.

Action Item 1: Phase out slash, agricultural, yard debris and land clearing burning. Provide incentives for beneficial use of by-products.

This action item is actually a combination of several ideas that emerged during several 2010 workshops that all have a common theme. The common theme is: phase out outdoor burning as a waste disposal practice. These practices have another thing in common - they are all significant air pollution sources that are "managed" as opposed to controlled. That is, rather than limiting emissions from these sources, we seek to direct the plume away from population centers, to less populated areas or only allow them to occur when it is suspected they will cause less harm.

Risk Reduction Potential

Eliminating outdoor open burning would eliminate the air contaminant emissions from that practice. As with many types and sources of air pollution, the geographic distribution of pollution varies from location to location and from season to season. Generally, we can look forward to the following reductions in the statewide emission burden.

Assuming statewide percentage emission reductions translate into corresponding risk reductions:

Table 7
RISK REDUCTION FROM ELIMINATING
UNCONTROLLED OUTDOOR BURNING

Pollutant	# people at risk (X10 ⁻⁶) 2010 ext.	% of Total ^b Emissions	# people in 2010 avoiding risk w/action
Particulates	0.5	8%	40,000 ^c
Carbon Monoxide	2.4	8%	190,000
Ozone	4.2	4%	170,000
Toxics	0.7	18%	120,000 (204 ^a)

^aExcess 70 year cancers

^bPercentage of total statewide emissions of this pollutant

^cPlus approximately 15 fewer deaths/year

Though it may be optimistic to suggest these practices could be eliminated, there is probably more to be gained by doing so than the numbers above would suggest. The database from which this table was derived is known to be incomplete and therefore emissions are underestimated.

Discussion

Smoke from several uncontrolled burning practices is "managed" rather than controlled. They include forest slash burning, agricultural field burning (including fields used for grass seed), burning land clearing debris, and household yard debris such as prunings and leaves. Though such practices have been a way of life in Washington for many years, it should be recognized that this form of "waste disposal" can cause significant air pollution problems. Studies have shown that ambient air quality levels can exceed health based standards in areas impacted by slash burns, and the same is undoubtedly the case for other types of burns, especially larger agricultural field burns.

There are alternatives to uncontrolled outdoor burning. It is the waste disposal method of choice simply because it is cheapest. Without significant economic disincentives, it will continue to be the cheapest. Explicit rules phasing out such practices will be needed.

Costs

There are two types of costs associated with the strategy of essentially banning outdoor open burning. First are the government implementation costs of administering and enforcing the phase down and bans. The practice of torching waste is so common and ingrained that strict compliance and enforcement is necessary. There will be costs the of research into alternatives and public education. We estimate a staff of twelve with an annual budget of \$840,000.

The second type of cost is really a previously avoided expense. Those who have disposed of waste through burning (at very little cost) will argue that alternative disposal practices will represent new costs of doing business, but in reality alternative disposal expenses were just previously avoided costs - savings that have accrued through the year as these wastes were dumped into the atmosphere at no cost to the business but at substantial public health and environmental cost to society. Offsetting these expenses may be revenue gained through new markets for today's waste products.

The taxpayer or those burning (through permit fees) must pay for the administrative, research, education and enforcement costs. The group or entity producing the waste should pay a fee commensurate with alternative disposal practice expenses.

Other Factors

There are no technical constraints, only economic arguments. Burning waste is cheap and easy. Waste reduction, recycling, re-use, alternative use, alternative waste disposal methods and alternate agricultural or forest practices will cost more than a book of matches, which one can get free at any restaurant.

The Washington Clean Air Act (RCW 70.94) states as the public policy of the state to reduce and eventually eliminate outdoor open burning. This strategy is consistent, and complements existing statutes. However, burning interests will challenge any attempt to phase this practice out. Logging and farming practices commonly use fire as a waste disposal practice. Timber and agriculture interests are among those who strongly discourage regulation.

This issue is very political. Citizens who must refrain from using their wood stove and who must haul their waste to the dump resent breathing the smoke of agriculture and timber fires. Farmers and loggers enjoy strong political representation.

Roles and Responsibilities

It seems as though everyone is currently involved to some degree in smoke management - from the federal, state, private, and tribal land holders to local fire departments. Though all are either managing or protecting a resource, none have taken much responsibility for protecting the air resource. Serious efforts to protect the air resource should be implemented through state and local air authorities.

One advantage to a complete phase-out of such practices is that it would be relatively easy to administer and enforce such a program - if it's burning, it's illegal. Again, state and local air authorities are best suited to overseeing such a program.

We would suggest a six-step approach to phasing out uncontrolled outdoor burning:

- Step 1. Strictly enforce existing laws and regulations which prohibit or condition outdoor burning.
- Step 2. Conduct an inventory of current open burning practices and occurrences. Eliminate those practices/occurrences unlawful under existing statutes. Divide the state into zones of two types: developed or open. Focus existing limited resource on control in developed zones.
- Step 3. Study the development of potential markets for the wastes which are now burned (especially agricultural and logging residues). Study and identify alternative waste disposal methods for yard and garden wastes, commercial/industrial wastes, and demolition wastes which are often burned today. Include analysis of effects on other portions of the environment; possibly through an Environmental Impact Statement.
- Step 4. Conduct an aggressive, massive public information and education program or campaign to educate Washington farmers, loggers, businesses, and citizens of alternatives to burning.
- Step 5. Require the use of alternative disposal practices by adopting a phase down schedule. The practice of waste disposal to the atmosphere should be eliminated by the year 1995 in developed zones and no later than 2000 statewide.
- Step 6. Eventually ban outdoor burning. Allow only accidental fires, backfires used in fire fighting, fire fighter training exercises (under strict permit conditions), ceremonial fires, and infestation control fires (under strict permit conditions).

Action Item 2: Further discourage all home combustion of wood products.

Burning wood for home heating has been a custom in the Northwest for many years. As oil shortages caused dramatic rises in oil prices, wood heating was encouraged even more than in earlier years. Today, an estimated 1.2 million homes in Washington are equipped with fireplaces or wood stoves, burning over 2 million cords of wood each year. While wood fires may be pleasing from an aesthetic point of view, emissions are generally high and rich in toxic air pollutants. To add to our concern, the smoke from wood fires used for home heating is typically emitted nearly at ground level, and most often during cold winter months when air pollutants are trapped near ground level. A large number of workshop participants recommended going beyond current curtailment programs to outright bans of all woodstoves.

Risk Reduction Potential

The risk reduction potential of this option is based on a gradual phase out of wood burning for home heating. The Environment 2010 Comparative Risk Assessment report estimates a current mortality rate of 104 people per year in Washington due to fine particulate exposure, projected to increase to as high as 160 by the year 2010. In areas with elevated particulate levels, wood burning typically accounts for from 10 to greater than 60 percent of total year-round emissions. Since these are generally the population centers, we estimate that the outcome of phasing out wood stoves would be from 15 to 100 fewer deaths resulting from exposure to elevated levels of fine particulates.

Risk reduction from exposure to several toxic air pollutants would most likely be significant, though difficult to quantify. Currently, home wood combustion accounts for 18.5 percent of the total toxic emissions statewide. Most of the toxics of concern from wood stoves are known or suspected carcinogens. In the absence of additional controls, we would anticipate a 54 percent increase in these toxics between today and 2010 (see Appendix A). This translates into approximately 1,100 lifetime excess cancers resulting from toxics in ambient air. Currently, roughly 19 percent of all toxics studied in the Environment 2010 comparative risk assessment are emitted from home wood combustion, so we estimate that this strategy would reduce lifetime excess cancers by 210 in the year 2010.

Finally, during winter months wood stoves contribute a significant fraction of the carbon monoxide (CO) in many areas that exceed air quality standards for this pollutant. If, on days that exceed the standard, 10 percent of the CO is from wood stoves, a 10 percent reduction in risk from this pollutant could be expected, which translates into 240,000 fewer people at risk in the year 2010.

Table 8
RISK REDUCTION FROM PHASE OUT OF HOME WOOD HEATING

Pollutant	# people at risk in 2010 (x10 ⁻⁶)	% reduction ^b	% people in 2010 avoiding risk
Particulates	0.5	22.5	115,000 ^d
Carbon Monoxide	2.4	23.4 ^c	240,000
Toxics	0.7	18.5	130,000 (210 ^a)

^aExcess 70 year cancers

^bPercent of statewide emissions of pollutant from woodheating

^cTen percent effect on CO levels

^dPlus 15-100 fewer deaths annually

Discussion

Though home heating with wood accounts for 22.5 percent of the total fine particulates emitted statewide, the percentage can jump to as high as 90 percent in some communities during winter inversions, when warm air aloft traps colder air at ground level. Washington currently implements a wood stove curtailment regulation during these peak periods. The curtailment program is intended to keep fine particulate levels below the health-based air quality standard.

While the curtailment program has been successful in many ways, there are still substantial risks from burning wood to heat homes. Generally, certain wood stoves certified by the USEPA as being less polluting are exempt from curtailments, as are homes using wood burning as their sole source of heat. Furthermore, enforcement of the ban is a significant problem (USEPA estimates a 50 to 70 percent compliance rate). Finally, several toxic air pollutants are emitted at high rates from wood burning and recent data suggests that the highest toxic emission levels come from so-called certified stoves.

Other Factors

Technical constraints: None. There are many alternatives to wood burning as a means of heating homes.

Institutional and political constraints: It is unlikely that wood burning in the home could ever be completely eliminated. But reserved primarily for ceremonial purposes, the risk from home wood burning would be extremely low. With this as a goal, phasing out home wood burning would rely primarily on public education and stronger statutes including possibly, a government buy-out program to eliminate situations where wood burning is a home's sole source of heat.

Wood is recognized as being relatively cheap, especially to those living near forested areas. It is also renewable, which was a big reason many people in the 1970's switched to wood heat. Similar circumstances in the future may once again influence people to move to wood heat.

Action Item 3: Reduce emissions of ozone depleting substances through recycling, product substitution and changes in manufacturing processes.

Ozone in the upper atmosphere protects the earth from damaging ultraviolet radiation. Recent evidence indicates that this shield is being destroyed at an alarming rate, the principle cause of which appears to be the release of certain ozone depleting chemicals (e.g. chlorofluorocarbons, or CFC's). In the spirit of "think globally, act locally", this action idea would put Washington in a leadership position in efforts to solve this global problem.

Risk Reduction Potential

It would be difficult to estimate the impact of a rule requiring recycling of CFC's in Washington State on the rate of decline in stratospheric ozone - it would no doubt be very small. The potential reduction in CFC's that would otherwise be emitted into the atmosphere are summarized in the following table:

Table 9
EMISSIONS OF OZONE DEPLETING
GASES IN WASHINGTON BY USE
(thousands Kg)

Item	Use	Emission
Solvent	8,267	6,714
Polyurethane Foam	2,667	515.17
Car A/C & Refrigerating	2,590	1,295
TOTAL	13,524	8,524.17

From these three processes alone, over eight thousand kilograms per year that could be captured are needlessly emitted.

Discussion

Stratospheric ozone shields the earth's surface from dangerous ultraviolet radiation. To the extent depletion occurs, penetration of ultraviolet radiation will increase, resulting in potential health and environmental harm including increased incidence of certain skin cancers and cataracts, suppression of the immune response system, damage to crops and aquatic organisms, increased formation of ground-level ozone, and increased weathering of outdoor plastics.

The United States ratified the Montreal Protocol in April 1988. This agreement requires nations who join to restrict their consumption of ozone depleting substances. To implement the Protocol, EPA promulgated a rule which requires a near-term freeze at 1986 levels of production and consumption of various CFC's based on their ozone depleting potential, followed by a phased reduction to 80 percent and 50 percent of 1986 levels beginning in mid-1993 and mid-1998 respectively. In addition to a mandated phase down, virgin CFC's and halons will be subjected to a graduated federal tax based on the ozone depleting potential of the compound. The effect of the production phase down and tax will be to dramatically increase the price of virgin ozone depleting substances. As the price increases, substitutes and alternatives will become attractive and be phased in. Considerable research is already being conducted in this area.

The use of substitutes does nothing, however, to address the large amounts of ozone depleting substances which are "banked" in refrigeration and air conditioning systems throughout the state. Recycling can capture as much as 90 percent of these emissions. Market forces working in concert with an effective recycling program

can dramatically reduce Washington's contribution of ozone depleting gases to the world's atmosphere.

Costs

A number of businesses would be affected by a rule requiring CFC recycling. Included would be commercial, industrial, and residential servicers of air conditioning and refrigeration systems (DOL lists 425 statewide). Automotive air conditioner service shops would also be affected (US census listing of wholesale, retail services shows 5,813 facilities statewide). This list includes auto service, repair, parts, body shops, parking garages, and gasoline outlets. Most of these outlets would not service air conditioners. Finally, businesses using air conditioners, heat pumps and refrigeration units would also be affected.

Different types of business would be affected in different ways, and thus their costs would vary. For example, in the non-automotive service industry, costs would include initial equipment to capture gases (recovery bags) and maintenance at an estimated \$1500/yr. One bag will service up to 12 units. Bag costs are projected at \$3.00 each. Costs estimate assumes 25 service calls per day and 244 working days per year.

There are savings associated with recovering and reusing these products. Service companies would probably obtain a discount on the price of refrigerants purchased to recharge appliances because they would turn in used refrigerants to be recycled. Today, recycled refrigerants are cheaper than new product and will become increasingly cheaper as federal taxes on virgin CFCs increase. Bag costs would probably be passed along to the consumer. Service industries would realize net profit at years end by recovering full costs of bags from the customer and paying reduced costs for refrigerants. It is estimated that cost increases of \$5.00 per service call would be passed on to the customer.

Another example would be the automotive air conditioning service shop, presented here as worst case costs. This scenario assumes a small volume shop with no other revenue source would purchase a full scale recycling system for refrigerants.

Costs: Initial equipment \$3,000 - 8,500 (manufacturer's list price)

 Maintenance \$100 (filters and labor per year)

Manufacturers of these systems generally offer them on a lease purchase basis.

Savings: Costs to purchase new refrigerant \$10,912 per yr

 (3 services/day @ 4 lbs/service @ \$4/lb @ 244 days/yr)

Savings if onsite recycling is used \$6,547/year (based on an low estimate that recycling will reduce the need to purchase refrigerant by 60%)

Note that the payback time for capital equipment purchase is approximately one year or less.

Our final example is costs to owners of air conditioning or refrigeration systems. Depending on the type and age of the equipment, one service per unit is generally recommended each year. Assuming servicers will pass on all costs and not include customers in credit or savings received from purchasing recycled refrigerants, customers would likely face additional charges of \$5.00/unit/year.

The trends in the cost of virgin CFC's is up. With existing international agreements to cut production by 50%, availability of virgin CFC's will decrease by at least 50% by 1998. Costs are also expected to rise several dollars per pound based on a recently enacted graduated federal tax on newly produced refrigerants. Recycled refrigerant will be (and is today) cheaper than new material.

Other Factors

No technical impediments exist to the capture and recycling of CFC's used in refrigeration and air conditioning systems. Some large corporations, for example the Whirlpool Corporation, already conduct large-scale recapture and recycling.

Some political opposition can be anticipated from small businesses concerned about costs. This can be largely overcome, however, by educating business owners about the cost-effectiveness of recycling, and by providing some financial assistance.

All needed institutions exist for immediate implementation.

Roles and Responsibilities

Legislation would be needed to establish the extent to which Washington would step out on the issues of both recycling/reusing and the banning of products or practices. Implementation schedules, and the governmental agency most suited to implementing regulations would depend upon the content of legislation.

Action Item 4: Adopt standards to protect visibility.

The action items discussed so far have all been primarily concerned with reducing human health risks. Visibility degradation is mostly a quality of life issue. Many Washingtonians cherish this area for its natural beauty and scenic vistas. To them, living here is special largely because of what can be seen on a clear day. This action item would set a limit on the extent to which our visibility could be degraded before some form of regulatory response would be initiated.

Risk Reduction Potential

The risks we are dealing with when discussing a visibility standard are more visceral than human health or ecological risks - they threaten a quality of life issue that some highly value and that others care little about. There are economic damages associated with visibility degradation. Homes with a view, for example, sell at a significant premium to those without.

Discussion

There is a certain grandeur to the natural wonders in Washington State. Somehow, the image of getting lost in our thoughts while looking out over a smog shrouded view of our favorite vista just doesn't work for most of us.

There are many technically valid reasons for setting a visibility standard - to enhance our "most livable" image, for the economic advantage we enjoy over competing states in attracting tourists, new businesses, or to bring Hollywood to our natural film studio. But the real issue, the most valid reason we should consider setting a visibility standard, is our obligation as stewards of the air resource to preserve the scenic vistas that many of us grew up with. Future generations should have the opportunity to view the Olympics or Cascades even when looking across urban centers.

What sort of visibility standard should we set? The best answer to that is the standard should be set at whatever level the public demands. In fact, Denver, Colorado recently set a visibility standard in this way. A sampling of residents was polled, using a series of photographs representing varying degrees of visibility degradation, and asked to select the point at which they felt the haze was unacceptable. The actual number then used for the standard was based on that level which to a certain percentile represented too much haze. The range they chose was 32 miles (there may have been some technical difficulties that caused this number to be biased to the low end).

In an effort to get some idea of how the Puget Sound area would fare given two possible standards (40 and 50 miles), one year of SeaTac data was scanned. During that year, there were a meager 96 days that the area's meteorology allowed for virtually unimpaired visibility, or only 26% of the entire year. As a result of manmade sources of air pollution, a 40 mile visibility standard would have been violated 27 of the 96 days (28% of the time) and a 50 mile standard would have been violated 59 days (61% of the time).

Fortunately, there are viable strategies to control those sources of air pollution most responsible for visibility degradation. One need go no further than this report. Wood stoves in the winter, large point sources, slash burning and agricultural burning in the spring and fall, and elevated ozone levels are the most likely sources, and strategies to reduce emissions for each of these are discussed in this report. The important difference between reducing human health

risk and improving visibility is that the public has set the goal, and that goal may effectively be much lower than any of the health based standards.

Costs

The cost of setting a standard would be quite low. Collection of data for the public survey, presenting the survey, and developing the regulation would take an estimated two years and between \$50-100,000 for monitoring capital costs, operation and analysis. Implementing rules to protect the standard may, on the other hand, prove to be costly.

Other Factors

Few technical constraints have been identified to controlling visibility impairing air pollution. Most of the strategies employ known technologies or are simply a twist on implementation of current regulations.

Where we would expect to have the most problem is overcoming institutional and political constraints. Consider all of the political and institutional constraints discussed so far. Imagine negotiating phasing out wood stoves, slash and field burning, and measures to get people out of their cars all at one time, all in the interest of improving visibility.

Roles and Responsibilities

The public would set the standard and all levels of government would need to commit themselves to achieving the goal. Much work needs to be done to determine the principle causes of visibility impairment, and what can be done to control them. It is hoped that efforts to reduce health risks, noted above, will go a long ways toward improving visibility. Most of the air pollution control action ideas discussed above would be implemented by state and local air pollution control authorities. The concept of a steering committee of citizens to oversee progress towards the goal would be strongly encouraged.

A study and standard setting process could be completed within two years. A three phase approach is recommended. First, collection of data for survey, survey of the public and development of standard on the basis of the survey. Next, develop control strategies to meet the standard. Causes of visibility degradation would need to be determined. Controls over some sources could be very expensive - options for apportioning controls between sources would need to be explored. The final step would be implementation of control requirements.

III. ACKNOWLEDGEMENTS

The action strategies covered in this report were the product of a two step process involving a group of talented, hard working professionals. In step one, over ninety action ideas were analyzed by the Air Resource Subteam of the Environment 2010 Action Strategies Analysis Committee. Of those, fifteen ideas were retained for further analysis. Participating on the Subteam were:

Charles Howard
Darlene Madenwald
Jerry Ficklin
Anita Frankel
Reese Wardell
Joanne Polayes-Wien
Stuart Clark
James Atkinson
Dan Johnson

Having chosen the action ideas to be further analyzed, a number of those on the Subteam contributed portions of this report. Contributions were also made by the following experts in their respective fields:

Leslie Carpenter
Alan Butler
Clint Bowman
Sally Otterson
Frank Van Haren
John Raymond
Cathy Carruthers
Greg Theyel
Jay Willenberg
Grant Pfeifer
Frank Soiza
Mike Landon

A comment from Jerry Ficklin is worth quoting here: "Personally, I feel that we should have spent a year determining solutions; rather than a year defining the State of the Environment"..." My sincere appreciation to all of those who worked so hard to do a very credible job on an impossibly short schedule.

Dan Johnson

APPENDIX A

COMPLETE LIST OF ACTION PROPOSALS CONSIDERED
by the
AIR RESOURCE SUBCOMMITTEE
of the
ACTION STRATEGIES ANALYSIS COMMITTEE

WASHINGTON ENVIRONMENT 2010

INITIAL SCREENING AND SCOPING OF AIR RESOURCE ACTION IDEAS

Proposals to Control Emissions from Motor Vehicle Related Sources

A. Ideas to reduce vehicle miles traveled

2) Create a graduated "pollution tax" linked to emissions performance to increase the rate of fleet turn-over.

[Merits further consideration with one or more retained idea]

7) Impose fuel taxes or gas guzzler penalties/gas sipper rewards in automobile registration fees to encourage greater fuel economy and less pollution from the combustion of gasoline.

[Merits further consideration with one or more retained idea]

30) Significantly increase the gas tax on gasoline and use the proceeds to improve air quality.

[Merits further consideration with one or more retained idea]

18) Require positive net air quality impacts from all state and local decisions regarding development or expansion of any infrastructure (transportation project, sewage treatment plant, etc.). [from old Land Use section]

[Concept retained for further analysis]

*1 Odd/even commute

[Some merit - not recommended for further analysis]

*2 Transit/rideshare promotion

[Some merit - not recommended for further analysis]

*3 land use/changing trip patterns

[Some merit - not recommended for further analysis]

*4 Mandated employer-based trip reduction ordinances

[Concept retained for further analysis]

*5 Provide alternatives to SOVs with incentives (e.g. toll roads)

[Concept retained for further analysis]

-6 Tax owners/operators of downtown parking lots

[Concept retained for further analysis]

- *7 Encourage high capacity transit system development

[Concept retained for further analysis]

- *8 Restrict driving in certain areas

[Some merit - not recommended for further analysis]

- *9 Disincentives for SOVs relative to HOVs (e.g. transit subsidies)

[Some merit - not recommended for further analysis]

- *10 Promote bicycling and other forms of non-vehicular transportation

[Some merit - not recommended for further analysis]

- +11 Transportation task force including DOE, DOT, WEO

[Some merit - not recommended for further analysis]

- B. Ideas to improve traffic flow (reduce vehicle idling times)

26) Require anybody with a drive through window to post a sign asking their customers to turn off their engines at the window. Alternatively, ban drive through windows.

[Concept retained for further analysis]

- *12 Signalization (including advisory on suggested average speed to make lights)

[Some merit - not recommended for further analysis]

- *13 System improvements (e.g. center turn lanes, one way streets, access management, ramp metering)

[Some merit - not recommended for further analysis]

- *14 Incident management systems

[Some merit - not recommended for further analysis]

- *15 Restriction truck hours and routes

[Some merit - not recommended for further analysis]

- 16 High speed light rail system (DORev noted as #10)
(moved to VMT section - HCT)

- *17 Prohibit/limit idling (e.g. taxis, cruising, bridge openings)

[Concept retained for further analysis]

*18 Driver information - advisories

[Some merit - not recommended for further analysis]

C. Ideas related to fuels

14) Establish state motor vehicle fuel quality standards including volatility, oxygen and sulfur content.

[Concept retained for further analysis]

4) Tighten controls on the gasoline marketing industry. Mandate capture of refueling emissions at stations.

[Concept retained for further analysis]

6) Concentrate on converting automobiles to cleaner burning fuels like Encourage the use of alternate fuels including ethanol, methanol, compressed natural gas, or electricity. Forgive sales and annual excise tax for motor vehicles manufactured to use any fuel other than gasoline or diesel. Ban leaded gas. Start with government vehicles then go to private. Provide tax incentives to expedite clean fuels program.

[Concept retained for further analysis]

*19 Develop/implement an expedited clean fuels program - tax incentives

[Concept retained for further analysis]

*20 Ban leaded gasoline

[Some merit - not recommended for further analysis]

D. Ideas to reduce vehicle emissions

3) Ban the sale of emission control defeat devices.

[Concept retained for further analysis]

9) Adopt State vehicle emission control standards, including gasoline and diesel vehicles.

[Merits further consideration with one or more retained idea]

32) Expand and strengthen the inspection and maintenance program, including (e.g. diesels, anti tampering, dynamometric analysis and higher repair exemptions).

[Concept retained for further analysis]

- combine with -

*21 expand geographical coverage of I/M program

[Concept retained for further analysis]

*22 Retrofit older vehicles

[Some merit - not recommended for further analysis]

*23 Encourage government to use high milage low polluting vehicles

[Concept retained for further analysis]

E. Ideas relating land-use decisions and transportation

II. Point Sources

5) Harness public pressure to encourage voluntary emissions reductions. For example, publish a "who's who" of pollution which includes understandable assessments of the human health and environmental risks associated with the emissions of major industrial sources. Publish a cost analysis of the long-term cleanups necessary to rectify planned pollution to air, land, or water.

[Merits further consideration with one or more retained idea]

10) Create a data collection and management system which citizen groups can access for community watch dog purposes. [note this came from number 5 above] Use Title III database to focus on large emitters of toxics air pollution.

[Concept retained for further analysis]

- combine with -

8) Develop capabilities to do air-shed modeling (eg, GIS) to identify industry pollutants and use of fuels; assess opportunities for alternative fuels and for alternatives to burning (eg, off-sets, district heating). [from IV.]

[Concept retained for further analysis]

12) Need aggressive odor control program. Odors can be an indication of toxics.

[Merits further consideration with one or more retained idea]

25) Require best available control technology (BACT) for all air emission sources from (e.g. storage tanks, treatment systems, and incineration systems) regardless of if they are new or existing.

[Concept retained for further analysis]

*24 Regulate air toxics from point sources

[Concept retained for further analysis]

*25 Regulate fugitive emissions from point sources

[Concept retained for further analysis]

*26 Develop and implement an operation permit program (also listed under IV below)

[Concept retained for further analysis]

*27 Require greater than 1 to 1 offsets on new source construction, not restricted to non-attainment areas.

[Some merit - not recommended for further analysis]

*28 Require clean fuels for new construction of power plants and as fuel for major sources

[Some merit - not recommended for further analysis]

*29 Improve toxics monitoring

[Some merit - not recommended for further analysis]

*30 Increase penalty authority

[Concept retained for further analysis]

III. Area Sources

1) Discourage home combustion of wood products. Promote the use of pellets in woodstoves and fireplaces. Allow only clean burning home heating devices to be installed in newly constructed dwellings.

[Concept retained for further analysis]

1a) Establish woodsmoke curtailment zones based on population density and geographic/meteorological features. At first these areas would receive special emphasis for enforcement, but as the public becomes aware of the boundaries of these areas, impaired air quality bans could be called with greater frequency and eventually woodstove use could be almost entirely eliminated.

[Some merit - not recommended for further analysis]

16) Impose a pollution tax on stinking fuels - tax polluting fuels at a higher rate than clean fuels. like kerosene or firewood. Require firewood to be purchased from a certified wood dealer to ensure that it is properly seasoned.

[Concept retained for further analysis]

29) Clearly label all ozone damaging products. Consider requiring recycling or banning CFC products and processes.

[Concept retained for further analysis]

*31 Control fugitive dust from roads, industrial commercial and agricultural activities.

[Some merit - not recommended for further analysis]

*32 Control emissions from or phase out slash , land clearing, and agricultural burning. Provide economic incentives for beneficial uses of ag and forest by-products.

[Concept retained for further analysis]

*33 Improve regulation of environmental noise.

[Some merit - not recommended for further analysis]

*34 Improve ability to monitor toxics

[Some merit - not recommended for further analysis]

IV. Institutional Changes to Improve Air Resource Management

11) Create an air quality planning branch within Ecology responsible for protecting future air quality, including updating regulations, monitoring SIP provisions, and providing institutional continuity to long-range plans.

[Some merit - not recommended for further analysis]

13) [move to point and area source section]

Improve Ecology's capacity to monitor ambient air toxics levels for highest priority toxic air pollutants in terms of health and ecological risk.

[Merits further consideration with one or more retained idea]

18) [move to area source section]

Require positive net air quality impacts from all state and local decisions regarding development or expansion of any infrastructure (transportation project, sewage treatment plant, etc.). [also under I.E. above]

[Concept retained for further analysis]

19) [move to point and area source section]

Significantly increase penalty authority to increase deterrence and send message the state is serious about controlling air pollution. Improve implementation of regulations in Eastern Washington.

[Concept retained for further analysis]

- 30) [move to vehicle section]
Significantly increase the gas tax and use the proceeds to improve air quality.

[Merits further consideration with one or more retained idea]

- 31) [move to vehicle section]
Establish a transportation control task force composed of DOT, DOE, and WEO to develop and implement (or recommend to appropriate authorities) transportation control measures.

[Merits further consideration with one or more retained idea]

- *35 [move to point source section]
Develop and implement an operating permit program [also listed under III above].

[Concept retained for further analysis]

- +36 [move to point source section]
Enact air toxics control legislation.

[Concept retained for further analysis]

- +37 Adopt standards to protect visibility.

[Concept retained for further analysis]

- +38 Develop procedures/programs to evaluate the non-air impacts of air pollution emissions (example, consider deposition impacts during new source review).

[Merits further consideration with one or more retained idea]

V. Other Ideas Screened Out

22), 23), 24) all having to do with indoor air

Steering committee advises that we should acknowledge the indoor air issue and risks in the action plan, and to pass the ideas along to the Governor's Indoor Air Task Force.

VI. Ideas Moved to Other Subteams

27) To Global Warming team

28) To Global Warming and Conservation teams

*39 Publish a yearly environmental atlas (to Education team)

WASHINGTON ENVIRONMENT 2010

Stewardship of the Air Resource
Draft Action Ideas Retained for Further Analysis
by
ASAC SubTeam on the Air Resource

Ideas to reduce pollution from motor vehicles and related sources

A. Reduce Vehicle Miles Traveled

1. Encourage high capacity transit system development.
2. Develop regulations/ordinances to require employer-based trip reduction (public and private employers).
3. Create disincentives to single occupancy vehicle mode of transportation (e.g. raise parking rates).
4. Require positive net air quality benefits on land use decisions.

B. Improve Traffic Flow

1. Require reductions in vehicle idling from such things as taxis, drive through windows, and cruising.

C. Reduce Vehicle Fuel Emissions

1. Control gasoline vapor emissions from gasoline marketing.
2. Encourage the use of vehicles operated on alternative fuels (e.g. methanol, ethanol, electricity, etc.) and oxygenated fuels.

D. Improve Vehicle Performance

1. Expand and strengthen vehicle inspection and maintenance program. Include tampering.
2. Encourage/require government to purchase high milage, low polluting vehicles.

II. Ideas to reduce air pollution threat from point sources

1. Require best available controls to limit emissions of all pollutants (including toxics) through implementation of an operating permit program.
2. Create a data collection and management system which citizen groups can access for community watch dog purposes. Use in modeling to identify high risk point sources.
3. Regulate fugitive emissions from point sources.
4. Increase penalty authority.

III. Ideas to reduce air pollution threat from area sources

1. Phase out slash, agricultural, yard debris and land clearing burning. Provide incentives for beneficial use of by-products.
2. Discourage home combustion of wood products. Allow only clean burning home heating devices to be installed in newly constructed dwellings.
3. Impose a pollution tax on fuel sales. Tax fuels based on how much they pollute.
4. Reduce emissions of CFCs (ban products, require recycling, ban processes).
5. Adopt standards to protect visibility.

Summary:

Ideas from symposium and workshops	53
Ideas added by sub team	33
Ideas from other sources	4
 Total ideas considered	 90
 Ideas retained for further analysis as of 2/8/90	 18

3/12/90 note: By combining with others having a common theme, the final count of ideas retained for further analysis was 15.

APPENDIX B

EXCERPTS FROM ENVIRONMENT 2010
RESOURCE CHARACTERIZATION REPORT

RISKS FROM AMBIENT AIR POLLUTION IN WASHINGTON

Threat: AMBIENT AIR POLLUTION

Human Health Risk

Cancer MEI probability (risk of contracting)	10^{-3} to 10^{-2}	Chromium, Whatcom Co B(a)P, Pierce Co Trichloroethylene, King Co Dioxin, Stevens Co
Excess cancers (number of cancers)	2 - 150	
Non-cancer effects (# people at risk)	4+ million 3+ million 175,000	severity 1-3 (O3) severity 4-5 (O3) severity 6-7 (CO, PM10)

Significant Ecological Risks

Animals	Fluoride at current levels may have minor impacts on some animal species; air pollution may be significant polluter of Puget Sound microlayer
Plants	Ozone in concentrations which have been monitored in the Cascades is likely damaging some tree species
Other	Visibility degradation

Economic Damages

<reserved>

Cancer Risk Probability to MEI

POLLUTANT PROBABILTY	AAL (ug/m3)	MODELED CONCENTRATION	AREA	MEI CANCER
Acetaldehyde	4.5×10^{-1}	1.43	Pierce Co.	3.2×10^{-6}
Arsenic	2.3×10^{-4}	0.031	Benton Co.	1.3×10^{-4}
Asbestos	$4.4 \times 10^{-6*}$	0.003	Urban areas	6.8×10^{-4}
Benzene	1.2×10^{-1}			
Benzo(a)Pyrene	6.0×10^{-4}	4.9	Pierce Co.	8.2×10^{-3}
Beryllium	4.2×10^{-4}	6.4×10^{-3}	Lewis Co.	1.5×10^{-5}
Cadmium	5.6×10^{-4}	3.8×10^{-3}	Lewis Co.	6.9×10^{-7}
Carbon Tetr	6.7×10^{-2}			
Chloroform	4.3×10^{-2}	2250	Clark Co.	5.8×10^{-3}
Chromium	$8.3 \times 10^{-5**}$	0.548	Whatcom Co.	6.7×10^{-3}
Dichl'methane	2.1	912	King Co.	4.3×10^{-4}
Dioxin	3.0×10^{-8}	6.0×10^{-5}	Stevens Co.	2.0×10^{-3}
Ethylene Dich	3.8×10^{-2}	25.4	King Co.	6.7×10^{-4}
Ethylene Dibro	4.5×10^{-3}			
Formaldehyde	7.7×10^{-2}	3.27	Pierce Co.	4.3×10^{-5}
Nickel	4.2×10^{-3}			
Perchloroeth.	1.7			
Trichloroeth.	5.9×10^{-1}	1079	King	1.8×10^{-3}

Non-Cancer Chronic Risks from Toxic Air Pollutants

POLLUTANT	ACCEPTABLE LIMIT (AAL)	24 HOUR (ug/m3)	HAZARD INDEX	COUNTY	POPULATION	RANK		
Manganese	3.1E+01	5.5E+01	1.77	CLALLAM	29000	4		
		2.1E+01	0.69	CLARK	195800	4		
		3.5E+01	1.13	COWLITZ	80500	4		
		2.8E+01	0.89	GRAYS HARBOR	66800	4		
		3.9E+01	1.26	JEFFERSON	16600	4		
		3.7E+01	1.21	KING	1309800	4		
		2.3E+01	0.74	LEWIS	56700	4		
		2.4E+01	0.78	PACIFIC	17800	4		
		4.4E+01	1.43	PIERCE	501300	4		
		1.6E+01	0.51	SKAGIT	64900	4		
		1.7E+01	0.56	SKAMANIA	8100	4		
		2.0E+01	0.63	SNOHOMISH	353400	4		
		2.0E+01	0.65	SPOKANE	347600	4		
		1.6E+01	0.51	THURSTON	129100	4		
		Mercury	6.0E-02	4.3E-02	0.72	LEWIS	56700	4
2.6E+01	0.51			CLALLAM	29000	4		
Phenols	5.2E+01	3.6E+01	0.69	CLARK	195800	4		
		8.6E+01	1.66	COWLITZ	80500	4		
		2.8E+01	0.54	GRAYS HARBOR	66800	4		
		5.4E+01	1.04	KING	1309800	4		
		6.8E+01	1.31	PIERCE	501300	4		
		4.9E+01	0.95	SNOHOMISH	353400	4		
		3.8E+01	0.73	SPOKANE	347600	4		
		4.6E+01	0.88	STEVENS	29500	4		
		Toluene	5.1E+01	5.1E+01	0.99	CLALLAM	29000	4
				9.1E+01	1.77	CLARK	195800	3
5.1E+01	1.00			COWLITZ	80500	3		
3.4E+01	0.66			GRAYS HARBOR	66800	3		
3.3E+01	0.65			ISLAND	45200	3		
3.4E+01	0.67			JEFFERSON	16600	3		
2.9E+02	5.59			KING	1309800	3		
8.0E+01	1.57			KITSAP	156800	3		
3.1E+01	0.62			LEWIS	56700	3		
2.6E+01	0.52			PACIFIC	17800	3		
3.9E+01	0.76			PIERCE	501300	3		
2.8E+01	0.56			SKAGIT	64900	3		
8.4E+01	1.66			SNOHOMISH	353400	3		
8.0E+01	1.56			SPOKANE	347600	3		
6.1E+01	1.20			THURSTON	129100	3		
Xylene	5.9E+01	3.0E+01	0.59	WHATCOM	109900	3		
		3.1E+01	0.60	YAKIMA	175000	3		
		8.8E+01	1.49	KING	1309800	4		
		3.4E+01	0.58	PIERCE	501300	4		

Summary of Risks from Criteria Pollutants

POLLUTANT	# PEOPLE AT RISK*	SEVERITY	EFFECTS
Ozone	3,174,500	4	Asthma, chronic bronchitis
	4,420,000	3	Headaches from short term exposures
PM10	104	7	Mortality
	348,000	3	Respiratory distress from 24 hour NAAQS exceedance
CO	174,900	6	Aggravated angina
	1,574,000	3	Headaches and dizziness from short duration exposure to hi values
LEAD	8,000	6	Perceptual and learning deficits in children
	3,300	4	Hyperactivity, focus and other visual deficits
SO2	2,682	4	Increased respiratory infections
	26,815	4	Asthma

* does not include frequency of exposure to levels at which health impacts are assumed to occur (a measure of the probability of exposure to unhealthful levels)

Lifetime Excess Cancers

POLLUTANT	70 YEAR EXCESS CANCERS	ANNUAL EXCESS CANCERS
Acetaldehyde	1.17	negl
Arsenic	2.75	negl
Benzene	221.3	3.2
Beryllium	1.03	negl
Cadmium	0.20	negl
Chloroform	8.36	0.12
Chromium	26.50	0.38
Dichloromethane/MeCl	0.17	negl
Dioxins 2,3,7,8 TCDD	827.10	11.8
Ethylene Dichloride	0.19	negl
Formaldehyde	14.40	0.21
POMs (Benzo(a)pyrene)	16.40	.23
Trichloroethylene	0.72	negl
TOTAL*...	1100	16

* estimates are plus or minus an order of magnitude

B. AIR QUALITY IN THE YEAR 2010

In this section, we will project the status of the air resource in the year 2010 using the Puget Sound AQCR as our example, a region in which over half the state's population resides, in which a majority of the air pollutants are emitted and an area that has been extensively monitored over the years. In addition to the significance of the Puget Sound Region in terms of population and industrial activity, our most accurate emission estimates are generally from this area, where a number of emission samples have been taken (typically a far more accurate emission estimation method than the ordinary factoring approach). Each air quality control region differs to some extent - emission sources vary, populations are projected to change at different rates, etc. Projected air quality for each of the six regions was derived from data in Appendix F and G, and are summarized below.

The basic formula used to project 2010 air quality levels is as follows:

$$2010 \text{ Estimate} = C * (1 + F * P) \quad (1)$$

where:

C = Current monitored value ("25th" value)

F = Fraction of total emissions manmade (not natural)

P = Projected fractional increase in emissions, as determined in equation (2) below.

and:

$$P = \text{Pop} * (1 + Ft) \quad (2)$$

where:

Pop = fractional increase in regional population

Ft = fraction of total emissions from transportation related sources.

Note that Appendix G lists, by source type (transportation or non transportation related), emission sources within each region. From this compilation, Ft, the transportation related fraction, can be determined.

As noted above, this equation was adjusted in our analysis to account for current trends. To do this, we estimated the slope of the current trendline (the rate of decline or increase) and "overlaid" the estimated growth-related estimates. For example, if the current trend of a given pollutant were declining at the rate of 1 ppm every 4 years, and our growth related increase were 1.5 ppm every 4 years, the net projected increase would be 0.5 ppm every 4 years, or 2.75 ppm between 1988 and the year 2010.

1. Carbon Monoxide.

Referring to Appendix E, the Puget Sound AQCR average CO concentrations as represented by the 25th highest values have generally declined since 1979, but have shown a tendency in the last three years to level out and begin to increase. Currently, concentrations are neither trending up nor down.

The following values are used in equations (1) and (2) to estimate Puget Sound AQCR concentrations in the year 2010:

C = 9.0 ppm
F = 0.90
Pop = 0.35
Ft = 0.62
P = 0.57

2010 Estimate = $9.3 * (1 + 0.90 * 0.57) = 13.7$ ppm
= 51% increase over current levels

2. Ozone.

Referring to Appendix E, the Puget Sound AQCR average O3 concentrations as represented by the 25th highest values have generally increased since 1981 following a period of decline. Over the past four years, values have been within 0.01 of 0.07 ppm, showing no apparent tendency to increase or decrease. We will assume the current trend is flat.

The following values are used in equations (1) and (2) to estimate Puget Sound AQCR concentrations in the year 2010:

C = 0.07 ppm
F = 0.50
Pop = 0.35
Ft = 0.70
P = 0.60

2010 Estimate = $0.07 * (1 + 0.50 * 0.60) = 0.09$ ppm
= 30% increase over current levels

3. Sulfur Dioxide.

Referring to Appendix E, the Puget Sound AQCR average SO2 concentrations as represented by the 25th highest values have consistently declined over the past ten years. The rate of decline over the past four years has been 0.0005 ppm each year. Projecting this decline to the year 2010, we would estimate a 0.01 ppm decrease in current levels without accounting for population impacts.

The following values are used in equations (1) and (2) to estimate Puget Sound AQCR concentrations in the year 2010:

C = 0.022 ppm
F = 1.00
Pop = 0.35
Ft = 0.09
P = 0.38

2010 Estimate = $0.022 * (1 + 1.00 * 0.38) = 0.03$ ppm
2010 Estimate (adjusted) = $0.03 - 0.01 = 0.02$ ppm
= no change over current level

Note that this adjusted estimate which takes into account the current tendency for monitored values to decline may be optimistic since much of the decline in monitored values, and therefore the basis for the negative trend, can be attributed to the closure in the early 1980's of the Asarco smelter in Tacoma.

4. Particulate Matter.

Referring to Appendix E, the Puget Sound AQCR average Particulate Matter (TSP) concentrations as represented by the 25th highest values have shown a tendency to increase slightly in the last ten years. Over the past four years, values have not differed by more than a few percent, showing no apparent tendency to increase or decrease. We will assume the current trend is flat.

The following values are used in equations (1) and (2) to estimate Puget Sound AQCR concentrations in the year 2010:

C = 181 ug/m³
F = 0.90 assumed
Pop = 0.35
Ft = 0.72
P = 0.60

2010 Estimate = $180 * (1 + 0.90 * 0.60) = 282$ ug/m³
= 54% increase over current levels

5. Toxics.

Lacking both trend information and monitored data, we will "assign" each of the targeted toxic air pollutants to one of the criteria pollutants above based on the rationale given in the beginning of this section. Again, the only purpose in doing this is to overcome a lack of data, not to suggest that we can predict what ambient concentrations of toxic pollutants might be found in the year 2010. Further analysis of this issue would be appropriate once an adequate database has been established.

Surrogate: Carbon Monoxide
Principle Source(s): Vehicle tailpipe emissions
Estimated increase, 1988-2010: 51%
Toxics in this category include: Toluene
Benzene
Xylene
Formaldehyde

Surrogate: Ozone
Principle Source(s): Natural biological action
(precursors) Vehicle refueling
Estimated increase, 1988-2010: 30%
Toxics in this category include: Dichloromethane
Ethylene dichloride
Ethylene dibromide
Perchloroethylene
Trichloroethylene

Surrogate: Sulfur Dioxide
Principle Source(s): Electric utilities
Boilers
Estimated Increase, 1988-2010: no change
Toxics in this category include: Arsenic
Beryllium
cadmium
Chloroform
Chromium
Fluoride
Mercury
Nickel
POM's

Surrogate: Particulate Matter
Principle Source(s): Motor vehicles
Woodstoves
Estimated Increase, 1988-2010: 54%
Toxics in this category include: Acetaldehyde
Dioxins
Phenols
Formaldehyde

It would be far too speculative to use these projected increases in emission rates to estimate the increase in risk associated with the toxic pollutants. However, it should be noted that, with few exceptions, these toxics are currently not regulated, nor are emissions of these substances measured or concentrations sampled in the ambient air.

C. Summary of Projected Air Quality in the Year 2010

Generally, outside of the Puget Sound AQCR, monitoring data is very limited. Thus it is difficult, at best, to determine historical trends. In order to estimate increases in air pollution concentrations over current values, we will use the simplifying assumption that current trends are flat. Using data from Appendix F and G, estimated increases in ambient air pollution levels for each air quality control region are as follow:

	Percent Increase Relative to 1988 Levels			
	CO	O3	SO2	PM
Puget Sound	51%	30%	n/c	54%
Olympic - Northwest	44%	21%	31%	37%
Southwest	32%	15%	22%	27%
Northern	18%		16%	
South Central	33%	19%	28%	17%
Eastern	13%	8%	27%	8%

Figures 30 - 33 graphically show our projections of future air quality, based on 25th values, in the Puget Sound Region.

figure 30

Our conclusions regarding what we see from these plots are as follows:

- CO The average CO concentrations as represented by the 25th highest values have generally declined since 1979, but have shown a tendency in the last three years to level out and begin to increase. Being primarily all dr cost of rights of way in the future. Acceleration of the programs may provide some savings.
- Based on information from the Puget Sound area transit study, and assuming the costs of constructing a transit system are incurred 10 years early (2000 rather than 2010), the approximate cost of accelerating transit system development state wide is estimated to be 4.2 billion in todays dollars. This includes 10 years of gone real interest on capital and additional operation and maintenance. However, it doerevenues will increase, the return on the currently authorized 18 cents per gallon will be reduced. In order to maintain the current transportation system 7 cents per gallon (beyond the current 18 cents per gallon) of the increase drevenue will have to be assigned to the Highway Department in order to maintain their revenue base. Significant shifts of demand across the borders of Idaho and Oregon should be expected of these states do not increase their tax rates also. It should be noted that the increasedndards will continue to do so. Interestingly, once violations are recorded, the Department of Ecology, EPA and local authorities would probably respond in earnest to the

problem, but such response is often too little too late. It is not uncommon to find that effective control programs are not implemented until three or four years after air pollution standards are exceeded. Some delays are unavoidable, others institutional - in any case, the process can be expected to be slow. Some key steps in the process include:

- Submit air monitoring data to EPA, after QA by state
- Data analysis (monitoring/modeling/emissions inventory)
- Attainment demonstration
- Compliance schedules
- Implementation

This example serves to illustrate a point. Often there is a substantial, yet legitimate lag between when an air quality problem is "officially" discovered and actual air quality control strategies are implemented. Without taking steps to avoid nonattainment, it is our judgement that given a 30 percent growth rate, nonattainment of one or more pollutant will be inevitable in urbanized areas that are not currently so designated.

Our conclusion is that, given the no additional control scenario, the outlook for the air resource is bleak. Two fundamental changes relative to current practice will be needed to stave off significant problems between now and the year 2010:

- The public needs to understand there role in cleaning up the air - that they are a major part of the problem and that the solution will depend on their changing lifelong habits, the most important of which being the single passenger car mode of transportation.
- Air pollution control must shift from being reactive to preventive - a "prevention, not just attainment" philosophy.



APPENDIX C

ANALYSIS OF COSTS AND INCENTIVES TO IMPLEMENT
PROGRAMS DESIGNED TO REDUCE VEHICLE RELATED AIR POLLUTION

1. Alternative Fuels - Costs and Incentives

The cross price elasticity gas prices versus gasohol, gasoline with MTBE, etc., is extremely high. Unless there is a negative impression of a specific fuel consumers can be expected to buy either gasohol or gasoline based on whichever is cheaper. In Los Angeles, ARCO put its "EC1 clean air" gasoline on the market as a substitute for leaded and unleaded fuels. It has MTBE and lower pollutant emissions. ARCO has no problem with selling the fuel with a zero price differential.

Credits from the federal level of 6 cents per gallon for fuel containing 10% alcohol work out to have a value to the seller of 60 cents per gallon of alcohol. Until 1986, Colorado had a 20% penetration rate for the 10% ethanol fuel with a 5 cent tax credit. Their current program, mandating a 2% oxygen content, has added about 1.5 cents per gallon to fuel prices state wide. If Washington mandated a similar program the costs would be approximately 35 million dollars for a statewide full year program.

In order for the oxygenated additives to compete with octane enhancers such as xylene and toluene a tax credit of similar design would have to offset both the price difference and the difference in the blending costs. Lower RVP fuel has to be used for the gasohol blend. Lower quality fuel can be used with MTBE (or theoretically with ETBE) additive but the MTBE is a little more expensive. a 1.5 to 5 cent increase in the tax on gasoline with non-oxygenated additives would create the proper incentive. If this proposal is combined with a proposal to increase the tax on gasoline by 32 cents, that proposal could be designed to provide a tax credit for the oxygenated fuels. The credit of 1.5 cents (if combined with the 32 cent tax) would cost the state 32 million in foregone revenues.

2. Costs and Incentives of a Parking Tax

The largest share of traffic congestion is from employment related travel from 6 to 9 am and from 3 to 6 pm. This traffic produces the rush hours and significant idling of engines. Given a target of 20% reduction in the number of single occupancy vehicles used for the employment commute a parking space tax rate of about \$1 to \$2 per day for week days would create the proper incentives.^{1,2} Given a target of reducing SOV's to 50% of the employment commute a tax rate of \$2.80 to \$5.00 would create the needed incentive.³

¹Based on the 1989 employment forecast in table 1.2 State of Washington Economic and Revenue Forecast.

²The current level is 90 percent in areas with low parking costs. An additional 20 percent reduction would bring the level in these areas to 70. Given the expected increase in population (600,000 in the Puget Sound area) this reduction would just maintain the current levels of congestion on highways and streets and auto idling would not increase.

³This is extrapolated from only 2 data points in the Multicorridor Study and 2 data points in a PSOG study. Given that the two data sets produce rates that differ by a factor of 2 it is clear that additional work needs to be done to refine this estimate before a final proposal is made. The remainder of the estimates are based on the figure of \$1.50 per week day per slot. This will make

Malls, groceries, and places with large sales of bulky items will object if it affects consumer parking. Retail parking slots could be exempted temporarily or until 2010 or some arbitrary but effective mechanism could be found to identify them (eg, mandatory towing after 4 hours, mandatory fine of an extra \$5 after 4 hours). It would however create a significant enforcement problem if the retail slots are exempted.

Using the average figure of \$1.50 this comes to \$391 per parking slot per year. The figure in any proposed legislation should be indexed to allow for inflation, otherwise the incentive will have little impact after 10 years. Assuming the reduction would eventually have an impact on the number of slots available the revenue base would begin at about 2.2 million slots⁴ and fall to about 1.5 million slots. The revenue generated would be approximately 586 to 860 million. Assuming the elimination of slots brings the number of employment related slots down to 1.5 million the approximate value of the consumer and producer surplus loss is 724 million dollars.

This revenue base could be used by municipalities, counties, and transit authorities. If the tax is used at the local level it could be collected using the property tax system. Legislation allowing them to charge up to \$1.50 per week day per slot could be used to fund transit and other auto related work (e.g., storm water, air pollution programs). Ability to use the tax base could be contingent on making transit and car pool lanes available on a twenty minute wait basis for the high traffic hours for the area covered by the tax.

Alternatively, it is a large revenue base and could be used to offset part of the sales tax base. It is not a regressive tax. It could provide state funding to pay for transit systems. It could be added to the tax forms by the Department of Revenue on a self reporting basis if it is a state wide revenue base.

In some areas the entire cost of this burden will be borne by the current owners of parking lots. If parking is already seriously constrained and parking is provided at whatever price the market will bear then the current owners will not be able to raise their prices. Returns may be high enough that no slots will be eliminated. For most of the state substantial numbers of slots will be eliminated and the burden will be shared by parking lot owners and consumers.

Given a consumer willingness to pay for additional gas, auto maintenance, and replacement costs it appears that the value of driving a SOV is high. For short commutes of 10 miles (round trip) the cost already incurred is small by comparison with the cost of the parking fee. These commuters are more likely to respond to the change in price.⁵

parking slightly more expensive than bus passes and fares. Staff have chosen to use local data rather than Danacian or Los Angeles data.

⁴Staff assume this is a low estimate of the number of slots. Not all slots are employment related.

⁵There is significant support for the idea that commuters consider gas and parking costs in deciding whether to commute. Charges equalling 70 percent of the local commercial rates caused a shift of 20 percent of the Canadian

Long distance SOV commuters may be less willing to switch to transit. For long distance commuters the relative cost of the parking tax will be low by comparison to other costs already incurred in the trip. However the potential auto related savings of using transit will be higher. If the bus or carpool transit on HOV lanes will produce a significant time savings these long distance commuters may be more willing to change. Thus the impact on commute idling will depend on the relative willingness to shift to transit of the longer distance commuter.

Portland's statutory limit on parking slots is another approach used to limit SOV's but it also provides a massive one time gain to all current owners of parking space. There is no reason that the gain should not accrue to the public instead. This is what would happen with the tax.

Questions arise on definitions. These should be answered by further research. The major one is whether or not it is possible to exempt retail slots. Beyond this several questions are:

- Are motor cycle slots taxed at the full rate?
- How many slots does a gravel parking lot have?
- What classification do vacant lots have if people park in them to go to neighboring businesses? If it is owned by an entity other than the owners of the businesses that benefit, that does not intend to use it as a parking lot, do you tax it? If they post a no parking sign but clearly don't enforce it, is it still a tax base parking area?
- Are park and ride slots exempt?

3. Cost of Bus and Other Transit Options.

The approximate capital cost state wide of phasing in transit systems equivalent to the Seattle SMSA multi-corridor proposals is 8 billion dollars. Most of this expenditure will occur at some point due to increasing congestion problems. Once established, the operations and maintenance costs will be approximately 436 million dollars per year. Assuming that the actions proposed for 2010 accelerated the establishment of the transit systems by 10 years, the approximate cost of phasing in transit, statewide, is estimated to have a present value of 5.2 billion dollars. The undiscounted value of foregone interest and O&M is 6.7 billion dollars. These figures include the cost of the Seattle SMSA multicorridor proposals.⁶

It is important to keep in mind these expenditures will probably take place because of problems related to transportation whether or not air quality is a concern. The cost of providing service to low density areas may be an

Government SOV drivers. Taxation of gasoline or parking will in this case be a good way to get commuters to internalize the air pollution externalities they create. "Parking Subsidization and Travel Mode Choice," by Jessee A. Simon and Joel Woodhull, Office of Policy Analysis, Southern California Rapid Transit District, August 1987.

⁶Multicorridor study.

underestimate. On the other hand, rapidly increasing property values will increase the cost of rights of way in the future. Acceleration of the programs may provide some savings.

Based on information from the Puget Sound area transit study, and assuming the costs of constructing a transit system are incurred 10 years early (2000 rather than 2010), the approximate cost of accelerating transit system development state wide is estimated to be 4.2 billion in today's dollars. This includes 10 years of forgone real interest on capital and additional operation and maintenance. However, it does not include the cost savings associated with purchase of right-of-way sooner rather than later, and these costs are likely to escalate at a rate faster than the rate of inflation.

4. Taxing Gasoline as a Disincentive to Gasoline Use

A 32 cent per gallon tax could be expected to bring a long run drop in the per capita demand for gasoline that would just offset the growth in demand from a population increase. The tax increase should be phased in slowly. If added on at the rate of 1.6 cents per year the increase would take a little over 20 years to implement. Some of this reduction in fuel consumption will result in purchases of more efficient vehicles and some of the reduction will come from reduced vehicle miles traveled. More efficient vehicles had reduced vehicle miles will tend to have beneficial effects on air quality, congestion, and transit sue. The significant increase in the rate will allow incentive reduction in the rates for less polluting fuels. (eg, gasohol) without producing an overall drop in revenue to the Highway Department. (NOTE: See revised estimates from W.S.D.O.T.> indicating a need for 61 cent per gallon increase.)

Given a proposal of an increase the motor vehicle fuel tax of 32 cents per gallon several major shifts will take place. The following analysis is based on an assumption of a -.98 long run price elasticity for gasoline consumption and 1986 revenue figures and a 32% increase in population. Taxation of gasoline and its substitutes could raise an additional \$450,000,000 per year. Consumer surplus losses would be approximately \$600 million annually.⁶

While revenues will increase, the return on the currently authorized 18 cents per gallon will be reduced. In order to maintain the current transportation system 7 cents per gallon (beyond the current 18 cents per gallon) of the increased revenue will have to be assigned to the Highway Department in order to maintain their revenue base. Significant shifts of demand across the borders of Idaho and Oregon should be expected if these states do not increase their tax rates also. It should be noted that the increased revenue base will be regressive. The state could offset this effect by using a substantial part of the \$450 million in increased revenue to reduce the sales tax. The state sales tax could be reduced about .5% (1/2 cent) if all of the revenue increase is applied to a reduction in sales tax rates. Alternatively this revenue could be used to provide air quality or transit related subsidies or services.

5. Costs to Implement an Offset Program Applied to Land Use Decisions

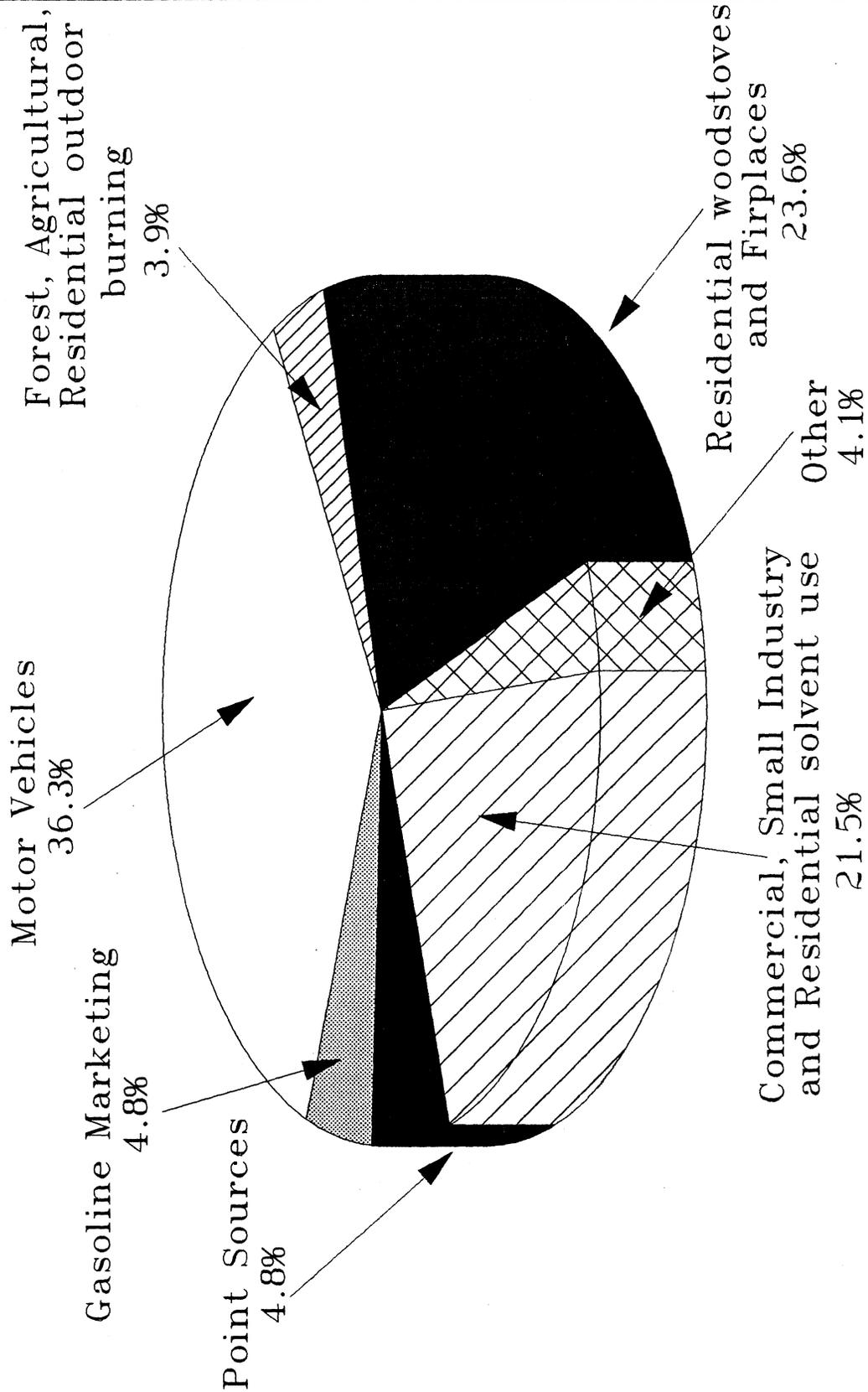
Costs associated with implementation of this proposal can be estimated. A new source CO emissions offset program would result in administrative costs to the jurisdiction and costs to developers. These cost estimates assume the program would be implemented in counties with in excess of 100 people per square mile (e.g. King, Pierce, Thurston, Clark, and Spokane).

Costs to the Public Sector. The state and each county affected would need to employ additional people to model carbon monoxide or other emission sources, monitor air quality, project emissions from new developments, and enforce compliance. Cost (overhead and wages) per employee is estimated at \$73,000 per year. For 12 employees, this would be a total of approximately \$1 million per year. This is a minimum estimate because three or more other counties are rapidly approaching the 100 person density limit.

Costs to the Private Sector. By extrapolating data from King County, 1420 proposed development projects per year can be estimated for the six counties. Of these projects, we estimate that about 10% (142) would require Air Quality Impact Statements, each costing \$20,000. Cost of statements per year would be \$2.8 million. As noted above, we have not attempted to estimate the actual implementation costs to the developers.

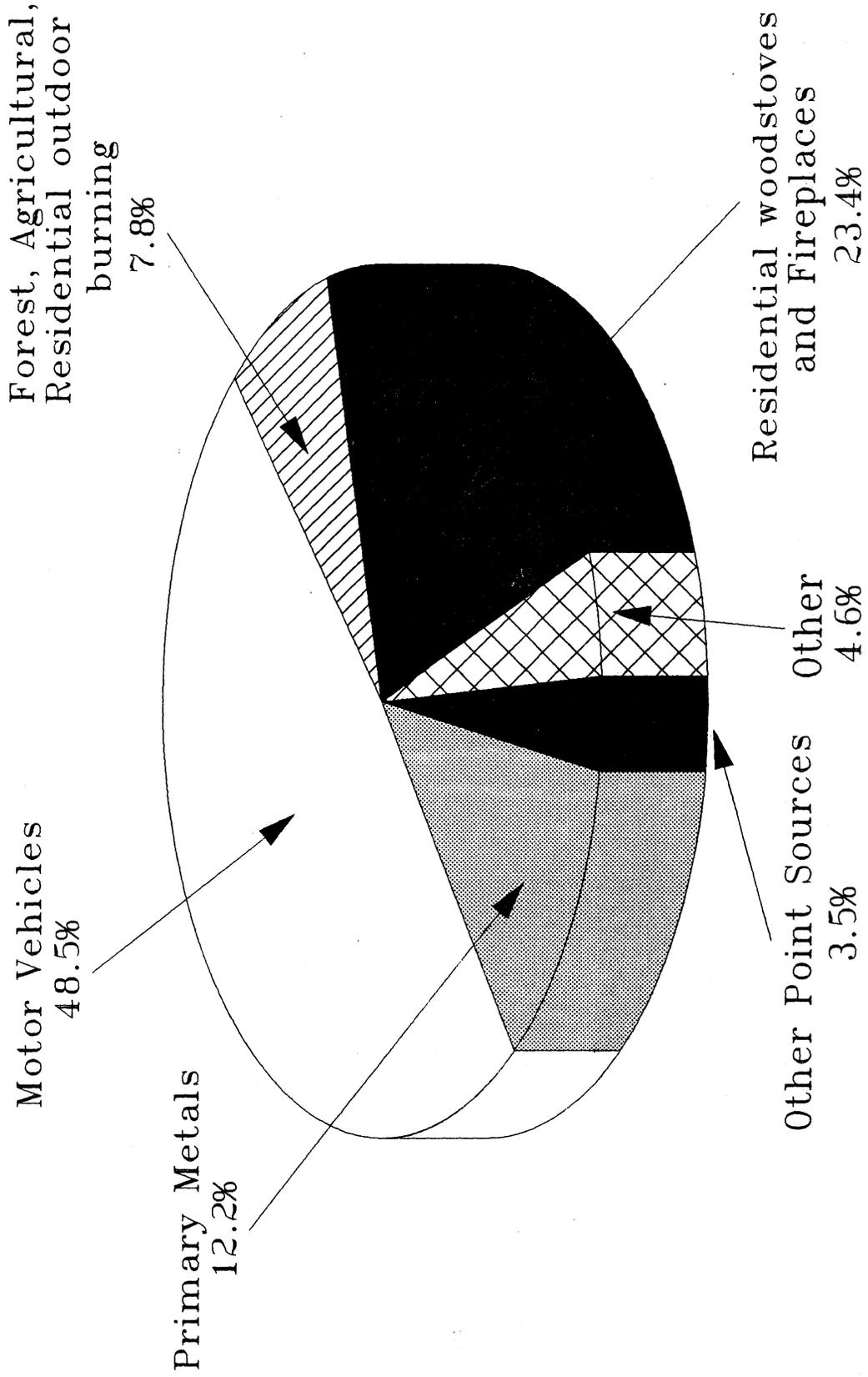


VOC Emission Statewide



1989 Annual Average Emissions.

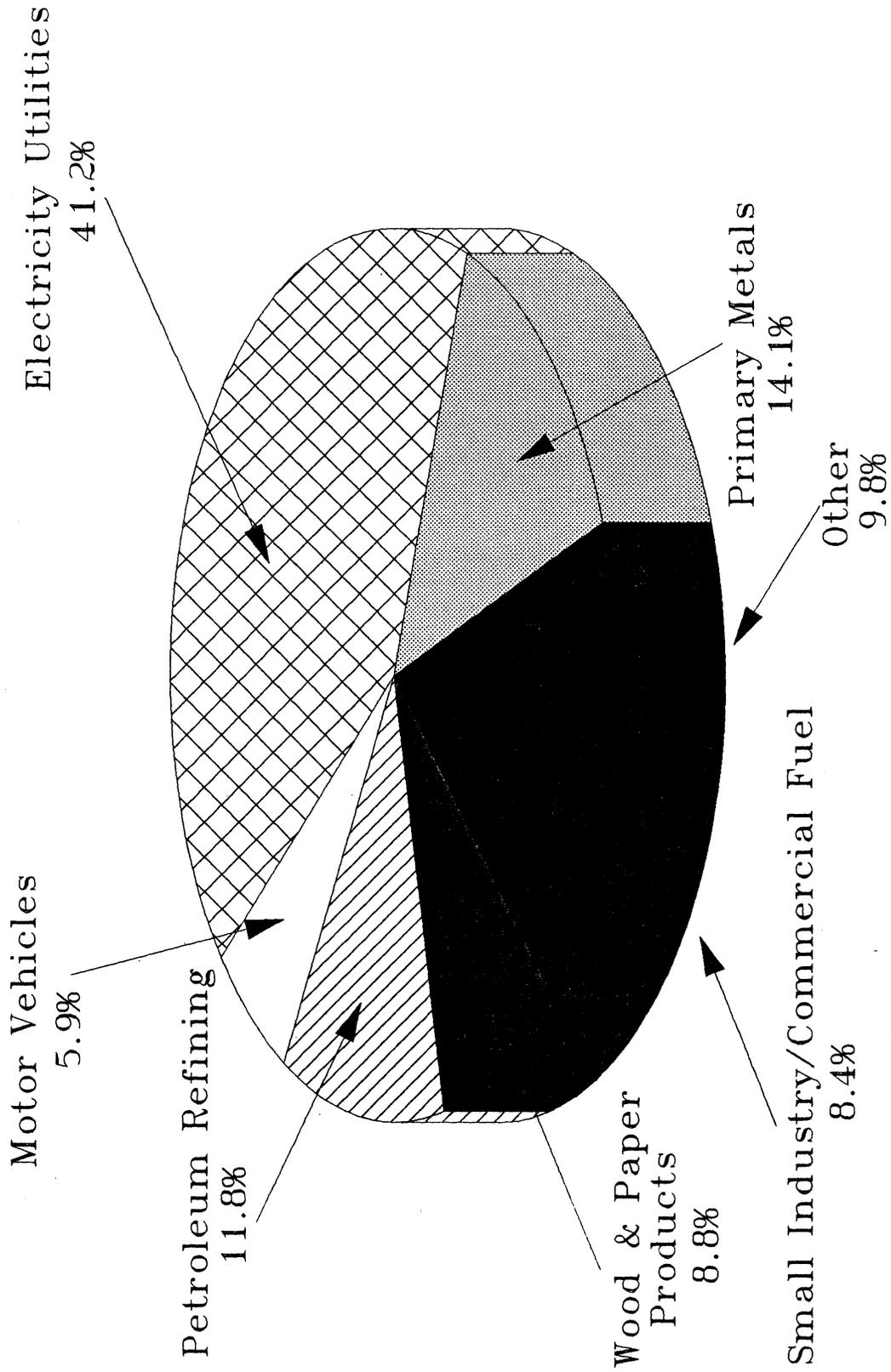
Carbon Monoxide Emission Statewide



1989 Annual Average Emissions

FIGURE 2

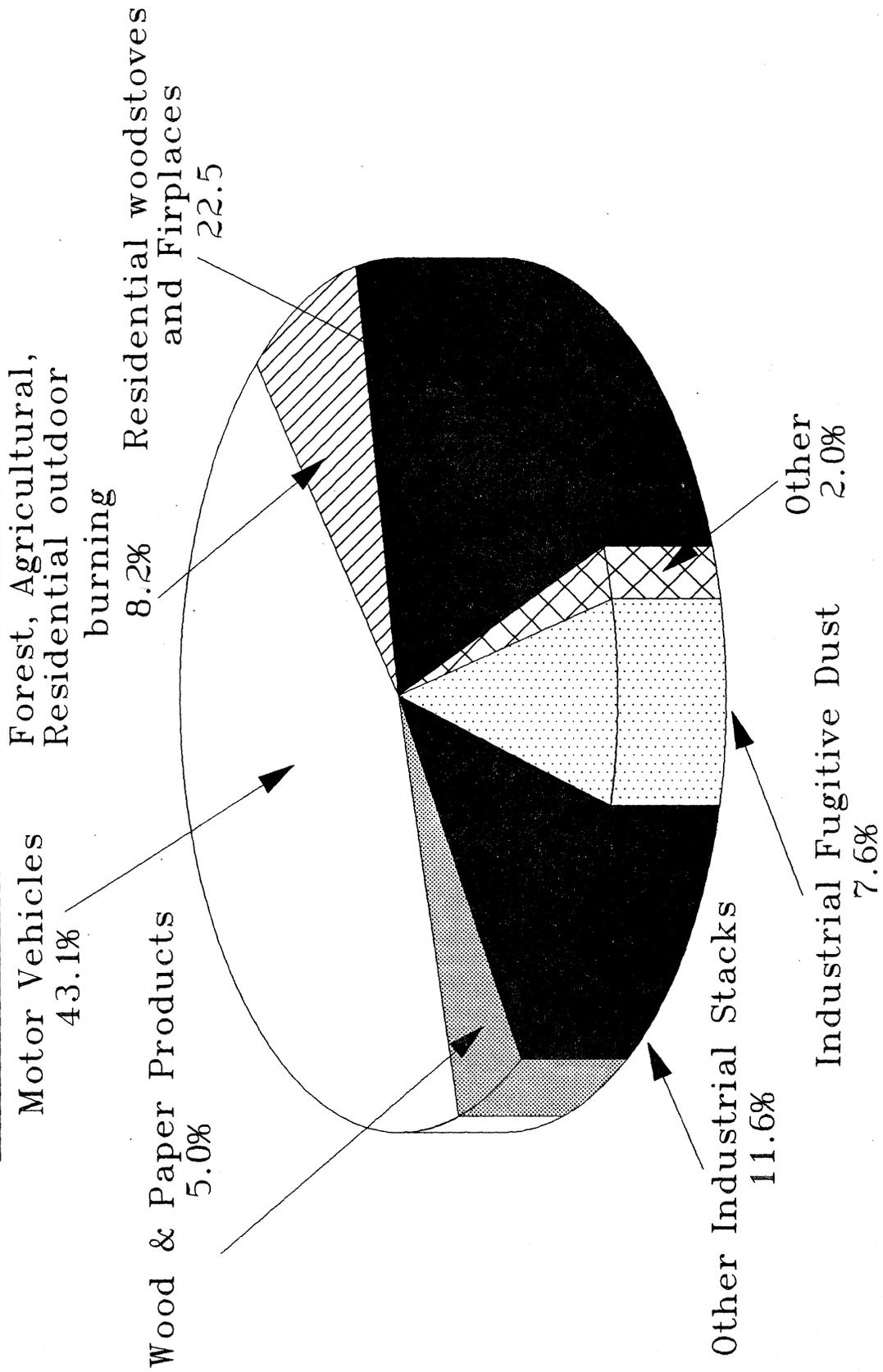
Sulfur Dioxide Emission Statewide



1989 Annual Average Emissions

FIGURE 3

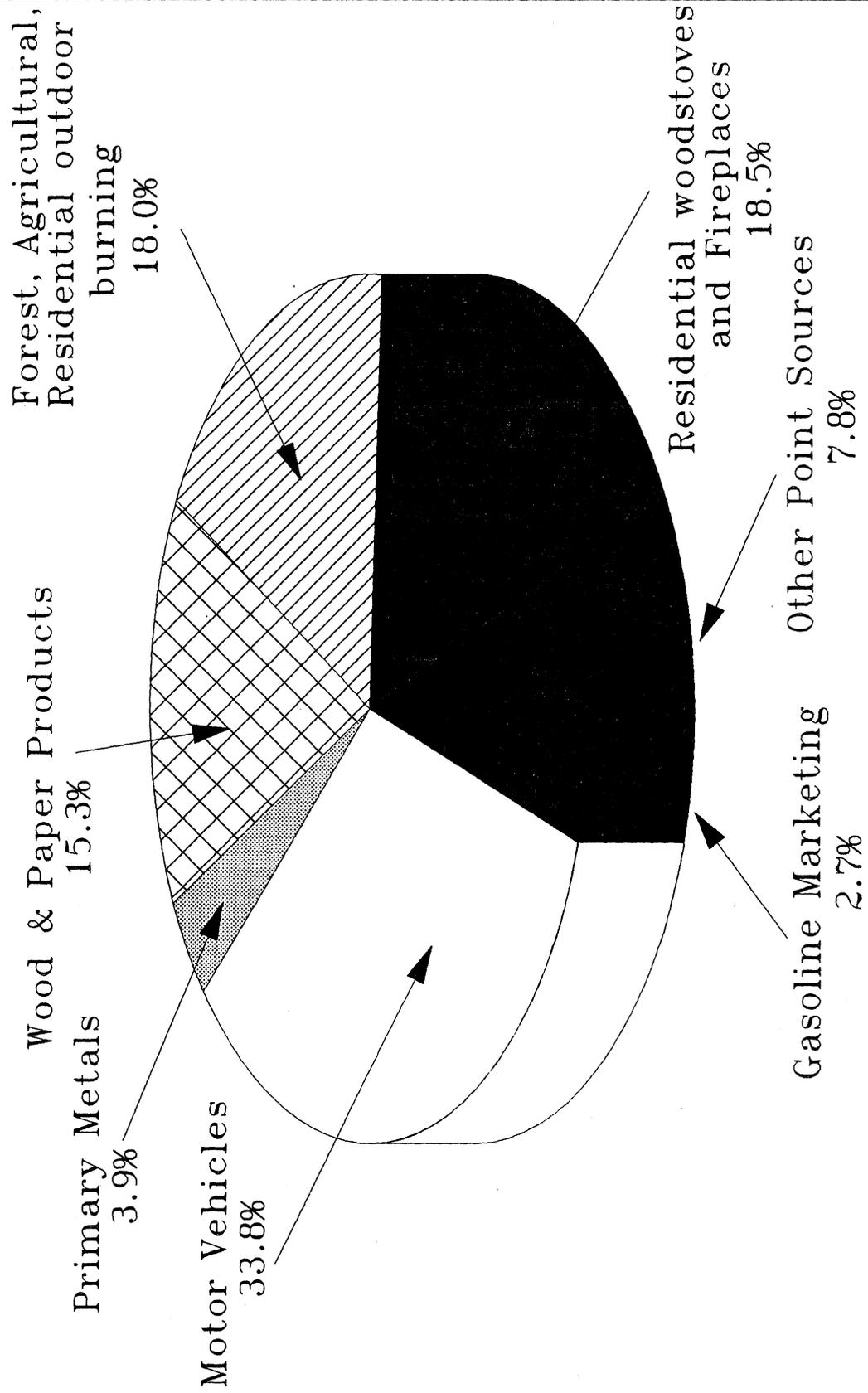
Particulate Emission Statewide



1989 Annual Average Emissions

FIGURE 4

Toxics Emission Statewide



1989 Annual Average Emissions

FIGURE 5

Environment
2010
Action
Agenda:

Action
Strategies
Background
Analyses

Package
Five:

**Water
Quality**



State of Washington
July, 1996

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INTRODUCTION

We have made great progress in reducing obvious sources of water pollution. Some of the state's major waterbodies are cleaner than they were 20 years ago, thanks to federal and state wastewater discharge permit programs. The challenge for the next two decades is to strengthen the current discharge permit program and to protect water resources from pollutants that are not so obvious. The permit program should be improved by bringing unpermitted dischargers into the permit fee system, and through the use of financial incentives and technological innovation. Better land use management practices on a local level are needed to reduce nonpoint pollution. Runoff from urban areas must be managed to improve water quality. It is necessary to develop strategies and find resources to reduce these types of pollutants so our surface and ground waters will be free of contamination by the year 2010. These proposals incorporate the 2010 vision by stressing the needs for an awareness of the vulnerability of water resources, and cooperation and responsibility between government agencies, businesses, and individual citizens. A better sense of stewardship will be developed when these goals are achieved.

The action package that follows lists proposals that have evolved from 2010 workshops and meetings to address water quality and water resource issues. The package incorporates 35 action ideas into 13 proposals. Action ideas are highlighted in bold type at the beginning of each proposal and a brief description follows. Then an assessment of each idea begins, following the standard outline for action packages. Risk reduction/resource enhancement potential, costs, technical factors, institutional constraints, political factors, and roles and responsibilities are included in the assessment. The proposals are grouped in the following categories:

1. **GROUND WATER** - 60% of our drinking water comes from ground water, yet we don't even have a monitoring program to know how much of it is contaminated. This proposal addresses the need for comprehensive legislation to control ground water contamination.
2. **WATER ALLOCATION** - Several action ideas involved water allocation. Implementation of the program is already beginning, and will occur separate from the 2010 process.
3. **DRINKING WATER CONTAMINATION** - Existing water systems need to be upgraded, and smaller water systems need to be merged with larger systems to ensure safe drinking water.
4. **NONPOINT SOURCE POLLUTION CONTROL** - Nonpoint pollution from agricultural, onsite sewage systems, and other sources is pervasive. Plans like best management practices exist to control these pollutants, but need resources to be effective. This section closes with a proposal for finance measures to help fund proposals.
5. **POINT SOURCE POLLUTION CONTROL** - We have been regulating point

sources through a permit system, but the system needs to be revised and fine-tuned. In addition, there are plans in place to regulate storm water discharges in the Puget Sound basin, but not enough resources to implement them, or develop plans for the rest of the state. This section closes with a look at incentives/disincentives to reduce pollutant discharge.

6. IMPLEMENTING WATER QUALITY PROGRAMS - A conclusion that summarizes gaps in the water quality program, and lists some issues not covered under the above categories.

COMPREHENSIVE GROUND WATER QUALITY LEGISLATION

I. INTRODUCTION

A. Description of Action Package

Develop a comprehensive ground water quality program which emphasizes pollution prevention, education, monitoring, and the protection of existing and potential beneficial uses.

Over 60% of Washington's residents rely on ground water for their drinking water. Ground water also contributes to recharge of streams, lakes, and wetlands, and thus is an important part of the scenic, recreational, and wildlife habitat resources of the state.

Ground water contamination has been documented in Washington from a number of point and nonpoint sources. Among these are landfills, industrial discharges, urban stormwater runoff, chemical spills, agricultural application of pesticides, and onsite septic systems.

Cleanup of ground water contamination is difficult and expensive. Yet, at present, ground water protection is poorly funded and inadequately coordinated. Activities and programs are scattered among several agencies, and in Ecology, among a number of programs. Current law establishes a mechanism for controlling point source contamination of ground water (such as industrial discharges and landfills) through permits. There is no similar mechanism for controlling nonpoint source contamination.

As the scope and complexity of activities with the potential to impact ground water increase, so does the state's need to efficiently manage the resource. Comprehensive ground water quality legislation can be an important tool in accomplishing that task.

Proposed comprehensive ground water quality legislation would:

- o Emphasize protection as the goal of ground water quality management.
- o Establish framework for ground water protection.
- o Clarify roles and responsibilities for state agencies.
- o Establish a coordinating body for various ground water related programs.
- o Provide enhanced funding for ground water protection activities.
- o Establish a public education program.
- o Establish an aquifer identification and characterization

- program.
- o Establish a ground water monitoring program.
 - o Establish a ground water data management program.
 - o Define and implement a procedure for responding to ground water contamination from nonpoint activities.

B. Relationship to Vision Statement

Comprehensive ground water quality legislation would contribute extensively to the realization of the 2010 Vision, particularly in building a broad awareness of the value and vulnerability of ground water, acquiring adequate knowledge of the resource to enable proper management, and fostering improved stewardship.

C. The following action ideas have been incorporated into this package:

- Comprehensive ground water quality legislation

II. GAINS AND COSTS OF COMPREHENSIVE GROUND WATER QUALITY LEGISLATION

A. Potential for risk reduction and resource enhancement

Comprehensive ground water quality legislation would include the following benefits to the State:

Improved coordination among programs/agencies:

While Ecology has the authority and the responsibility to protect the state's ground waters, many other entities also have jurisdiction over activities with potential to degrade ground water. Comprehensive ground water quality legislation would provide the following improvements in ground water quality management:

- o Improved coordination of ground water protection and management activities within the Department of Ecology and among Ecology and other state agencies.
- o Improved coordination of state and local ground water protection and management activities.
- o Improved ground water data acquisition and management.

Tracking and prioritizing ground water quality activities:

Several factors impede our understanding and ability to manage ground water. Currently there is no ambient monitoring program and very limited compliance monitoring in the state. There also

is no monitoring of the performance of best management practices and very limited capability to investigate contamination incidents. Throughout much of the state, there is inadequate data about aquifer characteristics.

A series of USGS reports describe in general terms the ground water quality in the major aquifer systems across the state. This data could serve as a baseline for comparison with data collected under an ambient monitoring or other coordinated ground water data collection program funded under comprehensive ground water quality legislation.

Ambient monitoring, aquifer mapping, and development of a coordinated statewide ground water quality data management system would allow the state to focus resources where most needed, and to evaluate effectiveness of ground water protection activities. A coordinating group is needed to identify needs and recommend ways to improve our understanding of aquifer systems.

Table 1 ranks activities which present the primary threats to ground water quality. These rankings originally appeared in a report developed for the 2010 committee, "Threats Related to Point and Nonpoint Source Discharges to Ground Water." Activities are ranked by current level of threat to ground water, by estimated threat in the year 2010, and by estimated risk to human health in 2010. Rankings are based on qualitative information, and represent relative risks to ground water of activities associated with these threats. The methodology used in assessing the risks was outlined in the report.

Table 1: Summary, Ground Water Hazard Rating

Source	Existing Hazard	2010 Hazard	Relative Health Threat*
Aluminum	4	4	Low
Oil Refineries	4	4	Low
Sand & Gravel Mining	8	13	Medium
Pulp & Paper	9	9	Medium
Salt Water Intrusion	11	17	Medium
Resource Extraction	12	18	Medium
Municipal Sludge	13	19	Medium
Animal Feeding Operations	14	14	Medium
Municipal Waste Water	15	22	Medium
Food Processors	16	23	Medium
Onsite Domestic Systems	16	20	Medium
Agricultural Chemicals	16	24	High

General Industry	22	39	High
Underground Injection	28	49	High

Existing Threat Scale 1 - 35 2010 Threat Scale 2 - 70

* Represents relative health threats of contamination sources as compared to each other.

Table 2 ranks these activities according to the reduction in risk that would occur as a result of comprehensive ground water quality legislation.

Table 2. Expected Effects Of Comprehensive Ground Water Quality Legislation On Threats To Ground Water

<u>Significant reduction of threat:</u>
Use of agricultural chemicals (pesticides and nutrients)
Domestic onsite septic systems
Municipal sludge management
Underground Injection Control (UIC) - stormwater management
<u>Moderate reduction of threat:</u>
Sea-water intrusion
UIC (non-regulated)
Municipal Wastewater Treatment (land application/community septic)
Landfills and solid waste management
General industry (not directly permitted under current systems)
Surface mining
<u>Limited reduction of threat:</u>
Feedlots
Mining (mineral)
General industry (NPDES/SWDP systems permits)
Food Processors
<u>No expected reduction of threat:</u>
Oil Refineries
Pulp and Paper
Aluminum

B. Costs of Implementation

A range of costs was developed based on the following two scenarios:

1. Limited ground water legislation would, at a minimum, provide a mechanism for coordination of ground water programs.

2. Comprehensive legislation would include coordination, ground water monitoring, data management, public education, aquifer mapping, and a funding mechanism to support these activities

The second scenario more nearly achieves the goals of a comprehensive ground water program.

Two states which have comprehensive ground water quality legislation are Wisconsin and Arizona. Costs for the two scenarios are based on figures developed by those two states.

SCENARIO 1: Ground Water Coordination

Objectives:

- o coordinate interagency programs
- o provide technical assistance
- o acquire and interpret ground water data

Estimated annual budget = \$720,000 for 9 additional FTEs.

SCENARIO 2: Comprehensive Ground Water Protection

Objectives:

- o coordinate ground water protection programs
- o promote ground water education programs
- o provide technical assistance
- o establish a hydrogeologic assessment coordinating group
- o monitor ambient ground water quality status and trends
- o conduct intensive ground water quality investigations
- o develop statewide aquifer mapping
- o develop and coordinate data management
- o regulate ground water discharges (includes permitting and compliance monitoring)
- o fund ground water protection programs

Estimated annual budget = \$2,800,000 for 40 additional FTEs.

Potential indirect impacts of comprehensive ground water quality legislation include:

- o Changes in agricultural practices in sensitive areas.
- o Restrictions in certain land use activities over vulnerable aquifers.
- o Restrictions in water use in areas where water quality threatens health.

C. Costs of Prevention versus Costs of Remediation

While the cost of comprehensive ground water quality legislation appears high, the cost of remediating contaminated ground water is 10 to 100 times higher. Protection of ground water quality benefits all Washingtonians. Drinking water supplies would be protected, ground water used for industrial processes would require less costly treatment, and wetlands to which ground water discharges would be better protected. The costs would be distributed broadly to those who discharge to the ground water including users of onsite septic systems, the agricultural community, and industry.

III. OTHER FACTORS

A. Technical Factors

Since currently there is no ground water quality monitoring program, little of the background data needed to establish a baseline is available. Because of the heterogeneity of hydrologic conditions across the state, existing data cannot be widely applied. Also missing is a consistent statewide data management system. Mapping highly vulnerable aquifers for prioritizing efforts would be difficult without a fully developed data management system.

B. Institutional Constraints

Any proposed legislation would require greater emphasis on coordination between agencies. This would require coordinators with authority to negotiate for their respective agencies. Coordination of ground water activities within Ecology would also require enhancement at a minimum. Designated technical staff could be assigned to coordinate in developing rules, policies and technical guidelines. This would require .5 FTE from each program dealing with ground water (i.e., Water Quality, UST, Solid Waste, Hazardous Waste, and HWICP).

To be successful, coordination requires funding and a serious commitment by management to presenting a unified message to the public and the regulated community. Protection of ground water resources would require no less.

C. Political Factors

Political controversy is likely to be encountered because such

comprehensive legislation would affect a number of groups, such as agriculture, industry, onsite septic system users, and municipal sewage treatment. The strongest resistance may be felt from the agricultural community. A focused education program might mitigate a portion of this resistance. Support is likely to come from the environmental community. If an education campaign is planned for the general public, they could also provide support for the package.

IV. ROLES AND RESPONSIBILITIES

Since implementation of any legislation is a function of its structure, roles and responsibilities for implementation cannot be accurately projected. Certainly Ecology's regulatory role to protect the ground water would be enhanced. Ecology's role in education and coordination would also likely increase. Local governments (city and county) could implement protective land use and zoning ordinances. Both point and nonpoint dischargers would be required to implement AKART prior to discharge to the ground.

The Water Resources Steering Committee would encourage implementation of these actions.

The development of a legislative package could begin in FY 91. It could then be presented to the 1992 legislative session for action.

WATER ALLOCATION ACTION PACKAGE

Water allocation will be a crucial issue in the next two decades, requiring a comprehensive state effort to resolve conflicting demands. Proper allocation of water is essential to assure the availability of water supplies for existing and future instream and out-of-stream uses. Water allocation has become an increasingly controversial issue over the past decade due to rapid population growth and increased demand for instream and out-of-stream water needs.

The Department of Ecology (Ecology) is authorized to carry out planning for future water needs, including the establishment of instream flows and reservations for future use. Because of increasing controversy, Ecology initiated an administrative review of its instream resources and water allocation program in 1986. A legislative review of that program has been underway since 1988. Water allocation planning has been on hold since 1986 while these reviews have been underway.

Efforts have been underway in recent months to formulate a cooperative process for water resources planning that may involve the participation of water users, Indian tribes, local government, environmental groups, and state agencies and other interests. The general outlines of this process will be determined in the next several months. The water allocation process will occur separately from the Environment 2010 project.

DRINKING WATER CONTAMINATION

I. INTRODUCTION

1. Consolidate smaller water systems or merge with larger systems to improve water quality.
2. Upgrade existing water conveyance and delivery systems to provide high quality water with reliable and efficient service.
3. Adopt efficiency and performance standards, and offer technical assistance to system owners/operators.

For several years, the number of small water systems in Washington, and the problems associated with them, have been increasing. In 1977 there were 4,728 water systems serving two or more connections. Today, that number has increased to over 12,000. A variety of problems concerning different aspects of small water system development related to ownership and management, financing, engineering and design, operation and maintenance, and regulatory and institutional oversight have been identified.

Small water system regulatory burdens will be compounded as regulations implementing the federal Safe Drinking Water Act amendments of 1986 go into effect. With a growing number of small water systems on one hand, and increasing government regulation attempting to raise the level of water quality and reliability on the other, small water system issues are increasing at a rapid rate.

The drinking water recommendation identified as part of the 2010 process is a viable solution to the many problems associated with small water systems. Public health will be protected by the decrease in water contamination. Ground water protection will be enhanced by the reduction of small systems, which often degrade ground water.

II. GAINS AND COSTS OF TAKING ACTION

A. Risk Reduction/Resource Enhancement Potential

The primary objective of the drinking water recommendation is to reduce the number of small water systems. The result will be improved service delivery and water quality to utility customers. The drinking water recommendation focuses a great deal on large water utilities assisting in meeting this objective. Large water utilities are in a better position of providing improved service. They have a larger financial base from which to draw. Most large utilities are publicly owned and, therefore, have access to public financing (grants and low interest loans). Large utilities also

have good technical and management skills.

The drinking water recommendation, when fully implemented, will improve public health by improving water quality. There will be less of a potential for water contamination. Proper treatment of water supplies will be more readily available. Water quality monitoring will be conducted on a more regular basis. For example, only 36% of water systems that serve less than ten connections are in compliance with bacteriological monitoring requirements whereas over 85% of all systems serving ten or more connections are in compliance. Enactment of the recommendation will also enhance the environment. By reducing the number of small systems, degradation of ground water supplies will be reduced. Since each well represents a possible conduit for contamination, a reduction in the number of wells reduces the opportunity for ground water degradation.

Other benefits that could be gained by enacting this recommendation include improved service delivery, a reduction in utility rates, a higher utility design standard level, including adequate fire flows, and an improved relationship between land use planning and water system development.

At the present time, there is a proliferation of over 600 new small water systems each year. Most of these systems do not have the ability to provide potable water and adequate service delivery on a regular basis. If implementation of the recommendation were not to occur, an already undesirable situation would be compounded. Many small water system customers would be at greater risk from a public health standpoint and governmental oversight would be diminished.

Measures to evaluate the effectiveness of implementing the recommendation include water quality monitoring results pursuant to State Board of Health standards. Also, periodic review of long-range water system plans would indicate how many small water systems are being absorbed by large water utilities.

B. Costs

Successful implementation of the recommendation will take the effort of several different entities. The cost must be distributed equitably. Developers and utility customers must be willing to pay their appropriate share of utility construction and operation in order to obtain an adequate potable water supply. Large utilities must be willing to make necessary improvements to existing, failing systems in order to improve the level of service. Also, local and state regulators must have the ability to increase staff resources in order to have effective oversight and provide technical assistance.

It is difficult to estimate the exact cost of implementing this recommendation. To date, over three million dollars is spent by government in regulating and providing technical assistance to small water systems. This amount could eventually be reduced if there is a willingness by large utilities to be more responsible for small water development. The key to this approach is providing acceptable funding alternatives (grants and loans) to utilities.

Even with a successful utility funding program, it is estimated that state and local staff resources will need to be doubled in the short-term (next five years).

Potable drinking water at a responsible rate is important to all of us. The benefits of insuring adequate drinking water supplies far outweigh the costs of protection.

III. OTHER FACTORS

A. Technical Factors

Currently, many utility customers do not understand many aspects of water system development. This lack of knowledge can be viewed as a technical constraint in improving water quality and service delivery. An improved public awareness campaign and training program needs to be developed. This is slowly happening; but again, funding is needed by many different entities for public awareness and training.

B. Institutional Constraints or Implications

In order to reduce the proliferation of small systems and improve water quality, institutional change must be accepted. Most small water systems are privately owned (i.e. home owner's associations). There has to be a willingness by small independent systems to be absorbed by a publicly-owned large utility. Existing state and local regulations might have to be changed in order to promote institutional restructuring.

C. Political Factors or Implications

The attitude of many citizens and politicians is that it is an implied right to be able to develop your own small water supply. Without understanding the complexities of a drinking water system and its operation, successful implementation of this recommendation presents a challenge both at the local and state levels of government. Also, the location of small water systems and the level of utility design many times becomes a land use issue. Sometimes an

overriding land use decision can actually be detrimental to good utility development.

IV. ROLES AND RESPONSIBILITIES

A. Implementation Responsibilities

As stated in the Costs Section (II-B), successful implementation of this recommendation will take the cooperation of state and local government, water utilities and utility customers. Because of the magnitude of the problem, no single entity will be able to do it alone. A close partnership is necessary for implementation of a successful program. An example is the relationship that exists between the DOH Drinking Water Program and the Ecology Water Resources Program.

B. Accountability

The Washington State Department of Health (DOH) will be accountable for implementing this recommendation in a cooperative effort with local government and water utilities. The DOH presently has responsibility for administering a statewide drinking water program. Reducing the number of small water systems and improving water quality will be the primary focus of DOH for the next several years.

C. Schedule

Implementation of this recommendation will be an ongoing process. Phase I (1990/91) action plan includes establishing a legislative foundation for implementation and obtaining funding for utilities and staff resources. Phase II (1991/92) activities include improving the drinking water training program and becoming more involved with land use-related issues.

For a detailed account of the DOH strategy to implement this recommendation, please refer to the "DOH Small Water System Action Plan, March 1990".

AGRICULTURAL POLLUTION

I. INTRODUCTION

1. Regulate nonpoint pollution by establishing watershed protection plans for every watershed which address agriculture, forest practices, on-site septic systems, stormwater, and any other pollution sources. Provide support in the form of education, technical assistance, and increased funding to local governments so these plans can be implemented.
2. Increase support for existing agricultural best management practices by offering more incentives, technical assistance, education, and regulatory back-up. Encourage technological research and innovation. Develop similiar programs to protect ground water and address noncommercial farms and rangeland management.
3. Coordinate nonpoint source control measures with point source control measures to remediate waterways limited by these types of pollution. Set total maximum daily load of pollutants (TMDL) for nonpoint as well as point sources of pollution.

Nonpoint sources of pollution have significantly impacted water quality in the streams, lakes and estuaries of the state of Washington and have the potential to impact much more. An assessment conducted in 1988 indicated that the beneficial uses such as swimming or fishing of over 70% of the assessed rivers and over 60% of the assessed lakes were either threatened or impaired by nonpoint pollution. The Environment 2010 Summit recognized this threat and included it as one of the top two priorities for the next twenty years. The vision for the year 2010 is to have innovative technologies and programs that include new land use and management and changes in personal life-styles coupled with strict enforcement that leave our marine, surface and ground water in excellent condition.

To achieve this vision we will need to work to protect water quality and conserve water resources in agricultural areas by:

- o Strengthening partnerships with federal, state and local agencies to carry out a balanced program of information/education, technical assistance, and monitoring back up regulatory actions. Coordinate activities of key players Soil Conservation Service, Cooperative Extension, and the state departments of Agriculture, Ecology and the Conservation Commission through local conservation districts.
- o Encouraging development, and application and testing of innovative technologies to conserve water and reduce ground and surface water pollution. Agricultural practices to be addressed include dryland erosion control, animal waste, pesticide, fertilizer, and irrigation

water management.

- o Implementing a comprehensive education program to show relationships between environmental protection, resource management, and principles of good stewardship. (Action strategies will be developed by the Education subcommittee.)
- o Under the Clean Water Act, waters not meeting water quality standards must be brought into compliance by setting an acceptable total maximum daily load of pollutants (TMDL). This requires that each source limit their waste loads by a certain amount. Ecology has implemented this process for some point sources, and is working towards determining TMDL's for nonpoint sources. Programs on the books for comprehensive water quality management planning and TMDL development and implementation are presently unfunded.

The specific action ideas this strategy addresses are:

- a. Fund new technologies for agricultural pollution and provide for technology transfer. Research and develop alternatives to agricultural pollution sources. (4,17,21)
- b. Enact regulatory requirements (29)
- c. Dryland agriculture and animal waste are equally important sources of nonpoint water pollution as agricultural runoff. Strategies to control agricultural runoff should include references to these two problems.

II. GAINS AND COSTS

The waters of the state of Washington have statewide and national significance from an economic, environmental, and social perspective. Risks to human health occur from drinking polluted surface or ground water, swimming or wading, and eating contaminated shellfish. Fish kills are not uncommon, spawning habitat is reduced, and lakes experience excessive plant growth and algal blooms. Economic costs occur from fewer fish for sport and commercial fisheries, closed shellfish beds, and lost recreational opportunities.

Costs to landowners to implement agricultural best management practices are in the range of \$10 million annually. Public information and technical assistance responsibilities of the 48 local conservation districts will require \$1.8 million annually over existing levels. Development of programs to address rangeland and noncommercial farm management will have a one time cost of \$0.5 million. Ecology's responsibilities which include some elements of education and technical

assistance for landowners and watershed planning as well as a strong regulatory and monitoring program will require \$0.85 million annually over current levels. Ecology's effort will be focused in the field to provide a service oriented program as well as a regulatory presence.

Innovative technology and approaches will require considerable commitment on the part of all agencies and research institutions. An annual budget of \$1.5 million will allow for ongoing research, monitoring and evaluation of new technologies and management practices.

Nonpoint source pollution control means looking at everything that goes on in a watershed and finding ways to protect water quality every step of the way. Watershed planning by local government will need to be funded by over \$5 million annually over existing Centennial Clean Water Fund levels. Technical assistance to watershed planning efforts in Puget Sound are provided by 10 staff from federal and state agencies. This level of assistance should be extended statewide by the year 2000 and will require about \$0.6 million annually.

The gains accrued to public resources such as fish, wildlife, and recreation are significant although difficult to quantify. These along with fishing and other rights of Indian tribes and gains to human health are difficult to put a price on.

III. INSTITUTIONAL CONSTRAINTS

Programs to control nonpoint sources of pollution through the adoption of agricultural best management practices are well developed but progress remains dependent on available resources. Programs to protect ground water and to address smaller noncommercial farms and rangeland management are not as well developed or accepted. Broad legal authority exists to regulate the agricultural industry, however, a balanced program of education, technical assistance, research, incentives, and regulatory backup is needed. Where economic or regulatory impacts affect the agricultural community, there is potential for political opposition.

Some technological constraints exist particularly for the protection of ground water but these will likely be overcome in the near future. The institutional and legal frameworks are firmly established. Success depends on the willingness of individuals to change their everyday habits and the ability of agencies to assist them and, if needed, force them into practicing good stewardship of our natural resources.

IV. ROLES AND RESPONSIBILITIES

Primary responsibility for controlling nonpoint sources of water pollution from agriculture lies with the landowner. The public needs to

be involved in developing programs and reviewing their implementation and effectiveness. Local conservation districts (CD's) have been given the responsibility to coordinate the activities of the federal, state, and local agencies into an effective grass roots program. Technical assistance is provided by the CD's and the USDA Soil Conservation Service with research and education provided by Cooperative Extension. Innovative technology is developed through research institutions in the University system and the private sector. The state Department of Agriculture regulates handling and application of pesticides and the Department of Ecology has overall responsibility for implementing programs and regulating protection of water quality. Where the voluntary program fails a strong and consistent regulatory program must assure compliance with locally accepted best management practices. All these programs must be in balance to assure protection of water quality. Research and monitoring of the appropriate practices and their effectiveness must be fed back into an adaptive management program to assure that landowner and water quality objectives are met. Planning and implementation focused on specific priority watersheds provides the most effective approach.

These efforts are ongoing but are limited by the availability of resources. The geographic distribution of agricultural activities and the high variability within the industry will require a long term effort with the commitment of the industry to apply BMP's and the commitment of the agencies to assure BMP's are effective and in place. Programs as well as practices must be monitored and evaluated so they can be adapted to provide effective and efficient control of nonpoint sources of pollution related to agriculture. Additionally, problem definition is needed in some areas along with follow-up monitoring to ensure correction and proper maintenance. Total maximum daily load must be established for limited waterbodies in consideration of both nonpoint and point sources.

Ecology has overall responsibility for protecting water quality but success will only come with cooperation, commitment, and teamwork on the part of a number of agencies, particularly local conservation districts. This team is already well established and working together with limited resources. Increased support should be phased in over a five year period to allow for acceptance by landowners and the interested and effected public.

Additionally, problem definition is needed in some areas along with follow-up monitoring to ensure correction and proper maintenance. Total maximum daily loads must be established that lay a basis for management of both nonpoint and point sources.

ONSITE SEWAGE SYSTEMS

I. INTRODUCTION

"Where on-site sewage (septic tank) systems are used, emphasize providing proper known levels of treatment. Upgrade existing systems that are not providing treatment. Encourage public entities to provide operation, maintenance, and monitoring for onsite systems. Fund and implement a program for monitoring the performance of onsite sewage systems."

A. Local government has two options available to them for managing wastewater within their jurisdictions:

1. Public sewer systems with a treatment plant and discharge either to surface water or the surface of the land. Sanitary sewers or public systems of sewerage are deemed more appropriate as populations and population densities increase.

2. Onsite sewage systems where the treatment is provided by septic tanks or some alternative and disposal is below the surface of the ground.

B. Somewhere between 575,000 and 600,000 onsite sewage systems presently exist within Washington State. Fifteen thousand to twenty thousand systems are installed annually. The rate of failure (as defined by detecting sewage on the surface of the ground or in ground or surface water) for onsite sewage systems is considered to be three to seven percent, although localized areas have much higher rates.

C. Either sewage handling option can result in public health problems or degradation of surface or ground water quality if appropriate measures are not taken.

D. Onsite sewage systems are considered one of the potential sources of nonpoint pollution. In any comprehensive planning process for mitigating sources of nonpoint pollution, activities to prevent pollution from new systems, as well as abating problems from existing systems, must be considered.

II. GAINS AND COSTS OF TAKING AN ACTION

A. Identify the risk reduction/resource enhancement potential of the action(s).

1. Local government needs various options for treating and disposing of wastewater in their jurisdictions. In many locations,

sewers are still considered the only long-term method of handling sewage. Depending on the characteristics of the receiving waters or other final discharge point, a large point source of sewage may or may not be desirable from an environmental degradation perspective. Also, sewers tend to result in greater populations and population densities, which may or may not be desirable to local citizenry.

2. Onsite sewage disposal systems may be a long-term alternative, especially where populations and population densities are somewhat limited. Such systems can provide adequate long-term treatment and disposal of domestic sewage if systems are located, designed, installed, operated, and maintained properly. To accomplish this, onsite sewage systems must be used which can provide levels of treatment commensurate with the conditions of the sites on which they are located.

a. Using new onsite sewage systems that provide known levels of treatment can:

1) Significantly reduce potential bacterial and viral populations within sewage. This can be provided by either assuring unsaturated vertical flows of septic tank effluent through at least two to three feet of soil or by using alternative treatment and/or disposal systems where sufficient soil or site conditions do not exist. Thus, using onsite sewage systems that emphasize treatment can prevent situations that have resulted in typhoid fever within the last two decades within Washington State. Also, bacterial contributions to waters used for growing shellfish or recreation will be significantly reduced. Onsite sewage systems can produce effluent prior to final disposal that is superior to the secondary treatment required for surface discharges, if the appropriate systems are used.

2) If nitrogen is determined to be a concern, the use of appropriate onsite sewage technology can remove 50 to 90 percent of the total nitrogen within the wastewater stream. This can significantly reduce nutrient contributions that can degrade surface water quality or increase nitrate concentrations in groundwater.

3) Usually, typical household (domestic) sewage does not contain significant concentrations of other chemicals that are considered hazardous to public health or environmental quality. However, there are exceptions to this. Minute quantities of different organics have been found. Soil may not remove these organics or other chemicals that may be present. Municipal wastewater treatment facilities

reduce some, but not all, of these chemicals prior to discharge.

b. If onsite sewage systems are chosen, consideration must be given to replacing existing systems with new systems that can provide adequate, known levels of treatment. Many onsite sewage systems have been installed that emphasized disposal only. They were designed and installed only to dispose of the wastewater. Thus, thousands of systems exist along shorelines and inland that were installed on little or no soil or in excessively permeable soil. Such conditions are not conducive to providing normally acceptable levels of treatment prior to discharge of the sewage to the environment. Especially in areas determined to be environmentally sensitive or experiencing problems, decisions pertaining to how wastewater should be handled must be made.

c. While onsite sewage systems should not be advocated as a land use planning tool, one of the results of their usage is a more sparse development than would be permitted with sewers.

d. As the systems become more sophisticated and complex, and as onsite sewage systems are more widely used in sensitive areas, it is imperative that such systems receive proper operation and maintenance and monitoring. Eligible public entities must be encouraged to provide such services.

1) Such on-going activities would help assure that the systems continue to treat and dispose of sewage properly. Knowledge of their performance would be available for the first time.

2) If problems do occur, the availability of a public entity will help assure a quick and proper abatement of the problem.

e. If systems are not used that emphasize treatment, and if on-going operation and maintenance is not provided, there will be increased incidences of public health and/or environmental quality hazards. Also, abating such problems will be more costly, whether using sewers or other onsite sewage systems.

f. In order to understand how the various onsite sewage systems are performing, they need to be adequately monitored. Monitoring performance will allow determinations to be made as to effect on surface and ground water quality, what changes are necessary in technical guidelines/standards, and what regulatory changes should be made. Just as there are many ways that on-going operation and maintenance can be provided, there

are a wide variety of ways that system monitoring can be provided.

B. Costs

1. Costs of taking the action

a. Costs of onsite sewage systems that emphasize treatment tend to cost significantly more than systems that have been used historically. Such systems may cost \$3,500 to \$10,000 as compared to the \$1,500 to \$2,500 that a conventional system costs. Increasingly sites for housing have site and soil conditions that do not permit the installation of conventional septic tank-drainfield systems. Such sites will require systems that assure known levels of treatment prior to disposal; thus, increasing the cost.

b. How the costs of using onsite sewage systems compares with the costs of sewerage an area will depend on many factors. Usually, certain populations and population densities are necessary to make sewers cost effective.

c. Using systems that emphasize the provision of levels of treatment commensurate with the areal conditions should prevent or minimize the need for rehabilitation projects for ground or surface water.

d. The existence of another long-term alternative for treating and disposing of wastewater both in new and existing settings will allow local governments to choose the most cost-effective option. This will allow the necessary wastewater handling costs to be minimized. Most funding sources available to resolve problems for existing areas are targeted toward public sewerage systems. Monies must also be readily available to areas where the long-term solution has been determined to be onsite sewage systems that provide appropriate levels of treatment. At a minimum this will require the availability of low or no interest loans or grants.

e. Historically, users of onsite sewage systems have not paid any on-going costs for someone to operate and maintain their system, except for periodic pumping or repairs. Considering decentralized onsite sewage systems that can be operated and maintained by a centralized entity as a utility will add to the user's costs. However, based on numerous studies, this cost should be competitive with routine costs paid by those on public sewers.

f. There are a wide variety of ways that an onsite sewage system monitoring program can be implemented. Three ways include, but are not limited to:

1. A state administered program evaluating a small, statistically significant, population of the different systems;
2. A local health department either monitoring systems themselves or requiring certified private sector individuals as part of an operational permit system (renewable/withdrawable);
3. A local public and operation and maintenance entity monitoring all or a portion of the systems within their areas of jurisdiction; and/or
4. Combinations of the first three examples.

g. There will be costs to adequately inform and educate users of onsite sewage systems, as well as public management entities, local and state decision makers, and members of the public.

2. Other adverse implications

a. Onsite sewage systems use the soil for treatment and disposal. Soils will not remove all chemicals of concern. Thus, even with the best onsite sewage systems, some chemicals in the wastewater will reach ground or surface water. This may not be acceptable. A similar problem exists with public systems of sewerage, although the problem may be transferred to bodies of water into which the treated sewage is discharged.

b. A public perception still remains that onsite sewage systems cannot be as acceptable as sewers. Thus, problems with public confidence and support may arise. This illustrates the need for good public information and education programs.

c. There is a long history of individuals on onsite sewage systems being totally responsible for the operation and maintenance of their own systems. However, there is public acceptance of public entities being necessary to operate and maintain systems of public sewerage. Obtaining public acceptance of the need to treat onsite sewage systems as a utility will be difficult and time consuming. This, again, illustrates the need for good public information and education programs.

3. Implementation costs for state and local government

a. Local health jurisdictions and other local government agencies will need additional staffing to survey areas with existing systems to determine the need for upgrading those systems and to monitor the performance of onsite sewage systems. The amount of needed additional staffing will be highly variable depending how many existing systems a local jurisdiction has and what monitoring program is implemented. It would be anticipated to range from a portion of an FTE in rural counties with few onsite sewage systems to ten or more in more populated counties with tens or hundreds of thousands of existing systems.

b. The state health department will need additional staffing. Most of the increased needs and costs will result from additional monitoring and technical assistance and training activities. Again the costs will be variable depending on what direction is selected for providing on-going monitoring of onsite sewage system performance. It is anticipated that a minimum of two to five additional staff will be needed.

c. Public management entities must gear up to handle onsite sewage systems. This may require new equipment and new staffing with different training. The amount of staff needed will be dependent on:

1. Whether a public entity does the work themselves or contracts out to a private entity to do it; and
2. What direction is selected for providing monitoring of onsite sewage system performance.

d. In order to abate existing problem areas, it will probably be necessary to provide funding assistance, especially to the indigent. The program could be similar to the financial assistance programs for planning and installing sewers, but would specifically include onsite sewage disposal options.

e. This effort needs to be closely coordinated with the nonpoint pollution control finance measures action.

C. Summary

1. The availability of another alternative to local government for handling wastewater will provide a significant benefit. The gain should compare favorably with the cost. This is especially true when the costs of future sewerage that may potentially be avoided are considered.

2. If land use planning and zoning can appropriately indicate areas where sewers, onsite sewage, or combinations of both systems are most appropriate and local actions follow the plan, public health and environment quality protection should be optimized.

3. Additional costs will be incurred by all who are presently using or who propose to use onsite sewage systems. Using systems that emphasize treatment and having on-going operation, maintenance, and monitoring are costs not traditionally faced by those not on public sewer systems. However, by using appropriate treatment systems and providing on-going management should prevent the potential for paying the costs of having to sewer an area.

4. Additional costs will be incurred by local and state health agencies, as well as public management entities. These costs are necessary in order to assure protection of public health and environmental quality. How these costs compare with the long-term costs of having to sewer an area because inappropriate systems were used or on-going management was not provided is not specifically known. It is anticipated that the comparison should be favorable.

III. OTHER FACTORS

A. Technical Factors

1. As populations and population densities increase, even the available technology may be insufficient to provide adequate long-term treatment and disposal. Sewers may become the only long-term answer, if appropriate treatment and disposal sites can be found that do not pose a greater potential hazard.

2. As sewage begins to contain constituents not normally found in typical household (domestic) wastewater, onsite sewage technology becomes inadequate.

3. Technology is being evaluated which can provide higher levels of treatment on individual or small community sites. Such technology may cost more and may require more intense levels of operation, maintenance, and monitoring.

B. Institutional Constraints or Implications

1. Philosophically, sewers are still considered by many to be the only long-term answer to handling wastewater, both to prevent new problems or to abate existing problems.

2. Regulatory and public sewer management entities must be willing

to realistically consider other alternative sewage systems if long-term solutions are to be found.

C. Political Factors or Implications

1. Historically, onsite sewage systems have been considered to be temporary systems, systems to be used until sewers are installed. This proposed action runs contrary to this long-held belief.

2. Sewers tend to support greater populations and population densities. This is consistent with the objectives of land development interests. The use of onsite sewage systems mandate less dense development and will usually result in a smaller financial return on a development.

3. Most of the populace still believes that the septic tank system automatically pollutes ground and surface waters. Many of the decision-makers in local and state government, also, tend to believe this. The populace and the decision-makers must be shown information on the capabilities of onsite sewage systems so they can make informed decisions.

IV. ROLES AND RESPONSIBILITIES

A. Implementation Responsibilities

1. Local and state health agencies and the Department of Ecology (currently responsible for onsite sewage systems handling more than 14,500 gallons of sewage per day) must promulgate appropriate regulations and guidelines and provide increasing public information opportunities.

2. Potential eligible public entities must be willing and able to be responsible for assuring on-going operation and maintenance for individual and/or community onsite sewage systems. They may perform the activities themselves or contract it out to different private entities.

3. All parties that relate to potential buyers of properties or residences presently served by or to be served by onsite sewage systems must become educators. This includes engineers, real estate agents, certified designers, certified installers, certified pumpers or other operation and maintenance personnel, and regulators.

4. Local and state government must include all possible alternatives in their wastewater management planning and funding processes. Public sewers may be the system of choice in some

locations, onsite sewage systems in others, and combinations of both in other locations.

B. Accountability

1. The Washington State Department of Health (DOH) will be accountable for ensuring/encouraging implementation of this action in a cooperative effort with the local health jurisdictions throughout the state and the Department of Ecology.

2. The DOH presently has responsibility for administering the statewide program for onsite sewage systems. The detailed, day-to-day program is administered locally by the local health departments and districts. The Department of Ecology has direct responsibility for reviewing and approving all systems treating and disposing of more than 14,500 gallons of sewage per day.

C. Schedule

1. This action will be a five to ten year venture.

2. Regulations will be considered in the fall of 1990 which will provide additional impetus to:

- a. Providing proper treatment with onsite sewage systems,
- b. Properly correcting existing failing systems,
- c. Provide notification of users of onsite sewage systems how their system functions and how to take care of it,
- d. Provide on-going operation and maintenance for all systems in areas of special concern, and
- e. Require monitoring for all alternative systems, for replacement onsite sewage systems along fresh or marine water shoreline, for all large onsite sewage systems, and for systems located in areas of special concern.

3. A handbook should be completed by DOH by July, 1992 containing strategies for local governments on dealing with existing onsite sewage systems.

4. A handbook should be completed by DOH by July, 1992 containing strategies/options for local governments on providing on-going operation and maintenance.

EDUCATION OF ONSITE USERS

I. INTRODUCTION

"Educate users of onsite sewage systems of what they have, how it works, and how to care for it."

A. Local government has two options available to them for handling wastewater within their jurisdictions:

1. Public sewer systems with a treatment plant and discharge either to surface water or the surface of the land. Sanitary sewers or public systems of sewerage are deemed more appropriate as populations and population densities increase.

2. Onsite sewage systems where the treatment is provided by septic tanks or some alternative and disposal is below the surface of the ground.

B. Somewhere between 575,000 and 600,000 onsite sewage systems presently exist within Washington State. Fifteen thousand to twenty thousand systems are installed annually. The rate of failure (as defined by detecting sewage being found on the surface of the ground or in ground or surface water) for onsite sewage systems is considered to be three to seven percent, although localized areas have much higher rates.

C. Either sewage handling option can result in public health problems or degradation of surface or ground water quality if appropriate measures are not taken.

D. Users of onsite sewage systems must be aware of what type of sewage system they have and how to take care of it, if onsite sewage systems are to be a realistic long-term alternative for local government. They can't just flush their toilets or put anything they desire down the sinks and forget about it like they do with sewers. Such practices will certainly lead to unnecessary problems.

E. The education activities should be coordinated with those activities of the 2010 strategy analysis education subcommittee.

II. GAINS AND COSTS OF TAKING AN ACTION

A. Identify the risk reduction/resource enhancement potential of the action (s).

1. Users should tend to be more careful what they put down their toilets and sinks. If the users do not dispose of products such as cleaners, degreasers, pesticides, paint thinner, etc. down sinks and toilets the concern for adverse effects on ground and surface water will be reduced.

2. Users should understand that their system can't be buried after installation and never looked at again. They will understand that someone has to look at their system periodically, pump the septic tank when needed, and perform other maintenance and monitoring activities. This understanding will help provide support for treating onsite sewage systems as a utility, like public sewers, to be handled by some public entity.

3. Users should understand the need for controlling the amounts of water used, and the resulting volumes of wastewater generated. Using the water resource wisely and conservatively will not only help conserve a valuable resource but also will reduce the hydraulic loading on the onsite sewage system. This will allow the system to treat and dispose of the sewage more readily.

4. Systems should perform more efficiently and effectively. Systems will perform better and with a need for less frequent maintenance if they are not used for disposing of material not suited for onsite sewage systems, including chemicals, non-degradable solid matter, etc. The provision of on-going operation, maintenance, and monitoring will provide greater assurance of properly operating systems. Also, there will be knowledge how the systems are performing.

B. Costs

1. Costs of taking the action

a. The development and printing of brochures and other handouts for onsite system owners will result in a cost. Such written information can be given users at various "moments of opportunity", including during sales transactions of property, when permits are obtained, when operation and maintenance are provided, county fairs, etc.

b. Accompanying the brochures and handouts should be the development of routine press releases, programs to be presented in the mass media, and children education materials. This may include the development of stories to be told to children by professional storytellers. There are costs involved in this.

c. These costs will be incurred by all levels of government and by operation and maintenance entities.

2. Other adverse implications - None
3. Implementation costs for state and local government
 - a. State government must take the lead in the development of optional methods for providing the necessary public education. This leadership will require the use of professional educators, public information people, storytellers, etc. Cooperative efforts between the state regulatory agency for onsite sewage systems and the Superintendent for Public Instruction will be mandatory.
 - b. Local government and operation and maintenance entities will also incur a cost in implementing the necessary education locally.
 - c. This effort will require a cooperative effort between state and local government to be successful.
 - d. This effort needs to be closely coordinated with the nonpoint pollution control finance measures action.

C. Summary

1. The anticipated gains for this action should compare quite favorably to the anticipated costs. For a relatively low cost, long-term changes in individual habits may be achieved. Such changes can have a dramatic effect on the performance of onsite sewage systems and on the overall effects on ground and surface waters.
2. The benefits and costs will be shared by everyone within Washington State.

III. OTHER FACTORS

- A. Technical Factors - None
- B. Institutional Constraints or Implications
 1. The current institutional and legal framework does not pose a significant constraint. There are entities at both the state and local levels that have traditionally thought the only long-term method of handling sewage is a public sewer system. Such traditional thinking must be expanded to include the use of onsite sewage as an additional viable option. Thus, such entities must also be adequately educated so they will actively participate in this

process. Also, cooperative efforts between entities that do not usually work together, for example, local/state health departments and the Superintendent of Public Instruction, must occur.

2. State and local entities must willingly work with each other throughout this effort to provide adequate information and education to the public.

C. Political Factors or Implications

1. There are both local and state entities that still predominantly believe the only long-term method of handling sewage is a public sewer system. This includes both regulatory agencies and public sewer utilities.

2. State and local rule-making bodies and the public, also, tend to believe the only long-term method of handling sewage is the public sewer system.

3. The local and state entities and rule-making bodies must be informed and convinced that onsite sewage systems can be a realistic alternative, if applied properly. Part of the convincing should include the benefits of having another alternative available to local government for handling wastewater. Having more than one option available allows cost comparisons and the choice of the best and lowest cost alternative.

IV. ROLES AND RESPONSIBILITIES

A. Implementation Responsibilities

1. Local and state health departments must promulgate appropriate regulations and guidelines and provide increasing public information opportunities.

2. Potential eligible public entities must be willing and able to be responsible for assuring on-going operation and maintenance for individual and/or community onsite sewage systems. They may perform the activities themselves or contract it out to different private entities. One of their activities is educating/informing the onsite sewage system users in their jurisdiction.

3. All parties that relate to potential buyers of properties or residences presently served by or to be served by onsite sewage systems must become educators. This includes engineers, real estate agents, certified designers, certified installers, certified pumpers

or other operation and maintenance personnel, and regulators. All of these groups should be part of the team that helps educate the users of onsite sewage systems.

B. Accountability

1. The Washington State Department of Health (DOH) will be accountable for ensuring/encouraging implementation of this action in a cooperative effort with the local health departments and districts and management entities throughout the state.

2. The DOH presently has responsibility for administering the statewide program for onsite sewage systems. The detailed, day-to-day program is administered locally by the local health departments and districts. On-going operation, maintenance, and monitoring may be provided by various means locally, including eligible public entities.

C. Schedule

1. This action will be a five to ten year venture to develop an adequate program for public education/information. After that the program will be on-going.

2. Regulations will be considered in the fall of 1990 which may require notification of all users of onsite sewage systems about how their system functions and how they can take care of it.

3. Additionally, the regulations to be considered in the fall of 1990 will provide impetus for the following which will require understanding and support of the public:

a. Providing proper treatment with onsite sewage systems,

b. Properly correcting existing failing systems,

c. Provide on-going operation and maintenance for all systems in areas of special concern, and

d. Require monitoring for all alternative systems, for replacement onsite sewage systems along fresh or marine water shoreline, for all large onsite sewage systems, and for systems located in areas of special concern.

LAKE MANAGEMENT ACTION PLAN

I. INTRODUCTION

Establish lake watershed management plans for all lakes as part of a statewide lake management approach. Require these plans as a prerequisite for aquatic herbicide application approval.

The State of Washington has nearly 7,800 lakes, reservoirs, and ponds. These water-bodies may be natural or man-made and range from small, pristine lakes of the Cascade and Selkirk Mountains to large, hydro-electric impoundments of the Columbia and Snake River systems. Just like Puget Sound, lakes reflect the quality of their drainage basins. Land use activities, including agriculture, silviculture, urban, suburban, and commercial development impact lake quality as forests are cleared and cultural activities take place. Sediments, nutrients, organic matter, pesticides, herbicides, fertilizers, and petroleum distillates all end up in lake systems. The quality of lakes and reservoirs is only as good as the quality of the water which flows into them.

While cultural activities are desirable, high quality lake systems for aesthetic and recreation pursuits are also prized. Heavy demands are placed on existing lakes for recreational pursuits and this demand gets larger every year. Lake Roosevelt, located in the Coulee Dam National Recreation Area, is an excellent example. In 1985, 510,300 people visited the area and 19,100 boats were launched. In 1988, visitors approached 1,384,300 and 51,400 boats were launched. This is a 171 percent increase in just four years. As the population in Washington State increases, greater demands will be placed not only on Lake Roosevelt, but many other lake systems, as well.

To maintain existing water quality and to accommodate current trends in cultural development and recreational opportunities, an action plan aimed at developing a statewide lake management concept is recommended. Eventually, a lake watershed management plan should be required as a prerequisite to approval of aquatic herbicide application requests. The plan should be designed to phase out the use of herbicides. The ultimate goal is to develop water quality driven management plans for all lakes in the state. The lake management approach acknowledges the need for preventive efforts in some lake systems and remedial action at others. Long-term management activities can be identified for all lakes and a greater focus placed on preventive measures. Adequate environmental safeguards can be implemented at the local rather than state level as both public and private resources benefit. Ecology should strongly advocate lake water quality protection rather than concentrate on just enforcing water quality regulations or remedial restoration activities.

Sustaining water quality through better stewardship of lake resources is a goal of the 2010 effort. The lake management concept focuses on nonpoint pollution control and public education to promote wise land use activities and less lake water quality degradation. Lake management also delineates between short-term and long-term improvements. Through incorporation of this concept, proactive lake management can become a reality and our reliance on remedial restoration activities can be reduced. The lake management concept can help achieve and protect lake water quality for future generations.

The recommended action is to revamp our current approach toward lake water quality issues by fostering a lake management concept. Staff would assist local government in the development, maintenance, and execution of lake management plans. Through these plans, specific activities can be recommended. Capital improvement projects, ordinance development, enforcement, monitoring or evaluation efforts can be performed. Water quality degradation will undoubtedly occur, but at a rate similar to natural conditions.

Lake/watershed planning efforts can best be supported by staff in Ecology's regional offices. Coordination with other resource agencies including the Department of Natural Resources, Fisheries and Wildlife, local districts, etc. should be part of any lake management plan. Lake watershed management activities should be blended with other planning processes like local land use planning, nonpoint source planning, and stormwater management. Additional staff would be needed to review and approve lake/watershed management plans if they were required to gain approval of aquatic herbicide use, but should also be maintained at the local level.

II. GAINS AND COSTS OF TAKING AN ACTION

Nutrient enrichment is a natural process which is accelerated by cultural activities. No action on this recommendation prolongs our current posture which places a reliance on degradation to occur before state assistance can be given. Between 1976 and 1987, approximately \$58.8 million of federal, state and local funding has been spent through the lake restoration program. Of the 35 projects funded, all but one had experienced major water quality degradation. Outside of lake restoration projects, Ecology has funded water quality assessments, one of which (Lake Chelan) has focused on prevention. The reason for these events is not a lack of concern by the agency but rather a dependence on local government to cost-share projects. Local governments are geared, much like the state, in problem mediation and not in prevention. Ecology must provide the lead for reversing this oversight.

The focus of current activities is all too often on treating symptoms of lake degradation, particularly those associated with nutrient enrichment, such as attempting to control aquatic plant growth as opposed to

controlling the sources of the nutrients. These activities have led to a reliance on short term solutions, such as aquatic herbicides use, which may exacerbate existing problems or create new problems over the long term.

Water quality problems can always get worse. In the 1988 Federal 305(b) water quality assessment, 156,518 acres of lakes were characterized. Of these, 21.5 percent of the lakes evaluated were determined to have impaired uses while 74.2 percent were threatened. Only 4.3 percent of the lakes evaluated were not impaired or threatened. The next 305(b) assessment is due out in 1990 and if national trends prevail, additional Washington lakes will be threatened or exhibit impaired uses.

It is virtually impossible to place a value on lake resources as they can be used in a large variety of ways. Active recreation like swimming, fishing, boating, sailboarding, and water-skiing contribute millions of dollars to the local and state economies through equipment purchases and license fees. Passive recreational activities, like wildlife and waterfowl observation, contribute to the aesthetic benefit lakes afford. Real estate values for nearshore homes can also be affected by lake quality. Placing an economic value on passive recreational returns or the quality of life cannot be easily accomplished. Individuals measure this differently. Implementing lake management activities before problems arise can help insure that recreational and economic losses from impairment are kept to a minimum.

The effectiveness of a lake management approach can be evaluated in several different ways. Effectiveness can be measured by tracking the number of lake management plans which are developed, the number of impaired or threatened lakes and changes over time, the number of restoration verses number of preventive projects, the frequency of herbicide applications, the number of public requests for water quality referrals or the number of violations of the state standards. Effectiveness can also be measured through direct water quality monitoring associated with respective lake management plans. Water quality trend data can be evaluated to determine the degree of improvement which has occurred since a lake management plan was implemented. Efforts can focus on measuring recreational preference both before and after management plans are implemented. Public health department records can be evaluated to document health related complaints resulting from lake water quality.

State water quality standards have already been established for lakes. Standard limnological (study of freshwater lakes and streams) protocols are already available for establishing baseline water quality data. Lake trophic status (degree of nutrient enrichment) and biological productivity methodologies can be correlated to nutrient enrichment.

Additional staff would be needed at Ecology regional offices, and one individual per region could be used to support local planning efforts,

promote formation of lake management districts, public education, etc. Additional staff would likely be needed to review and approve lake/watershed management plans if they were required to gain approval for aquatic herbicide use.

The social objectives of the lake management concept are all aimed at renewing a sense of stewardship toward lake resources. If lake management plans are developed at the local level substantial public and citizen input would be received. This process would allow public involvement while still assuring timely decisions. Lake management planning requires the support and cooperation of all individuals living in the lake basins. Consensus building takes considerable time and effort.

The environmental objectives of the lake management concept centers on prevention and protection. Lake management does not automatically signal a end to growth or development. However, it does promote responsible and Lake Management Action Plan

Planned development and ensures that appropriate environmental safeguards are implemented, early on when the water quality benefit is greatest.

III. OTHER FACTORS

Ecology is already staffed with qualified individuals well versed in lake management issues. Local government is not. Less than five of thirty nine counties have technical staff, outside of their respective health departments, who have experience with lake water quality issues. Conversely, local government is well versed in land use planning and has the expertise and jurisdiction to make land use decisions. Ecology staff should/needs to initially play a stronger role until technical competence at the local level in lake water quality issues is developed.

Current federal, state or local laws do not mandate lake management activities. The Shoreline Management Act is the only comparable legislation and it addresses lakes through oversight of shoreline development. Incorporation of the lake management concept can easily follow the WAC 400-12 approach used for Puget Sound planning. This concept can be easily altered to accommodate lake basin planning activities for all counties and geographic regions of the state.

The development of lake management planning may be viewed as another example of state government dictating to local government where to spend their limited resources. Critics can be silenced by pointing out that Ecology is taking the lead and working with local government to prevent greater water quality problems from occurring. Consistency statewide can be maintained and management and prevention activities will be stressed. Technical assistance will be available to private and public groups,

alike. Through public outreach activities, proaction rather than reaction will be fostered.

Political support for lake management activities is growing. Three years ago, the Washington State Lake Protection Association was formed with 38 charter members. Currently, its membership exceeds 250 individuals and groups and interest is growing. Legislation passed in 1985 developed a process by which local residents can assess themselves for lake water quality improvement projects. Since its creation approximately nine districts have been formed and numerous activities have begun.

IV. ROLES AND RESPONSIBILITIES

In order for the lake management concept to be effective, cooperation will be needed between state and local governments, businesses, communities, and individuals, alike. All will need to join forces and demonstrate a commitment toward improving water quality in the lake basin.

Individual citizens will need to be cognizant of water quality degradation which originates from residential activities. Personal preferences and old habits may need to be replaced. Individuals will need to police themselves and promote a water quality ethic among their friends, neighbors and families. All individuals in a lake basin will need to acknowledge the role their activities have on downstream and lake basin water quality.

Local communities will need to provide oversight for new and existing developments and promote community awareness activities. Local decisions will need to weigh water quality benefits in the same light as economic gain. Communities may need to reevaluate priorities. The local business community will have to weigh profit and loss with water quality benefit. It is conceivable that bans on certain products may need to be implemented to safeguard the environment and reduce impacts to water quality.

State and local governments also have a large challenge. Government will need to exhibit leadership, consistency, and overall knowledge. The key to success or failure is to provide a forum for the resolution of conflicting values and an opportunity for reevaluating priorities on both on a short-term and long-term basis. Success or failure of lake management activities also rests on the public's perception that tangible benefits have been received from their efforts. Evaluation tools must address all management efforts.

Overall accountability of a lake management concept would fall under the auspices of the water resource subcommittee for Washington Environment 2010.

NONPOINT POLLUTION CONTROL FINANCE MEASURES

I. INTRODUCTION

Enact a financial incentives and disincentives program to control nonpoint pollution from land use practices.

- A. Nonpoint pollution is generated in some measure by almost all lands and types of uses. It is widely recognized that to control non-point pollution individual management of on-site waste disposal, farming, logging, stormwater control, and others activities needs to be modified. Finance measures are desperately needed to increase the scope of programs needed to teach and institute these best management practices. A unique opportunity exists to combine financing measures with incentives to encourage use of best management practices.

The action program proposed and analyzed is as follows:

Enact state legislation to create a non-point source pollution fee that incorporates low basic rates for landowners that use Best Management Practices and avoidable, higher surcharge for landowners that do not use these practices. Utilize the basic fees to fund source control actions and the higher, avoidable fee revenues to subsidize construction of practices. Create the system through state legislation but allow local governments to collect fees and spend the revenue locally subject to state program requirements. Address major aspects of non-point pollution: failing on-site waste systems, farm practices, and stormwater planning and possibly others. Phase the program, beginning in Puget Sound, and expanding statewide later.

Additional effort to authorize local government to enact such fees and to incorporate subsidy programs and financial penalties into other state non-point grant programs should also be pursued. The analysis of these activities is substantially the same as for a state program.

- B. These proposals address primarily the vision goals of awareness, responsibility and stewardship of Water and Fish and Wildlife Habitat. The proposal is to utilize incentive oriented finance that will make individual responsibility a real choice, and will significantly increase individual stewardship.

C. Action Package Description - Incentive based finance

The 2/9/90 action idea is use of "state and local fees, taxes, financial incentives, and subsidies for non-point pollution control". The detailed explanation can be summarized as the following for ideas based on draft # 10,23,28, and 40.

- * new local fees with incentive/disincentive structure
- * new state fees with incentive/disincentive structure
- * specific reductions in existing taxes or fees for use of best management practices.
- * subsidies for implementation of BMPs

Development of all of these sources of revenue is critical to accomplish the rest of the non-point pollution goals for education, on-site maintenance, stormwater management program, and agricultural source abatement efforts. The overriding concept articulated in these ideas is to use financial incentives and disincentives to improve individual management practices.

II. GAINS AND COST OF TAKING ACTION

A. Resource Benefits

1. Non-point pollution from failed on-site waste systems, for agricultural practices, stormwater run off, and poor forest practices have significantly impaired shellfish and fish resources. Due to non-point pollution:

- * 70% of rivers and 60% of lakes are threatened or already cannot support a full range of beneficial uses.
- * Twenty-two percent of commercial shellfish areas have been closed in the last 10 years.
- * Quarter of recreational shellfish beaches are considered threatened.

We assume that initially 30% to 50% of the rate payers will comply with the requirements to avoid the higher avoidable fees. (Over time this would increase.) This means that up to 50% of the actual sources of pollution will be corrected. For a statewide system addressing the major aspects of non-point previously identified, over 5 a year start up period, a conservative estimate based on how compliance is:

- * 9,000 corrected on-site waste systems (600,000 systems, 5% - failure, 30% compliance)

* 7,200 farm plans developed (300,000 farms, 60% need plans, 30% compliance)

* 90% completion of stormwater planning.

In general if 30 to 50% of the problems are corrected over the first 5 years we would expect a significant reduction in bacterial, sediment and toxic loading to impaired streams and shellfish beds.

2. These estimates have a medium confidence level. They are based on estimates of compliance levels. According to the Department of Revenue, about 80% to 90% of citizens comply with most established taxes, newer less accepted taxes, such as the boater excise tax several years ago, experience 30% to 40% initial compliance.

3. The reduced contamination of shellfish beds will reduce the risk of human health effects associated with illegal use of shellfish from closed areas. The reduced closures of shellfish beds will have direct economic benefits reduced threat to streams will greatly enhance the value of fisheries resources.

4. & 5. It is possible to convert the reduced threats and value of shellfish beds into dollar terms. By 2010 we estimate half of the commercial shellfish beds will be closed. That could be a loss of 19 million at the wholesale level.

6. Other Benefits

A. Incentive based fees will commence a very important and critical phase of nonpoint pollution control which is to begin holding landowners responsible for management practices on a large scale. This is the only technique that can reach, in an effective way, the existing landowners with current problems. Regulation, by contrast, primarily reaches new developments. Special area projects take many years to achieve results for just one watershed.

B. Costs associated with the Action

1. To implement a state imposed incentive/disincentive based fee for Puget Sound the Shorelands program has estimated a collection cost of 12%. This is higher than average due to the complexity of an incentive system, but is offset by the fact that the incentive aspect is a significant pollution control measure in its own right. It is not a finance system that accomplishes no pollution control until spent on programs. Costs would be similar for local programs.

Affected landowners will incur significant other costs to comply with the needed inspections and/or corrective measures needed to escape the higher avoidable fee. For on-site waste owners such a system could cost up to \$100 once every five years to have their system inspected. For Puget Sound region this would have annual private cost of 1.5 million dollars if 50% of landowners complied. Statewide or locally costs would be proportionate. These estimates are 90%.

It is also necessary to coordinate with point source control measures to remediate waterways limited by nonpoint and point source inputs. Under the Clean Water Act, waters must be brought into compliance with standards by setting an acceptable total maximum daily load of pollutants, and consider the nonpoint and point source contributions. The program is inadequately funded.

2. The only competing interest is that local governments also use fees, which are usually traditional revenue raising fees and not linked with management practices like the incentive-based fee. The state will probably need to lead the way into this type of fee.

3. Covered in #1

C. In general, the value of commercial anadromous fisheries and shellfish dependent on healthy watersheds and estuaries totals 97 million. Recreational, life-style, and aesthetic values are in addition. If those resources are 30% more productive due to less impairment of streams. That is a value of 29 million. The noncommercial values probably enable that figure to be doubled, at least.

This benefit is obtained by imposing a fee of 10 million to 15 million per year in cost. Private costs to comply will be in addition and could be substantial in early years.

III. OTHER FACTORS

A. Technical Constraints

A slightly complex billing system is the only constraint. This can be addressed by using revenues to administer collection costs, the higher collection costs are offset by the environmental benefit of the two-tiered fee system.

B. Institutional Constraints

Pre- and post-water quality monitoring is required to measure success of the program. We presently lack data to define the extent and severity of existing problems.

C. Political Factors

State level incentive/disincentive fees will be supported by environmental groups and by local governments if local government is allowed to spend most of the revenue and is compensated adequately for its collection costs. State agencies will support

this proposal if they receive some benefits for their mandates or responsibilities, and if on-site waste or fisheries resources are benefited.

Homeowners, businesses, and farmers who pay the fee and must utilize BMPs to qualify for low fees are likely to oppose the fee. Watershed management committee and other citizen bases water quality groups are likely to support it.

IV. ROLES

A. Implementation

- * local government would collect and spend the revenues from the fees
- * state government would propose and justify enactment of the fee system and area revenue use
- * private landowners would pay the fees and proper management costs
- * businesses and individuals are treated alike in their capacity as landowners

B. Accountability

Ecology and local governments would be the responsible agencies. The responsibility is entirely consistent with existing responsibilities.

C. Schedule

A first phase state/local fee system for Puget Sound should be proposed in the 1991 legislature. It will take several years for the system to be fully operational, so delays have an environmental cost.

STATE OWNERSHIP OF SUBMERGED LANDS

I. INTRODUCTION

Use regulatory authority of state ownership of submerged lands to prevent or reduce contamination from point source dischargers.

The state of Washington owns over two million acres of submerged or aquatic lands. The lands are managed by the Department of Natural Resources (DNR), the state public lands management agency, to ensure their long-term ecosystem and economic viability. The benefit of all current and future citizens of Washington must be considered by DNR when making decisions affecting aquatic lands and associated resources. As steward under state statute, DNR minimizes adverse impacts to the ecosystem while providing social and economic benefits.

Urban growth is placing increased pressure on aquatic lands. Point source discharges which contribute to the pollution of state waters include: wastewater treatment plants, combined sewer overflows and storm sewers, urban runoff, and manufacturing processes. The metals, bacteria, organic compounds, and debris from point source discharges accumulate in the sediments of aquatic lands and affect aquatic lands by diminishing their ability to sustain aquatic life and by creating a public health hazard.

Historically regulatory agencies have required permits for point source discharges. State funds may be used for cleanup costs when potential responsible parties contaminate state-owned aquatic lands.

The proprietary interests of the state and associated liability require the Department of Natural Resources to take an active role in evaluating the siting and level of allowable pollution from point source discharges on or near aquatic lands. The Department of Natural Resources may need to establish stronger environmental standards of performance for users of state-owned aquatic lands, due to the risk of public liability for damages and cleanup and to protect the natural resources.

The Department of Natural Resources could establish additional controls on point source pollution by exercising its proprietary responsibilities in the following areas:

- * Increase environmental review coordination with other agencies.
- * Incorporate more environmental considerations in authorizing the use of state-owned aquatic lands for discharges.
- * Develop an aquatic lands inventory and monitoring program to determine appropriate locations for discharges and to monitor cumulative impacts.

- * Seek full compensation for damage to or loss of state-owned aquatic lands and associated resources.
- * Pursue environmental cleanup of state-owned aquatic lands.
- * Change use fees to accurately reflect the environmental costs associated with point source discharges.

The following action ideas have been incorporated into this package:

"Use the state's ownership of submerged lands on which outfalls are located as an additional tool, not subject to the same legal constraints as regulatory authorities, i.e., when determining whether to lease state submerged land for outfalls and when calculating lease rates, the state as a landowner has a cause for legal action to prevent or correct damages, etc." (Water Resource Public Comment 12).

II. GAINS AND COSTS OF TAKING AN ACTION

A. Risk Reduction/Resource Enhancement Potential

Risk Reduction: The potential of the above actions to reduce the long-term impacts of point source pollution is considerable. If damages to aquatic lands and associated resources are prevented or reduced, the long-term public interest will be assured through limited impacts to the aquatic ecosystem, continued safe use of state-owned aquatic lands, and through a reduction in future liability for damages or cleanup expenses.

B. Costs

1. State funds may be used for cleanup costs when potential responsible parties contaminate state-owned aquatic lands. Revenue from state-owned aquatic lands leases has been the major source of administrative funds for the DNR's Division of Aquatic Lands; this has limited the ability of the division to fully assert a stewardship role.

The DNR's Division of Aquatic Lands is not currently conducting the activities described above. The activities would significantly increase budget costs. Existing management funds are completely committed to current priority activities.

2. Aquatic lands which are damaged by point source pollution are less environmentally productive. The presence of contaminated sediments on state-owned aquatic lands results in a significant loss of DNR's ability to manage for a range of uses, including dredging for navigation or marinas. Where commercial and recreational shellfish beds are affected, the sites are decertified and no longer usable. The local economic base is reduced.

The Department of Natural Resources will lose opportunities for lease revenue as more state-owned aquatic lands are contaminated and unavailable for use. Less revenue results in less funding for necessary land management and a smaller amount of funds for DNR-sponsored public access projects. Other recreational sites become more intensively used. To the extent that the entities responsible for the contamination might not pay for the cleanup, the potential cost to the state for future cleanup may represent a significant financial burden.

3. The lack of available management funding means that other sources would be necessary.

C. Summary

The cost of expanding the Department of Natural Resources' role would be substantially offset by the prevention of damages to state-owned aquatic lands and associated resources and the reduction in future liability for damages or cleanup expenses. However, there will be no increase in revenue to finance these expenditures.

III. OTHER FACTORS

A. Technical Factors

Data is needed on locations and amounts of existing contamination on state-owned aquatic lands. Aquatic habitats and resources that could be impacted by pollution need to be identified.

A near-shore habitat inventory and monitoring program to measure existing aquatic habitats and resources has just begun, and little of the background data for a baseline is available. DNR decision makers must consider requests for use of state-owned aquatic lands using limited information. In the next biennium, the DNR will be seeking funds for a site evaluation program of state-owned aquatic land lessees to further investigate the possible presence of contaminated sediments. The purpose will be to determine which sites need long-term monitoring or cleanup.

B. Institutional Constraints

More coordination would be required between the proprietary responsibilities of the state and the regulatory responsibilities of local and state government. It would be necessary for the Department of Natural Resources to actively participate in point source discharge decisions early in the design and permitting phases. Additional technical staff would be necessary to coordinate in the review of point source discharge siting.

Currently, the Department of Natural Resources is limited by statute from charging for placement of public sewage discharge pipes on state-owned aquatic lands (RCW 79.90.470).

C. Political Factors or Implications

The Department of Natural Resources currently has legislative authority to determine where and whether point source discharges will be allowed on state-owned aquatic lands. Where uses on private land causes damage to state-owned aquatic lands, the Department may be able to recover compensation for those damages.

Expanded use of the state's proprietary responsibilities and authority may make negotiations between point source waste dischargers and regulators more complex. Dischargers may be reluctant to compensate for the full impact, and regulators may be reluctant to consider more long-term, cumulative impacts of permitting discharges. However, the full environmental and economic cost of point source pollution would be more thoroughly considered.

The ability of local communities to grow may be affected. A higher level of treatment for point source discharges may be required. Compensation to the state for the value of lost resources and lost opportunities for lease revenue may be required.

The environmental community is likely to strongly support coordinated proprietary and regulatory state efforts to control environmental impacts. A public education program would be needed to inform the general public about the benefits of potentially higher utility rates in exchange for lower future public liability for environmental cleanup expenses.

IV. ROLES AND RESPONSIBILITIES

A. Implementation

Under existing law, proprietary authority resides in the Department of Natural Resources, the state's public lands management agency. The Department of Natural Resources' ability to protect and manage state-owned aquatic lands could be enhanced by increasing environmental review coordination with other agencies; incorporating more environmental considerations in leases of state-owned aquatic lands; developing an aquatic lands inventory and monitoring program; seeking full compensation for damage to or loss of state aquatic lands and associated resources; and pursuing environmental cleanup of state-owned aquatic lands.

Regulatory agencies, such as the Department of ecology, would coordinate their interests and activities with the Department of Natural Resources to reconcile possible conflicting state goals. Local governments would need to consider the possible impacts of their planning and development decisions on state-owned aquatic lands. Public and private development interests would be expected to discuss and negotiate with the Department of Natural Resources early in the development process.

B. Accountability

The Department of Natural Resources would have accountability for ensuring the implementation of the proprietary activities discussed above. The existing aquatic lands management program would need additional funding and technical staff to perform an expanded role in public policy discussions on point source discharge.

C. Schedule

Over the next six years (1990-1996), aquatic lands and associated resources need to be inventoried, impacts from point sources need to be monitored, and the true (full) cost of resource impacts must be established and factored into discharge siting decisions.

URBAN STORMWATER

I. INTRODUCTION

Establish stormwater management programs on a local level to improve water quality. Include plans for vegetation management to control sedimentation and erosion.

Residential, commercial, and industrial land uses have a much higher volume of stormwater runoff than rural land uses. In these developed areas, certain pollutants are more prevalent than in undeveloped areas. Typically, contaminants include suspended solids, nutrients, bacteria, oils and grease, and metals and other toxicants. Many of these contaminants are associated with motor vehicles; others with applications of fertilizers and pesticides; pet feces; or poor management of various wastes. Runoff from developed areas carries those pollutants into the nearest body of water. Stormwater is a significant source of the pollutants that have concentrated in sediments in several urban bays. Washington State's 1988 CWA 305(b) report to EPA states that pollution from diffuse sources such as runoff from urban and agricultural areas is cited as the leading cause of water quality impairment. Nonpoint sources were the cause of nonsupport for more than 70% of the assessed rivers and streams, nearly 70% of the assessed lakes and more than 90% of the assessed estuaries. Contaminants in stormwater may exceed the allowable levels of pollutants for secondary sewage treatment plants.

Successful elements of a stormwater management plan would include:

- o Technical guidance from Ecology which would include sedimentation control, best management practices, and retention/detention basin design. Ecology is already developing a technical model.
- o Possible requirements for stormwater pollutant control and maintenance programs for public and private systems.
- o Education of private homeowners on proper household chemical use, proper disposal of used motor oil, and proper care of automobiles.
- o Encouraging the expansion of local stormwater utilities to finance stormwater management programs.

As the 2010 Vision Statement aptly points out, public awareness and knowledge of the part we all should play in preventing and controlling pollutants in stormwater will help us become better stewards of the environment. Proper disposal of used motor oil, proper use of household and garden chemicals, proper care of automobiles, proper design and maintenance of industrial areas, etc. will help improve the water quality in stormwater runoff.

The following action ideas have been incorporated into this package:

- o "Develop strategies for controlling urban stormwater runoff"
- o "Develop vegetation management and sediment retention requirements"

II. GAINS AND COSTS OF TAKING AN ACTION

Risk Reduction/Resource Enhancement Potential

The implementation of a Stormwater Management Program statewide would play a major role in preventing and controlling pollutants from being discharged into the environment. Because urban runoff contributes about 60% of the total lead, 30% of the total zinc, and much of the total fecal coliform bacteria, stormwater management would provide a high level of pollutant prevention and control. Sediment runoff rates from construction sites are typically 10 to 20 times that of agricultural lands; therefore, erosion and sedimentation control for new construction will significantly reduce the amount of sediment leaving the site. It has been estimated that approximately two million gallons of used motor oil are illegally dumped into the environment each year. There is a high confidence level that a public education program will considerably reduce these illegal discharges into stormdrains. As stated earlier, nonpoint sources such as runoff from urban and agricultural areas is cited as the leading cause of nonsupport for more than 70% of the assessed rivers and streams, nearly 70% of the assessed lakes and more than 90% of the assessed estuaries. The stormwater program will play a significant part in restoring these water bodies and thereby opening closed shellfish beds, improving swimming beaches, increasing fish spawning area production, etc.

All of the above actions have a direct link to human health risk reduction benefits and resource enhancement. Reduction of pollutants in sediments improves fish and shellfish production and reduces bioaccumulation of toxics that directly affect human health through consumption. Reduction of erosion improves stream and wetland habitat and fish spawning beds. Reduction of oil discharges into storm drains improves the environment for water fowl, sea animals, and fish. These actions also have a direct link to economic risk reduction benefits through improved shellfish harvesting by opening closed beds, improved fishing enhancement of stream habitat and spawning beds, improved beaches used by the public and the total improvement of quality of life.

Stormwater management for improving water quality is still in its beginning stages. At present there are approximately 25 local stormwater utilities in this state. These utilities charge rates ranging from \$18 to \$88 per household per year. It has been estimated that to implement the Puget Sound Water Quality Management Plan would require an additional

\$39 million per year. Of this total, the stormwater program needs are approximately \$9 million per year. Local governments, however, have noted that these figures do not include the full costs of local program implementation and that about \$160 million per year is a more realistic estimate of the cost to implement the stormwater program.

Any existing studies on the cost of stormwater management would have been specific to a particular drainage basin or site. Some of the "208" studies include stormwater quantity control and are quite outdated.

The cities and counties that have established utilities have done some planning and cost estimates for stormwater management. These estimates may provide information that could be applied on a more generic basis statewide. Departments of Health and Fisheries have estimates on the shellfish and fish productions and revenues lost to pollution. There aren't many reports available on the economic benefits of a stormwater management program. With such a program and the diffuse nature of the pollutant sources and its effect on the environment, the establishment of dollar values for the program may be extremely complicated.

As pointed out above, the stormwater program provides benefits to increased shellfish beds being recertified, public beaches being opened, increased fisheries, protection of valuable wetlands, human health protection, protection of stream habitat, etc. Because of the extent and variability of rainfall and soil types across the state, the benefits of the stormwater programs will be as extensive and variable in its distribution.

III. COSTS

Ecology is currently developing guidance for local stormwater management programs required under the Puget Sound Water Quality Management Plan. This includes a comprehensive technical manual and guidelines and model ordinances for local government use in developing stormwater pollutant control and maintenance programs for public and private systems. Ecology estimates that eleven additional FTEs per year (existing staff = 4 FTEs) will be required to implement the program for the Puget Sound basin (estimated cost at \$984,500 per year). Ecology also has estimated that to extend the program statewide would require three additional FTEs in headquarters (cost = \$196,900/year) and ten FTEs in the regional offices (costs = \$656,300). These estimates are based on the level of guidance, and technical assistance needed by local government and the estimated time to do program development and biennial audits for compliance.

The Stormwater Program includes a "Basic" and a "Comprehensive" element. The Basic element includes public and private storm sewer system maintenance requirements and runoff controls for new development. The comprehensive element is in addition to the Basic (applies only to Census

Bureau defined urban areas) and includes: problem identification; location and correction; public education; spill-control; inspection, compliance and enforcement measures; and an implementation schedule. Most of the cities and counties required to do the Basic program are smaller jurisdictions and require a lot of guidance from the state to complete their requirements. However, the urban cities and counties will have the bulk of work to do and require most of the staff time and resources. The city of Seattle, for example, has just established a utility to do a stormwater management program and set their rates at approximately \$32 per household per year. This is about the average for existing utilities; however, this charge is not adequate to accomplish all the needed stormwater management projects. This cost could be as high as \$54 per person per year or a total of approximately \$160 million for the Puget Sound region. No estimate is available for the remainder of the State.

IV. OTHER FACTORS

A. Technical Factors

The Stormwater Management Program requires local government to implement their own program to control pollutants in urban runoff. Because stormwater is so diffuse and methods of treatment and control are untested, the management practices and control measures in the technical manual require additional investigations to determine applicability and effectiveness. There are many existing demonstration projects funded through state grants that are monitored and will provide some of the needed information. However, it will take more monitoring data and many different projects to determine technological constraints.

B. Institutional Constraints or Implications

The state guidance is being developed under Chapter 90.48 RCW (Water Pollution Control). Local government will develop their programs using this guidance and their existing statutory authorities. Local government has the option to form a stormwater utility or develop other methods to finance their program.

C. Political Factors or Implications

There are some local governments that object to the financial burden of a stormwater program. (Refer to Initiative 62). Adopting a stormwater utility may be difficult for some cities and counties because of the political situation and financial capabilities of the citizens. The technical requirement for sizing stormwater treatment systems will make some larger developers and local planners rethink the amount of open space that should be set aside. However, most

cities and counties in the larger urban areas already have a stormwater utility in place and support the development of the stormwater management rule.

Very recently, Ecology has been informed by the State Attorney General's office that it may not have adequate legal authority to adopt the regulatory program for stormwater management envisioned under the Puget Sound Water Quality Management Plan. This issue is being examined in more detail at this writing to determine an appropriate approach,

V. ROLES AND RESPONSIBILITIES

A. Implementation Responsibilities

Government: ECOLOGY will develop the guidelines, train local government about requirements, offer technical support and training, review and approve local programs, investigate complaints, enforce regulations, and audit local programs biennially. LOCAL GOVERNMENT will develop stormwater management programs that include public and private maintenance requirements, development of new stormwater controls, problem identification with follow-up investigation and correction, public education, spill control program, inspection, compliance, enforcement measures, and an implementation schedule.

Business: The program and technical guidelines adopted by local government will require private commercial and industrial development to complete a drainage plan and install and maintain stormwater controls in accordance with the technical manual. Stormwater controls include best management practices for source control and prevention. Businesses should provide appropriate recycle collection centers for the disposal of used or unused portions of their product (e.g., used motor oil).

Individuals: The individual citizen is a vital part of a successful stormwater management program. Through public education and involvement programs, the individual should learn proper disposal techniques for used motor oil, proper use and disposal of household and garden chemicals, proper vegetation management, and proper waste recycling as well as actually working on projects to improve, prevent and control stormwater pollution in their communities.

B. Accountability

Ecology shall develop and implement the stormwater management program. Stormwater pollution control is directly related to the Water Pollution Control Act (Chapter 90.48 RCW) and is an integral part of the Water Quality Program. Stormwater management is also

interrelated with the wetland, sediment and flood control programs, solid and hazardous waste regulations, grant projects, UBAT plans, and water resources.

Local governments will be accountable for the development and implementation of local programs.

C. Schedule

The present schedule for implementation of the Puget Sound basin stormwater management program is to complete development of the rule, guidelines, model ordinances and technical manual by May 31, 1991. Implementation by local government requires completion of the "Basic" program within two years of rule adoption and completion of the "Comprehensive" program by the year 2000.

Development and implementation of a statewide stormwater management program is possible by amending the proposed rule with assistance from other public and private individuals throughout the state. The technical manual will also require amendments because of the different climate and soils condition statewide. To complete the statewide program together with the Puget Sound program would require extra staff time and extended implementation schedules.

REDUCING DIOXIN RISKS

I. INTRODUCTION

Encourage the development and use of unbleached paper products to reduce risks associated with the bleaching process.

A. The basic purpose of this "Action Element" is to reduce the risk or perception of risk to human health caused by exposure to dioxin and other chlorinated organics in paper products and pulping effluents using two methods:

1. Eliminate this source of dioxins and chlorinated compounds to the environment through promotion of non-bleached paper products. The emphasis would be to change the buying habits of Washington State agencies, businesses, and the general public. A first step would be to require all state agencies to purchase unbleached paper.
2. Reduce this source of dioxins and chlorinated compounds through better understanding of the sources of these compounds in the various pulp bleaching processes and by actively promoting the use of industrial bleaching processes and practices that reduce dioxin and chlorinated compounds production.

Pulp manufacture, like most chemical processes, results in emissions, effluents, and solid residues that must be disposed of. This action element focuses on residual chlorinated compounds in paper products and chlorinated bleached pulp mill waste effluents (with emphasis on TCDD and TCDF). Air emissions and solid wastes are not considered here.

Most uses of paper products require that the original stock and/or the final product be as white as possible. Careful analysis in many cases will reveal that a slightly brown colored product would function just as well. Coffee filters are a good example. Aesthetics, tradition, and habit usually are involved.

It has been estimated that no more than 10 percent of the total solids in the waste stream of a pulp bleaching plant contain chlorinated derivatives. However, their toxicity to aquatic biota has raised concerns among biologists. Chlorinated mill wastes have only recently been focused on in the United States. Three pertinent EPA/Industry cooperative studies known as the "5 Mill, 104 Mill, and the 25 Mill" studies either completed or in progress. At least one Washington State mill is involved in the "25 Mill" study which will look extensively into both the effluent levels and process sources of dioxins and chlorinated compounds. A study of dioxins in the Columbia river has been completed by Washington State. Several

Puget Sound bays and other state waters have been studied for chlorinated organics contamination.

"Dioxin" is the term used in referring to the family of 210 chlorinated chemicals known as chlorinated dibenzo-para-dioxins and chlorinated dibenzofurans. The most toxic member of this large family of compounds is 2,3,7,8-tetrachloro-p-dibenzodioxin (2,3,7,8-TCDD or TCDD). The closely related compound 2,3,7,8-tetrachloro-dibenzofuran (2,3,7,8-TCDF or TCDF) is believed to be about one-tenth as potent.

Both of these chemicals can be formed during the manufacture of bleached wood pulp if chlorine is used as a bleaching agent. TCDD is considered to be highly toxic based on laboratory animal experiments and has been linked to malignancies, birth defects, and physical deterioration in animals. Evidence of human health effects is less certain and remains a contentious issue among scientists. The U.S. Environmental Protection Agency (EPA) classifies it as a "probable human carcinogen." (1)

B. The 2010 vision statement lists responsibility as a necessary goal of the future. Citizens would have to be responsible for buying non-bleached paper products and industry would be responsible for reducing/eliminating bleaching processes.

C. Specific Action Ideas

1A. Identify non or less bleached paper products whose use could and should be promoted.

1B. Identify sources of these products.

1C. Promote markets for these products by methods such as to
a. Require state agencies to buy them preferentially even if more costly (some % preference could be given).
b. Publicize through state publications, educational workshops, and any other means available.

2A. Collect and analyze the best scientific data available concerning current bleaching technologies with their typical product and effluent contaminants and levels. This is being done now by some programs but it needs to be given out more. The perception/reality situation on TCDD risk exposure by the public is an example of the problem this would hopefully lessen if it is approached properly. People probably are leery about numbers like $.013 \times 10^{-15}$. It is extremely small.

2B. Apply this best technology to Washington State sources through any influence we have. Currently NPDES permits and

other regulatory efforts are doing this. These efforts should be continued based on the best scientific data available. Perception of risk is not scientific data.

II. GAINS AND COSTS OF THE PULP DIOXIN REDUCTION ACTION

A. Risk Reduction/Resource Enhancement Potential

This action agenda item does not pretend to be an exhaustive treatment of the risk exposure potential. The cursory review of literature and personal contacts with Ecology staff by this section have turned up very little actual documented human examples of dioxin induced health problems. As mentioned in section IA, high dose animal studies link TCDD to malignancies, birth defects, and physical deterioration in animals. A DOW Chemical study of 2,192 employees that had some degree of exposure to dioxins while working with chlorinated phenols showed a 15% rate of chloracne but a mortality rate that was lower than normal. (2)

The above paragraph shows that a numerical measurement of risk reduction will be difficult. The reduction in the perception of risk that would come from this element would be very real to the public. Fears about use of paper products such as milk cartons would be reduced. Use of state waters and the fish caught from them would be enhanced.

IIB. COSTS

State costs to implement this program are minimal. Probably 1 FTE's time equivalent plus the publishing, workshop, and related educational expenses. Most activities on the process element (Item 2) are currently being done somewhere in Ecology.

If data indicates that major process changes are needed, costs to industries involved could be in the millions of dollars, depending on the extent of process modifications required.

III. OTHER FACTORS

Information will be added at a later date.

IV. ROLES AND RESPONSIBILITIES

Information will be added at a later date.

IMPLEMENTING POINT SOURCE POLLUTION PROGRAMS

I. INTRODUCTION

Expand the existing wastewater discharge treatment program by adding more dischargers to the permit system.

In order for the state's waters to be protected, Ecology must continue to operate the Wastewater Discharge Permit Program, which controls and limits the discharge of effluent that has been fouled by industrial uses or municipal treatment processes. This program has had some remarkable successes, but is faced with increasing challenges as the state faces unprecedented population and industrial growth.

Ecology has the technical skill to ensure reduction of contaminated discharges to the State's waters. In order for this program to be effective, however, more unpermitted dischargers must be brought into the permit fee system. In addition, better coordination with nonpoint pollution control programs must be achieved to limit both point and nonpoint source inputs. Waters must be brought into compliance with standards by setting an acceptable total maximum daily load (TMDL) of pollutants. Measures taken to accomplish these goals should include:

- o Increase existing Wastewater Discharge Permit Fees (presently \$3.6 million per year) to an amount that will fully fund the program. This action has the potential to more than double fees. This increase will be accomplished via existing rules making processes (authorized by Chapter 90.48 RCW and WAC 173-224). No new legislation is required to accomplish this goal.
- o Amend existing legislation that presently holds discharge permit fees paid by municipalities at an artificially low level. This legislative effort must also include actions that assure budget appropriations that are sufficient to allow Ecology to fully protect water quality from contaminated point source discharges.
- o Keep permits current through regular updates, and increase inspections to insure compliance (see page ?? of this report for further discussion.)

2010 identifies the protection, and improvement, of Water Quality as one of the most critical environmental concerns facing the State. Full funding that supports the control of point source discharges of wastewater is critical if this important task is to be accomplished.

This package addresses the action plans which questioned how Washington can generate sufficient revenue to fund point source pollution control and evaluation measures (action plan numbers 31, 33, 34).

II. GAINS AND COSTS OF TAKING ACTION

A. Risk Reduction/Resource Enhancement

1. Without increased and improved controls on point source discharges, there is a real and immediate, threat to human health, animal health, and general water quality conditions. If Washington fails to generate sufficient revenue to support water quality (point source) protection programs, we will be unable to administer the wastewater discharge program in a manner that eliminates these immediate threats.

2. There is a direct link between raising permit fees, and fiscal resources in general, and the effectiveness of this proposed action in reducing risk. Ecology has the personnel, experience, and skills to protect against unregulated point sources of contaminated discharges to the State's waters. Ecology needs adequate funding to ensure this happens. Increasing existing discharge permit fees, eliminating the municipal fee cap ("5 cent" per month), and requesting full support from the legislature in the State budget, will all help Ecology to achieve success in controlling pollution from point source dischargers.

3. In addition to protecting human and animal health, and protecting the water resources, the quality of life of every Washingtonian will be preserved as a result of these measures.

B. Costs

1. There are approximately 1000 point source discharge permits administered by the Department of Ecology. Each permit holder pays a fee. The fees vary from a low of \$1.62 per year to a high of \$40,000 per year. Under these recommendations, each industrial permit holder will pay at least twice as much as at present. Because of limits placed on what municipalities pay by Initiative 97, there will be no fee increases for municipal dischargers.

2. Any increase in the amount of permit fees paid by holders of point source discharge permits will result in protests from permit holders.

3. There are no additional monetary costs to Ecology to implement these increased fees.

III. OTHER FACTORS (technical, institutional, or political constraints)

There are no technical constraints to implement any plans to increase permit fees. However, industries and municipalities impacted by increase permit fees may elect to challenge any new fee schedule. Such a challenge might result in an attempt to change permit legislation.

Pollution prevention through waste reduction is one area that needs to be explored further. The potential for cost savings are enormous. Ecology should encourage this by developing a municipal pollution prevention program. Ecology should also coordinate with local universities and research centers to pursue any new waste reduction technologies that develop.

IV. ROLES AND RESPONSIBILITIES

A. Ecology's role is to implement rules to increase fees, then act to aggressively collect revenue due. Fundamental to this role definition is the assumption that there will be an open, frank dialogue between the Department and its permit holders. Ecology must then use all available resources in an effective and efficient manner to manage point source discharges. This will include changes in Water Quality Standards, Water Quality permits, compliance activities (self-monitoring and inspections) and enforcement. In addition to their responsibility to follow permit guidelines and limits, industry and municipal governments also have a responsibility to pay their fair share of the costs assigned to them.

B. Time Schedule. Ecology will begin the rule making process to amend WAC 173-224 in July of 1990. It is expected to take a full year to follow all of the steps necessary to adopt changes to the rule which will increase permit fees. While this process is underway, the department must also begin the state budget process in April, 1990. This process will result in an appropriation request that will be significantly above previous years requests, and will reflect the increased revenue available to the agency generated by increased permit fees.

USE OF INCENTIVES TO DECREASE POLLUTANT DISCHARGE

I. INTRODUCTION

Encourage the recycling and reduction of wastewater from permit holders by implementing a variable fee system based on the amount and toxicity of discharge.

A. Description of Action Package

The 2010 Public Advisory Committee listed point and nonpoint source discharges to water in the top priority level of threats to the environment. Water quality can be threatened by everything from wastewater treatment plants, to urban runoff, to agricultural and forest practices. This section will focus on incentives to decrease point source pollution. Nonpoint source incentives are covered in the section titled "Nonpoint Pollution Control Finance Measures". Point source pollution comes from industrial facilities and sewage treatment plants. It is regulated by federal and state permits. Under the permit system, the permit holder cannot discharge above a legally enforceable limit. Fees are charged for these permits to help cover the administrative costs to Ecology of operating this program.

The permit system has achieved considerable progress in limiting conventional pollution. Many industries have reduced their discharges substantially, and most sewage treatment plants in the Puget Sound have converted, or are converting to, secondary treatment. Secondary treatment will further reduce the amount of pollutants entering our waters. However, there are several problems associated with this system. Toxic pollutants are not effectively regulated. There are few requirements for monitoring receiving waters. In addition, funds and methods for detecting unpermitted dischargers are limited. Therefore, the state's waters are still threatened from point source pollutants.

Another criticism of this system and other types of regulatory programs is that the cost of discharging waste into the state's waters is not fully borne by dischargers. The permit system does not charge a price for the right to discharge wastewater; rather, it sets limits on the use of that right in order to decrease environmental damage. Some people think that if pollution prevention were a cost of the production process, then there would be an economic incentive to reduce wastes and recycle. As it stands now, permit holders have no incentive for reducing waste below the levels set by the permit systems. A true variable fee would be

based on all of the costs and damages that a discharge imposes.

The Puget Sound Water Quality Management Plan required the Department of Ecology to conduct a study of the feasibility of establishing variable fees based on the harmful characteristics of effluents. This paper is based on that study. In addition, the Model Toxics Control Act (Initiative 97) states that fees charged for permits may be designed to encourage recycling and reduce pollutants. If a variable fee accurately reflects the economic damage a permit holder causes by discharging waste into our waters, it will give the permit holder an incentive to reduce that waste. A true variable fee would, in effect, impose stricter effluent limits on dischargers. It should be noted that it is illegal under current permit systems to impose only fees to limit pollution in water quality limited water bodies. Therefore, the variable fee system would be used in addition to the regulatory permit system already in place.

B. Relationship to the Environment 2010 Vision Statement

The 2010 vision statement encourages the use of more incentive-based approaches to environmental problems to increase cooperation between government, industry and citizens. Variable fees would make permit holders more aware of the environmental damage inflicted by their operations. Higher costs for more harmful effluents would provide incentives to find innovative ways to reduce and recycle discharges. The government would no longer be the only party responsible for controlling water pollution. Finally, any action that would reduce point source pollution would be beneficial to the vast majority of people in this state.

C. Specific Action Ideas Supporting this Action Package

This package supports the following action idea from the Public Advisory Committee meetings:

"Use taxes, fees and other financial incentives to decrease pollutant discharge."

II. GAINS AND COSTS OF TAKING AN ACTION

A. Risk Reduction/Resource Enhancement Potential

1. The state's water quality standards are based on the assumption that each waterbody has beneficial uses which must be supported. Examples of beneficial uses are domestic and industrial water supply, and fish spawning and harvesting. These uses are threatened

if pollution sources are close to the level which could cause water quality to drop in the near future. They are impaired if one or more of the beneficial uses are not fully supported. Data from Ecology's water body system printout lists some of the waterbodies threatened and impaired by industrial point sources, municipal point sources, and storm sewers. For this survey, 24 estuaries, 7 lakes and 34 rivers were assessed:

	Size Impacted	Total Assessed	% Impacted of Total Assessed
Estuaries (threatened)	95 square miles	841 sq.m.	11%
(impaired)	144 sq.m.	841 sq.m.	17%
Rivers (threatened)	84 stream miles	941 st.m.	9%
(impaired)	857 st.m.	941 st.m.	91%
Lakes (threatened)	111,110 acres	111,690 acres	99%
Lakes (impaired)	580 acres	111,690 acres	1%

Clearly, many of our waterbodies do not meet the Water Quality Standards.

Shellfish beds are affected mainly by non-point source pollution, but point sources also play a role. In 1987 harvesting was either restricted or prohibited at 33 shellfish beds around the Puget Sound area. Five out of 15 requests for commercial shellfish bed classifications were denied due to bacterial contamination.

Swimmers can contract gastroenteritis from swimming in water contaminated from sewage treatment plants. As the population rises in the Puget Sound area, the infection rate of swimmers may also rise as the number of sewage treatment plants are increased, and placed closer to swimming beaches.

Those who fish recreationally in urban areas are also at risk from contaminated waters. The 2010 risk evaluation report states that the maximum exposed individual (MEI) who fishes recreationally is at risk from PCB, DDT, alpha-BHC, and dieldrin and dioxin concentrations in fish. Shellfish gatherers are at risk from polynuclear aromatic hydrocarbons (PAH). Several of these toxins are known to be discharged by point source pollutants. This report also states that a high consumption of PAH rich shellfish could result in 4 additional cases of cancer over 70 years. The methods used to calculate these figures assumed that the MEI who gathers shellfish weighs 70 kg, which is an average weight for a man. Women, children, and minority populations are not represented in this assessment and may be at a higher risk for cancer if they consume PAH rich shellfish.

2. Variable fees are not an alternative to the current permit

programs. Instead, they can be used in addition to discharge permits to control water pollution. Variable fees would add a modest incentive to discharge below the current pollution limits. Data to implement variable fees is available.

3. Variable fees are set according to the amount and toxicity of discharge. Thus, they make pollution control a cost of doing business, which was a goal suggested by the Public Advisory Committee. They also provide incentives for recycling and reducing waste.

B. Costs

1. Variable permit fees are most effective in lowering pollution levels if permit holders respond to fees rather than current limits. These fees would have to correspond to the amount of environmental damage caused by each permit holder's discharge. Fee levels would have to be determined very accurately, in order to give incentives that would achieve pollution reduction. Unfortunately the cost to Ecology of determining accurate fees would be very high, if not prohibitive. Extensive engineering and cost studies would be required.

Therefore, at this time it is not cost effective to have a variable fee system if the goal is merely to impose tighter effluent limits. It would be far more effective to impose stricter limits on the permit system already in place. However, variable fees can be used in another capacity. If a variable fee was set at an estimate level, using existing data from the current system, it could be used to charge permit holders according to a rough estimate of the amount and toxicity of their discharge. These fees would provide a modest pollution-reduction incentive. Revenue from these fees could be used to fund water quality programs, once the initial costs for setting up the new system were absorbed.

If such a system were adopted, funds will be needed in the implementation process to hire scientific consultants to estimate fee levels. Funds will also be needed to hire permit writers to write additional monitoring requirements. Funds to administer the system will have to be included in the 1994-95 biennium's budget.

2. The use of variable fees can only work if limit on fees to municipal sewage treatment plants is lifted. Currently, this charge does not even cover the cost of writing and administering most of their permits. In addition, sewage treatment plants would not be charged according to the amount and toxicity of their effluents. This would only lead to resentment by industrial sources and could threaten any variable fee system.

In addition, every effort should be made to find to bring unpermitted dischargers into the variable fee system, for the same reasons.

3. The most cost effective way to have a variable fee system is to have the fee levels based on those already determined by the current permit systems. In this capacity, variable fees would have a modest usefulness in reducing pollution. Stricter limits on existing permits could reduce point source pollution with little added cost.

III. OTHER FACTORS

A. Technical Factors

Determining variable fees for a few pollutants could be achieved with a minimum of technical effort, using NPDES data. If variable fees were based on a very accurate account of all pollutants discharged, effluents would have to be tested and monitored, which is technically feasible but very costly.

B. Institutional Constraints or Implications

As stated earlier, variable fees will not be useful unless the limit on sewage treatment plants is raised.

One area that needs to be explored further is pollution prevention through waste reduction. The potential for cost savings are enormous. Ecology should encourage this by developing a municipal pollution prevention program. Ecology should also coordinate with local universities and research centers to pursue any new waste reduction technologies that develop.

C. Political Factors or Implications

A policy decision must be made on which pollutants to impose variable fees on. For some pollutants, monitoring requirements of existing permits will produce sufficient data. If pollutants are added for which significant data is not available, testing and monitoring could be very costly.

A variable fee system would likely be supported by citizens and environmental groups who believe that the right to discharge pollutants into the state's waters should be priced. Once it is implemented, it would provide revenue which could be placed in the state's general fund, or be used for water quality programs at Ecology.

IV. ROLES AND RESPONSIBILITIES

A. Implementation Responsibilities

Under the law, Ecology would administer the permit system and variable fee system. An external advisory committee with current permit holders could help determine which pollutants variable fees would be based on.

B. Accountability

The Department of Ecology would be the agency responsible for ensuring continued administration of a variable fee system, since it already administers the existing permit system.

C. Schedule

The earliest that a feasible variable fee system could be put into effect legally is July 1, 1993. It should be easy to meet this deadline. In order to do this, funds for setting up the system must be in the 1992-93 biennium's budget. Put in costs section: funds may be needed to hire consultants to estimate fee levels. Also needed to hire permit writers to write additional monitoring requirements. Funds to administer the system will have to be included in 1994-95 biennium's budget. Permit fees are one source of funding.

IMPLEMENTING WATER QUALITY PROGRAMS

I. INTRODUCTION

A. Description of Action Package

This final action plan lists additional water quality issues not adequately addressed in the previous proposals. Each item is described, a solution is discussed, and costs of implementing the solution are examined. The proposals are divided into two sections, the first requiring legislative authority to implement and the second requiring increased funding for programs already in place. The proposals are listed below.

1. Items requiring legislative authority:

a. Groundwater

Contamination of ground water is a serious concern because more than half of the state's drinking water comes from groundwater, and it contributes to stream flows, lakes and wetlands. Comprehensive legislation for ground water is needed to develop an efficient protection program. See the ground water section of this report for a detailed analysis. See also wastewater discharge permits to groundwater under "items delayed due to lack of funding."

b. Water Quality Standards Modifications

- Aquatic Pest Control

Ecology has responsibility for issuing short-term modifications (permits) to the State Surface Water Quality Standards allowing for the use of aquatic herbicides and pesticides where appropriate. Some examples of permit uses include mosquito control in rivers, streams and ponds and the use of a chemical called sevin to condition oyster grounds in Willapa Bay and Gray's Harbor. Ecology is developing an Aquatic Plant Management Program which will, in part, address the use of aquatic herbicides to control aquatic plants. An SEIS is also planned for addressing the use of aquatic pesticides. No funding or legislation exists for this program. Legislation needs to be established to allow Ecology to collect a fee for aquatic pest control permits. The funding would enable Ecology to develop and implement an aquatic pest control program, which would decrease the use of toxic substances to control pests. The program could result in a total of 300-600 permits/year.

One FTE is needed for every 100 permits. Only 1.5 FTE's are assigned now to this program. Therefore, an estimated 1.5 - 4.5 additional FTEs would be required to administer this program.

- Other Standards Modifications

1. Department of Transportation projects that affect waterbodies.
2. Any private construction near a stream or lake.
3. Bank stabilization and channelization projects.

All of these modifications require permits but lack complete funding. In addition, enforcement and compliance of permits is not being executed, due to lack of resources.

2. Items delayed due to lack of funding:

a. Wastewater discharge permit program

- Wastewater discharge permits to groundwater

Currently about 2/3 of state waste discharge permits that involve discharges to the ground do not require ground water monitoring. In addition, a potentially large number of unpermitted facilities could be affecting ground water quality. There is no written guidance for developing ground water monitoring requirements, and little consistency among the four Ecology regional offices in terms of ground water monitoring provisions. Written guidance, inspection and sampling are needed, especially where groundwater contamination would cause significant threats to the public and the environment.

Requirements: 12 additional FTE's to improve waste discharge monitoring. Assume at least 2 FTE's for compliance monitoring inspections. Add \$150,000 annually in analytical resources, and \$25,000/year for equipment costs.

- Wastewater discharge system

Ecology administers the waste discharge permit programs under the National Pollutant Discharge Elimination System (NPDES) or state waste discharge permits. See the section under "Implementing Point Source Pollution Control" for a discussion of this program. Current funding gaps lead to a failure to:

- eliminate permit backlog in five years and keep permits in current status
- incorporate control of toxic pollutants
- complete necessary inspections and monitoring activities
- review/approve/disapprove required plans and reports from

dischargers

- obtain full recovery of costs on municipal dischargers due to a cap on fees
- discover unpermitted dischargers and incorporate them into the permit fee system. Fee system doesn't permit use of fee derived resources to seek out unpermitted dischargers.
- develop pollution prevention programs for municipal treatment plants

b. Review of Plans and Specifications for Sewage Systems

Ecology is required to review all plans and specifications for the operation and maintenance of sewage or disposal systems. Many hours are spent on this process, yet there is no fee reimbursement to Ecology for this service. Ecology is essentially subsidizing plant owners and operators. A fee system needs to be established to recover costs.

c. Measures to Determine Total Maximum Daily Loads

There is a need for coordination of measures to remediate waterways limited by nonpoint and point source inputs. As per the Clean Water Act, waters must be brought into compliance with standards by setting an acceptable total maximum daily load of pollutants, and consider the nonpoint and point source contributions. The program is inadequately funded.

d. Antidegradation Program

EPA issued a ten year plan for states to meet requirements of the Water Quality Standards for surface waters. The State of Washington is required to fund an antidegradation program. At this time, no resources exist to develop or implement that policy. Development and implementation would need:

- sediment quantity criteria
- bioassessment criteria and procedure,
- monitoring and implementation

Ecology now has 1.5 FTE for development of these activities. 5-7 FTEs are needed for implementation (total).

e. Nonpoint pollution control

See the section on agricultural pollution for a full discussion of this issue. Agriculture, forest practices, stormwater, and onsite sewage systems are some of the nonpoint sources affecting surface water quality. Nonpoint source control programs can be carried out by existing state and local

regulatory authorities. Options to control agriculture are available under the statewide "208" plans, but increased enforcement is needed to implement them. A Memo of Agreement (MOA) with Ecology, the Conservation Commission and individual conservation districts was created to handle agricultural-related water quality complaints. The January 1988 Timber, Fish and Wildlife (TFW) agreement outlined best management practices for the U.S. Forest Service. Implementation of the Clean Water Act requires nonpoint source quantification remediation through best management plans and ongoing evaluation to ensure adequate measures have been implemented. All of these projects require additional resources to be effective.

In addition, the Centennial Clean Water Fund appropriates 10% of its budget for nonpoint pollution projects. In the last grant application cycle, there were many more feasible applications for nonpoint than were able to be funded.

f. Stormwater

The Federal Clean Water Act requires stormwater permits for cities with over 100,000 people. That covers three cities in the state - Seattle, Tacoma and Spokane. The Puget Sound Management Plan requires (by the year 2000) six large urban areas to have a comprehensive stormwater management program. The comprehensive program includes problem identification of and follow-up, public education, spill control, inspection compliance and enforcement, and developing implementation plans for each area. The PSMP also requires basic programs that are less comprehensive for smaller areas around the Puget Sound. There is no stormwater plan for cities under 100,000 outside of the Puget Sound basin. Funding for the PSMP is limited. Also neglected are industries that discharge into cities of less than 100,000. See the "Urban Stormwater" section for details of requirements.

g. Lakes Monitoring

Ecology has an established ambient monitoring program for streams and rivers, but not for lakes. A two year program was established with federal funds, but funding for this program expires in December of 1990. The program will be terminated unless additional funds are found. The program would include:

- | | |
|--|--------------|
| - Volunteer monitoring of approx. 100 lakes | \$68,000/yr |
| - Ecology staff monitoring of 25 lakes/yr | \$ 35,000/yr |
| - Ecology monitoring of 10 lakes/yr for toxic sub. | \$ 70,000/yr |

- Acid precipitation monitoring of 11 alpine lakes		\$ 45,000/yr
	Total	\$218,000/yr

h. State Revolving Fund

The State Revolving Fund was established as part of the 1987 Clean Water Act amendments. It is a loan program that is suppose to be self-sustaining through loan repayments by 1994. Eighty percent of this money is to be used for planning, design and construction of water pollution control facilities. By 1994, the repayments are expected to be in the range of 10-20 million per year. Ecology's water quality needs evaluation states that 168.7 million (1986 dollars) will be needed for planning, design and construction of municipal treatment plants from 1994 through the year 2000 outside the Puget Sound Basin. Estimates for costs inside the Puget Sound Basin will be much higher, due to Metro's secondary treatment plant construction. Therefore, more funds are needed meet secondary treatment plant goals.

i. Education

Education is often listed as a major component in limiting environmental degradation. Each section in water quality has or should have an education component, yet there is no overall coordination among sections. A water quality education coordinator would ensure that duplicate or conflicting education messages are resolved and that the public receives a concise, clear picture on water quality education. An estimated 1-2 FTE's would be needed for this role.

j. Compliance Monitoring

Due to a lack of resources, once programs are created often no follow-up occurs to ensure that they are being implemented correctly. A stronger field presence is needed for regulatory reasons and to provide technical and educational assistance.

3. New Ideas or Approaches

a. Basin by basin planning

Currently water quality problems are addressed using a programmatic approach - they are divided according to nonpoint sources, point sources, stormwater, etc. It may be more useful instead to develop strategies to protect water quality using geographic criteria. This way, all the different programs

would coordinate and implement basin wide plans to control pollution, which may be more effective. Once the reorganization was accomplished, no extra funding would be required. This idea requires further study.

b. Use of new technology

Ecology should coordinate with local universities and research centers to pursue any new technology or management plans that are developed to reduce pollution.

B. Relationship to Vision Statement

By the year 2010, we want our waterbodies to be in excellent condition. By the year 2000, the population of the Puget Sound area alone is expected to increase by 20-25%. This will place increased pressures on water resources. It is essential that we protect water quality.

C. The following action ideas have been incorporated into this package:

- "Enact legislation authorizing fees for Ecology authorizations and approvals that affects water quality, specifically including fees for Water Quality Standards Modifications, and Water Quality Certifications. Use fee revenue to fund Ecology administrative expenses for these activities."

- "Develop budget proposals to fund implementation of nonpoint, stormwater and groundwater programs, public/business/local government education and outreach, enhanced water pollution complaint response and investigation, and development of improved surface water quality standards to address human health, wetlands water quality, and antidegradation. Specific funding should be provided for implementation of Ecology/Conservation Commission Agricultural Pollution Agreement."

- "Enact legislation authorizing fees for Ecology review of plans and reports for water pollution control facilities (RCW 90.48.110). Use fee revenues to fund Ecology administrative expenses for these activities."

II. GAINS AND COSTS OF TAKING AN ACTION

A. Risk Reduction/Resource Enhancement Potential

1. Ecology's statewide water quality assessment report surveys waterbodies in the state to see if current water quality supports

the beneficial uses (as established in the Water Quality Standards for the State of Washington) of the waterbodies. Some of the beneficial uses include domestic and industrial water supply, wildlife habitat, fish and shellfish rearing and harvesting, and recreational uses. The assessment studies whether the beneficial uses are fully supported, threatened, partially supported, or not supported. The following lists percentages of waterbodies with uses either threatened, partially supported, or not supported:

Rivers and streams	-	77%
Estuaries	-	22%
Lakes	-	26%

Obviously, further protection is needed to support beneficial uses. Water quality problems found in rivers and streams are high levels of bacteria, nutrients, suspended materials and toxic metals, siltation, and other habitat modifications. Problems in estuaries include high bacteria levels, low oxygen levels caused by excessive algae growth, and toxic metals and chemicals. Lakes are mainly affected by excessive nutrients, due to nonpoint source pollution associated with urbanization. Fish and wildlife habitats and swimming and other recreation are affected by these problems. In addition, contamination of groundwater may be more widespread than previously believed. Groundwater quality is a serious concern because more than half of the state's drinking water comes from groundwater, and it contributes to stream flows, lakes and wetlands.

Shellfish harvesting is a type of economic indicator to assess the quality of the state's waters. Since 1980, estimated losses from closure of shellfish beds have been over \$3 million annually. Annual harvest of shellfish contributes \$38 million (wholesale value) to the state's economy. Of course, these figures don't begin to address the historical, cultural and recreational values of shellfish that add to the quality of life in this state.

2. Some programs are fully developed, and waiting for funding to be implemented. Others await legislative approval. Water quality staff believe these programs will be effective once they are implemented. Data needs to be collected for some programs, and others can use existing data.

3. Enhancing the quality of life in Washington state is another benefit gained from protecting water quality. This is a nebulous indicator, but it is a major reason why tourists and businesses choose Washington as a place to travel or work. Clean and usable lakes, rivers and estuaries play an immeasurable part in the total quality of life picture.

B. Costs

Costs are listed individually for each proposal.

III. OTHER FACTORS

A. Technical factors

See individual program gaps. In most cases, technical factors are not a major part of the problem.

B. Institutional Constraints

Most of these programs can be handled in the existing institutional framework, and merely require more funding. Ground water legislation would involve coordination between agencies, see ground water section.

C. Political Factors

Political factors should be considered within each program area.

IV. ROLES AND RESPONSIBILITIES

Ecology would have a broader regulatory role if these programs were implemented.

The Water Resources Steering Committee should implement these actions, within the different program areas.

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Environment
2010
Action
Agenda:

Action
Strategies
Background
Analyses

Package
Six:

**Land
Resources**



State of Washington
July, 1996



2010 LAND RESOURCE SUBCOMMITTEE ACTION PACKAGE

INTRODUCTION

The Pacific Northwest's variety of land forms, clean water and abundant salmon, and endless forests of towering fir and cedar nourished the bodies and souls of generations of Native Americans. But starting with the first small group of European-American immigrants to the region, the indigenous hunting and gathering lifestyle began to give way to more intensive use of land and resources. The newcomers cleared the land for agriculture and towns and developed a thriving timber industry, and dammed the rivers for power. The salmon and tall trees became fewer, but a burgeoning agricultural sector supplied apples, wheat, and other important crops.

Gradually, the economy grew and diversified. Natural resources were still important but no longer the only source of income for a growing population. Then, in the 1970s and '80s, further economic opportunity coupled with increasing interest in outdoor recreation and the desire of people in other parts of the country to leave their congested cities, led to rapid development of the Puget Sound area. Now, the very resources and qualities that make the Pacific Northwest a special place to live and work are threatened by urbanization.

THE IMPORTANCE OF RESOURCE LANDS AND OPEN SPACE

This paper addresses lands used for forestry, agriculture, and parks and recreation. Aspects of land resources not covered in this paper include: wetlands, urban lands (although some discussion of urban lands is found in the recreation and taxation sections), and wildlife habitat. These issues were addressed by other 2010 subcommittees.

How significant is the loss of resource lands and open space? Statewide there has been a modest decrease of land in agriculture and forestry resources. Between 1969 and 1987, land in farms declined by approximately 2 percent, or .5 million acres, but in the Puget Sound region, land in farms declined between 7 and 16 percent. Between the mid-60's and 1980, non-federal timberland decreased by about 3.5 percent, but in the Puget Sound region, the loss was over 6 percent.

Moreover, growth has been accompanied by an increase in per capita use of land. This increase is due to a greater number of households, and to a preference for low-density residential development and low-rise commercial and industrial buildings. In King County, for example, the average residential density for new development in 1986-87 was 1.6 units per acre. A related phenomenon is that most growth has occurred in unincorporated areas of the state.

Not only does conversion reduce the number of acres available for resource production and for open space, wetlands, and wildlife habitat, but it results in

the loss of the highest quality land for those purposes. Low-elevation Pacific Northwest forest lands are among the most productive and ecologically rich in the world. Yet, direct development of those lands eliminates a multitude of forest values, and even development next to commercial forestlands makes commercial forestry difficult and, thus, hastens further conversion.

Washington also contains some of the most fertile farmland in the world. Because human settlements have historically been located in proximity to fertile farmland, urban expansion tends to encroach on land of superior agricultural value. The most level areas with well-drained soils that make the best cropland afford the most desirable conditions for industrial, residential, and commercial development; for example, the commercial and industrial development in the Kent River Valley south of Seattle sits upon topsoil 150 feet in depth.

Washington is unique in having significant amounts of open space suitable for recreation and wildlife habitat, although these are rapidly disappearing. Twenty years ago, the state could have assured a network of parks and open space. Land was available and relatively inexpensive. Now, most land within proximity to urban areas is zoned industrial or commercial and priced accordingly. Opportunity still exists, however, to create a regional open space and parks plan, and to purchase significant natural areas, but the time to act is now.

Ecological and amenity values, and important forestry and agricultural land uses, can only be protected if conversion to urbanized uses, and degradation, are reduced. Included in this paper are three "proposals", which explore a variety of measures to protect Washington's remaining parks and recreational areas, forest lands, and agricultural and range lands. Also included are two other proposals concerning issues which strongly influence the other three proposals: taxation reform, and the education of Washington's schoolchildren. These five proposals offer significant opportunities for reversing the trend toward loss and degradation of our remaining land resources.

I. PARKS AND RECREATION

PROPOSAL

Work to achieve the following state recreation and conservation goals:

1. Protect and increase recreation resources near population centers and in areas of natural qualities;
2. Establish a variety of mechanisms designed to increase funding (bond measures, loan programs, etc.) for acquisition of recreation resources and improve effectiveness of facility management (technical assistance programs, etc.);
3. Encourage the private sector to contribute more recreation opportunities;
4. Preserve open space and greenbelts in urban areas;
5. Create partnerships with federal agencies to maintain a variety of outdoor recreation settings; and
6. Produce a state trails policy and implementation plan.

INTRODUCTION

The state recreation and conservation goals listed above are based on the seventh edition of Washington Outdoors: Assessment and Policy Plan, a document produced by the Interagency Committee for Outdoor Recreation. The goals listed above summarize the 23 actions covered in greater detail in this document. For further information on policies, background, etc., readers should consult the Assessment and Policy Plan.

RELATIONSHIP TO 2010 VISION STATEMENT

This proposal supports the stewardship goal of the 2010 Vision Statement.

1. **Protect and increase recreation resources near population centers and in areas of natural qualities**

GAINS AND COSTS

A. RISK REDUCTION/RESOURCE ENHANCEMENT

1. Recreation resources are facilities and properties that range in uses from observing nature in conservation areas, hiking or biking on trails, camping, to using exercise facilities or general relaxation on

waterfront parks. Having these resources available reduces what can be called "social and human" risks such as tension, family or community disintegration, and inappropriate uses of public property. A nearby park or community center with exercise or socializing facilities adds to the general well-being of a community.

The ecological risks to recreational lands are timber harvesting, road building, mineral extraction, misuse of public lands and urbanization. Such risks can be minimized if passive recreation resources are increased in population centers and in well marked and controlled areas with natural qualities.

2. The most accurate way to measure the supply of recreational resources is to count the number of acres and facilities set aside for these purposes. Another indicator of success is the number of visitors using the parks or recreation facilities. A less tangible, but nevertheless valid, indicator is to survey citizens about their impressions of their "quality of life".
3. See number 1 above.

B. COSTS

The cost of buying urban and recreation facilities has been partially documented in the Wildlife and Recreation Coalition's proposal to the 1990 Legislature. These figures do not include operating expenses to maintain and staff the properties. A minimum of \$450 million over a ten year period is required to meet the critical needs of state and local agencies for both wildlife habitat and recreation land acquisition.

Other costs associated with procuring recreation resources are changing land use from industrial or commercial to open space or community recreation facilities. The economic loss depends on the economic uses and profits from the property which would be forgone as the property is shifted to recreational uses. Recreational resources, however, will also bring in tourist or user dollars which may offset the land use change from industrial/commercial to recreation.

C. SUMMARY

Recreation resources benefit a community by giving people places or activities for relaxation and escaping from everyday work. Furthermore, recreational lands can protect habitat for wildlife, and preserve the intrinsic qualities and useful functions of an ecosystem. The resources can also attract visitors who in turn contribute economically to the area.

The costs are the purchase value of the land, operating expenses and economic opportunities lost for the property.

OTHER FACTORS

A. TECHNICAL FACTORS

None

B. INSTITUTIONAL CONSTRAINTS

Funding agencies, such as the state's IAC or the Federal Land and Water Conservation Program, should give priority to urban area parks, i.e. counties which exceed 250 persons per square mile and in cities with 5,000 or more in population.

More cooperative projects should be encouraged to spread the costs of acquisition, development and operation. For example, state funds could buy property, the county could develop it and city and county staff maintain the recreation resource.

C. POLITICAL FACTORS OR IMPLICATIONS

Property owners may not want to sell their own lands nor have nearby property converted for public use. Funding recreational resources also takes away from funding other public needs such as roads, prisons or schools.

ROLES AND RESPONSIBILITIES

A. IMPLEMENTATION

Local agencies; Interagency Committee on Outdoor Recreation; State Parks and Recreation, Department of Natural Resources; Department of Wildlife; Department of Fisheries; Trust for Public Lands; Local Land Trusts; BLM; NPS; Fish and Wildlife Service.

B. ACCOUNTABILITY

Same as above.

C. SCHEDULE

The timeframe depends on how much money is made available in the 1990 Legislative session. Over the next five years (1990-1995), recreation resources need expanding through cooperative agreements, focusing existing funds on urban areas, and establish an environmental ethics committee to stop misuse of public lands.

2. **Establish a variety of resources designed to increase funding (bonds, loans, etc.) and improve effectiveness of facility management (technical assistance to local park agencies, etc.).**

GAINS AND COSTS

A. RISK REDUCTION/RESOURCE ENHANCEMENT

1. Risks to recreational resources (land or facilities) can be stopped by creating new opportunities to buy, develop and manage such resources. When recreational opportunities are absent, then human and ecological risks increase because people need places to relax, communities need to have gathering places and natural habitats, which can easily be part of recreational facilities, afford some ecological protection.
2. The amount of funding at risk, and subsequently the amount of human and ecological risks attributed to the lack of these funds, can be measured by the following data. Local parks and recreation construction project requests over a five year period amounted to \$22.7 million. Actual dollars granted: \$11.1 million. Only half the projects were funded and these figures underestimate the true need by communities because the requests are only those that actually applied to IAC. (1) State agency capital budgets have fared no better. In the 1989-91 budget period, agencies requested \$51.7 million in capital projects (does not include operating expenses). Actual dollars received: \$8.1 million.
3. The benefits of establishing a variety of funding sources for recreation, means that governments will have to be more creative in financing their projects. Possible options for new funds are conservation futures programs, bonds issued statewide or locally, systems to encourage public-private enterprises, community land trusts, or low-interest loan from the state to local governments.

B. COSTS

1. The latest costs of buying, and developing recreational areas and facilities and wildlife habitats were calculated by Wildlife and Recreation Coalition: \$450 million statewide. This figure only makes an attempt to list projects that are available today. Future projects and opportunities will undoubtedly make that figure go higher.
2. Competition with establishing a variety of funding mechanisms is only the availability of funds and perhaps interest rates.
3. Agency implementation costs would depend on the programs or strategies chosen to fund recreational opportunities.

OTHER FACTORS

A. TECHNICAL FACTORS

There are no technical difficulties in implementing this item.

B. INSTITUTIONAL CONSTRAINTS

Agencies would have to develop a simple way of agreeing to multi-jurisdictional funding and operating agreements. They would have to create simple memoranda of agreements in order to avoid expensive staff time and delays in writing the "ultimate" agreement.

C. POLITICAL FACTORS OR IMPLICATIONS

Local officials would have to be willing to ask their constituents to vote to raise taxes (property, B&O, sales) to pay for recreational lands or facilities. State and local officials would have to make trade-offs between funding recreation and other social needs.

ROLES AND RESPONSIBILITIES

A. IMPLEMENTATION

State agencies could take the lead in developing creative funding between jurisdictions after the Legislature gave them seed money to go work on acquiring recreational opportunities. Businesses could work with the state to develop tax incentives for donating open spaces for recreation. Local community groups should be the ones putting political pressure on local elected official to make a commitment to recreational resources.

B. ACCOUNTABILITY

Agencies represented on the Land Resources Subcommittee of 2010.

C. SCHEDULE

1990-1995

3. Encourage the private sector to contribute more recreation opportunities.

GAINS AND COSTS

A. RISK REDUCTION/RESOURCE ENHANCEMENT

1. Publicly owned land available for recreation is becoming more crowded every year. Washington State Parks received over 40 million visitors in 1989 and many of the parks were fully reserved within one month of the reservation system opening up to the public. Private property owners, on the other hand, often have outstanding recreational resources on their land which could supplement crowded public lands.

However, landowners are reluctant to open their property to the public because they are concerned about liability. Recreational opportunities on private land could be increased if private landowners were appraised of liability restrictions on recreational activities in Washington State (RCW 4.24.210). The costs of not publicizing and modifying the liability law will be further closures of private recreational resources.

2. In #3 below are specific actions that could be taken to improve public access to private lands. If these are put into place, then measures of success would be the number of private lands opened to the public. Also, the courts would be handling less liability cases as a result of recreational activities on private lands.
3. Public health and recreational resources will be increased by taking the following steps to open up private lands for public enjoyment.
 - * Large landowners should be made aware of the State's Recreational Immunities Act (RCW 4.24.210) which relieves a landowner of liability if they do not charge to use the land and the "known, dangerous, artificial and latent conditions" are posted.
 - * The Recreational Immunities Act could be modified to allow entrance and user charges for non-profit recreational lands.
 - * Add a provision which would pass the initial costs of liability defense to someone other than the landowner or insurance carrier.
 - * Private landowners could be assisted by the state to write and implement risk management plans for their property. These would include constructing, inspecting and maintaining

warning signs, medical emergency handling, crowd management plans, or accident and injury reporting.

B. COSTS

1. The participants in the activities listed above would be the Washington Cities Insurance Authority, Washington Association of Counties, Counties Risk Pool, State Risk Manager, private landowner associations (Washington Forest Protection Assoc., Farm Bureau, Grange), non-profit landowners (Public Land Users Society, Trust for Public Lands), the Governor's Office, the State Legislature, and the state's natural resource agencies.

Costs for their participation would be staff and attorney salaries to amend the Recreational Immunities Act. Other staff costs would include presentations to private landowner organizations, publishing easy-to-understand brochures about the liability act and helping landowners write risk management plans. Private landowners' costs would include materials for signs, fencing and monitoring public use of their lands.

2. Trial lawyers association may find these activities threatening because their clients want to be able to take a landowner to court for damages incurred while recreating.
3. The costs to state agencies would be at least one full time staff person assigned to staff a task force of representatives from all parties. The staff person would coordinate and work through the needed changes to the statute. Another FTE would be necessary to assemble material for publication and distribution to private landowners; this could be an administrative assistant to the primary staff person. Associated travel and office costs would need to be added to the salary costs for these two staff.

C. SUMMARY

To open up private lands for public use, accurate information about the State's Recreational Immunities Act must be given to private landowners. Furthermore, the Act should be modified to cover the continuing concerns held by private property owners about public use of their lands. Risk management plans must be written and implemented for private landowners.

The costs are staff time spent preparing statutory changes and educating private landowners and the expense to land owners for proper signs and fencing.

OTHER FACTORS

A. TECHNICAL

The only technological constraint, and this is a very minor one, is to make signs or fences vandal-proof. If the warning signs were indestructible, then the private property owners costs would be less for maintenance.

B. INSTITUTIONAL

Existing law would have to be changed. Interest groups, such as the trial lawyers would have to be included in the discussions about changing the Recreational Immunities Act because their clients would be effected.

C. POLITICAL

The legislature would have to be involved in modifying the statute. Their constituents who are private landowners may not want to change current law and practices. The state agency assigned to this task would have to have early discussions with legislators from districts with outstanding recreational resources on private lands.

ROLES AND RESPONSIBILITIES

A. IMPLEMENTATION

The participants are listed on page 2 under "B. Costs". The participating groups would appoint a representative to a one-year task force to decide what changes are acceptable to the statute. The staff person would also contact and speak to the representatives parent organizations. The agency responsible for coordinating the task force could be IAC or State Parks.

B. ACCOUNTABILITY

IAC or State Parks

C. SCHEDULE

Obtain general fund appropriation: 1991-93

Staff task force: July 1993 - July 1994

Present legislative changes: January 1995

4. Preserve open space and greenbelts in urban areas.

INTRODUCTION

Open space and greenbelts are rapidly vanishing, transformed by subdivisions and second homes, industrial and commercial development, agriculture and orchard expansion, hydroelectric dams, highways, logging, and many other land consumptive activities.

As our population grows, steadily intruding on our state's remaining special places, nature and its wildlife, wetlands, forests, fields and streams continue to disappear, usually forever. *Today we have the greatest amount of natural open space we will ever have.* Yet, every day that passes leaves us with significantly less.

In order to control this trend, a high priority must be given to preserving these special places. A variety of mechanisms are planned to accomplish this, including: 1) Stronger partnerships with land trusts; 2) Acquisition of sites in and near areas of high population; 3) Use of appropriate regulatory and non-regulatory methods to achieve preservation goals; and 4) The re-evaluation of plans, ordinances (such as strong land-use planning laws), tax structures, and support mechanisms (such as conservation easements, current use taxation, and mandatory dedications).

GAINS AND COSTS

A. RISK REDUCTION/RESOURCE ENHANCEMENT POTENTIAL

Risk Reduction: Although sufficient and predictable funding resources will also be necessary, the potential of the above mechanisms to save open space and greenbelts is considerable. If the loss of open space and greenbelts can be controlled, it follows that human health, ecologic and economic losses can also be controlled. Numerous studies demonstrate the important contribution of these special places to: physical and mental health (they give us areas for play, exercise, and appreciation for intrinsic values); the ecology (they purify our air and water); and economy (they provide jobs and income from tourism, outdoor equipment sales, and construction trades; and, because they help us to keep our minds and bodies strong, they help lower our health care costs and make us more productive workers).

Economic Savings: When used as parks and recreation areas, open space offers at least four areas of benefit for which economic measurements are possible. These are: jobs and income, improved health, enhanced property values, and general cost savings.

Jobs and Income: For example, the recreation and leisure industry in Washington is one of the largest in the state. We spend more money participating in sports than watching. It is estimated that

state trail users alone have a current investment in outdoor recreation equipment of over \$ 3 billion. Other heavy expenditure activities related to open space includes water and snow recreation, camping and picnicking. At some point, all involve facility construction, equipment purchase, and support systems which generate income, such as restaurants and hotels.

Improved Health: In the past 20 years the cost of health care has skyrocketed from about \$50 billion to more than \$500 billion. Companies with 10,000 or more workers spent an average of \$1.3 billion in 1987 on paid sick leave. The point is that those who use the outdoors to maintain physical fitness reduce the risk of heart disease, improve worker efficiency, and spend less on hospitalization costs.

Property Values: A study done on the property value affect of the Burke-Gilman Trail in Seattle estimated that the Trail increased the value of near-by homes by as much as 6.5 percent and increased the ease of sales of nearby homes. In addition, the more crowded an area, the greater the value of open-space and near-by recreational opportunities.

Cost Savings: Diminished open space acreage requires that the public budget funds to replace lost natural systems. For example, functions such as floodwater detention, water recharge and purification, and habitat support for fisheries and wildlife all occur naturally in open spaces. In addition, the public bears the burden of infrastructure costs associated with urban sprawl, such as roads, sewers and utilities. With proper planning, public expenditures could be redirected to preserving open space and save taxpayer dollars in the long run.

B. COSTS

Costs associated with implementing these actions will cover: a) Vigilance in reviewing and commenting on the various documents that guide land use planning in Washington (for example, environmental impact statements and assessments, local comprehensive plans, etc.); b) Maintaining grant-in-aid programs that encourage open space projects; c) Encouraging legislation which allows jurisdictions to meet open space needs; d) Promoting government-land trust partnerships; and e) Disseminating information regarding land preservation techniques.

For federal, state, and local agencies, these activities should require no new funding, just a continuation of support for existing programs. However, other parties could be impacted by these open space and greenbelt preservation measures. They may include real estate, development, agricultural, timber, and mineral interests. It is anticipated, however, that over time, such costs will be offset by gains in health, ecologic, and economic areas.

OTHER FACTORS

A. TECHNICAL FACTORS

There are no known technical constraints to implementing these actions.

B. INSTITUTIONAL IMPLICATIONS

In attempting to balance landowner rights and public open space/greenbelt needs, Washington State law has generally favored the former. Evidence for this is found in the many instances of urban sprawl, highway strip development, and the excessive time needed to travel to quality parks. Along with funding, to change this balance, new tools in the form of laws designed to control growth and encourage open space preservation will be needed.

C. POLITICAL FACTORS

Enactment of growth and open space preservation laws are controversial whenever their effect is that of restricting development. Development often leads to demonstrable short term economic advantages which are supported by influential real estate and similar interests.

Open space preservation is a facet of the larger growth management issue. Preserving open space will largely depend on society's recognition of the unacceptable ecological, social and economic costs associated with unrestrained growth and development. Ultimately, society must develop a land-use ethic which gives weight to the environmental, social, and philosophical values of open space, as well as the traditional economic standard of income potential.

ROLES AND RESPONSIBILITIES

Parties involved in implementing open space/greenbelt needs include local agencies; Interagency Committee for Outdoor Recreation; State Parks and Recreation Commission; Departments of Ecology, Natural Resources, Fisheries, Wildlife; Washington Recreation and Park Association; Washington Wildlife and Recreation Coalition; Land Trusts; development interests; conservation groups; Legislature; and Governor's Office.

Most of the activities required under this goal should be implemented by 1995. Key initiation milestones include: a) Review and comment on appropriate plans and other documents for compliance with needs (on-going); b) Adoption by the Interagency Committee for Outdoor Recreation of a grant-in-aid program which encourages projects with a predominately natural setting (by 1991); c) Promotion of legislation which allows local jurisdictions to meet open space needs (by 1991); d) Promotion of government-land trust partnerships (by 1991); e) Dissemination of information regarding land preservation techniques (by 1991).

5. Create partnerships with federal agencies to ensure the maintenance of important outdoor recreation settings.

INTRODUCTION

Federal agencies manage over 80 percent of the State's acreage dedicated to, or managed for, recreation. They also manage nearly all of the semi-primitive settings. Such settings are those which are characterized by a predominately natural or natural-appearing environment. Visitors to such areas will have a high-to-moderate probability of experiencing isolation, independence, tranquility, and closeness to nature. Motor vehicles may be permitted.

Analysis of draft forest plans indicates that the supply of these semi-primitive settings will be cut by more than half, from the over 2.6 million acres in the early 1980s, to less than 1.2 million acres, by 2030. This action will eliminate valuable recreation opportunities. The solution to this problem is to retain semi-primitive settings at the current level of 1.8 million acres with no net loss.

GAINS AND COSTS

A. RISK REDUCTION/RESOURCE ENHANCEMENT POTENTIAL

Risk Reduction: Ecological risk to forested semi-primitive lands is significantly reduced if managed for recreation in lieu of timber harvest. Other gains include an improved quality of life, economic and health.

Likely Effectiveness: Semi-Primitive areas are similar to Wilderness areas with one primary difference: management activities are not so tightly limited on semi-primitive lands. The semi-primitive designation is administrative and relatively easy to change to permit logging. Logging converts such lands to the "roaded-modified" setting. Broader controls on resource extraction activities would be effective in preserving outdoor recreation opportunities on such lands.

B. COSTS

Implementation costs would vary depending on the strategy that recreation managers choose. Aggressive management -- increasing trail miles, building campsites, providing signing -- means higher costs. Primary costs would be incurred by Forest Service, however, at least one state grant program can offer assistance, the Interagency Committee for Outdoor Recreation's Nonhighway and Off-Road Vehicle Activities program.

Competing social objectives include the extraction of wood fiber for various uses. At the least, over the short run, the retention of semi-primitive lands would lead to some job losses in timber and related industries. Such losses, however, would be little more than already projected by the Forest Service under current plans.

The direct cost of implementation to state government would be virtually nil.

OTHER FACTORS

A. TECHNICAL FACTORS

There are no known technological constraints.

B. INSTITUTIONAL CONSTRAINTS

There are no serious institutional constraints other than the need to modify or amend some forest plans that are already in the final stages.

C. POLITICAL FACTORS OR IMPLICATIONS

This proposal carries a high potential for controversy, even though current Forest Service plans call for the preservation of about 1.2 million of the current 1.8 million semi-primitive acres. The argument is an extension of an on-going debate over timber harvest versus retention. Political support generally comes from recreation and conservation groups such as The Mountaineers, Cascadians, and Backcountry Horsemen; opposition is from the timber industry, off-road vehicle groups (although ORV groups would probably benefit from retention; for example, Mad River semi-primitive area), and other "extraction" interests.

Although there has been considerable competition between timber and recreation interests on this issue, there is some indication that the latter is gaining strength. Nationally, it is believed that Congress will seriously consider reducing timber harvest objectives on the National Forests in next 1-2 years.

ROLES AND RESPONSIBILITIES

Although the primary responsibility for implementing this action will rest with Congress and the Forest Service, agreement must first be reached regarding the objective of "no net loss" of semi-primitive lands. Other actors will include: recreation businesses (such as equipment suppliers, outfitters and guides, restaurants, hotels, etc.), conservation and recreation groups (including mountain bicyclists, ORV interests, etc.), state agencies (including the Interagency Committee for Outdoor Recreation).

Generally, the goal called for in this action will be met in two stages. The first stage, involving acceptance of the no net loss goal, should be accomplished by 1995. This will include the following milestones: IAC meets with Forest Service Region 6 recreation staff to establish partnership, agree on goal (by 1992); IAC and Forest Service begin outreach to user groups to enlist support for retention (by 1993); User groups educate/inform legislature and Congress on need to retain semi-primitive settings (by 1994).

6. Produce a state trails policy and implementation plan.

INTRODUCTION

Trails are important to outdoor recreation in Washington State. Seventy-five percent of all state households walk or hike for recreation, and 26 percent use vehicles off-roads for recreation.

Recreation managers at virtually all levels of government recognize the importance of trails. A 1989 survey of public agency needs shows that a need for more trails of all kinds is widely recognized. In brief, trails are a common denominator among agencies providing outdoor recreation. Issues such as growing numbers of users, new technologies employed by users, and the pressures brought to bear on trail facilities and their settings need to be addressed by the state.

GAINS AND COSTS

A. RISK REDUCTION/RESOURCE ENHANCEMENT POTENTIAL

Risk Reduction: Trail planning is not coordinated on a comprehensive, statewide basis. Development of a plan supported by managers and users will prevent further loss of trail opportunities in urban and rural areas.

B. COSTS

OTHER FACTORS

A. TECHNICAL FACTORS

There are no known technological constraints.

B. INSTITUTIONAL CONSTRAINTS

C. POLITICAL FACTORS OR IMPLICATIONS

ROLES AND RESPONSIBILITIES

Actors: Local agencies; IAC; State Parks; Depts. of NR, Wildlife, Ecology, Transportation; National Park Service, Forest Service, recreation user groups.

The goal called for in this action will be met by 1991. The IAC will complete the text of the plan document, in consultation with the State Trails Advisory Committee, by 1991.

II. FOREST LANDS

PROPOSAL

- A. Protect ecological and amenity values on public and private forest land by:
1. Using and promoting public land management decisions or acquisition programs to preserve forest areas possessing critical values; and
 2. Refining, developing, and ensuring the application of new and existing forest management concepts that uphold and protect ecological values, including riparian values, while permitting commercial use of forest land.
- B. Protect from conversion to non-forest uses productive forest lands providing open space, watershed, and habitat values through:
1. Land use controls incorporating both state and local authorities;
 2. Development of higher value wood products in order to improve economic incentives to retain forests in forest uses; and
 3. Public acquisition of critical commercial forest lands.
- C. Improve sustainable forest use by exerting reasonable controls on rates of harvest.

RELATIONSHIP TO 2010 VISION STATEMENT

These measures are steps toward the 2010 objectives: consistent economic growth in a region characterized by diverse human and natural communities balanced with environmental protection and quality. Specifically, programs protecting ecological and amenity values and discouraging forest land conversion contribute to ensuring healthy and productive human and natural communities in a diverse ecosystem and maintaining high aesthetic and amenity values. Improving sustained forest use strengthens the region's economy, smoothing economic highs and lows with consistent timber supplies and jobs.

Protect ecological and amenity values on public and private forest land by:

- Using and promoting public land management decisions and acquisition programs to preserve forest areas possessing critical values (Public Land Management Decisions); and
- Refining, developing and ensuring the application of new and existing forest management concepts that uphold and protect ecological values,

including riparian values, while permitting commercial use of forest land (Refine, Develop and Enforce Forest Practices).

GAINS AND COSTS

A. RISK REDUCTION/RESOURCE ENHANCEMENT

These approaches would expand existing management programs and/or establish new standards for protecting values.

Public Land Management Decisions:

- Reduce loss of species diversity, open and green spaces and public use opportunities.
- Enhance quality of life for citizens of Washington.
- Management: the right lands may not currently be in public ownership; management can pursue goals beyond those achievable through regulation since legal equity concerns are not a factor.
- Acquisition is the most effective way to preserve critical areas.
- Management and acquisition success would be measured by the representation of critical ecosystems or scenic resources in protective status.

Refine, Develop and Enforce Forest Practices:

- Changing the method of forest management to an ecosystem approach with a landscape perspective provides a better means for maintaining a healthy forest and utilizing forest resources.
- This may be an effective way to reduce risk and maintain options in the face of uncertainty and possible loss of forest productivity and diversity.

B. COSTS

Public Land Management Decisions:

- \$100,000 per year for plant community inventory.
- \$2.5 - \$5.0 million per year for Natural Area Preserves.
- \$450 million over 10 years to acquire critical habitat, urban wildlife habitat, state parks, local parks, trails, and water access. (Also see proposed Action I (2) earlier in this Land Resource section.)
- Protective decisions on multiple use lands can reduce opportunity for commodity producers (costs borne by resource industries).

Refine, Develop and Enforce Forest Practices:

- \$5 million per year basic research needs.
- \$20.2 million per year improved planning and enforcement in the Forest Practices program.
- \$2.4 million per year adaptive management.

OTHER FACTORS

A. TECHNICAL FACTORS

Public Land Management Decisions:

- Acquisition does not guarantee protection; it is the first step toward protection. Management of preserved areas (e.g., fencing, removal of exotic species, posting signs) is the only way to ensure protection.
- Lack of inventory and information on specific factors.
- Inability to prioritize acquisitions.
- Willing sellers lacking.

Refine, Develop and Enforce Forest Practices:

- Ecological and amenity values requiring protection are not clearly and precisely defined. These values can vary greatly by location making consistent regulatory approaches difficult.
- Social benefit and cost relationships have not been developed for major public and private forest operations.
- Most information relating to producing certain ecological and amenity values and commodities is theoretical and has not been demonstrated.

B. INSTITUTIONAL CONSTRAINTS

Public Land Management Decisions:

- USFS and DNR have different missions:
 - USFS' multiple use management can forego economic returns for increased protection and public use.
 - DNR as Trust Land Manager cannot forego economic returns for long term protection/conservation and public use without compensating the trusts.
- Lack of funding for planning, maintenance, operations and acquisition.
- Poor coordination among organizations with similar functions.
- Conflicting agency missions (within DNR).
- Competition with external organizations (The Nature Conservancy, local land trusts, city, county and other state agencies).

Refine, Develop and Enforce Forest Practices:

- Improved protection of ecological values can be incorporated into the management of publicly-owned lands to the extent consistent with legal constraints governing management (particularly effective for large public ownership encompassing entire landscape units).
- Improved ecosystem protection on private land must recognize private property rights and the diversity of private management objectives. Multiple small landowners across a landscape make providing improved ecosystem regulation conceptually and legally difficult. In addition, greatly increased administration and enforcement efforts will be needed to make more sophisticated regulatory systems work in practice. (Also see proposed Action III,

Taxation, in this Land Resource section, for a discussion of financial incentives and disincentives to accomplish public environmental objectives on private lands through non-regulatory means.)

C. POLITICAL FACTORS

Public Land Management Decisions:

- Lack of local support for management/acquisition (political/private).
- Public ownership shrinks tax base.
- Limited growth opportunity for certain locations/communities.
- Agencies/constituencies in competition for different uses of multiple-use lands.

Refine, Develop and Enforce Forest Practices:

- Forest landowners will resist increased regulation, maintaining that additional regulation: (1) is not necessary, (2) makes forestry unprofitable, and (3) creates a taking because of revenue losses.
- Legislature, counties and state trust land beneficiaries may oppose potential revenue losses.
- Potential job losses will be opposed in rural areas.
- Urbanites will likely favor additional controls.

ROLES AND RESPONSIBILITIES

A. IMPLEMENTATION

Public Land Management Decisions:

- All segments of society should have a role (complementary, not competitive).
- State lands management agencies (DNR, WDW, State Parks) should receive publicly acquired lands for conservation/protection purposes.
- Role/responsibility of each participant should be clearly defined at the beginning of acquisition to avoid "turf" battles later.

Refine, Develop and Enforce Forest Practices:

- Legislature must authorize and fund development of additional controls.
- State agencies charged with protection and conservation should be responsible for coordinating and funding research (likely involving universities, PNW Forest Experiment Station, USFS New Perspectives Program, and Olympic Natural Resources Center).
- The State Forest Practices Board and the Department of Ecology (with respect to water quality) are responsible for adopting and DNR is responsible for administering forest practice regulations on 8 million acres of private land, including TFW agreement and the adaptive management process. Efforts to control, monitor and adapt forest operations to protect ecological values logically grow from these programs. The Sustainable Forestry Roundtable is an example of the ongoing development of this program.

- The establishment of a private foundation to protect and manage ecological values (similar to Rocky Mountain Elk Foundation) could create incentives.
- DNR's management of 2 million acres of state trust lands requires financial support for the trust beneficiary. Ecological forestry concepts are being developed as experimental programs on some trust lands.
- USFS manages 5 million acres of forest land according to a multiple-use mandate that includes ecological protection. Improved management practices, most easily applied on these lands, can be accomplished through influencing the administrative plans for these forests, the federal statutes that guide management and the federal budgets that determine levels of management attention to various objectives. In addition, under the Clean Water Act, the Forest Service must meet or exceed state best management practices for water quality and riparian area protection. This is accomplished through a MOA with the Department of Ecology.

B. ACCOUNTABILITY

Department of Natural Resources, U.S. Forest Service, Washington
 Department of Wildlife, State Parks, Department of Ecology

Protect from conversion to non-forest uses productive forest lands providing open space, watershed and habitat values through:

- Land use controls incorporating both state and local authorities (Land Use Controls); and
- Public acquisition of critical commercial forest lands (Critical Forest Land Acquisition).

GAINS AND COSTS

A. RISK REDUCTION/RESOURCE ENHANCEMENT

Land taken out of production ceases to provide wood fibre, recreation, fish and wildlife habitat, and high quality water resources. Conversion land uses often significantly reduce environmental quality and eliminate amenities. Commitment to developing and managing a long-term supply of wood products contributes to solid, sustainable economic base.

Land Use Controls and Critical Forest Land Acquisition:

- Estimates by the Washington Forest Protection Association (WFPA), indicate that 80,000 acres of productive forest land will be lost during the next decade to meet housing demands in the Puget Sound region. This does not include the other spin-off effects of population pressures, including further subdivision of large tracts of

forest land into 5-acre rural homesites. With each passing year, more productive forest land is lost from production of the whole range of renewable forest products and services.

- Retention of lower elevation forest lands in production, rather than shifting to other "higher and better" uses, will minimize future harvesting pressures on more environmentally sensitive higher elevation and steeper forest lands; keeping lower elevation sites out of development modes also reduces adverse development effects on salmon and wildlife habitat.
- Land use control through local government comprehensive planning and zoning is one means of preventing lands primarily valuable as forest land from being subjected to pressure to convert to other uses. Lands would be designated as resource lands and applications for conversions would not be approved.
- Acquisition, by public agency or private non-profit (such as The Nature Conservancy or local land trust), is the only proven method for permanently assuring the status of a piece of property. The measure of effectiveness would be the number of acres purchased in areas threatened by conversion to other uses.
- Public ownership ensures permanent protection of forested lands for timber supply, open space, watershed protection and other values enjoyed by all residents of the region in which acquisition takes place; the greatest benefits accrue to those residents closest to areas acquired and to those selling the land; provides the opportunity to purposefully define the regional and local "green separators" necessary to maintain a sense of the Puget Sound region as a series of distinct communities connected with the backcountry.
- Benefits of acquisition far outweigh costs. Acquisition now is an investment in future stability for the forest industry, to maintain environmental opportunities, ensure community stability and maintain landscape integrity. Would require a predictable income stream to ensure ability to strategically acquire land assets.
- Acquisition of forest lands threatened with conversion will also protect/buffer adjacent industrial forest land holdings in public and private ownership from intrusive and conflicting land uses.
- Important ancillary benefit is protection of the timber supply for mills and the local economy. To the extent that timber supplies are assured on productive sites, withdrawals of sensitive areas will provoke less concern about future supply availability.

B. COSTS

Land Use Controls:

- \$5 million per year statewide for local and county planning and implementation of land use controls (costs to landowners may be offset by greater return on their investment).
- \$2 million per year for state agency support to local planners on forestry, fisheries, wildlife and water quality issues.

Critical Forest Land Acquisition:

- DNR testimony supporting SB 6536 (1990 Legislature) indicates purchase of forest land in the "mixed use" zone would cost between \$1,300-2,500/acre, depending on site class, age of reproduction (or timber) and proximity of higher-valued land uses. The DNR proposal would be funded from general fund revenues at a proposed \$20,000,000 per year level. Estimated acquisitions would range from 8-15,000 acres per year. (Approximately \$1 million per year is required to cover appraisal, cruising and other associated transaction costs. Future management costs would be derived from the Forest Development Account, generated from forest management revenues.)

OTHER FACTORS

A. TECHNICAL FACTORS

Land Use Controls:

- While the mechanisms of land use control over conversions are well understood, difficulties in implementation can arise in developing meaningful criteria for the lands to be protected, the types of effects to be controlled, and the basis for exemptions.

Critical Forest Land Acquisition:

- No technical constraints on acquisition (activities associated with acquisition are familiar to DNR).

B. INSTITUTIONAL CONSTRAINTS

Land Use Controls:

- The legal basis for regulatory control over conversions exists at the state level but could be strengthened. Local governments vary in the degree to which they have enacted land use laws that can be effective tools. Many local governments also currently lack staff capability to carry out such a program.

Critical Forest Land Acquisition:

- Few constraints exist for land acquisition other than funding. This is a well-established activity in state government.

C. POLITICAL FACTORS

Land Use Controls:

- Land use regulation can be controversial and opponents of restrictive measures can argue their point of view in legislative and judicial bodies. Different counties vary widely in the degree of political support for different levels of control.

Critical Forest Land Acquisition:

- Acquisition of forest lands for less intensive uses than required of federal grant lands would require statutory changes (see SB 6536). This proposal has strong support from the public, including environmental groups, forest industry, local governments and major newspaper editorial boards.

ROLES AND RESPONSIBILITIES

A. IMPLEMENTATION

Land Use Controls:

- County governments will have primary responsibility for developing and implementing comprehensive land use plans that protect forest lands (to be overseen by Department of Community Development). DNR, DOF, WDW, and DOE will provide technical assistance both at the planning and implementation phases of land use plans as well as in administering the Forest Practices Act.
- Land use plans will be developed over 4 to 5 years and completed by 1996. Where plans currently exist, any necessary modifications should occur by 1993. Success will be measured by the forest land acreage protected from conversion to other uses.

Critical Forest Land Acquisition:

- Acquisition would be carried out by DNR or by the Trust for Public Land or similar groups on behalf of DNR.
- Could be implemented as soon as funds are available. Conforms with current DNR missions, purposes and staff skills.

B. ACCOUNTABILITY

Department of Natural Resources

Improve sustainable forest use by exerting reasonable controls on rates of harvest.

GAINS AND COSTS

A. RISK REDUCTION/RESOURCE ENHANCEMENT

Providing some reasonable upper bounds to harvest rates within specific watersheds could reduce the potential for cumulative environmental impacts during times when favorable market conditions act as an incentive to rapid harvesting. Cumulative impacts that could be reduced include effects on wildlife from widespread changes in habitat and rapid changes in the distribution of forest stands across landscapes.

The effectiveness of harvest rate controls in achieving these potential benefits will depend on the degree to which cause-effect relationships are understood and controls can be precisely matched to actual resource conditions. Poorly thought-out controls applied indiscriminately will be ineffective in achieving desired benefits. The value of the potential benefits of effective harvest rate controls also represents the costs of not providing such controls.

Ancillary benefits could include stabilization of timber supply within the region, which may benefit the manufacturing sector within the timber industry.

B. COSTS

Cost would be borne by large and small forest landowners, and would take the form of reduced income as a result of not being able to respond freely to periods of high market demand when prices for timber are highest. Additional administrative costs would be borne by both the public and private sectors for more elaborate planning and deliberations.

OTHER FACTORS AND ROLES AND RESPONSIBILITIES

The Forest Practices Board, the Commissioner of Public Lands and the Timber/Fish/Wildlife Policy committee agreed to convene a meeting of interested parties, including local governments, to address the complex issues of maintaining the forest land base and controlling the rate of harvest on private lands (state lands must, by statute, be managed on a sustained yield basis).

The Sustainable Forestry Roundtable held its first meeting in mid-November, 1989. Since that time, representatives of the forest industry, environmentalists, state agencies, tribal interests and county governments have met in working groups, and other forums to address these issues.

Developing a system for regulating the rate of harvest of timber on private lands (in contrast to the current Forest Practices Act which addresses, in the main, site-by-site harvest activities) strikes to the core of the discretion and flexibility of the land manager. In light of public concern and the perceived impact on various resources, the forest industry has expressed a desire and a good faith willingness to try to develop a reasonable approach to the problem.

In light of the intense discussion underway and the great differences of approach, it would be premature to assert at this time a preferred or proposed method to address this issue. The Roundtable has issued an interim report to the Legislature (available from DNR) and is committed to bring a balanced package of incentives, disincentives and a harvest regulation scheme to the 1991 Legislature.

III. AGRICULTURAL AND RANGE LANDS

PROPOSAL

- A. Protect from conversion to non-agricultural uses productive agricultural lands through:
 - 1. Land use controls incorporating both state and local authority; and
 - 2. Investigating the use of taxes and subsidies to promote desired actions.
- B. Develop methods to protect riparian and native species from damage caused by rangeland practices by:
 - 1. Building incentives into the current grazing permit system on public lands;
 - 2. Investigating the use of taxes and subsidies to promote desired actions; and
 - 3. educating rangeland users, and applying existing range species protection research.
- C. Develop effective mechanisms to apply new agricultural management concepts that protect ecological values within commercial uses of agricultural lands.

RELATIONSHIP TO 2010 VISION STATEMENT

This proposal supports the stewardship goal of the 2010 Vision Statement.

Protect from conversion to non-agricultural uses productive agricultural lands through:

- 1. Land use controls incorporating both state and local authority (land use controls); and**
- 2. Investigating the use of taxes and subsidies to promote desired actions (taxes and subsidies).**

INTRODUCTION

The conversion of agricultural land is a complex process, and involves such factors as farm profitability, urban growth pressures, land values, personal decisions about work and retirement, community expectations, taxes and government programs, incentives, and regulations. Programs to protect

agricultural lands from conversion may include any or all of the following concepts: 1) differential assessment for property tax, including preferential assessment, deferred taxation, or restrictive agreement, 2) farm use valuation for death tax, using either IRC rules or something similar, 3) incentives such as agricultural districting, right-to-farm legislation, or agricultural zoning, 4) purchase or transfer of development rights, 5) state issued development permits, and 6) integrated programs with federal, state, and local governments.

GAINS AND COSTS

A. RISK REDUCTION/RESOURCE ENHANCEMENT

1. Land Use Controls

-Land use control must be more than zoning. Regulatory laws that require state permits for big projects aren't good enough; prospective land-use planning must be done as well. Minimum lot sizes should be specified in agricultural areas.

- Farmland protection programs should be based on accurate information. Prime and locally important farmland must be identified. A farmland inventory on a Geographic Information Systems database would be ideal.

- The urban dweller must be educated in agriculture. Communities should understand the importance of agriculture to their economies.

- The farmer must be able to operate without fear of losing land or land speculation. Farmers need adequate credit, suppliers, service businesses, labor, marketing facilities, and storage and processing facilities.

- There is a need for state leadership in protecting agricultural lands. The state should establish criteria concerning urban growth, the protection of environmentally significant areas, and the protecting of agricultural lands which local governments would be required to meet in planning and regulatory land use.

- Construction of new urban services (roads, sewers, water, etc.) need to be strictly regulated and minimized in agricultural areas.

- Benefits of protecting agricultural lands include: stabilizing economy, improving wildlife and fisheries habitat, providing open space, reducing flood damage.

- Programs should be legally defensible; based on sound enabling legislation, developed through comprehensive planning and policies that give appropriate recognition to housing, commercial development, and environmental protection objectives. At the same time, they must not contravene fundamental private property safeguards, including taking clauses of the US constitution.

2. Taxes and Subsidies

- Purchase of development rights can be successful in preserving agricultural lands.

- Open space taxation has a positive effect but is not the only answer.

- Many subsidy programs are instituted too late to save large parcels of land.

- The public may be willing to pay to save farmland.
- The farmer must be willing to give up the rights to develop the land forever.
- Buying development rights is extremely expensive, particularly in highly urbanized areas.
- Additional taxation ideas are discussed in section IV of this action plan.

B. COSTS

1. Land Use Controls

The costs of preventing conversion are dependent upon the viability and profitability of the agricultural land under consideration. Information on the amount and viability of Washington acreage subject to conversion pressures is unavailable. Extending services such as roads and sewers into farming areas is extremely expensive and developers and land speculators pass the costs of developing agricultural lands onto the homeowner and public. A recent concept in land use planning is emerging as a politically popular move toward "impact fees," which require developers to pay for infrastructure.

2. Taxes and Subsidies

King County has spent at least \$40 million on purchasing development rights. If the program has been instituted 10-20 years earlier, it would have been much cheaper and more effective. Land already zoned industrial is priced by the square foot!

OTHER FACTORS

A. TECHNICAL FACTORS

1. Land Use Controls

We have the technical capability to identify the location and extent of our agricultural land.

2. Taxes and Subsidies

The technology and processes are available to subsidize farmers.

B. INSTITUTIONAL CONSTRAINTS

1. Land Use Controls

The institutional and political constraints limit our ability to really protect farmland. Local government has the authority to enforce planning ordinances which affect development.

2. Taxes and Subsidies

Using public funds to purchase lands and development rights are within the existing institutional framework.

C. POLITICAL FACTORS

1. Land Use Controls

Politically, the state can expect a serious tussle with local officials, who will try to retain maximum control over land decisions but cannot be expected to carry out statewide planning goals.

2. Taxes and Subsidies

Local ordinances would have to be passed and tax initiatives passed, which could cause controversy.

ROLES AND RESPONSIBILITIES

1. Land Use Controls

A. Implementation: Land use law is perhaps the only area of governmental concern where regulatory power is currently moving upward. With growth patterns and traffic congestion crossing local boundaries, states are stepping in and seizing some of the power. Most counties have land use plans and zoning but they are not effective. Other counties do nothing to protect agriculture. Cities, counties, state and federal agencies all have a role to play. Individuals and groups can have a profound impact at the local and state level. Local governments would not be required to draw up local plans, but they would be given powerful incentives to do so: planning grants, special treatment in the cumbersome regulatory process, and the power to impose impact fees.

B. Accountability: State Departments of Agriculture and Natural Resources, Washington Association of Counties, Conservation Districts, Conservation Commission

C. Schedule: Information/education raising public awareness could start immediately. Land use controls could take 3 - 5 years to complete.

2. Taxes and Subsidies

- A. Implementation: Counties, State Departments of Revenue, and Community Development
- B. Accountability: State Department of Revenue
- C. Schedule: 12 month study

Develop methods to protect riparian and native species from damage caused by rangeland practices by:

- 1. Building incentives into the current grazing permit system on public lands (grazing permit incentives);**
- 2. Investigating the use of taxes and subsidies to promote better range management (taxes and subsidies); and**
- 3. Educating rangeland users and applying existing range species protection research (education, applying existing protection).**

INTRODUCTION

In rangeland areas, conflicts among users, poor management practices, overgrazing by both domestic and wild animals, erosion, and noxious weed invasion have caused severe deterioration of much available rangeland. Some such lands are in arid regions, steep mountainous areas, or areas of shallow soils that make them unsuitable for commercial grazing. Others can be improved by scientific range management, although there is continual dispute among experts over the relative benefits of attempting to increase forage production as opposed to reducing grazing intensity.

Rangeland in Washington covers about 7 million acres, with an additional 5.5 million acres in grazable woodland. Since the riparian zone is attractive to animals for its lush vegetation for forage and water source, the effects of intensive grazing and other activities might include damage to the stream corridor.

Overgrazing, off-road vehicle use, drought, fire, timber harvesting techniques, and conversion of rangelands to other uses can cause loss and/or degradation of rangelands. Such activities create a susceptibility to noxious weed infestation, and decrease the amount and variety of native species on rangelands. Thirty-nine percent of Washington rangeland is estimated to be in poor condition, producing less than 25 percent of its potential livestock forage. Thirty percent of the range is in fair condition, estimated to produce between 25-50 percent of full grazing potential. Twenty percent is in good condition, producing 50-75

percent of its potential, and 11 percent is in excellent condition, approximating full capacity.

Continuing encroachment of noxious weeds, loss of valuable forage species, and loss of soil through erosion cause deep concern. Corrective programs are needed to reverse this situation. Such problems can be addressed with present knowledge and current programs: Coordinated Resource Management Planning, Extension education, technical assistance, and research.

GAINS AND COSTS

A. RISK REDUCTION/RESOURCE ENHANCEMENT

1. Grazing Permit Incentives

- A unified state range program to set goals, coordinate and evaluate programs, and focus range-related activities. The Washington State Rangeland Committee might direct this effort.
- Extension programs should be expanded to address opportunities for rangeland improvement and protection of native species and riparian areas.
- Technical assistance via Conservation Districts and Soil Conservation Service, using Coordinated Resource Management Planning where appropriate.
- Further research to provide a wider knowledge base on the complex functioning principles and varied range ecosystems to ensure successful education and technical assistance programs.
- Institute a grazing land monitoring program to assess trends in condition at 10 year intervals of rangelands.
- Increase financial and staff support of the rangeland management program in state agencies (e.g., DNR) and federal agencies (BLM and USFS).
- Fund studies to identify the economic and environmental costs of poor management.
- Establish demonstration areas for best management practices.

2. Taxes and Subsidies

- Establish a state cost-share program.
- Establish a Conservation Reserve Program (CRP), or take over and continue the existing program when it runs out.
- Permittees on state and federal rangelands should receive fee reductions in return for range improvement work. Permittees may be able to make improvements faster and at less cost than the government.
- Increase range improvement funds provided from state (DNR) grazing fee receipts.
- Allow enrollment of private landowners in agricultural land under the Open Space Act only if they comply with rangeland conservation measures.

- Charge permittees on public lands rates high enough to recoup the true costs of grazing.
- Government and private landlords should review grazing and leasing practices and reduce grazing pressure, where detrimental.

3. Education, Applying Existing Protection

- Increase range technical staff in Extension, DNR, and federal agencies (SCS, USFS, BLM).
- Form agricultural organizations for technology transfer, or identify and work more closely with those already in existence.
- Increase public awareness of all values provided by rangeland and their potentials for maintenance and enhancement.
- Educate the public about importance of noxious weed control and how to prevent spread of noxious weeds.
- Additional technical support is needed to encourage more widespread implementation of rangeland BMPs.
- Timing of animal grazing to allow riparian vegetation to become well established.
- Maintain and improve desirable vegetation for grazing.
- Provide adequate cover to prevent soil erosion.

B. COSTS

1. Grazing Permit Incentives

The economic success of range livestock operations is strongly related to forage availability, and thus to range condition. A range renovation program dependent on private resources will continue to be slow and incomplete. Federal and state assistance will be required on private rangelands, and cooperative programs on public lands.

2. Taxes and Subsidies

It is assumed that upon implementation of certain technologies, landlords would suffer short-term loss of potential income through reduced grazing rental income and ranchers will suffer short term losses of potential income by limiting herd size and increased costs of moving their livestock between ranges.

3. Education, Applying Existing Protection

Stream corridor protection needs identified in the Water Quality Protection Needs Evaluation total \$15.8 million. Additional education and training needs could be folded into existing Cooperative Extension programs and costs would be moderate.

OTHER FACTORS

A. TECHNICAL FACTORS

1. Grazing Permit Incentives

No technological constraints have been identified.

2. Taxes and Subsidies

No technological constraints have been identified.

3. Education, Applying Existing Protection

The list of identified rangeland BMPs have not been officially adopted by the state, nor have they been subject to full public review. There is no current state water quality management plan for rangeland.

B. INSTITUTIONAL CONSTRAINTS

1. Grazing Permit Incentives

Government agencies with management responsibility have the authority to control numbers of animals grazing public lands. The Rangeland Protection Act enables the National Forest Service and the BLM to better manage rangelands. The state has the authority to restrict ORV use, restrict campfires, close land to trespass, and require resource protection agreements be entered into and complied with by its lessees. Poor coordination among public and private landlords, and lack of funding for maintenance and planning would be anticipated problems. Greatly increased administrative and enforcement efforts would be required to make altered regulatory practices successful. A priority system for implementing range improvement projects should be developed to expend funds in a cost effective manner.

2. Taxes and Subsidies

Counties have the legal authority to form weed boards and levy weed assessments on all land owners in the county, but are not able to implement programs at a scale necessary to alleviate the problems. Changes in laws, regulations, and organizational structure would be required for development of a range protection program.

3. Education, Applying Existing Protection

Training of existing program personnel on the state and federal level would be required, as well as convincing permittees of the

need for change. Education programs need to be intensified to inform land managers of economically feasible technologies.

C. POLITICAL FACTORS

1. Grazing Permit Incentives

There is concern that a reduced fee program might be abused by the permittees. State and federal agencies may oppose potential revenue loss.

2. Taxes and Subsidies

The most controversial area existing in Federal rangeland management is the issue of fees charged for livestock grazing. Proposed changes in the fee system will undoubtedly be polemic.

3. Education, Applying Existing Protection

Without additional funding and resources, development of new or enhancement of existing programs in rangeland protection will require diversion of existing resources from other areas.

ROLES AND RESPONSIBILITIES

1. Grazing Permit Incentives and Taxes and Subsidies

A. Implementation: State and federal agencies with rangeland management responsibility have a role to play, including assurance of compliance with the incentive program. Lessees would be required to adhere to program responsibilities.

B. Accountability: State and federal agencies with rangeland management responsibility (DNR, BLM, USFS) would be accountable

C. Schedule: 1 - 3 years for program development

2. Education, Applying Existing Protection

A. Implementation: Washington Rangeland Committee, Cooperative Extension, Soil Conservation Service, Department of Natural Resources

B. Accountability: Department of Natural Resources

C. Schedule: 3 - 5 years for education program development and implementation

Develop effective mechanisms to apply new agricultural management concepts that protect ecological values within commercial uses of agricultural lands.

INTRODUCTION

Agriculture has changed the structure and function of natural ecosystems dramatically over much of the US. The primary goal of agroecosystem management traditionally has been to maximize the flow of energy and materials to human consumption, directly as harvested grain and fibre or indirectly as animals. Deleterious outputs can accompany agricultural practices, including soil erosion and contamination of surface water and groundwater. In the last decade, the maximization strategy has become increasingly less viable for many economic and political reasons. The agriculturalists' list of environmental issues has expanded, partly as a result of new information on pollution problems and pressure from environmentalists and partly as a result of changes in the economic and technological forces affecting agriculture. Current concerns include soil erosion, water supply, nonpoint source pollution, and agrichemical pollution. Emerging concerns include wetlands preservation and air pollution.

GAINS AND COSTS

A. RISK REDUCTION/RESOURCE ENHANCEMENT

- Establish state cost-share program.
- Increase agency (state and federal) staffing to work with operators to adopt best management practices.
- Increase agency staffing to work with operators to adopt LISA practices.
- Withhold farm program payments if certain conservation requirements are not met.
- Increase public awareness concerning sources and effects of erosion, nonpoint water pollution.
- Identification and inventory of critical agricultural land. Make use of SCS efforts in this area and identify and fill gaps.
- Improve pesticide and nutrient management through better timing and restriction of leachable chemicals in groundwater recharge areas. Encourage reduction of overall agrichemical usage and conversion to IPM systems.
- Develop erosion control options applicable to specific crop types to include proper crop rotation, no-till or minimum-till programs, strip cropping, and proper timing and amount of irrigation.
- Improve animal waste management including manure control, storage and proper field application.

B. COSTS

Implementation of agricultural BMPs is considered cost effective over the long term, but are not currently in wide use because of the up front costs and skepticism of long term benefits.

Estimated costs include:

- \$40 million for animal waste management (800 operations @ \$50K)
- \$10 million for dryland erosion control (1000 @ \$10K)
- \$10 million for rangeland management (1000 @ \$10K)
- \$30 million for non-commercial farms (15000 @ \$2K)
- \$60 million for stream corridor management (4K miles @ \$15K/mi)

Research funding required for development of effective mechanisms is not included in the above figure.

OTHER FACTORS

A. TECHNICAL FACTORS

BMPs have been developed for agrichemical management in response to nonerosion-related agricultural water quality problems, though data on the effectiveness and implementation of these initiatives are limited. BMPs addressing soil erosion are widely available and have proven effective in reducing water quality impacts where implemented. BMPs for rangeland, stream corridor management, and noncommercial farms are not as well developed or proven. BMPs evolve over time to reflect new technical understanding of erosion and other environmental problems.

B. INSTITUTIONAL CONSTRAINTS

Conservation programs have a 50-year history, during which a close-knit system of federal, state and county institutions has developed to generate local technical assistance, research, extension, and education programs and to distribute cost-sharing funds. Statutorily, one legislative vehicle dominates agricultural resource issues: the farm bill, which is periodically reviewed and reauthorized. Coordination problems among service agencies, such as SCS, ASCS and Extension, can be a problem when implementing new programs. Decentralization of services on the local level may cause dilution of national or statewide conservation efforts.

C. POLITICAL FACTORS

Suspicion of increased regulation of agriculture may result in political controversy.

ROLES AND RESPONSIBILITIES

- A. Implementation responsibilities: Federal agencies such as the SCS, ASCS, Cooperative Extension. Conservation Commission, Washington State Department of Agriculture. Conservation Districts.
- B. Accountability: Conservation Commission, Washington State Department of Agriculture.
- C. Schedule: 5 - 10 years for implementation

IV. TAXATION

PROPOSAL

Evaluate and restructure taxes, in particular property taxes, to promote the protection of agricultural and forest lands, including:

1. Restructuring "open space" taxation and considering a land-value based taxation model for statewide application; and
2. Further reduction of taxes for forest and farm land owners if conservation practices are employed.

RELATIONSHIP TO 2010 VISION STATEMENT

This proposal supports the stewardship goal of the 2010 Vision Statement. In order to preserve and protect open space, development must use less land. Therefore, measures to encourage the efficient and frugal use of land should be developed and applied.

1a. Restructuring "Open Space" Taxation

INTRODUCTION

Are open space and resource lands being lost because of deficiencies in the Forest Tax and Open Space laws? While some lands have been lost to conversion, the amount of land in both tax programs has increased moderately over time. Two recommendations are made: first, a literature review and study should be performed that identify problems, if any, with the current "open space" and forest taxation programs. Second, if problems are identified, a study should be conducted to develop and recommend improvements to the act or its implementation.

Two laws in Washington authorize preferential assessment for property tax purposes:

- Forest Tax law (RCW 84.33). Under the Forest Tax law, owners of 20 acres or more of timberland may apply for a preferential tax assessment through their county assessor.
- The Open Space law (RCW 84.34). The Open Space law recognizes three categories of open space as follows:
 - open space-agricultural land of any size;
 - open space-timber over 5 acres in size; and
 - "open space-open space" of any size.

Owners of such lands may apply for "current use" valuation through their county assessor.

In assessing land value, assessors consider a number of factors, including the selling price of land for development ("highest and best use" or "fair market value") and the value of land for producing timber, or other crops. If land registered under either of these two programs is used for a purpose other than growing timber under the Forest Tax law, or current use under the Open Space Act, owners must pay the difference between the preferential tax last paid and the tax on fair market value.

The difference in taxes can be considerable: current use valuation represents an average of 30 to 90 percent less valuation than fair market value. For example, in 1988, Adams County had 1,051,754 acres in current use valuation. The fair market valuation of this land was \$315,188,105, and the current use valuation was \$176,893,740, or 44 percent less than fair market value. In Clark County, the difference in valuation was 93 percent.

Several problems have been identified with these programs:

- The incentives provided to keep land in open space, or "designated forest land", although considerable, are not great enough to prevent conversion, in view of greater returns from development;
- The programs are seen by some as a "giveaway" to property owners, in that owners can enjoy years of preferential taxation, eventually convert their land, and only pay a portion of the accumulated tax difference between fair market value and preferential taxation.
- Open space and resource land programs are being subsidized by local government in that they forego the difference in valuations (although counties make up some of the money lost to them under current use assessment by raising assessments on other property, many counties have reached their constitutional tax limit and, therefore, are losing net revenue);
- Although existing open space authority is broad enough to allow local governments to protect open space, it is not fully being used. For example, RCW 84.34.230 authorizes the creation of "conservation futures" funds; funds to buy open space or development rights through the levy of an amount not greater than 6.5 cents per thousand dollars of assessed valuation. Yet, only a half dozen counties have created such funds.
- External factors, such as local ordinances, can act as a disincentive to registration. For example, when a landowner wants to sell land that is registered in the open space program (RCW 84.34), King County authorizes the county to buy the land at the price it was worth when it was first registered. Conceived as a disincentive to conversion, this policy is actually a disincentive to registration.

GAINS AND COSTS

A. RISK REDUCTION/RESOURCE ENHANCEMENT POTENTIAL

1. Restructuring open space and forest taxation programs could lead to improved protection of open space and resource lands.
2. Measures should be developed to evaluate the effectiveness of the restructured programs; e.g., the amount of land protected from and the amount of land lost to development.

B. COSTS

Ballpark cost estimate for problem identification is \$5000. Cost estimate for a further one-year study is \$45,000.

C. SUMMARY

OTHER FACTORS

A. TECHNICAL FACTORS

None.

B. INSTITUTIONAL CONSTRAINTS

Solutions to any problems that may exist with the Open Space Act may require amendment of existing statutes. Tax reform is complex and involves the participation of many players. For maximum effectiveness, it should be considered in conjunction with the use of other land use tools; e.g., purchase of development rights.

C. POLITICAL FACTORS

If higher penalties were sought upon conversion than already exist, owners may be reluctant to register their land. Local government will resist any change which will reduce their revenue base.

ROLES AND RESPONSIBILITIES

A. IMPLEMENTATION

Washington Association of Counties, Department of Revenue, Department of Natural Resources (Forest Tax), and Department of Community Development. Restructuring should be relatively easy in that the basic legal frameworks are in place and constituencies have been built around the programs.

B. ACCOUNTABILITY

Department of Revenue.

C. SCHEDULE

12 month study beginning in July 1991.

1b. Land-Value Based Taxation

INTRODUCTION

A study of the costs and benefits of land value based taxation, as well as a land value tax pilot program, should be conducted in Washington. Proponents say that the tax structure would lead to higher density development which, assuming constant demand, would reduce development pressure on open space and resource lands.

Current property taxation is really two taxes: a tax on land and a tax on improvements. Typically, the tax rate on improvements ranges from two to five, six, or more times the rate on land. Land value based taxation (also called site value taxation) would reverse this ratio. The theory behind land value taxation is that the value of land is a function of the community investments around it: schools, fire protection, roads, etc. These publicly funded investments raise the value of land, but rather than being returned to the community, this value is captured by the landowner in the selling price of the property.

Proponents of land value based taxation believe that this tax structure would have a number of benefits:

- **Revenue Enhancement:** Land value would be returned to the community in the form of taxes. This would not only be equitable, but would eliminate the need for developer impact fees. Proponents say that taxes on land would not raise its price, but would lower its value in direct proportion to the size of the tax, because taxes could be structured so as to equal the capitalized values of land rent.
- **End Speculation -- the holding of land in wait for higher prices:** Landowners would put land to use immediately, or would sell it to someone who would, because they could not afford to pay high taxes on idle land. Speculation, by keeping land idle, creates artificial shortages, raises land prices, and forces development into the suburbs and beyond where land is less expensive.
- **Encourage infilling by reducing taxes on improvements:** Lowering taxes on improvements would remove a disincentive to building and maintenance. By no longer penalizing building and maintenance, this tax

structure would encourage infilling and higher density development in urban areas. This would reduce sprawl and leapfrog development, which devour open space.

- Conservation of open space and resource lands: Since land used for agriculture or forestry is located far from urban amenities, the value of, and taxes on, such land would be lower. Therefore, there would still be a comparative tax advantage in keeping (rural) open space as open space. To create a further disincentive on conversion, taxes could be structured so as to be lower on zoned rural land than on zoned urban land; i.e., urban land could be taxed twice as high as improvements, while rural land could be taxed half as much as improvements.

COSTS AND BENEFITS

1. RESOURCE ENHANCEMENT

The advantages described in this paper are somewhat hypothetical because land-value based taxation has rarely been used in this country, and only in a few other countries. The first question that must be answered is, would land-value based taxation deliver what it promises?

Disadvantages related to land-value based taxation include possible pressure to put "land into higher uses when suitable demand exists for these uses and when the lands qualify for the uses in question." When these conditions do not exist, taxes could have an injurious effect in fostering the waste that comes with premature development, tax delinquency, and the tax forfeiture of property rights.

For example, in New Jersey, the State Tax Policy Committee cautiously approved adoption of land value based taxation, but only in larger cities. The committee felt that it was not appropriate in other parts of the state in that it would run counter to other policies, such as the Farmland Assessment Act, which seeks to preserve open space through preferential tax assessment.

2. EVALUATION

A first step in deciding whether or not to adopt land value based taxation in Washington state is evaluating its success elsewhere. Success, however, may depend more on urban objectives than on rural ones. Determining whether land conversion is affected by this tax structure would be difficult because many variables are involved.

3. COSTS

A ballpark estimate for a two-year study is \$100,000. If implemented, this tax structure would be costly in that it would create the need for new programs at the state and local levels. Revenues raised through land value based taxation could be shared among counties ("regional tax base

sharing") to prevent local governments from having to compete for development to increase their local tax base.

4. TECHNICAL CONSTRAINTS

None.

5. INSTITUTIONAL CONSTRAINTS

The proposal would entail a change in existing laws, regulations, and organizational structure. Considerable advantage has been seen in combining land value based taxation with planning, in that tax incentives alone may not go far enough to protect open space and resource lands. Using taxation gives planners a positive tool for influencing land use where now they have only negative powers. It also permits them to plan for open space instead of allocating it (if any) as a secondary by-product of land speculation.

6. POLITICAL FACTORS

Resistance from those persons and corporations benefitting from the present system would be great. An argument against the use of land value based taxation includes what critics see as disregard for "ability to pay" (the notion being that improvements on land generate income and, thus, ability to pay, whereas "raw land" does not generate as much income/ability to pay).

7. IMPLEMENTATION

The transition from the prevalent property tax structure to land-value based taxation would be difficult. For example, issues such as the choice of tax rates, the length of the phase-in period, and who is affected by windfalls and wipeouts would lead to protracted discussions and hearings. Land value based taxation would be most effective when combined with other programs, such as zoning and purchase of development rights.

8. ACCOUNTABILITY

Department of Revenue.

9. SCHEDULE

24 months beginning in July 1991.

2. Further Reduction of Taxes in Exchange for Improved Conservation Practices

INTRODUCTION

This proposal calls for a comprehensive study of the tax incentives that could be used to promote improved conservation practices. The study should include a discussion of the synergistic effects of using tax incentives that also maximize the use of conservation practices, and the effects of such incentives on state and local revenue. To date, the feasibility of restructuring property tax to promote such practices has not been studied in Washington. Currently, the only factors considered in property assessment are those mandated by law: fair market value and current use.

Restructuring other taxes to promote conservation practices has been suggested, however. For example, restructuring the forest excise tax would promote environmental protection. The forest excise tax is equivalent to 5 percent of the value of harvested timber. Since lengthening rotation ages results in fewer harvests in a given area, longer rotations are environmentally beneficial. Therefore, ways to encourage timberland owners to increase rotation age should be explored. Currently, the tax increases as the value of the harvested timber increases. By charging a tax amount that is uniform regardless of how much timber is cut, an incentive to early harvest would be removed.

Another option is to reduce or defer taxes in exchange for better agricultural, range, and forestland management. Further tax reductions or deferrals may be the best way to promote conservation practices, in that alternative ways of funding such practices (e.g., higher prices for consumers) may not work unless the competitive market advantage for not using such practices could be removed.

COSTS AND BENEFITS

1. RESOURCE ENHANCEMENT

Further tax reductions or deferrals may promote improved land quality and productivity in that money not paid in taxes could be used for conservation practices, such as reducing soil erosion.

2. EVALUATION

As with land value based taxation, evaluation of the effectiveness of tax incentives to improve conservation practices may be difficult because of the number of variables involved.

2. COST

A two-year study could cost \$100,000. Once tax incentives were fully implemented, taxes may have to be raised. If taxes are not raised,

property tax deferrals or reductions could have the disadvantage of reducing local government revenue. Local governments may want the state to rebate the difference between the reduced tax rate and the normal tax rate for such lands; the rationale being that conservation practices are a public or statewide benefit.

3. TECHNICAL CONSTRAINTS

None.

4. INSTITUTIONAL CONSTRAINTS

Laws would have to be passed and existing laws amended.

5. POLITICAL FACTORS

Local government officials would be opposed to any revenue reductions that may result from tax deferrals and reductions. Citizens may be opposed to higher taxes.

6. IMPLEMENTATION

Washington Association of Counties, Washington County Assessors' Association, Department of Revenue, Department of Agriculture, Department of Natural Resources, Department of Ecology, and Department of Community Development.

7. ACCOUNTABILITY

Department of Ecology.

8. SCHEDULE

24 months beginning July 1991.

CONCLUSION

An array of tools exists to direct land use, but these proposals call for attention to property and other taxation. How significant is property tax as a determinant of land use? What are the effects of various property tax structures on land development? What are the effects of other kinds of tax on land use? What mix of land use or regulatory controls and taxation incentives should Washington use? The studies called for in this paper would help answer these questions.

V. EDUCATION

PROPOSAL

Integrate environmental education with other curriculum elements to show relationships between environmental protection and the management of Washington's natural resource based industries (forestry, agriculture, and range), including "tradeoffs" and principles of good stewardship.

RELATIONSHIP TO 2010 VISION STATEMENT

INTRODUCTION

GAINS AND COSTS

A. RISK REDUCTION/RESOURCE ENHANCEMENT

1. A useful way to calculate risk reduction is to examine case studies. For example, at an innovative school district, an environmental education program will be integrated into curriculum for K-12. Three grades will be included in the pilot program (4th, 7th, and 8th). 1,728 students will benefit by learning the ecological and environmental values of forests, rangelands, and agricultural lands.

Benefits to students, community members, and resources include:

- a. A greater sense of involvement and responsibility through direct participation, field monitoring of environmental hazards, and field trips to natural resource based industries.
 - b. Early appreciation of commodity and non-commodity uses of land based resources in the communities' vicinity, leading to increased levels of concern, stewardship, and appreciation of trade-offs.
 - c. Community members are involved through lectures and workshops on land resources, and volunteer to work with students in the monitoring program and field activities.
2. Economic efficiency evaluations should be conducted during and after the implementation of the program. The highest level of precision in evaluating effectiveness of a program is through formal interviews, questionnaires, and observation of behavior after learning activities. The cost for staff time in conducting this type of evaluation is higher than a less precise method, such as self testing devices. Careful evaluation of cost effectiveness is undoubtedly

worth the expense and effort, and will help develop an adequate analysis, by showing how behavior and values are affected.

3. Additional benefits:
 - Better communication between students, community members, and environmental educators through a cooperative program.
 - A chance for students to see an active role for themselves in influencing resource management and environmental quality decisions in the future.

B. COSTS

1. A land resource environmental program could concentrate state funding for environmental ed. on a "model" program. Other negative costs include the possibility of taking time away from equally important curriculum elements.
2. Possible competing interests: Communities in which this program is initiated may have different approaches to environmental education.

State agencies may feel that funds are best used in a regulatory manner if education programs do not yield immediate results.

3. The costs for this proposal were taken from the Vashon School District project "WAVES". The initial funding for this project was through the Public Involvement and Education Model Projects Fund (PIE-Fund). The PIE fund is a possible source of funding for a land resource curriculum that addresses forestry, agriculture, and fisheries.

The program costs were \$31,800 for a one and a half year pilot program, and were borne by a tax on cigarettes in Washington. This resulted in participation by 1,728 students and community residents, at a cost of less than \$20 per person involved. The emphasis on volunteer help may offset some of the operating costs the program would otherwise incur.

4. An alternative model. Project Learning Tree (PLT) is an existing program that integrates forestry and environmental topics into K-12 curriculum. Sponsored by the Superintendent of Public Instruction and The Washington Forest Protection Association, PLT also works with the Department of Natural Resources, USDA Forest Service, and Project Wild. PLT is a large program, with up to \$150,000 in grants, donations, and other funding annually. The regular annual budget is \$20,000. (Communication, Lynne Ferguson, 3-7-90.) 10,000 teachers have received training through PLT in Washington. Considering the existence of PLT, it may be useful to emphasize agricultural and range lands in environmental curriculum planning.

C. SUMMARY OF COSTS AND BENEFITS

Although it is difficult to quantify the benefit of environmental education, the change in behavior of people who have experienced it should reflect more sophisticated understanding, and positive values about natural resources and the environment. At a minimum, they will be aware of both the beneficial and adverse consequences of natural resource development and their own role in resource decisions. Environmental education costs can be relatively low-- less than \$20 per student or community member. This is a participatory public program, minimizing the possibility of fluff and media gloss.

OTHER FACTORS

A. TECHNICAL FACTORS

There are no technological constraints at present.

B. INSTITUTIONAL CONSTRAINTS

Teachers may not have time or nor the training to integrate this information into their curriculum. School districts may resist adding another requirement to a very full load.

C. POLITICAL FACTORS OR IMPLICATIONS

Environmental education can be controversial, because sponsoring organizations and institutions may be uncomfortable with the values expressed in any given environmental education approach.

ROLES AND RESPONSIBILITIES

A. IMPLEMENTATION RESPONSIBILITIES

The program would be implemented at the school district level, and funded through a program such as the Centennial Clean Water fund. Individuals from the community would be recruited as volunteers to help students with field work and environmental monitoring. The Superintendent of Public Administration would be responsible for any curriculum changes.

B. ACCOUNTABILITY

The Environmental Education Task Force will be responsible for encouraging implementation of this proposal.

C. SCHEDULE

Within two years, programs focusing on land resources could be initiated at two to three interested school districts.

**Environment
2010
Action
Agenda:**

**Action
Strategies
Background
Analyses**

**Package
Seven:**

**Wetlands
Protection**



State of Washington
July, 1990

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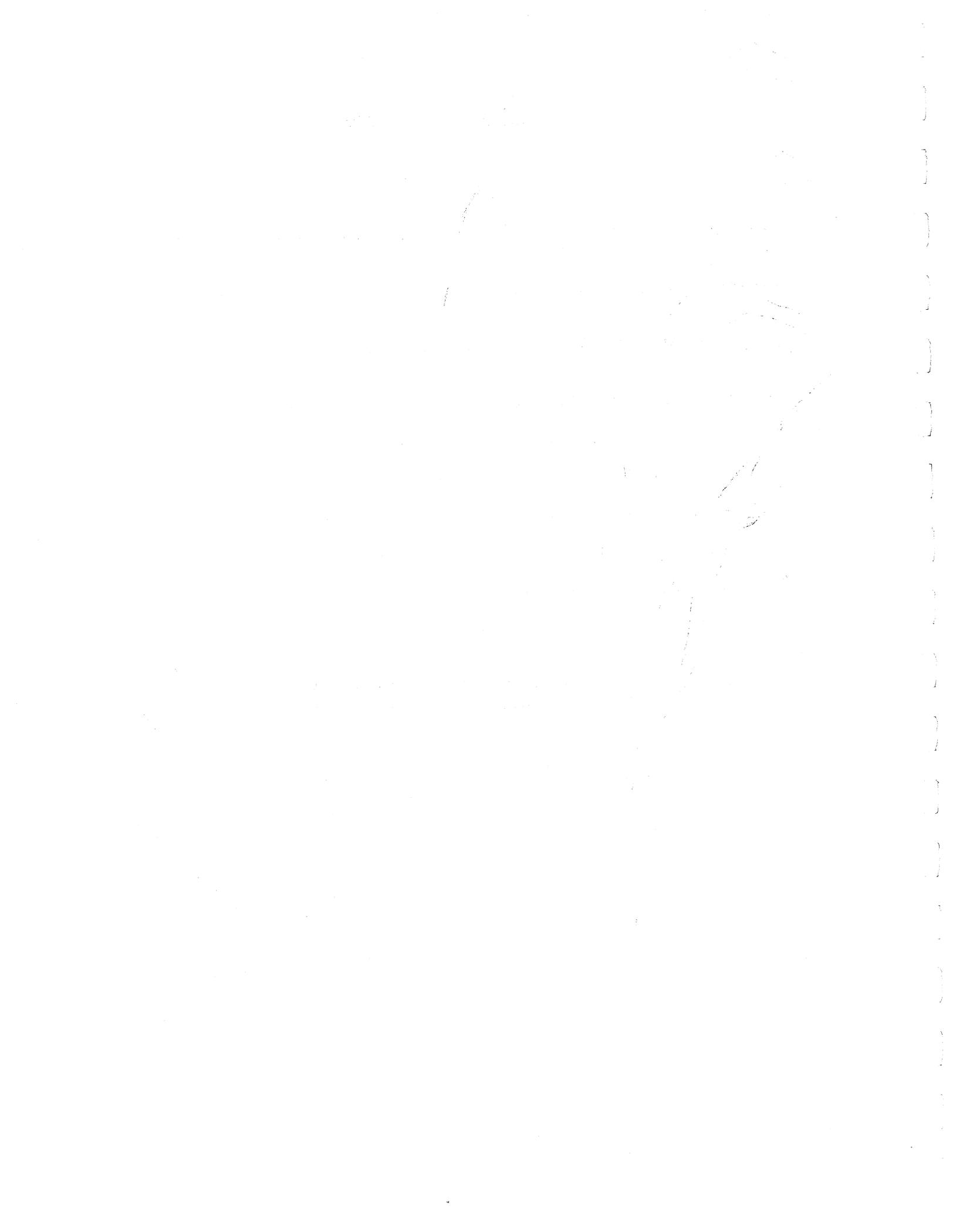
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PROBLEM STATEMENT

The Vision 2010 "State of the Environment Report" identifies the continuing loss and degradation of wetlands in the state as one of Washington's highest environmental priorities. The irreplaceable role wetlands play in the state's ecology dictates the urgency in which we now must act to retain those which remain.

While many actions have been undertaken recently, to abate the loss and degradation of wetlands, no comprehensive statewide wetlands protection strategy has been instituted. A legislatively established state goal on this issue, with an authorized program for implementation, is long overdue. The use of a range of approaches from non-regulatory to regulatory is crucial to effectively stopping this trend.

The potential for preserving key high quality wetlands ecosystems lessens every day. Without the preservation of core wetlands systems, ecosystem sustainability will fall. Replacing depleting wetlands with restoration is likewise limited due to the small number of areas suited to recovery. We have only so much, and can not readily or very feasibility make more. What little bit we try to create, will not be the diverse wetlands, rich in functions and values that are now being lost.

Background on Some Action Efforts Underway

At the state level, the Washington Department of Ecology has been working hard to advance wetlands protection. Within the Department's Shorelands and Coastal Zone Management Program, the Wetlands Section has addressed this issue for several years now. The Wetland Section's earliest work began with activities directed at educating the public and providing technical assistance to local governments. These efforts now include many distributional materials such as booklets, brochures, videos, posters, etc. and include a range of different training programs for teachers and planners on curriculum development, wetlands identification and delineation, and project guidance.

Efforts have expanded to include the Puget Sound Water Quality Management Plan task of protecting wetlands in the Puget Sound through wetlands preservation and development of standards and guidelines for local government regulatory programs. Also, a cooperative wetlands inventory and data base demonstration project is under development between Ecology and Department of Natural Resources.

Ecology Wetlands staff were involved in the National Wetlands Policy Forum, contributing to the final report, "Protecting America's Wetlands: An Action Agenda" and the supporting booklet, "Recommendations for Comprehensive State Wetlands Programs". The section has also spearheaded implementation of two executive orders from Governor Gardner: Executive Order (E.O.) 88-03 requiring a study report examining several wetlands issues with recommendations for wetlands management and protection, and E.O. 89-10 establishing an interim goal of no net loss and directing Ecology to provide guidance to state agencies for the development of action plans to meet these goals.

Also, Wetlands staff completed work with the Washington Wetlands Policy Forum and drafted wetlands protection legislation at the request of the Governor for introduction in the 1990 legislative session. Failure of this legislation prompted a new E.O. 90-04 authorizing maximum use of existing authorities to protect wetlands from loss.

These major activities and many other smaller ones are the ongoing work of the Department of Ecology. Other agencies at all levels of government, federal, state, and local have engaged in various activities which address wetlands protection in one form or another as well. For example, the Army Corps of Engineers administers Section 404 of the Clean Water Act addressing fill activities in wetlands, the Washington Department of Wildlife provides technical assistance and engages in acquisition of wetlands, Washington Department of Natural Resources secures wetlands under the Natural Heritage Program, and Island County administers a wetlands regulatory program as part of their comprehensive land use planning effort, to name a few.

Summary

Many discrete activities are underway, addressing different aspects of the wetlands loss and degradation problem from education to regulation. However, none address all aspects of the problem or even cover one portion of the problem thoroughly. An urgent need exists to create an overall program under which the existing patchwork of programs can be expanded, integrated, and/or modified to provide a comprehensive statewide wetlands protection effort. In such an effort, it is necessary to coordinate with and obtain the cooperation and participation of all involved agencies, governing bodies, and citizens.

In Vision 2010 we are provided an opportunity to identify elements needed for a comprehensive wetlands protection program which fills in the gaps in existing efforts. The following pages offer an action outline to address this need.

WETLANDS GOAL

The vision for the year 2010 paints the following picture:

"The biological value of wetlands is appreciated as well as their valuable contribution to flood control and water quality. Inventories of wetlands have been completed and planning for wetlands protection and sensitive development has been enhanced. A combination of preservation and mitigation has achieved no net loss of wetlands."

In the action package which follows each of the statements in this vision is addressed. Appreciation of the biological, as well as other functions and values of wetlands, is addressed in education under #2.2. Inventory work is addressed in #2.1. Planning for wetlands protection in all of #2's inventory, non-regulatory, and regulatory elements. No net loss of wetlands through non-regulatory and regulatory programs is provided in #1, #2.2, and #2.3.

The 2010 Wetlands Action Package is consistent with the action ideas resulting from the 2010 Symposium and the 2010 work shops (see Appendix). Additionally, the action ideas propose certain key initiatives: [1] development of innovative fiscal means of wetlands acquisition and protection (action ideas 2, 3, and 4); and [2] development of a program for increasing Washington's wetlands acreage (action idea 9).

The action package which follows seeks: To achieve no overall net loss of Washington's remaining wetlands base, as defined by acreage and function, and to restore and create wetlands, where feasible, to increase the quantity and quality of Washington's wetlands base.

From this statement, the immediate objective is to achieve no overall net loss of Washington's remaining wetlands base, while the long-term objective is to increase the quantity and quality of that wetlands base.

These objectives mirror those of the National Policy Forum's national recommendation, the Washington State Policy Forum's recommendations to the Governor for 1990 wetlands protection legislation, the support for a no net loss policy expressed by Governor Gardner in his wetlands executive order #89-10, and reflect public input in the 2010 process.

PROPOSED ACTION PLAN

The proposed action plan for wetlands protection is:

1. Establish no net loss of Washington's remaining wetlands base, as defined by acreage and function, and the longer term objective as state policy and put the implementation framework in place for achieving it.

2. The Washington State Department of Ecology shall coordinate with other state agencies in the development and implementation of a comprehensive statewide wetlands protection and management plan which incorporates non-regulatory and regulatory program elements to effectively address wetlands threats.

2.1 Inventory and characterize wetlands within discrete ecosystem units, such as river basins, and maintain a statewide database containing this information.

2.2 Expand on comprehensive non-regulatory efforts in the areas of preservation (acquisition & other "securing" approaches), restoration, education, research, technical assistance, and long-range/regional planning, etc.

2.3 Establish and implement statewide regulations on land-use activities on and near wetlands, with the supportive programs that go along with them, such as criteria, standards, mitigation, monitoring, etc. Criteria and standards will be developed for maintaining quality and quantity of all wetlands types which should be achieved or maintained within discrete ecosystem units.

3. Explore and develop new and existing revenue sources for use in all areas of wetlands protection with targeted financial incentives and disincentives.

Background for Action Plan

Nine original action ideas were placed on the table at the start of the action plan development process. These ideas came from audiences at the 2010 symposium and subsequent 2010 town meetings in early 1990. Each of the original nine action ideas were examined and discussed (see the Appendix for comments on each).

Several of the ideas were not clear or did not take into consideration technical work already underway in the area of wetlands protection. Many ideas were not fully developed as can be expected given the brief brainstorming forum in which they were solicited. Taken alone, they did not deal comprehensively with the problem of wetlands loss and degradation. Subsequently, none of these nine suggestions were adopted as written to constitute a major component part in a comprehensive wetlands action plan.

However, most of the ideas expressed some basic underlying concept of value (underlined portions of the Appendix) that makes up a component of the proposed action plan and/or goal objectives. The action plan as presented incorporates these concepts either directly in the action statements and/or goal objectives themselves, or will in the further development and implementation of the statement.

ACTION PLAN CHARACTERIZATION

The action package characterizations which follow have been arranged in the following manner for clarity of understanding. The action package component to be discussed is presented in quotations as it appears in the initial action plan outline. It is followed by a brief paragraph or two elaboration on what the intended action entails. Then the characterization assessment is conducted elaborating sequentially on: risk reduction/resource enhancement and costs; technical factors, institutional constraints, and political factors; and implementation responsibilities, accountability, and schedule.

1. "Establish no net loss of Washington's remaining wetlands base, as defined by acreage and function, and the longer term objective as state policy and put the implementation framework in place for achieving it."

Legislation would be passed establishing no net loss and the longer term objective and statewide program authority to implement a wetlands protection and management plan as described in #2. This action should establish a consistent wetlands regulatory definition as state policy and include supporting budget to initiate plan development. Until legislation is passed, every effort would be made to institute improved protection using available authorities and programs while continuing to pursue eventual founding legislation.

I. Gains and Costs of Taking the Action

A. Risk reduction/resource enhancement potential

Putting the policy and framework in place for achieving a no net loss goal of Washington's remaining wetlands would provide the legal and institutional framework needed to effectively halt their continued loss and degradation.

Statewide policy of no net loss of wetlands with a statewide program to implement it will fill in the existing gaps in both regulatory and non-regulatory program elements. Currently, a policy of no net loss is being instituted by executive branch state agencies under directive of the Governor's Executive Order 89-10. However, this goal does not extend to all land-use activities within the state, until legislative action is taken to establish it.

The existing regulatory programs such as the Clean Water Act, Shoreline Management Act, and local ordinances are all incomplete approaches for halting loss. Each addresses only part of the problem or part of the jurisdictional area in which wetlands fall. The non-regulatory program addressing wetlands preservation is being conducted in the Puget Sound only and has no assured state funding source to implement it. A state wetlands restoration effort has not been started.

It is estimated that between 716 and 2,034 acres of wetlands are lost in Washington each year. Adoption of a no net loss policy in 1990 could save between 14,320 to 40,680 acres of wetlands by the year 2010. The corollary goal of increasing quantity and quality of wetlands over the long term could begin the trend in the opposite direction by the year 2010, such that some gains in Washington's wetlands base could be achieved. These benefits would continue to accrue as each year passed.

Establishing this component of the action plan is critical to changing existing problems associated with loss and degradation of wetlands. Retaining the functions and values associated with wetlands directly affects the health, economic, and ecologic well being of this state and its population.

Functions wetlands provide such as floodwater detention, sediment entrapment, water purification, fish and wildlife nursery and habitat values, maintenance of plant gene pools, aesthetics, etc., are either very expensive to replace or are totally irreplaceable. Although different wetlands perform each of these functions and others to greater or lesser degrees, most wetlands perform many valued functions which when the wetland is lost, are likewise gone.

The risks associated with the loss of wetlands is high throughout Washington. The overall health of the environment and its ability to sustain human life are at stake when wetlands continue to be destroyed. Wetlands function as kidneys for the landscape, cleansing and regulating the ecosystem in which they reside. Without them the ecosystem disfunctions and loses its life sustainability.

Wetlands are so directly tied to the health of watershed ecosystems, and these ecosystems to general environmental integrity, that the connection to continued life sustainability can easily be made. How much is sustainability worth then? What dollar figure would we put on it? These are questions that can not

be answered in a pragmatic detached context.

Market studies and economic assessments characterizing the replacement costs associated with wetlands function and value loss are sparse to non-existent. A few figures have been collected regarding some of these costs as they relate to one or another wetland function or value. They are presented as a potpourri of information from which one can get some sense of the magnitude of value wetlands serve.

For flood control, the city of Bellevue has found that construction of stormwater control facilities would be 130% more expensive than maintenance of natural wetland systems. They have put in place a stormwater rate structure system citywide which rewards the maintenance of wetlands by saving the owner of a 4,000 square foot wetland on an undeveloped 40,000 sq. ft. parcel \$20,124 per year in service fees.

Pierce County estimated in 1989 that with 100% loss of existing wetlands along a floodplain in one of its districts, more than 90% of the stormwater conveyance facilities would have to be upgraded to meet 25 year design flow requirements. At current conditions 34% of the conveyance and detention facilities will need to be upgraded at a cost of \$1.75 million.

In 1976, the U.S. Army Corps of Engineers estimated that wetlands provide 75% of the natural water storage. In one area of study (Charles River, Mass.) they state that flood damage as a result of 40% loss of wetlands results in a 600% increase in annual property loss. The annual flood control value was determined to be \$2000 per acre in perpetuity.

Two-thirds of all commercial fish species depend during some part of their life cycles on wetlands. Commercial fisheries harvest in 1987 exceeded \$175 million dollars. Sport fishing proceeds for chinook and coho salmon alone have been estimated at over \$60 million a year as well.

Recent mitigation costs to replace estuarine wetlands in various areas of Washington were: \$16,000 per acre for intertidal area construction in Tacoma, \$40,000 per acre for eelgrass beds in Blaine, \$125,000 per acre for preliminary experimentation on a site in Lummi Bay, and \$316,000 per acre for fish mitigation construction costs in Grays Harbor. Monitoring mitigation projects adds about \$10,000 per acre per year as well.

For value of wildlife habitat estimates, the U.S. Fish and Wildlife Service states that in the continental

U.S. in 1980, 1.9 million hunters of migratory waterfowl spent \$307 million, and observers and photographers spent \$10 billion. Migratory waterfowl are critically dependent on wetlands for survival.

In Washington, the 1981 waterfowl hunters harvest was estimated at \$30 million. No estimates were found for observation and photography. Also no figures have been estimated for value of all other species besides huntable waterfowl.

Water quality enhancement and aquifer recharge figures are scarce. A 1977 U.S. EPA study estimated the savings in water supply and quality in one acre of wetland to be worth \$31,656. Another study done in 1981 states an average acre of wetland can supply 100,000 gallons of water per day at a capitalized annual savings of \$100,730 for the utility service to replace it.

Figures on recreation values and the aesthetic amenities associated with protecting wetlands were not available. But it is know that these attributes are highly valued and most often add considerably to the real estate value of properties surrounding wetland sites.

B. Costs associated with the action

Establishing the no net loss goal as state policy with an implementation framework for achieving it would require legislative action. Agency preparation associated with drafting appropriate legislation and undertaking public involvement activities needed for legislation passage would require an estimated \$175,000.

The costs to all potentially affected parties are impossible to assess. However, currently the general public is paying for the replacement costs associated with loss of wetlands functions and values. A no net loss program could lower these replacement cost while also shifting the burden of responsibility from the public to the resource users.

C. Summary of resource gains vs. costs

Estimating the total cost savings the public receives by protecting wetlands and the functions and values they serve would require several pieces of information which are currently lacking. These are: a complete understanding of all wetlands in Washington in regards to their locations and functions/values, knowledge of level to which wetlands provide each function/value,

and complete costs information of what each function/value is worth.

However, in the absence of this information, it should still be obvious that the long term benefits of improved protection of wetlands through implementation of a no net loss goal far outweigh the short term costs associated with implementing a statewide protection program.

II. Other Factors

A. Technical Factors

Technical constraints associated with implementing this action center around the issue of measuring progress toward achieving the no net loss goal and the longer term goal of increasing quality and quantity of wetlands.

Washington does not have a comprehensive statewide inventory documenting location of all existing wetlands and describing their attributes. Without this information it will be difficult to measure progress on the goal until such time as the information is obtained, or some other means of assessing progress is established.

Research and knowledge are lacking on appropriate and feasible ways of assessing functional characteristics of wetlands. Without effectively assessing wetlands functions, losses due to degradation can not be determined and corrected. To achieve the longer goals of increase in quality, technical knowledge needs to be expanded. To obtain an increase in quantity, methods of restoration and creation of wetlands need to be improved to assure success.

Each of these areas needs improvement to obtain the stated goal, however, working toward that end is possible and advisable to improve our collective knowledge base.

B. Institutional constraints

Existing law to implement a no net loss goal is not in place, but could be soon. With legislative authorization, existing institutional constraints can be overcome. Institutional changes that would ensue would place an emphasis on documenting and dealing with Washington's wetlands resource losses. This would require inventory, planning, and implementation actions by the state and local governments.

C. Political factors

Wetlands protection is controversial. However, the concept of no net loss is supported by diverse factions. The Governor, in Executive Order #89-10 establishes no net loss as a goal for all state agencies. The Washington Wetlands Policy Forum effort to draft legislation for the Governor on wetlands regulations has shown that different factions can be brought together to address the problem and come to terms with it because they have a consistent overall goal to focus on. Both environmental and development interests were brought to the table to address wetlands losses in the context of land use planning, and the subsequent legislation included the no net loss goal. The general public is becoming more supportive and concerned with this issue, which substantiates the potential for obtaining this recommendation.

III. Roles and Responsibilities

A. Implementation responsibilities

Ecology, other state agencies, local government, industry and business, and local citizens would each share responsibilities for achieving the no net loss goal. These responsibilities would cross over inventory, non-regulatory, and regulatory categories of the wetlands management plan.

B. Accountability

Ecology would support the passage of legislation to establish the wetlands goal and the implementation framework for obtaining it. They would also oversee activities conducted to achieve the goal.

Ecology has been pursuing passage of wetlands protection legislation for several years now. They also currently have the largest number of full time staff working on all facets of wetlands protection of any Washington state agency.

C. Schedule

The timeline for initiation of this action element is as soon as possible. It is uncertain how long it may take, possibly 1, 2, or more years to come about depending upon the political climate. Implementation of the Governor's Executive Order for executive agency policy and program application of the no net loss goal is June, 1990.

2. "The Washington State Department of Ecology shall coordinate with other state agencies in the development and implementation of a comprehensive statewide wetlands protection and management plan which incorporates non-regulatory and regulatory program elements to effectively address wetlands threats."

This plan would include an across the board effort to arrest wetlands loss and degradation using a mix of approaches. The plan would focus on wetlands natural system maintenance and integration. It would take a holistic approach and promote an ethic of sustaining and nurturing the environment. Coordination and involvement of all relevant agencies' activities/programs would be incorporated. Public involvement and participation would be built in throughout the plan to assure effective change.

Components of the statewide management plan, items 2.1, 2.2, and 2.3, are separated into categories of inventory, non-regulation, and regulation for analysis purposes. Although separated, these categories are interrelated and shouldn't be thought of as totally distinct from each other.

The assessment characterization will not be done on #2 but on each of its three component parts.

2.1 "Inventory and characterize wetlands within discrete ecosystem units, such as river basins, and maintain a statewide database containing this information."

Inventories would be conducted using ecosystem units such as watersheds as the focus. Criteria and procedures would be developed to conduct a coordinated and scientific assessment of wetlands in the state. Inventory and characterization would incorporate the needs of both regulatory and non-regulatory program components. Inventory data would be used to meet goals and objectives established throughout the action plan and it's design would deal with assessment of functions/values at some level. A statewide database would be created and maintained to house this information and to monitor success.

I. Gains and Costs of Taking an Action

A. Risk reduction/resource enhancement potential

Conducting field wetlands inventory and maintaining a database will provide Ecology, other state agencies, local governments, and other interested parties with

invaluable baseline resource information. It would allow for better planning, management, and permitting decisions about wetlands ultimately resulting in reduction in wetlands loss and degradation, and achievement of the no net loss goal. Wetlands functions and values which contribute to health, ecologic, and economic benefits can better be retained if their state/condition is known.

A great benefit of this information is the predictability it would provide for land-use decisions. Government and private parties would know, up front, what resource conditions they are dealing with. Knowing this, investors in land development could identify a wetland prior to purchase and understand the limitations associated with investing in it.

Monitoring of activity in wetlands could be the direct result of a statewide inventory. Maintaining records on wetlands and changes to them allows for direct assessment of wetlands status. Currently, Washington's wetlands base figures are estimates, as well as the figures on annual wetlands loss.

It is virtually impossible to make an estimate of cost savings associated with this issue given its nebulous nature. Cost savings estimates would have to consider the benefits from functions/values retained in wetlands saved due to identification and proper management. These estimates would also need to incorporate all future investment dollars saved or earned by informed investors who selectively invest in wetlands transactions for appropriate uses.

B. Costs associated with the action

There are many costs associated with conducting statewide inventories and creating and maintaining a database. It should be noted that costs are high in regards to the time and staffing needed to conduct inventories. There are training, materials, travel, and maintenance costs associated with this effort.

Wetlands processes and subsequent characterization of them is dynamic. Any information collected is a point in time encapsulation of conditions using the current level of scientific knowledge about wetlands processes. These two dynamic components of the inventory process are important to consider, as collection of more inventory information will always be possible and often desirable (particularly when project proposals are reviewed).

Understandably however, the initial collection effort is the most intensive phase, with maintenance and updating of data conducted on an ongoing but lower level of investment.

Some very rough estimates of costs to local jurisdictions for field inventory are provided based on the following assumptions: 1) statewide inventory does not include federal or tribal owned lands, 2) two professionals and two interns would be used in each jurisdiction, 3) there would be some public outreach, and 4) the final product is a hard copy map. This represents the basic minimum needed for field inventory assessment of wetlands.

Cost estimates are presented in increasing order in accordance with level of detail/data-collection. Note that costs increase with increased detail. Boundary identification and wetland classification work (6 hours labor per 1 square mile of wetland) has an estimated cost of \$8 million. Adding a small amount of selected function/value data (10 hours labor per square mile) costs approximately \$11 million. Extensive function/value data collection (16 hours labor per square mile) costs approximately \$24 million. In addition to these local costs, state oversight for coordination, technical assistance, monitoring for no net loss, and addressing specific needs in other parts of the wetlands action plan would require 2 FTEs at a cost of \$136,000 annually.

Data management costs are estimated at \$4 million over a 5 year period for database development and \$400,000 annually thereafter for maintenance of the system.

C. Summary of resource gains vs. costs

A rough estimate of inventory costs for program set up range from \$12 to \$28 million in the first 5 to 10 year period, plus annual maintenance costs of \$536,000. How these general figures relate to the actual resource enhancement value can not be calculated given existing information (see #1 I.C. statement) and figures of increased wetlands identification and thus potentially protected occurring from this element.

II. Other Factors

A. Technical factors

One technical factor that would be limiting to conducting wetlands inventories is current level of scientific knowledge regarding the assessment of functions and values wetlands provide. Our

understanding that wetlands provide many benefits is newly recognized. Therefore, research into understanding and assessing these functions has had a short track record in which to answer questions relating to the complexity of these issues.

At present, a few methodologies exist to conduct assessments of some functions and values that wetlands serve. These continue to be improved and expanded upon as time passes and research provides more answers to how wetlands function within the landscape. But currently they are complex and require allot of best professional judgement. A rapid method applicable to a broad brush inventory approach needs to be developed. With the current increase in inventory efforts nationwide, our understanding of wetlands functions/values will increase, and inventory techniques should improve rapidly.

One other technical problem at present is the limited number of skilled technicians with wetlands assessment knowledge to provide the expertise needed to conduct a massive statewide inventory. Current demand for individuals with these skills is far exceeding supply. However, this could be overcome with some intensive training programs.

B. Institutional constraints

The implementation of inventory assessments assumes that the wetlands goal and implementation framework described in statement #1 above, are in place. This being the case, no institutional constraints would exist. The only potential difficulty would be coordination/consistency of inventory work and data keeping when conducted by various agencies.

C. Political factors

Much of the inventory work would be conducted by local governments, particularly as it relates to land use regulations for wetlands protection. Local governments have limited dollars for increased activities above basic maintenance of community services. They would need support funding and technical assistance to accomplish the needed inventory work. However, given increased requests Ecology is receiving for grant funding of inventory work it is clear that most local governments feel inventory is valuable to the protection of wetlands and they are anxious to do it.

One other issue that may arise in the course of conducting inventories is the perception by some landowners that the inventory of wetlands on their land

is a threat to their private property rights. This attitude is certain not to be predominant, but will be encountered.

III. Roles and Responsibilities

A. Implementation responsibilities

Ecology would be responsible for developing the statewide inventory effort and standards. Work would be conducted with the involvement, cooperation, and coordination of other agencies, local jurisdictions and possibly private citizens. Database development and implementation responsibilities would be based upon recommendations from a current data management feasibility study.

B. Accountability

Department of Ecology would be accountable for overseeing the statewide inventory work and database development.

Current efforts Ecology is responsible for include oversight of wetlands inventory related grants, technical assistance and coordination efforts for inventory work, and collaboration on development of a statewide wetlands database.

C. Schedule

Completion of a baseline statewide inventory, that would meet the needs of this action package, would take 10 years. It is likely that the inventory would be conducted in a phasing process according to areas of threat and levels of assessment complexity. Phasing dates for this effort would be impossible to assess at this time.

2.2 "Expand on comprehensive non-regulatory efforts in the areas of preservation (acquisition & other "securing" approaches), restoration, education, research, technical assistance, and long-range/regional planning, etc.

Statewide non-regulatory efforts, supported with adequate and assured funding, would be established. Wetlands preservation and restoration would be directed at securing a minimum of 2000 acres of wetlands with adequate buffer areas annually. Provisions for long-range/regional planning would be developed and implemented at the state/regional/local levels. Gaps in understanding about wetlands would be addressed through research and education. Public

involvement would be promoted. Technical assistance would be expanded to keep up with the increased need the action plan will generate. Other non-regulatory efforts would be incorporated as identified and needed.

I. Gains and Costs of Taking an Action

A. Risk reduction/resource enhancement potential

Non-regulatory activities such as preservation, restoration, education, etc. will greatly advance efforts to achieve the goal of no net loss and eventual increase in quantity and quality of wetlands. Regulations alone can not stop all losses, and will never be able to increase numbers of wetlands or their functions.

Stopping losses and increasing quantity and quality will provide an increase in the functions and values that wetlands serve. This again directly provides for improved health, ecological, and economic benefits as discussed under item #1. Education and research activities directly support improvement in wetlands care, increasing these factors more.

Preservation assures that current healthy and diverse wetlands are set aside as standards of a healthy ecosystem and as core areas to critical ecosystem units. Restoration of degraded surrounding can add to these healthy core areas to make them more viable and to interconnect system subunits for a more sustainable whole ecosystem. Restoration work is critical to maintaining the current amount of wetlands for a no net loss goal, given that wetlands will continue to be lost even with a strong regulatory program in place.

Long-range/regional planning will improve the environment by retaining healthier ecosystems. This is done by monitoring the resources and managing resource altering activities in the context of cumulative effects to a sustaining system. Improved planning can provide a comprehensive picture of the situation and can improve the wetlands resources and the benefits they provide.

B. Costs associated with the action

Costs associated with non-regulatory activities would be ongoing. Preservation and restoration actions at the state level would require 4 program administration and implementation staff to initiate the program (2 for Ecology and 2 for the acquisition agency(s) - probably Natural Resources and/or Wildlife) at a cost of

\$272,000. This assumes that inventory work to identify appropriate sites can be folded into task 2.1 above (if not, 2 additional technical personnel would be necessary to conduct ongoing field work).

The securing effort would be conducted by both state and local level jurisdictions and possibly non-profits. Secured sites would require funds for management and restoration activities as well. A very rough estimate of cost here is approximately \$4200 per acre of wetland secured, or \$8.4 million annually. This figure includes acquisition of wetland plus buffer with restoration and initial management figured in. Ongoing management would require \$150 per acre yearly or \$300,000 for every 2000 acres of wetlands secured.

Some local governments would also be administering and implementing local preservation and/or restoration programs at their discretion. It is anticipated that the more urbanized counties, in the Puget Sound basin, would be interested in pursuing this option. It is estimated that these local programs would cost between \$70,000 and \$150,000 to set up and \$50,000 annually to administer. Assuming twelve counties set up programs by 2010, most of them probably in the more urbanized Puget Sound basin, set-up costs would be \$840,000 to \$1.2 million.

At a minimum, technical assistance for non-regulatory related activities, such as assistance to local governments on restoration and preservation programs, would take 6 staff, 2 for Ecology, 4 for other agencies, 1 each for Departments of Fisheries, Natural Resources, Parks, Wildlife, etc. This cost would be \$408,000 annually.

Stepping up education work statewide would require 2 Ecology staff in headquarters and 4 (1 per office) in the regional offices, costing \$408,000 annually. In addition, funds in the amount of \$50,000 and \$200,000 would be needed to support educational materials and programs at the state and local government level respectively. The \$200,000 would be used as pass through funds in a grant program to locals.

A minimum research effort would require one staff person to administer, at a cost of \$68,000, and \$100,000 in grant funds annually. Minimally, long-range/regional planning work would need one staff person at \$68,000 annually.

C. Summary of resource gains vs. costs

The cost per year for preservation and restoration securing efforts is \$8.4 million. The total of other yearly preservation and restoration administrative costs is \$322,000 (\$272,000 + \$50,000). A one time set up of twelve local government programs costs \$840,000 to \$1.2 million. The total of yearly expenses for all other non-regulatory elements is \$1.3 million. How these general figures relate to the actual resource enhancement value can not be calculated given existing information (see #1 I.C. statement) and the lack of figures on percent of wetlands benefited by the activities in this action component.

II. Other Factors

A. Technical factors

The only technical problems anticipated here are again those associated with restoration actions. Restoration has had a relatively low level of success to date. Restoration activities nationwide are in their infancy. Knowledge in this area is continuing to evolve rather quickly.

It is anticipated that in the coming years more will be known and the success rate will increase. Because restoration is receiving national recognition as the best means of meeting no net loss goals and eventually increasing the wetlands base, much research and practical experimentation is currently underway.

B. Institutional constraints

The one non-regulatory element that may have institutional constraints is the regional planning one. Regional planning for improved protection of ecological systems such as watersheds, crosses over discrete political boundaries. As political boundaries have no foundation in resource management, jurisdictional problems arise when ecosystems are managed as a unit.

Coordination and cooperation between the involved jurisdictional entities becomes critical to the success of the resource management approach. This is a recognized issue, but one in which some experience has been gained in the implementation of Puget Sound-wide planning under the Puget Sound Water Quality Management Plan.

C. Political factors

There appears to be considerable support for non-regulatory efforts by the public. In the recent Washington Wetlands Forum effort to draft wetlands legislation, there was general consensus in regards to the need for expanded non-regulatory approaches addressing wetlands loss.

The issue that is most controversial is the cost associated with non-regulatory approaches, such as acquiring and managing wetlands under preservation or restoration efforts.

III. Roles and Responsibilities

A. Implementation responsibilities

Ecology and various other agencies would be involved in all areas of non-regulatory activities. Implementation responsibilities on some non-regulatory activities may be lead by other agencies such as Dept. of Wildlife or Natural Resources, a cooperative association of governments, a local jurisdiction, or non-profit organizations or citizens groups. There is the possibility for virtually any level of involvement in implementation of non-regulatory activities.

B. Accountability

Ecology would be accountable for development and oversight of the non-regulatory elements. Currently Ecology is administering non-regulatory activities in almost all these areas. Ecology and DNR share responsibility for implementation of the Puget Sound Wetlands Preservation Program.

C. Schedule

Implementation would begin as soon as funding and authorization for purchasing programs was received, and would be ongoing.

2.3 "Establish and implement statewide regulations on land use activities on and near wetlands, with the supportive programs that go along with them, such as criteria, standards, mitigation, monitoring, etc. Criteria and standards will be developed for maintaining quality and quantity of all wetlands types which should be achieved or maintained within discrete ecosystem units."

Passage of legislation authorizing statewide regulations would occur in #1. Thus implementation here would entail rule development of land use regulations relating to wetlands. Details on standards, buffers, mitigation, and other component parts of a regulatory program would be put in place.

Ways of avoiding process duplication and providing permit coordination would be sought as appropriate and feasible. One might be Corps of Engineers delegation of Section 404 or some other ways of streamlining 404 with the state regulatory process.

Supportive programs, such as advanced identification or special area management plans, and mitigation banking (creation of wetlands prior to loss), etc. may be established. For mitigation banking, it is important that the state take a close look at its value and effectiveness in the context of comprehensive planning to offset wetlands losses.

I. Gains and Costs of Taking an Action

A. Risk reduction/resource enhancement potential

Estimates of annual wetlands loss range from 716 to 2,024 acres. Although it isn't possible to identify the actual number of wetland acres that would be saved with regulations in place, it is safe to say that much of this loss would be prevented.

The reduction in wetlands loss with the application of regulations, would directly result in significantly reduced loss of functions and values which benefit community and economic health. These function/value benefits, as discussed in #1, would greatly reduce the public's cost for replacement. Wetland buffer areas, maintained natural spaces around wetlands, would help assure that wetlands functions and values are retained.

Regulations would allow for predictability in the administration of land-use decisions. This would benefit both the local jurisdictions and landowners. A direct economic benefit to landowners, would be the predictable application of regulations to specific lands. With established regulation parameters, investment for development purposes can be made with knowledge of the allowable development applications for the parcel. This alone can save investors considerable money and also increase profits should certain wetland amenities be desirable for particular development projects.

Regulations could also provide an incentive for restoration and some creation of wetlands for mitigation purposes. This would not add to the wetlands base, as much as attempt to replace allowable losses.

B. Costs associated with the action

Costs of a statewide wetlands regulatory program would be incurred by the state, local jurisdictions administering regulations, and developers of land. Restrictions on some wetlands development activities that have been allowed in the past would occur. Regulations would encourage avoidance of wetlands. With avoidance, costs associated with wetland compensation (i.e. making upland out of wet land) are prevented.

However, when avoidance was not possible the proposed development action would be required to mitigate for the wetlands lost. When developments took place in wetlands, costs would be higher for mitigation of impact. Up-front mitigation costs would balance, the current costs the public now pays to replace lost functions and values.

Most likely, regulatory programs that would ensue from state legislation would require local program development, administration, wetlands inventories, and possibly mitigation monitoring. Costs associated with program development relate to assessment of existing ordinances and programs, research, preparation of ordinances required to implement statutory mandates, and public involvement and hearing processes. Local government program development costs are estimated at \$4.8 million (this does not include field inventory work which is discussed in #2.1). It is anticipated that much of this cost will accrue to the state.

After development and adoption of local wetlands programs, local governments will be faced with administrative costs. Long-term administrative costs are estimated at \$1.5 million annually statewide. Most of the administrative costs will be borne by the regulated community as wetlands program-generated revenues.

State costs would result from development and adoption of rules, standards and guidelines to implement the state authority, compliance with the State Environmental Policy Act, and data management costs. State program set up costs are estimated at \$900,000. There would also be wetlands protection program oversight costs to the state to assure that the goal of

no net loss of wetlands is achieved and to ensure appropriate local compliance.

At a minimum, long term state oversight would require 4 Ecology employees at a cost of \$272,000 for regulatory oversight. The necessary FTEs here may be higher based on resulting demand for technical assistance, needs of enforcement, possible grant administration, mitigation oversight, and other as yet unidentified program components. All of these are highly variable parameters difficult to estimate at this time.

In addition to Ecology's role, it is assumed other state agencies such as the Departments of Agriculture, Community Development, Fisheries, Natural Resources, Parks, Transportation, Wildlife, etc. will participate in providing some technical assistance to other governments and/or internal application of these regulations as well. Estimates of total numbers of staff and costs associated with these needs are more tenuous and are not included at this time.

These estimates assume a regulatory program that is locally implemented with state oversight only, versus a fully state run regulatory program.

C. Summary of resource gains vs. costs

Set-up costs for the regulatory component would amount to \$5.7 million, with annual maintenance of approximately \$272,000 thereafter. How these general figures relate to the actual resource enhancement value can not be calculated given existing information (see #1 I.C. statement) and figures on the percent of wetlands receiving regulatory protection from implementation of this action component.

II. Other Factors

A. Technical factors

The technical limits associated with implementing regulations are minimal. Difficulty implementing a regulatory rating system, to identify classes of wetlands receiving different treatment, will vary depending on the criteria being used. Basically however, whatever criteria is used should be fairly easily applied within the context and limits of existing knowledge regarding wetlands functions and values.

This being the case, the areas of technical concern are restoration and creation technologies associated with mitigation. The ability to restore or recreate

functioning wetland ecosystems is a very new science. Creation activities in particular have a very low success rate for replacing losses. Much more research and development needs to occur before compensatory mitigation will indeed provide effective replacement. It is anticipated that in the coming years much more will be known and the success rate will increase.

The extent to which resource characterization, to fully assess wetlands functions, is accomplished in #2.1 will dictate the level to which maintenance standards, for the purpose of maintaining wetlands types and functional quality within an ecosystem unit, can be developed. The question here is not one of whether it is technically possible to accomplish this task, but rather to what level it will be possible and the acceptability of that level.

B. Institutional constraints

Assuming that item #1 is in place, there would be no other institutional constraints preventing implementation of a regulatory program. State government oversight of regulatory programs would require additional planning personnel to implement, administer, and enforce the regulations.

C. Political factors

The political factors are similar to those expressed in #1. There is some mixed receptivity to this issue, with growing consensus that wetlands regulations are needed. Local governments support a strong state lead on this issue, and the public is growing more and more vocal as well. With regulation authorization provided, the most difficult task would be gaining consensus on implementation rules.

III. Roles and Responsibilities

A. Implementation responsibilities

Ecology would develop the rules and review local wetlands plans. Other state agencies would be consulted to obtain their resource expertise during review of local plans and development projects. Local governments would develop jurisdictional plans with input from their communities.

Some coordination and technical assistance activities would be required of other agencies at various levels of government.

Landowners with development interests would need to modify current activities to accommodate changed land use patterns.

B. Accountability

Ecology would be responsible for program development and oversight. Coordination and incorporation of other agencies activities and oversight responsibilities, as they relate to wetlands, would need to be folded into this effort.

Current related efforts Ecology has been responsible for include: development of wetlands management guidelines under the Puget Sound Water Quality Management Plan, implementation of two Executive Orders relating to wetlands, development of water quality standards in relationship to wetlands, and work with the Washington Wetlands Forum to draft the 1990 wetlands regulatory legislation.

C. Schedule

With passage of legislation outlined in #1, rule development would be completed within 18 months. Local plan development and approval for Puget Sound counties would follow one year after and for other counties within one year after that. Recognizing the critical role wetlands regulations play in reducing loss, legislative authorization as soon as possible is crucial.

3. "Explore and develop new and existing revenue sources for use in all areas of wetlands protection with targeted financial incentives and disincentives."

A full assessment of this issue would be conducted to meet the financial needs of the Wetlands Action Package. Public and private funding sources/options would be reviewed. Recommendations for what needs to be done financially to support the action package, and who should do it, would be made and implemented.

I. Gains and Costs of Taking an Action

A. Risk reduction/resource enhancement potential

Funding would allow for implementation of a comprehensive statewide wetlands protection plan as described above. The benefits of which directly relate to abating the loss and degradation of wetlands by

accomplishing a no net loss goal and long term gains in quantity and quality of wetlands. This retains functions and values which contribute to the health, ecologic, and economic benefit of the community.

Achieving a funding package would zero-out or cover the implementation costs identified in the previous discussions. This is not to imply there would be no costs, simply that the means of covering the costs would be accounted for. Some funding approaches could generate a continued source of revenue for implementation of the action package which would allow these efforts the financial backing to stand on their own and thus be assured continued implementation.

B. Costs associated with the action

The costs here are associated with the administrative tasks of researching available options, selecting preferred alternatives, and pursuing their implementation.

Ideally, a contract would be entered into to conduct the assessment of appropriate funding alternatives. The estimated cost being \$40,000. It is assumed that some legislative action would be needed to implement the recommended funding option(s) whether they are new funding choices or modifications to existing authorities. In that event an estimated \$100,000 would be used to pursue the legislative changes. The actual cost impacts of any fund raising legislation can not be assessed without knowing what action would be proposed.

C. Summary of resource gains vs. costs

This action contributes to obvious major advances for wetlands management in relationship to the cost of getting a funding package set up. The amount of \$140,000 to initiate a funding program is small in relationship to the benefits of achieving a goal of no net loss. Once appropriate and continued funding is available and the wetlands goal is in place, the comprehensive statewide wetlands protection and management plan activities can begin, with assurance of financial support for implementation.

II. Other Factors

A. Technical factors - Not applicable

B. Institutional constraints

Unless continued state general funding appropriations were approved for this action package, financing these

efforts, and even applying financial incentives or disincentives, will require some legislative action. Institutional constraints are associated with getting the needed action to accomplish this end.

C. Political factors

It is impossible to say who or what would be the political constituency to consider in this action element. Depending on the recommendations themselves, different audiences could become opponents of a tax, for example, or other action that would affect them. This is more-or-less a moving target issue.

III. Roles and Responsibilities

A. Implementation responsibilities

This study would probably be contracted to an appropriate financial expert for analysis and reporting to Ecology. The assistance and advise of any agencies, businesses, or citizens groups with expertise and opinions on this issue would be solicited as needed.

B. Accountability

Ecology would oversee the study itself. The appropriate entity(ies) as identified in the study would pursue implementation of the funding option(s) advised. This would likely be either Ecology or another appropriate state agency.

C. Schedule

Full implementation would take between 3 to 5 years, with funding ongoing thereafter.

NOTE: All cost projections discussed in the sections on "Costs associated with the action" are estimates only. Changing conditions and presently unidentified issues will undoubtedly require alterations to the scenario of staffing and resources projected at this point in time to meet a twenty year need. Also, note that all projections included in this document are requirements above the present level of staffing (20 wetlands FTE's in Ecology) and resources.

APPENDIX**COMMITTEE COMMENTS AND INCORPORATION
OF INITIAL ACTION IDEAS**

1. "Develop a uniform definition of what a wetland is, inventory the state's wetlands, and create one official database for tracking losses. Determine which areas are threatened and should be the targets of preservation efforts. Model research after the Puget Sound Wetlands Stormwater Study."

This statement was a catch all for several different ideas.

For the first statement that a uniform definition would be desirable, attempts have been made for many years now to bring diverse groups to agreement on this issue, with no success. In fact, current consensus is that two definitions may be appropriate - a broad ecological definition for inventory and planning, and a narrower one for regulatory purposes. More relevant is whether the definition argument has a significant amount to do with the continued loss of wetlands. For the real issue is not whether we use 2 or 3 parameters to define wetlands, it is whether we can stop the destruction.

Inventorying the state's wetlands and creating one official database for tracking losses is an important approach, and one that is currently being initiated and coordinated by Dept. of Ecology's Wetlands Section. Here, identification of funding source(s) is the greatest challenge to meeting inventory and data management needs.

The next statement, "determining what areas are threatened and should be the targets of preservation efforts" conflicts with itself. Areas that are threatened are not necessarily the same as areas that should be the targets of preservation efforts. Also, when selecting wetlands that are desired for preservation it's critical to consider all of other factors besides just the "threat". More significant in this regard are the attributes of the wetland itself, i.e., the quality of its functions and values.

Lastly, "Model research after the Puget Sound Wetlands Stormwater Study" needs more explanation. This study is excellent for the purpose it serves, but the study design would not necessarily be applicable to all other research. Generally, research needs to focus on addressing wetlands management and gaining better understanding of wetlands functioning.

- 2) "Create mechanisms, such as stormwater utilities, for generating new revenue sources."

Using wetlands as a stormwater basin conflicts with the goal of protecting wetlands from further degradation in most instances. As most wetlands which are now receiving stormwater runoff are heavily impacted and altered in character, and more of this use is not a savings. However, if the intent here is to propose using a utility fee as revenue for acquiring and protecting wetlands within a watershed or to construct settling basins in the course of contaminated waters that are impacting wetlands now, then this should be pursued.

- 3) "Fund public purchase of wetlands in critical situations or purchase of development rights."

What are critical situations; when a developer has to change their site design, when there is no use of the property, or when the wetland is so significant to the health of the environment that it can't afford to be lost? Some public acquisition of wetlands is appropriate but it should consider both fee simple and the full range of less-than-fee simple acquisition in a focused program approach.

- 4) "Provide financial incentives/disincentives for wetland retention/destruction."

This is one of many funding approaches that should be considered.

- 5) "Create a regional wetlands protection body funded by counties and the state responsible for implementing a comprehensive state wetlands protection plan with no net loss as its goal."

Comprehensive statewide wetlands planning and a no net loss goal are critical to saving wetlands.

Executive Order (E.O.) 89-10, signed by Governor Gardner on December 11, 1989 adopts the twin goals of no-net-loss in the near term and increase in quality and quantity in the long term as formal policy for all executive branch agencies. This E.O., and E.O. 90-04, also identifies Dept. of Ecology as the appropriate agency to coordinate the state's efforts to meet these goals. Creating a regional planning body to manage a statewide resource would fragment a statewide program and dilute efforts.

- 6) "Create mechanisms to improve coordination among all governmental programs having positive or negative effects on wetlands."

It is agreed that coordination should be part of the action program, but also recognized that better coordination alone is not enough to deal with the wetlands loss problem.

Approving coordination between some governmental programs would be advantageous. Ecology is currently working hard on coordination efforts. Executive Order 89-10, requiring state agency action plans for achieving no net loss of wetlands on lands administered by the state, and provisions in E.O. 90-04, should advance coordination efforts considerably.

- 7) "Increase the public's understanding of the value of wetlands as ecosystems. Develop sections of existing state wetland holdings into "living classrooms", with interactive paths, interpretive centers, and recreational facilities."

As a comprehensive approach to education, there are two concerns with this suggestion. First, taking the state's wetlands holdings and making classrooms out of them is not the answer to all the public's "understanding" needs. Many education oriented tasks are needed to raise the level of consciousness on this issue, and using some wetlands as interpretive education areas is important.

Second is the significant adverse ecosystem impact that implementing the above statement could have on existing state owned wetlands. The few wetlands currently owned by the state are primarily those which have been acquired by the Dept. of Natural Resource's Natural Heritage Program. These, by mandate of the program, are the highest quality undisturbed representative and sensitive plant communities of their kind remaining in the state. Opening these fragile "museum-piece" areas to intense public use would not be in the best interest of the wetlands or the public.

State identification and securing of less sensitive wetland areas that can be used for public education is an important need.

- 8) "For U.S. Army Corps of Engineers section 10 and 404 permits, the Dept. of Ecology should adopt mitigative policies no less stringent than those of the Environmental Protection Agency."

As phrased, taking action is not possible, as Ecology does not administer section 10 or 404. Nevertheless, a recommendation that Ecology develop a single statewide mitigation policy was one of the recommendations of the 1988 Washington Wetlands Study Report. Ecology's development of mitigation policies no less stringent than those of the EPA for application through SEPA and other existing authorities would provide consistency with the Corps.

- 9) "Develop a program, through wetlands banking, that provides for net addition to the number of acres of wetlands in the state of Washington."

This suggestion calls for an increase in the number of acres of wetlands in the state, which is an agreed need. However, it recommends obtaining that increase using a program of wetland banking. Mitigation and a mitigation banking program are essentially avoidance and/or "replacement" efforts. Wetlands banking operates by replacing wetlands acreage, values, and functions loss during development, with created or restored wetlands. They do not add to the wetlands base over the long term, but rather try to prevent or offset wetlands lost.

Replacement mitigation, when used at all, should never affect more than a minute number of wetlands were avoidance of impact is not possible. Certainly, not a significant enough number, that when compensated for, even at a greater than one ratio, would significantly "add-to" the number of wetlands in the state. Also adding to, in numbers of acres only, does not prevent loss of functions/values and wetlands types. Therefore, replacement of function and type, as well as size is critical.

By far the more effective means of adding to wetlands in the state is through the use of restoration. This approach has been recognized nation-wide as the best means of meeting a no-net-loss goal and increasing wetlands over the long-term.

Environment
2010
Action
Agenda:

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Package
Eight:

**Fish
and
Wildlife
Resources**



State of Washington
July, 1996

WASHINGTON ENVIRONMENT 2010
FISH AND WILDLIFE ACTION PACKAGE

I. It is the goal of this action package to maintain the present productive capacity of all fish and wildlife to the year 2000 and beyond. The focus is on protecting and restoring fish and wildlife habitat such that there is no net loss in function or value. This is intended to address the major threats to the resource from habitat loss and alteration, harvest and management constraints, information gaps, and inadequate regulatory effectiveness. This plan will also blend with other initiatives maintaining and improving the air, water and land resources.

A. Six basic action strategies are contained in the package. They include: (1) clean up and protection program for coastal waters and estuaries similar to present efforts aimed at Puget Sound; (2) compilation of a statewide fish and wildlife habitat inventory with assessments determining species distribution and abundance; (3) creation of a statewide fish and wildlife habitat restoration program with "outreach" concepts to foster volunteer assistance from the public and private organizations and a landowner's incentive program; (4) formation of a monitoring program to determine compliance and the effectiveness of various resource permit conditions; and (5) a variety of studies which are necessary to improve and extend present fish and wildlife management capabilities and direction; and (6) a habitat acquisition program.

The most serious risks and threats to fish and wildlife as identified in the 2010 Resource Characterizations and Risk Reports include habitat loss and alteration, various harvest and management constraints, data gaps, and inadequate regulatory effectiveness. This package is an attempt to address all of those issues at least within the extremely short time span that has been allowed.

B. The concepts and ideas involved in this action package would help fulfill numerous goals of the 2010 Vision Statement. They are especially related to the Vision Statement components which address awareness, knowledge, responsibility, diversity, and stewardship of water, forest land, range land, agricultural land, recreational land, wetlands, and fish and wildlife resources. In combination, they are expected to provide restoration and enhancement for lost or damaged habitat, more effective and efficient regulatory functions, and create an accurate and comprehensive data base which would serve to improve and extend existing management capabilities and establish a basis for long-term statewide fish and wildlife planning.

C. These six basic action ideas have not been listed in any priority.

1. This action calls for a cleanup and protection program or programs for coastal waters and especially the estuaries of Grays Harbor, Willapa Bay, and the Columbia River. This effort could parallel that of the Puget Sound Water Quality

Authority (PSWQA) which focused on Puget Sound. It could also be expanded to include Hood Canal and the Strait of Juan de Fuca as well. The first step would be to identify resources and the specific threats to these resources on an individual drainage basin and estuary basis.

It would build upon existing efforts relating to the Grays Harbor and Columbia River estuary activities, and to establishing one or more marine sanctuary areas. The Grays Harbor Estuary Management Plan has been developed and incorporated into local governments master plans, and is reviewed on an annual basis. The results of a Grays Harbor salmon survival study will be available in mid-1990 and will provide useful information. In addition, federal legislation is being considered that would be incorporated into the action plan. Marine sanctuary status has been proposed for the Washington Coast and Strait of Juan de Fuca areas. The sanctuary process includes the development of management plans and will also be useful in the overall estuary cleanup and protection action plan.

2. The Department of Wildlife (WDW) has just begun conducting a statewide inventory of fish and wildlife habitats and species found within its legislative mandate. This project started January 1, 1990 and will complete the first part of the project by September 30, 1990. This first part will address wildlife priorities on 17.7 million acres of commercial forest land, both federal and non-federal. WDW will work with the Forest Practices Board, DNR, and TFW participants to produce the following products.
 - (a) A new definition for the term "critical wildlife habitat";
 - (b) Criteria for identifying priority habitats and species;
 - (c) A list of priority habitats and species;
 - (d) Management recommendations for priority habitats and species; and
 - (e) GIS-based maps showing the location of priority habitats and species.

Phase two of the proposal would begin in 1991 and focus on

24.9 million acres of non-forest land.

This action proposal has as its foundation an ecosystems approach for dealing with habitat protection and management. A GIS-based system is currently the most desirable method for displaying habitat information in a format suitable for analyzing landscape changes over time. It is this "big picture" approach that will provide planners and resource managers with quantifiable wildlife information needed for managing "ecosystems" rather than single species. WDW's GIS system is compatible with DNR's GIS, which is a standard for the state.

The Department of Fisheries would conduct a statewide inventory of food fish and shellfish habitats and species. Inventory results would be used to develop management recommendations for all food fish and shellfish habitats and GIS-based information. The Department of Fisheries will work with other resource management entities (state, federal and local) and the public in developing the management plans.

3. Restoration and enhancement of wildlife and fish habitat and a landowner incentive program is a costly proposition, but one that merits attention. Many resource decisions that were made in the past were made without knowledge of their potential impacts on the fish and wildlife resource. There are, fortunately, many situations that can be rectified. Indeed, private landowners in particular often call on resource agencies for assistance in wildlife or fish habitat enhancement. However, funds and staff time are generally not available to assist in these requests.

Examples of activities under this action strategy include, wetland restoration, removal of manmade obstacles to fish migration, reestablishment of healthy riparian zones, re-creation of spawning sites, and restoration of damaged intertidal areas, among others. This strategy would also entail elements to gain public and volunteer support and assistance.

This restoration and enhancement program would also include a landowner's incentive element. State tax or lottery monies could be used to "subsidize" landowners to grow or maintain key habitat types such as riparian and wetland areas, old growth stands, shrub-stepp lands, etc. through the granting of long-term and perpetual easements.

4. This item would establish a monitoring program to help determine compliance needs and effectiveness of various conditions placed on Hydraulic Project Approvals and Corps of Engineers Section 10 and 404 permits in protecting fish and wildlife resources. A variety of types of construction projects and activities would be selected for study.

Examples could include bulkhead construction, dredging, culvert installation, pile driving, gravel removal, etc. Monitoring would include both pre-project and post project biologic assessments, and observations during actual construction work.

5. The studies element is intended to fill vital data gaps necessary for more effective resource management. These studies would help determine distribution and abundance of both game and nongame species and predator/prey relationships among fish species. Data from hatchery research would optimize the type, quality and quantity needs for hatchery reared fish. Research in disease control and prevention would allow increases in existing hatchery production. There are also about 115 nongame vertebrate species for which very little is known even about their life history. This information is essential to improving and extending present management capabilities.
6. This item would establish a long-term habitat acquisition program. Again, because of continuing reductions and deterioration of fish and wildlife habitats, fish and wildlife populations and related recreation cannot be maintained or improved unless additional habitat can be preserved. Current efforts of the Washington Wildlife and Recreation Coalition in this direction are commendable. To date, approximately 60 million dollars have been approved for acquisition. This may very well, however, be a one shot only effort. It is not enough to meet the fish and wildlife needs of 2010. Only key or critical habitats and recreation lands would be included in this program. This program would provide continued funding for acquisition of key fish and wildlife habitats.

II. (#1) Coastal Program - Gains and Costs of Taking an Action

The following sections dealing with risk analysis and cost benefits are the most difficult of elements to portray adequately within the time frame of this process. Economic valuation systems and methodologies are variable, site-specific and very complex. To determine economic value, one must consider commercial, game or sports, and nongame status of the species; age group and sex; rare, threatened, and endangered status; geographical distribution and abundance; recreational use and demand which includes a variety of generated revenues such as expenses to local economies (food, lodging, tourism, etc.); hunting and fishing license fees; federal Dingell-Johnson and Pitman-Robertson taxes; and even the concept of "willingness to pay." In simple terms, this means that, as an example, though many people may never have the opportunity to see a blue whale, they feel reassured, more at ease and less stressed, just to know that they still exist and are even willing to contribute to the perpetuation of a given species.

In light of these factors and the fact that we are dealing with more than 500 species, this section cannot be completed in a just fashion. To give some ideas regarding fish and wildlife values, several tables are attached at the end of this package.

A. Risk Reduction/Resource Enhancement Potential

1. The potential for statewide harbor estuary cleanup and protection programs to reduce the risk on fish, shellfish and wildlife resources is large because success in this area will enhance these valuable resources. Preliminary results from a study of the Grays Harbor estuary indicate that salmon passing through the inner estuary survive at only one-half the rate of salmon entering the northern estuary. Thus, the elimination of water quality problems in the inner estuary has the potential to double the salmonid runs from the Chehalis River.

The estuary cleanup also has the potential to restore areas that have been decertified for clam harvesting to being able to support clam farming and recreational fishing.

The initiation of estuary cleanup and protection programs will reduce the fish, shellfish and wildlife resource threat, provide a larger resource base for recreational and commercial fisheries, and provide a process for building a stewardship feeling within the public.

2. Successful estuary cleanup programs will be effective in enhancing fish, shellfish and wildlife resources. Several measurement techniques are possible now. Measurement of success can be done by exposing young salmonids to estuary water and monitoring physiological factors, and/or by comparing survival rates of fish exposed to the estuary with survival rates from other stocks of fish. Measurement of physiological factors can be done on an annual basis. Survival rate measurements can also be done annually, but would be delayed pending the return of the fish after ocean residence (one to three years).
3. This process would be designed to build the Environmental 2010 vision of all segments of our society being environmentally knowledgeable and responsible, and willing to cooperate to resolve tough issues.

This plan would also benefit the state's economy through the commercial and recreational fishing industries. This is particularly significant for coastal communities that are currently economically depressed and very dependent on fishing related business. Two recent studies demonstrate that the recreational and commercial fisheries are very significant to the state's economy.

A nationwide study, "The Economic Impact of Sport Fishing in the State of Washington" concluded that for 1985 the economic impacts of sport fishing were:

Expenditures	\$568.8 million
Output	\$1.0 billion
Earnings	\$297.9 million
State Tax	\$43.7 million
License Revenue	\$9.8 million
Jobs	19,275

The 1987 legislature directed the Department of Community Development to conduct a study to determine the economic contribution of sport and commercial salmon and sturgeon fishing. The report found that:

Expenditures	\$29.7 million
Sales	\$106.8 million
Household income	\$62.7 million
Net Economic Impacts	\$42.5 million
Jobs	3,134

Although the studies did not address the wildlife resource, it is evident from the magnitude of the numbers, that the fish, shellfish and wildlife resources are extremely important to the state's economy.

Finally, this program will benefit continuation of the way of life expected by the citizens of the state.

B. Costs

1. The costs for this program involve staff dedicated to facilitating cleanup and protection plans. This cost is estimated to range from \$250,000 to \$1,000,000 for the first two years. This is based on four to twelve staff positions with associated support funds. It is suggested that the Puget Sound Water Quality Authority be used to model this process. Consequently, costs would be born by an independent entity, not an existing state agency. An option would be to locate the new positions in the Department of Ecology. There is potential that the costs could be funded using federal funds. Implementation of the plans could be costly; shared between federal, state and local government and the business sector. Costs for actual cleanup projects could range from \$7,000,000 to \$10,000,000.
2. It is expected that business fears of tougher environmental controls would have to be addressed. This can be done by involving business in the process from the very beginning. The actual costs, if new controls are agreed upon, cannot be estimated.

3. The costs to state government would range from zero to \$10,000,000 per year depending on the level of federal, local and private funding.

C. The estimated costs are small in comparison to the value of the fish and shellfish resources to the state's economy and its importance to the citizens way of life.

III. (#1) Other Factors

A. Technical Factors

There are technical limitations relating to estuary cleanup, but methods exist or are being developed to address such situations. There are no constraints to developing action plans.

B. Institutional Constraints or Implications

There are no institutional constraints. If patterned after the Puget Sound Water Quality Authority, there will be implications relating to the Department of Ecology's role.

The existing activities relating to the Puget Sound Water Quality Authority process, the Grays Harbor Management Plan review process, the Columbia River water quality activity and the Outer Coast Marine Sanctuary process provide an institutional foundation for this action plan.

C. Political Factors or Implications

This action will be controversial with business interests who fear tougher environmental controls. It will be supported by environmental groups. The public comment will be on both sides. It provides an opportunity to show that the state places the same priority on the Columbia River and coastal estuaries as on the Puget Sound region.

IV. (#1) Roles and Responsibilities

A. Implementation Responsibilities

The responsibility for this action plan will be shared by government, business, local communities and individual citizens. Government, through the Department of Ecology or an independent entity, will take the lead and facilitate resolution of tough issues. Business, local communities and individual citizens will be partners in making the tough decisions. The state and local governments will be charged with implementing program recommendations.

B. Accountability

The governmental entity leading the action plan (Department of Ecology or independent governmental entity) will be accountable for the action plan. This is consistent with the Department of Ecology's mission.

C. Schedule

The action plan should be coordinated with the biennial budget process.

II. (#2) Habitat Inventory - Gains and Costs of Taking an Action

A. Risk Reduction/Resource Enhancement Potential

1. This comprehensive statewide data base of shellfish, game fish, food fish and wildlife habitats and species containing geographic locations and management recommendations for protecting wildlife will provide landowners and natural resource managers with accurate and consistent fish and wildlife information. The risk to terrestrial and aquatic ecosystems from land use actions should be reduced through the use of the best wildlife science available. The potential for enhancing shellfish, fish, and wildlife resources will be increased through the use of better data and accurate location maps of specific habitats and species. This would reduce the likelihood of species becoming extinct.

In addition to providing the public with the best wildlife science on Washington's most important wildlife habitats and species, outputs from the project will be used for:

- Reviewing and tracking permits.
- Prioritizing workloads.
- Allocating budgets.
- Quantifying habitat protected.
- Land acquisitions.
- Responding to requests from the Legislature.
- Reviewing individual programs; and
- Identifying information gaps.

2. Likewise, better data on wildlife, game fish, food fish, shellfish will allow biologists to measure the effectiveness of land use actions and enhancement projects. This data base will be continually updated and refined to provide state-of-the science information. It would also provide a means to monitor and measure the rate of habitat loss.

Conceivably, a fully integrated GIS system will be capable of displaying data, and maps and overlays featuring not only habitat types and species distribution and abundance, but also such features as anadromous fish blocks, stream flow topography, forest road systems, special plant and animal

occurrences, trail systems, migration routes, and breeding, nesting, calving, and spawning sites for fish and wildlife, and a variety of other features as well. In addition, data could be retrieved at the overall state level, by drainage basin, by county, and on down to quarter section with the same scale as a 7.5 minute USGS quadrangle. Data could be retrieved by month, by season, or by year. Continual updating would be necessary.

3. This project would also be a tremendous asset for planning and directing future growth and development.

B. Costs

1. See #3 below.
2. Better information will hopefully reduce conflicts between competing social and environmental objectives.
3. The costs to WDW for the first nine months (January 1 to September 30, 1990) of Project One (forest lands) will be about \$250,000. The completion of Project One and the beginning of Project Two (non-forest lands and fish and shellfish) (Oct. 1, 1990 to June 30, 1991) will cost about \$814,000 (WDW) and \$250,000 (WDF). Cost thereafter will range from eight to eleven million depending on the level of detail requested by resource managers, county planners, landowners, and regulatory agencies over the next five years.

C. Summary from Section A and B.

The gains far outweigh the costs, both quantitatively and qualitatively. Better data on the abundance and distribution of food fish, game fish, shellfish, and wildlife will improve the efficiency of local and state governments and land use developments, and improve and extend existing management capabilities.

III. (#2) Other Factors

A. Technical Factors

The technology exists today for compiling and disseminating all of this wildlife information. There are, however, gaps in our understanding of how certain land uses affect fish, shellfish and wildlife. This project will identify needs in such resource data as well as training and education of resource managers.

B. Institutional Constraints or Implications

All work on this project fits within current laws and regulations. The products from this project may be used to change some regulations, e. g. (Chapter 222 WAC) (forest practices regulations).

No major reorganization changes are required within WDW to conduct this project. The first nine month block of time is being done using existing personnel and budgets. Some people have been temporarily reassigned to work on this project. Many field biologists will reallocate their time to work on this project.

Products from this project are expected to be used in designing budgets, setting work load priorities for field people, and monitoring the effectiveness of wildlife management practices. There are no institutional constraints or limitations relating to this proposal.

C. Political Factors of Implications

All resource interest groups could be affected by this project. Developing a better inventory of game fish, food fish, shellfish and wildlife habitats and species and better state-of-the science management techniques places the landowner and/or developer on notice of the nature, source, and extent of the fish and wildlife resources on the proposed action site. Some people may prefer not to know this information because it may hinder or limit their options to develop a site.

IV. (#2) Roles and Responsibilities

A. Implementation Responsibilities

Department of Wildlife and Department of Fisheries would share primary role and responsibility in implementing this project based on respective management responsibilities. Because fish and wildlife is a statewide public resource, all local governments, landowners, and resource managers will all have some role in this project, as well as other state agencies.

B. Accountability

Accountability would be by the Fish and Wildlife 2010 Subcommittee.

C. Schedule

Project One of the project is nine months - January 1 to September 30, 1990. Project Two is another nine months - October 1, 1990 to June 30, 1991. Both projects will require additional work, plus updating, on an annual basis. This is not a one shot project. No schedule has been set for the food fish and shellfish component.

II. (#3) Habitat Restoration - Gains and Costs of Taking an Action

A. Risk Reduction/Resource Enhancement Potential

1. Some state and federal programs already exist that provide funds and volunteers to assist landowners in habitat enhancement. Examples are the Cooperative Projects program administered in the Department of Wildlife and funded by the Aquatic Lands Enhancement Account, and the Challenge cost-share program administered by the U. S. Forest Service. The former provides funds to enhancement projects that use volunteer labor, and the latter matches funds to accomplish enhancement projects on National Forest lands. The Department of Natural Resources recently initiated a Stewardship Forestry program, that will provide technical expertise to small woodland owners in matters of fish, wildlife and forest management. The Senior Environmental Corps program has been established to assist in enhancement work for the natural resources agencies. There are several examples of grants that are available for habitat enhancement.

Each of these meets a portion of the need for enhancement, but each requires specific criteria for funding, and, even when all available funds and programs are combined, they likely cannot take advantage of all the enhancement opportunities that exist. The landowners incentive element would help to fill these gaps through long-term and perpetual easements. Incentives would be provided for landowners to designate and improve certain parcels, which may have marginal suitability for other uses such as agriculture or forestry, to benefit fish and wildlife. Examples include riparian areas, steep slopes, non-irrigatable lands, poor soil areas, and a variety of wetland types. Subsidies could also be provided to landowners for growing or leaving a certain percentage of crops for wildlife, and for planting and maintaining vegetation types beneficial to wildlife.

The risks of not adding to enhancement opportunities or coordinating existing opportunities into a single statewide program are primarily that those who wish to do something positive for the environment, but cannot because of funding or assistance limitations will not be able to do so. The numbers of individuals and acres and types of habitat that could come into play under such a program have not been

quantified. However, services and funds available under existing programs have not gone unused or unspent, implying a greater need than is currently satisfied. A second risk is that of increasing inability to meet wildlife and fish resource objectives. Thirty thousand acres of habitat are being lost each year in Washington state. It is becoming more and more difficult for the state to meet objectives for wildlife and fish management, as the habitat base becomes more constrained by human population. There are many situations in which a simple, inexpensive enhancement can achieve tremendous results. An example is sealing a creek bottom to restore flows and allow fish passage. Another is providing nesting cover for upland birds on farm land. A third is snag creation for cavity nesting birds, which would otherwise not exist without that habitat. Enhancement has the unique feature of being strategic, in that the kinds and locations of enhancement can be developed for maximum benefit.

2. Several methods are available to measure benefits of a statewide habitat enhancement and landowners incentive program. The first question to ask, however, is which benefits should be measured? One important benefit of such a program is simply public appreciation and use of the program. To measure benefit to the wildlife and fish resources directly, habitat or populations could be measured.

Habitat can be measured in several ways: habitat suitability, using Habitat Evaluation Procedures (HEP); one of several existing habitat rating systems; developing a new rating system; calculation of acres of habitat or miles of stream that have been "added to the system" with the enhancement. Populations of wildlife and fish are more difficult to measure, and while the techniques have been established to do this, the expense could be great. There are a number of different kinds of population information that could be collected: simple presence/absence of species; population trends; productivity information.

The most cost effective way to measure the benefits of such a program would be: 1) to monitor use and appreciation of the program; 2) to calculate acres of habitat and/or miles of stream that have been added to the system, and 3) to monitor presence/absence of species before and after the enhancement, using local knowledge or a professional biologist, depending on funds and level of detail required.

A somewhat intangible benefit of this kind of program is educational. As users see the results of simple habitat improvements, they will likely want to do more. The system can become almost self-perpetuating.

Methods exist to determine the dollar values of participating in wildlife oriented recreation, and methods exist to determine the numbers of animals relying on a particular size and type of habitat. The difficulty lies in determining how the recreational dollar value will increase in the short run due to a specific habitat change. It is preferable to not quantify benefits in a monetary sense.

3. None identified at this time.

B. (#3) Costs

1. OPTION #1 - Develop a single program in one resource agency (fisheries or wildlife) which will examine existing programs, determine unmet needs, and utilize the following resources to meet these.

Staff - These estimates include salary, benefits, goods and services, and travel based on the average for Department of Wildlife biologists and program managers:

Program Administrator
Technical/Volunteer Coordinator
Mobile Team of Natural Resource Professionals
- Soil Scientist
- Agronomist
- Wildlife Biologist
- Fisheries Biologist
- Engineer
Information Specialist

Minimum total costs for restoration, first biennium:

\$1,092,400.00

To provide financial incentives to landowners, or provide materials at a minimum, the costs would be even greater than those already described. A minimum of \$1,000,000/year should be held in a account for materials costs if those are to be paid for.

OPTION 2: In addition to meeting unmet needs, enhance existing programs to meet the standards of this program. Apply statewide criteria to each existing program as well as to the new program. This would ensure a consistent, statewide perspective on enhancement and restoration. A best guess of costs involved would be simply to double the OPTION 1 figures.

Other Costs - Standard objectives, set by the resource management agencies (Department of Fisheries, Department of Wildlife) need to be adhered to. This should prevent competing objectives.

2. None.

3. See #1 above.

C. Again it is difficult to measure the potential dollar benefits of this kind of a program, but it is safe to say that benefits will likely exceed costs. Residents of the state of Washington spent 622.4 million dollars on recreational hunting and fishing, and 254.4 million dollars on nonconsumptive wildlife recreation in 1986. The value of the commercial anadromous fishery in 1986 was 62 million dollars. The net effect of these expenditures to Washington's economy are significantly larger than the expenditures themselves. The gross output to the state's economy is between 1.5 and 3 times the actual expenditures. For example, the Sport Fishing Institute (1988) estimated that as a result of expenditures on sport fishing of \$568.8 million dollars, total output was \$1.0 billion dollars, and the numbers of jobs created was 19,275.

Even at an average annual program cost of \$2,000,000/year, the costs represent about 0.2% of the 1986 direct expenditures for fish and wildlife recreation. The potential benefits are great. In Minnesota, 21,000 acres were enrolled in a similar landowners incentive program in the first year of implementation (1986).

III. (#3) Other Factors

A. Institutional Constraints of Implications

There are no conflicts with existing law or regulation. New legislation might be needed to fully activate the state's resources to accomplish this action. There is one bill (HB 1499) before the legislature dealing with the enhancement of fish and wildlife habitat, though it is unlikely to pass this session.

B. Political Factors or Implications

Attempts to recreate wetlands would likely create a measure of controversy in many parts of the state. In eastern Washington, landowner damage claims might rise following attempts to enhance wildlife habitat. Given these two possibilities, some agricultural and development interests might oppose this initiative. Overall, though, the action will probably enjoy widespread public support, given the increasing interest in fish and wildlife matters.

IV. (#3) Roles and Responsibilities

- A. Resource agency that is identified (Department of Wildlife or Department of Fisheries) should implement the program. The role of communities, individuals, other agencies is to apply for the funding for enhancement, and to agree to some level of effectiveness monitoring.
- B. Either the Department of Wildlife or the Department of Fisheries or both would have accountability. Similar or related programs of this scope and magnitude do not presently exist.
- C. By the end of the first biennium, the following should have been completed:

- Program plan development
- Hiring of staff
- Familiarization with existing programs
- Identification of "unmet need"
- Creating public awareness of program
- Assimilate existing habitat enhancement information
- Design monitoring system for program
- Implement several high visibility projects

II. (#4) Permit Monitoring - Gains and Costs of Taking an Action

A. Risk Reduction/Resource Enhancement Potential

1. This action strategy is intended to determine the effectiveness of and compliance with Hydraulic Project Approval (HPA) and Corps permit conditions. It is designed to improve the effectiveness of permit conditions and identify possible enforcement needs if compliance is determined to be lacking. This could significantly reduce current risks that fish and wildlife resources may be being lost unknowingly due either to inadequate permit conditions or lack of compliance.
2. The effectiveness of this action would be measured by before and after construction comparisons of biologic assessments, and during construction observations.
3. It is possible that some permit conditions may be unnecessary. In such case, development interests would likely react favorably.

B. Costs

1. At a minimum this action would require a fish biologist, a wildlife biologist, and an engineering technician. Total cost for one year, including equipment and travel would be about \$210,000 to \$240,000.

2. There should not be any adverse implications from the monitoring program in and of itself. If as a result for example it is decided that permit conditions and enforcement efforts need to be made more strict, development interests would likely react adversely.
3. At this time only rough estimates can be made. See number 1 above.

III. (#4) Other Factors

A. Technical Factors

No technological constraints are expected.

B. Institutional Constraints or Implications

This action would not affect existing laws, regulations or organizational structures. Depending on the findings of the monitoring program, existing regulations (WACs) and agency policies may have to be amended. The worst case scenario would occur if laws (RCWs) would have to be amended or enacted.

C. Political Factors or Implications

Again, the monitoring program itself would not have any political factors or implications. If, however, it is found that permit conditions and compliance is in need of strengthening, there would likely be opposition from the developmental community. Likewise there would likely be support from the environmental community.

IV. (#4) Roles and Responsibilities

A. Implementation Responsibilities

This action would be implemented either solely by the Department of Wildlife or jointly with the Department of Fisheries.

B. Accountability

Lead accountability would most likely be with the Department of Wildlife or the Department of Fisheries. To date only spot monitoring has occurred.

C. Schedule

At a minimum of this project would require one year for completion. It should run from January to December. In the first month, planning and development of methodologies and

strategies would occur. In the last two months, data and the final report would be compiled and prepared.

II. (#5) Studies and Research - Gains and Costs of Taking an Action

A. Risk Reduction/Resource Enhancement Potential

1. Developing new information to improve fish and shellfish habitat and management practices has been and will continue to be critical to maintaining the current "good shape" of fish and wildlife resources referred to in the State of the Environment Report. With greater emphasis, it would provide enhancement of Washington's resources.

The anticipated benefits for habitat include new methods to restore damaged habitat, new methods to protect existing habitat and allow development, and new information to protect existing habitat. Improved management effectiveness will reduce the threat of overharvest of fish, shellfish and game species. Studies relating to habitat mitigation techniques, fish hatchery practices, fish and shellfish disease control and prevention, interactions between different species, etc. all have great potential to enhance the resources of the state.

There is potential to reduce human health risks associated with paralytic shellfish poisoning. Ecological and economic risks are greater; without a proactive research effort long-term damage could occur.

2. The development of new information will reduce the risk or habitat loss and overharvests, and could result in dramatic enhancement potential. The effectiveness can be measured although somewhat imperfectly through examining catch trends and, in some cases, population estimates. Measurement of success should be done annually comparing the most recent information with at least the last ten years catch information.

The anticipated effectiveness of the action plan is difficult to quantify; the enhancement potential is probably between 10% and 50%. It must be emphasized that without new information constantly being developed, the current "good shape" will be impossible to maintain.

3. This action plan will also benefit the state's economy through the commercial and recreational fishing industries and the expected "way of life" of our state's citizens.

A nationwide study, "The Economic Impact of Sport Fishing in the State of Washington" concluded that for 1985 the economic impacts of sport fishing were:

Expenditures	\$568.8 million
Output	\$1.0 billion
Earnings	\$297.9 million
State Tax	\$43.7 million
License Revenue	\$9.8 million
Jobs	19,275

The Department of Community Development administered a study, "Economic Impacts and net Economic Values Associated with Non-Indian Salmon and Sturgeon Fisheries", to estimate the contribution of the state's commercial and recreational salmon and sturgeo fisheries to the state's economy. This report found that:

Expenditures	\$29.7 million
Sales	\$106.8 million
Household income	\$62.7 million
Jobs	3,134
Net Economic Value	\$42.5 million

From both studies it is evident that the state's fish and shellfish resources are important to the state's economy.

Despite the current "good shape" of the resource, there is evidence that the public is not satisfied with the existing resource base. Indicative of this is that during the last two legislative sessions, bills have been heard that would transfer catch from comercial fishers to sport fishers. Implementation of this action plan would partially address this concern.

B. Costs

1. It is estimated that the costs for developing the new information range between \$500,000 and \$2,000,000 per biennium. The costs would be incurred by the Department of Fisheries and the Department of Wildlife.
2. While the direct cost of such studies are purely monetary, the results may have significant impact on existing operational practices of industry, government and the public. This could be moderated by focusing studies on areas that minimize these impacts.

As the funds for this action plan would be general funds, there would be competing social and/or environmental programs that could not be funded.

3. The implementation costs for state government is estimated to range between \$500,000 and \$2,000,000 per biennium. This is based on implementing two to four studies. These costs would be partially offset by additional state revenues from the sale of licenses, fish landing taxes, and state sales tax revenue increases.
- C. The estimated costs are small in comparison to the value of the fish, shellfish, and wildlife resource to the state's economy and its importance to the citizens way of life.

III. (#5) Other Factors

- A. As the purpose of this action plan is to develop new answers, it is unknown as to technical limitations. It is known that there could be considerable progress in this area before technical constraints become a factor.
- B. There are no institutional, legal, or organizational constraints relating to this action plan.
- C. The development of new information may result in the identification of the need for significant changes in the operational practices of public and/or private entities. The interests that would be affected are those working in or near the state's fish and shellfish resources. It is expected that environmental organizations would support such efforts and business interests would be opposed. The latter concern could be addressed by involvement in all aspects of the action plan.

IV. (#5) Roles and Responsibilities

- A. State agencies would be the lead in this action plan. Business and local communities would be involved in the prioritization of needed studies and management effectiveness efforts.
- B. The Departments of Fisheries and Wildlife would jointly administer and be accountable for implementation. The action plan is compatible with existing programmatic responsibilities in each agency.
- C. As conclusions from studies of fish and shellfish usually require several years of data collection, it is important for a quick start.

II. (#6) Habitat Acquisition - Gains and Costs of Taking an Action

A. Risk Reduction/Resource Enhancement Potential

1. Washington's fish and wildlife is literally losing ground, as 30,000 acres of wildlife habitat are converted to other uses each year. Yet the interest in and demand for wildlife related recreation has reached an all time high and continues to grow. More than 80% of the state's citizens now participate in recreational activities related to fish and wildlife. At a value of more than one billion dollars to the state's economy, it is clear that the future of Washington's wildlife and especially that of the habitat on which it depends is of increasing importance.

While it is not possible to protect all remaining wildlife habitat in this rapidly growing state, the Department of Wildlife has long felt that it is essential to identify the most critical parcels so that steps can be taken to protect them before they too are lost. Without minimizing the value of such threatened habitats as oak woodlands, marine lands, and mineral springs, the Department has determined that most of the remaining habitat of importance falls into one of four general categories: wetlands; shrub-steppe; old growth forestry; and winter range. Each of these habitat types is home to a wide variety of species, yet is far less common today and under continuing threat of development. The value of each to wildlife cannot be overstated:

Wetlands: In Washington, more than 175 wildlife species depend upon wetlands for primary feeding habitat, while 140 species use them for primary breeding habitat. The Department of Wildlife considers the loss of wetlands to be the most significant threat to waterfowl and furbearer populations in this state; also threatened are the one-third of our state's endangered and threatened species which require wetlands for their survival. More than half of Washington's wetlands have been lost to development since the turn of the century.

Shrub-steppe: More than half of this state's shrub-steppe habitat is gone, leading to population declines in such species as sage and sharp-tailed grouse, ferruginous hawks, pygmy rabbits, burrowing owls and golden eagles. If shrub-steppe loss continues at the present rate, some of these species will disappear from Washington.

Old growth: Ninety percent of Washington's old-growth coniferous forests is gone, and species associated with it have declined dramatically, including the spotted owl, flying squirrel, fisher, Dunn's salamander and goshawk.

Winter range for large mammals (deer, elk, cougar, etc.) and other species: Although not a habitat-type per se, "winter range" is listed here because it is critical to the survival of a number of wildlife species in Washington. Much winter range has already been developed and the threats to existing areas continue. Along the east slope of the Cascades, winter range for elk and deer is being converted to orchards, while in Okanogan and Chelan counties, recreational and housing developments are a growing threat to these animals. Wintering habitat for other species is also at risk: sagebrush and riparian areas that provide critical winter habitat for a variety of birds are being removed throughout farming areas of eastern Washington.

Protection of all critical parcels within these categories represents the highest priority of the Department of Wildlife. The Department has established as an additional priority any breeding, feeding, or nesting site of any endangered, threatened or sensitive species, of which there are currently 34 in Washington. Identification and protection of these sites will be especially crucial to the survival of these species.

2. Acquisition of key habitat is the most effective means of protecting and enhancing fish and wildlife populations. This would guarantee that such lands would not be converted to other uses incompatible or detrimental to fish and wildlife use. Presently WDW manages about 900,000 acres of land for fish and wildlife and related recreation. The highest numbers and greatest diversity of many of the state's fish and wildlife resources are found on these lands. The future existence of several of the state's threatened and endangered species may depend on a continued program of acquisition of critical habitat. An expanded habitat base is also essential to meet increasing hunting and fishing demands.
3. By increasing the overall public land base benefits and opportunities would also be generated for hiking, camping, bird watching, photography, general outdoor appreciation and scientific study. Revenues from increased tourism would also likely increase and enhance local and state economies.

B. Costs

1. Costs for acquisition would be incurred by the Department of Fisheries and Department of Wildlife with the larger percentage incurred by the Department of Wildlife. This program would entail expenditures of 60 million dollars per year.
2. Some individuals, organizations, or interest group may oppose such a program on philosophical grounds that monies are needed for other programs, or that acquisition may limit future development options. Overall, however, it is expected that support would be widespread.
3. Administration and implementation costs of this program would be included in the 60 million dollars per year.

C. Summary from Section A and B

The gains of this program far outweigh the costs. Once habitat is acquired it would provide perpetual protection for the fish and wildlife it supports. The price of land is continually increasing. It is cheaper to buy now than later. Program costs would be about 120 million per biennium. Such an acquisition program would be on-going for at least five years.

III. (6) Other Factors

A. Technical Factors

There are no technical limitations or constraints affecting this proposal.

B. Institutional Constraints or Implications

This program would depend on landowners with a willingness to sell. No other constraints have been identified.

C. Political Factors or Implications

No major political factors or implications are anticipated. Since very little, if any, development would occur on acquired lands, it is likely that most adjacent landowners would look upon acquisition favorably. There would also likely be broad support from hunting and fishing interests and the environmental community. Some opposition may come from development oriented groups if they perceive acquisition as somehow interfering with future development options and land use speculation.

IV. (#6) Roles and Responsibilities

A. Implementation Responsibilities

Implementation would be the responsibility of the Department of Fisheries for habitat acquisition vital to that agency's resource management jurisdiction, and the Department of Wildlife for habitat acquisition vital to that agency's resource management jurisdiction.

B. Accountability

Accountability would be by the Fish and Wildlife 2010 Subcommittee.

C. Schedule

This proposal should be implemented as soon as possible. The program would be on-going. Every three to five years program needs and priorities would be re-evaluated.

EXISTENCE AND SPORT VALUES FOR DOUBLING THE SIZE
OF COLUMBIA RIVER BASIN SALMON AND STEELHEAD RUNS

EXECUTIVE SUMMARY

- * Approximately 2,900 Pacific Northwest households (rate payers) participated in the contingent valuation method (CVM) study, comprising an overall cooperation rate of 72%.
- * Pacific Northwest residents do express an existence value for doubling the size of the Columbia River Basin salmon and steelhead runs. This is the value obtained from the knowledge that the runs would be preserved in a more favorable state than present conditions--greater ecological stability and diversity would exist.
- * Individuals who do not participate in either the commercial or sport fishery and are not likely to do so in the future, express an almost "pure" form of existence value, when they indicate a willingness-to-pay to double the fish runs (resource nonusers).
- * Approximately 44% of Pacific Northwest households have had a household member participate in the region's sport salmon or steelhead fishery during the past five years (resource users).
- * Approximately 54% of the regional sample of resource nonusers indicate a willingness-to-pay to double the size of the fish runs.
- * Resource nonusers and users establish an economic value of \$68.49 per fish (direct net benefit) for doubling the size of the Columbia River Basin salmon and steelhead runs. For resource managers, this value level should serve as an economic threshold or point of caution when making mitigation and enhancement decisions.
- * The resource nonuser and user values derived from the CVM study indicate that, in some cases, "older" value estimates applied to the fishery have overstated the net economic benefits of the fishery.
- * The sport values (resource users) obtained from this CVM study are consistent with the value estimates derived from a recent travel cost method study prepared by researchers at Oregon State University. The sport-effort levels derived from this CVM study are consistent with estimates provided by fishery agencies.

TABLE G-4-4

WEIGHTED FISH VALUES
(1987 Price Level)

Enhancement (Willingness to Pay)

<u>Species</u>	<u>Sport (S) or Commercial (C)</u>	<u>Value per Fish</u>	<u>Share of Catch</u>	<u>Weighted Value</u>	<u>Total Value</u>
Spring Chinook	S	\$135.00	57%	\$76.95	\$95.06
Spring Chinook	C	42.12	43%	18.11	
Fall Chinook	S	101.00	20%	20.20	48.91
Fall Chinook	C	35.89	80%	28.71	
Snake R Steelhead	S	83.00	82%	68.06	71.99
Snake R Steelhead	C	21.81	18%	3.93	
Columbia R Steelhead	S	136.00	82%	111.52	115.45
Columbia R Steelhead	C	21.81	18%	3.93	
Coho	S	101.00	36%	36.36	42.11
Coho	C	8.98	64%	5.75	
Sockeye	S	---	---	---	---
Sockeye	C	9.02	100%	9.02	9.02

Restoration (Willingness to Sell)

Spring Chinook	S	\$225.00	57%	\$128.25	\$146.36
Spring Chinook	C	42.12	43%	18.11	
Fall Chinook	S	169.00	20%	33.80	62.51
Fall Chinook	C	35.89	80%	28.71	
Snake R Steelhead	S	135.00	82%	110.70	114.63
Snake R Steelhead	C	21.81	18%	3.93	
Columbia R Steelhead	S	226.00	82%	185.32	189.25
Columbia R Steelhead	C	21.81	18%	3.93	
Coho	S	169.00	36%	60.84	66.59
Coho	C	8.98	64%	5.75	
Sockeye	S	---	---	---	---
Sockeye	C	9.02	100%	9.02	9.02

Source
Corps Fishery Bypass Study

TABLE G-4-4

TABLE G-6-5

WEIGHTED FISH VALUES EXCLUDING PROCESSING COSTS
(1987 Price Level)

<u>Species</u>	<u>Sport (S) or Commercial (C)</u>	<u>Value per Fish (\$)</u>	<u>Share of Catch (%)</u>	<u>Weighted Value (\$)</u>	<u>Total Value (\$)</u>
Spring Chinook	S	135.00	57	76.95	91.04
Spring Chinook	C	32.76	43	14.09	
Fall Chinook	S	101.00	20	20.20	42.50
Fall Chinook	C	27.88	80	22.30	
Snake R Steelhead	S	83.00	82	68.06	70.38
Snake R Steelhead	C	12.92	18	2.32	
Columbia R Steelhead	S	136.00	82	111.52	113.84
Columbia R Steelhead	C	12.92	18	2.32	
Coho	S	101.00	36	36.36	40.64
Coho	C	6.69	64	4.28	
Sockeye	S	-	0	0.00	5.17
Sockeye	C	5.17	1 00	5.17	

Executive Table 1

Summary of selected unit values
for significant regional environmental products.

<u>Product</u>	<u>Unit Valued</u>	<u>Value Per Unit \$</u>
Commercial chinook salmon	- one ex-vessel pound	2.49
Commercial coho salmon	- one ex-vessel pound	1.35
Commercial pink salmon	- one ex-vessel pound	.31
Commercial chum salmon	- one ex-vessel pound	.46
Commercial sockeye salmon	- one ex-vessel pound	1.26
Sport caught salmon and steelhead	- one fisherman day	126.80
Sport caught resident fish	- one fisherman day	39.16
Hunted deer and/or elk	- one hunter day	57.36
Riparian habitat supporting recreational and/or aesthetic enjoyment	- one acre	3,625.00
Free flowing rivers supporting recreational and aesthetic enjoyment	- one mile	\$226,000.00

BCA (April 1986) Calculation of Environmental
Product Values as Reported in the Hechman Report in 1986

Table 20

Values for Resident Sport Fish in the Pacific Northwest

<u>Author(s)</u>	<u>Area</u>	<u>Type of Fishing</u>	<u>Base Year</u>	<u>Base Year Value</u> --\$/recreation day--	<u>Value Updated to 1984</u>
<u>A. Willingness to Pay/Travel Cost-Based Values</u>					
Gordon	Idaho	Trout	1968	3.65	9.92
Brown, Charbonneau & Hay	U.S.	Trout-Hedonic	1975	11.00	19.61
		Trout-Willingness to pay	1975	21.00	37.46
Brown & Plummer	Washington	Trout	1976	19.00	31.21
	Oregon	"	"	34.00	57.64
	Wash./Ore. Av.	"	"	26.50	44.92
Vaughn & Russell	U.S.	Trout	1979	19.49	26.76
U.S. Fish & Wildlife Service	Oregon	Trout	1980	13.49	16.96
	Washington	"	"	14.03	17.96
	Idaho	"	"	12.93	16.26
	Montana	"	"	16.47	20.71
	U.S.	"	"	14.50	18.23
Sorg, Loomis, Donnelly & Peterson	Idaho	Coldwater fishing-travel cost	1982	25.55	27.63
		Coldwater fishing-willingness to pay	"	14.25	15.39
Eco NW	Montana	Stream/Lake fishing	1984	34.50/yr	34.50/yr
<u>B. Compensatory Values</u>					
Eco NW	Montana	Stream/Lake fishing	1984	386.00/yr	386.00/yr

Table 22

Compensatory Recreational/Aesthetic Values
(for Riparian Habitat)

<u>Study Area</u>	<u>Study Product</u>	<u>Annual Net Value Per Acre</u>	<u>Total Present Value Per Acre^a</u>
		<u>\$ per Acre</u>	
Sacramento River	30 foot riparian leave strip	1,663	52,549
	full riparian habitat between set back levees	3,625	114,546
Old Growth Douglas fir forest in Western Washington	330,000 acres remaining outside parks (the present situation)	1,362	43,038
	remaining old growth reduced to 230,000 acres	2,929	92,553
	remaining old growth reduced to 64,000 acres	10,680	337,476

^a Total present value is calculated at 3 percent rate of discount. Some agencies confuse interest rates with discount rates, and use a higher discount rate. We concur with the increasing use of 3 percent by federal and state agencies in the energy field, and use it here. A theoretical discussion of discounting issues is found in Lind et al. (1982).

Table 21

Values for Deer and Elk in the Pacific Northwest

<u>Author(s)</u>	<u>Area</u>	<u>Type of Hunting</u>	<u>Base Year</u>	<u>Base Year Value</u> <u>\$/recreation day</u>	<u>Updated to 1984</u>
A. <u>Willingness to Pay/Travel Cost-Based Values</u>					
Brown W., Nawas & Stevens	Oregon	Big game	1968	9.20	25.00
Brown, G., Charbonneau & Hay	U.S.	Deer	1975	34.00	60.64
		Elk	"	39.00	69.56
Brown, G., Charbonneau & Hay	U.S.	Deer	1975	38.00	67.78
		Elk	"	39.00	69.56
Brown, G.	U.S.	Deer	1975	67.31	120.05
		Big Game	"	71.38	127.31
Brown & Plummer	Oregon	Big Game	1976	38.14	64.66
	Idaho	"	"	32.73	55.49
U.S. Fish & Wildlife Service	Oregon	Deer	1980	21.44	26.96
	Washington	"	"	24.18	30.40
	Idaho	"	"	28.77	36.18
	Montana	"	"	25.42	31.96
	U.S.	"	"	24.00	30.18
Donnelly & Nelson	Idaho	Deer - travel cost	1982	48.00	51.93
		Deer - Willingness to pay	"	23.82	25.77

B. Compensatory Value

No Values Available

Environment
2010
Action
Agenda:

Action
Strategies
Background
Analyses

Package
Nine:

**Waste
Management**



State of Washington
July, 1996



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INTRODUCTION

The Environment 2010 "Risk Evaluation Reports" characterize the substantial risks posed by improper management of solid and hazardous wastes, including uncontrolled sites and frequent sudden and accidental releases. The catastrophic consequences of such improper management is reflective in the 700 cleanup sites in the state, as well as the results of the Alaska's Prince William Sound spill and the Grays Harbor spill.

Preventing improper waste management from occurring is the goal of the actions in this plan. Preventing environmental resources from becoming contaminated in the first place, by superior control of the sources of contamination, is far more effective, less costly, and easier than treating the environmental resources after they have been contaminated.

The prevention ideas presented in this plan are methods (tools) that will assist in solving cross-environmental resource impacts and will directly connect into supporting the Environment 2010 goals as Awareness, Knowledge, Cooperation, Creative Leadership, Responsibility, and Stewardship. The following parts of this waste management plan will more specifically reflect the relationship between the action ideas and the 2010 vision statement.

The Waste Management Subcommittee reviewed 37 action ideas that were proposed at the November summit, public meetings, and by 2010 committees. Since several of the ideas were similar to one another, or redundant, the subcommittee decided to group the ideas. The groupings were later adjusted to reflect the comments of Steering and Public Advisory Committee members in March. The four categories are now:

- I. Target Educational Programs
- II. Prevent Future Environmental Contamination
- III. Manage Residues Safely
- IV. Develop Incentives for Sound Disposal

The above categories and the Action Ideas under each have been organized in accordance with the following outline:

- Category title;
- Under each category, a statement of the action idea in quotations, followed by a brief description of what the intended action entails; and
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 - 1) Gains and costs of taking the action,
 - 2) Constraints to implementing the action, and
 - 3) Roles and responsibilities associated with taking the action.

I. Target Educational Programs

A. Proposed Action:

"Undertake a comprehensive information and education program aimed at the approximately 3,500 generators of hazardous waste and inform them of regulatory requirements, environmental and public health concerns, and priority waste management methods."

The following are specific components of implementing the major action idea.

Action: Quarterly Newsletter for Known/Suspected Generators

A model newsletter has been developed by the State of Minnesota and others. The newsletter could easily be adapted to Washington and would serve to "get the word out" about regulations, enforcement actions, proposed regulations, and training opportunities.

1. Gains and Costs for Taking Action

Gains: This action would reduce the risk of mismanagement of hazardous waste by serving as a mechanism to inform the over 3,500 generators of regulations and training opportunities. With a better informed regulated community the potential for polluting environmental resources from mismanagement of hazardous waste (248,000 tons generated annually) will be reduced. Also, economic losses to generators from liability claims, cleanup costs, and enforcement penalties could potentially be reduced or eliminated. Very little information is in a readily available form to convert the above measures into a dollar value.

Costs: To implement this action, funds would be needed by the department to prepare the newsletter including production, materials, mailings, etc. Potential funding sources for these costs include the State Toxics Account, the Hazardous Waste Assistance Account, or the State General Fund.

Expenditure:

FTE:	0.5 (15)
Staff:	\$ 32,500
Materials:	<u>\$ 15,000</u>
Total:	\$ 47,500

Summary: The potential savings to the environment and financially to generators could be substantial compared

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Summary: The potential savings to the environment and financially to generators could be substantial compared

to the small amount of expenditures for enhanced generator awareness.

2. Constraints to Implementing the Action

Technical: None

Institutional: Currently, the department has the authority under the State Hazardous Waste Act, Chapter 70.105 RCW, to provide information and educational assistance to the regulated community, hence, there are no institutional constraints.

Political: Since the action is to inform and educate and expenditures are small, it is assumed there would be no controversy.

3. Roles and Responsibilities

Implementation: Assuming the legislature provides funding, Ecology would be responsible for preparing and distributing the newsletter. Business and Environmental Associations could assist the department in sending out the newsletter as well as encouraging their members to attend workshops and selected training.

Accountability: Ecology will be accountable for implementation, if funding is provided by the legislature.

Schedule: It is anticipated that it would take between six to nine months to hire staff and to produce the first quarterly newsletter.

Action: On-going Workshops for Generators

Develop a series of workshops designed to assist generators in specific industries in understanding the law, regulations, and emphasizing waste reduction and recycling. The program would be administered through the Department of Ecology and parts can be contracted with private contractors.

1. Gains and Costs for Taking Action

Gains: This action would reduce risk of mismanagement of hazardous waste by serving as a mechanism to train the over 3,500 generators and treatment, storage, and disposal operators in regulations and hazardous waste management. With a better informed regulated community the potential for polluting environmental resources from mismanagement of hazardous waste (248,000 tons are produced annually) will be reduced. Also, economic losses to generators from liability claims, cleanup costs, and enforcement penalties could potentially be reduced or

eliminated. Very little information exists to convert the above measures into a dollar value.

Costs: To implement this action, funds would be needed by the department to prepare the workshops including research, production, materials, mailings, etc. Potential funding sources for these costs include the State Toxics Account, the Hazardous Waste Assistance Account, or the State General Fund.

Expenditure

FTE:	2.0
Staff:	\$ 130,000
Materials:	\$ 35,000
Contracts:	\$ 25,000
Travel:	\$ <u>6,000</u>
Total:	\$ 196,000

Summary: The potential savings to the environment and financially to generators could be substantial compared to the small amount of expenditures for enhanced generator awareness.

2. Constraints to Implementing the Action

Technical: Need to gain knowledge of the specialized problems that specific groups of generators face, especially waste reduction and recycling.

Institutional: Currently, the department has the authority under the State Hazardous Waste Law, Chapter 70.105 RCW, to provide information and educational assistance to the regulated community, hence, there are no institutional constraints.

Political: Since the action is to train, inform and educate and expenditures are small, it is assumed there would be no controversy.

3. Roles and Responsibilities

Implementation: Assuming the legislature provides funding, Ecology would be responsible for preparing and developing a workshop format. Business and Environmental Associations could assist the department in developing and hosting the courses and encouraging their members to attend.

Accountability: The Department of Ecology will be accountable for implementation if funding is provided by the legislature.

Schedule: It is anticipated that it would take between six to nine months to hire staff and to produce the first quarterly workshops.

Action: Video Library for Generators

Maintain a video library for use by workshop instructors, hotline operators, and hazardous waste generators. Also provide funding for development of instructional videos.

1. Gains and Costs for Taking Action

Gains: This action would reduce risk of mismanagement of hazardous waste by serving as a mechanism for providing information to the over 3,500 generators and treatment, storage, and disposal operators in regulations and hazardous waste management. With access to better information the potential for polluting environmental resources from mismanagement of hazardous waste (248,000 tons are produced annually) by the regulated community will be reduced. Also, economic losses to generators from liability claims, cleanup costs, and enforcement penalties could potentially be reduced or eliminated. Very little information exists to convert the above measures into a dollar value.

Costs: To implement this action, funds would be needed by the department to prepare the library and fund contracts. Potential funding sources for these costs include the State Toxics Account, the Hazardous Waste Assistance Account, or the State General Fund.

Expenditure

FTE:	0.5
Staff:	\$ 35,000
Materials:	\$ 10,000
Contracts:	\$ 200,000
Travel:	\$ <u>1,500</u>
Total:	\$ 246,500

Summary: The potential savings to the environment and financially to generators could be substantial compared to the small amount of expenditures for enhanced generator awareness.

2. Constraints to Implementing the Action

Technical: None

Institutional: Currently, the department has the authority under the State Hazardous Waste Law, Chapter 70.105 RCW, to provide information and educational assistance to

the regulated community, hence, there are no institutional constraints.

Political: Since the action is to provide information designed to train, inform and educate it is assumed there would be no controversy.

3. Roles and Responsibilities

Implementation: The legislature is responsible for considering and acting on the funding request that would initiate the action. Ecology would be responsible for maintaining the library and preparing specifications for video productions. Business and environmental associations could assist the department in developing the specifications and encouraging their members to utilize the products.

Accountability: The Department of Ecology will be accountable for implementation if funding is provided by the legislature.

Schedule: It is anticipated that it would take between six to nine months to hire staff, develop the library and to produce the first videos.

B. Proposed Action:

"Distribute more information regarding 1-800 telephone numbers for information about what to do with hazardous materials."

Specifically, create more information, i.e., brochures, public service announcements, etc., regarding the availability of hazardous waste information via 1-800 telephone numbers such as the Hazardous Information Hotline and the RECYCLE Hotline. Increase resources to monitor the hotline.

1. Gains and Costs of Taking an Action

Gains: By increasing the awareness of the public to the existence of the Hazardous Substances Information 1-800 numbers, it is anticipated that the number of people calling in requesting information on hazardous materials and wastes will increase by 50 percent (+1%/-10%) from the current annual 9,200 calls to 13,800 calls. Expanding the universe of people educated on the best methods for handling hazardous materials or waste, increases the possibility that these individuals will apply this information in purchasing products that contain little or no hazardous constituents in them. They may also become more active in advocating changes to the existing system which continues to generate hazardous waste at the rate of an estimated 248,000 tons per year.

The consequences of the above actions by the public can result in reducing the 248,000 tons of hazardous waste being generated annually which in turn could lead to improved air quality, water quality (both surface and groundwater), and less contamination of soils.

Costs: The estimated costs of making the 1-800 hotline numbers service better known is based on the costs of providing information about the service through brochures, and through radio and newspaper announcements.

Representatives from a sampling of radio stations and newspaper publisher were asked if they would air or print an information announcement of these 1-800 hotline services. All stations and newspaper indicated they would.

The following is a breakdown of expenditures based on feedback from the radio stations and newspapers and from program needs to produce information and monitor the hotlines.

Expenditures (Annual):

FTE's:	Two (2)
Staff:	\$ 100,000
Production and Materials:	\$ 11,020
Travel:	\$ <u>2,000</u>
Total:	\$ 113,020

If paid advertising was used for radio and newspaper, the additional annual cost would be \$43,800 and \$27,300, for a total of \$71,100. (Karen Reiner)

Potential funding sources for these costs include the State Toxic Account, the Hazardous Waste Assistance Account, Worker Right-to-Know Account, Litter Control Account, and the State General Fund.

Summary: Firm data are not available to make definitive statement of gains as compared to costs. However, even without firm data, one can presume that as a result of the public being informed about the 1-800 numbers for accessing hazardous waste information, the public can act on this information and may cause them to reflect on the impact of using hazardous products. This, in turn, may prompt people to make conscious choices which will influence market demands and lead to a reduction in use of environmentally harmful products and the 248,000 tons of wastes that are generated annually.

2. Constraints to Implementing the Action

Technical: None

Institutional: The action idea fits well into the existing current institutional and legal framework, hence there are no constraints under these factors.

Political: Enhancing public awareness to the 1-800 number will involve increasing funds for additional people and materials. This increase in funds will require approval by the legislature. It is anticipated that there would be support for such a fund request, however, it cannot be taken as a certainty.

3. Roles and Responsibilities

Implementation: Responsibility for enhancing the public awareness to the 1-800 number rest on: 1) the legislature to provide the funds; 2) the department to provide staff to the 1-800 numbers, and develop and distribute public information materials to the public and the media; 3) the media to convey public service announcements; and 4) the public to utilize the numbers for obtaining information to questions or concerns they have on hazardous substances or wastes.

Accountability: Ecology would have accountability to ensure implementation once funding is approved by the legislature.

Schedule: The general time frame for implementing this action idea would take about six to nine months and would include hiring staff, assembling brochure information, production of fact sheets, written announcements and recorded announcements, and distribution to the public via radio and newspaper announcements and mailouts.

C. Proposed Action:

"Generators should be aware of and have technologies to treat waste to non-hazardous levels/characteristics before the materials resulting (recycled) from the wastes can be used."

For generators to be able to support innovative treatment technologies which can assist them in treating their hazardous waste, information must be readily available to them and in a context that they can understand.

In an effort to inform and educate generators about how best to manage their waste, a review will be undertaken by the department to identify available hazardous waste reduction, recycling, and treatment technologies. This review would focus on the best technologies for those types of hazardous

waste generated in the state and would be particularly targeted for those estimated 3,100 small and medium-sized generators who oftentimes do not have the resources to evaluate such technologies.

The development of such a technology review can be integrated as an element into the preparation of the proposed State Hazardous Waste Management Plan. Through this process (which will include public information reports and workshops), generators and the public can become informed about the available technologies and provide their input as they desire.

1. Gains and Costs of Taking an Action

Gains: By providing the types of technology review described above, the 3,100 generators will become much more informed and educated and can factor this availability treatment technology information into their decision-making when considering how to manage their wastes.

With increased support by the generators to use treatment technologies, less hazardous waste will be going to find disposal, hence reducing the amount of waste (248,000 tons annually) available for potential pollution to environmental resources.

Costs: The costs of researching and reviewing the best treatment technologies for various hazardous waste types is included as part of the costs for a much broader proposal currently before the legislature for a State Hazardous Waste Plan. This broader proposal includes determining the current methods of managing hazardous wastes, what is the potential of these wastes for higher priority management methods (including treatment technologies), and what is preventing the movement of these wastes from the current management method to the higher priority method. The cost of this broader study is estimated at \$150,000.

Summary: Having the information on treatment technologies available to generators during their decision on waste management is vital to reducing the overall amount of waste being generated. The costs for not having this information will perpetuate the need for final disposal capacity and all the environmental costs and potential liabilities that entails which is substantial.

2. Constraints to Implementing the Action

Technical: There are no technical constraints to evaluating treatment technologies and reporting on them; however, once the reviews of technologies are completed and provided to generators for their use, it will be up

to them to support and implement appropriate treatment technologies into their waste streams. Factors that may constrain generators in selecting these treatment technologies will be economics and the availability of the technologies.

Institutional: None

Political: A major part of this action idea relies upon approval by the legislature of the department's supplemental budget. Upon approval of the budget by the legislature, there would be no further constraints to implementing this action idea on behalf of the department.

3. Roles and Responsibilities

Implementation: The legislature for its part needs to approve the department's supplement budget which contains funds to implement Phase III of the State Hazardous Waste Plan. Upon approval of the budget by the legislature, the department will as a function of preparing the State Hazardous Waste Plan, review and report on available treatment technologies. The State Hazardous Waste Planning Subcommittee will provide advice and guidance on the review. The public will provide feedback on our findings through workshops and information mailouts.

Accountability: Ecology will be accountable for implementing the action upon final funding approval by the legislature.

Schedule: The schedule for reviewing and reporting on treatment technologies will take approximately six months. This would include doing: 1) the necessary research on treatment technologies and their application to state hazardous waste streams; 2) discussion of research findings with the state hazardous waste planning subcommittee; and 3) writing into a report. In addition, another approximately six months of workshops and public hearings would take place with the public to discuss the findings of this action idea as well as the remainder of the broader hazardous waste plan recommendations. In total, it is estimated to take a little over one year to complete.

II. Prevent Future Environmental Contamination

A. Proposed Action:

"Review the current state solid waste Minimum Functional Standards (MFS) for adequacy, and update them accordingly."

Major areas of upgrading in the MFS will be for specialized waste disposal standards. This includes inert and demolition waste, woodwaste, and "problem" wastes which are defined as contaminated sediments and lightly contaminated soils. While the exact accounting of the numbers of each type of existing facility is not easily obtained, it is expected that several hundred specialized landfills throughout the state are likely to be affected by upgraded standards.

1. Gains and Costs of Taking an Action

Gains: The Minimum Functional Standards (MFS) for Solid Waste Handling are designed to set minimum standards for facility design, maintenance, operation, and closure to minimize the possibility of degradation to the health or environment of the citizens of Washington. The standards need constant review and updating to reflect technological and statutory changes in solid waste law. The effect of updating the regulations would be through monitoring reduced ground and surface water and air pollution problems in the vicinity of the facility. This would decrease the number of drinking water problems and prevent future cleanup sites.

Adherence to changes in the MFS will speed up reduction and recycling activities because of the costs involved in building facilities to meet MFS requirements. Besides the environmental benefits of recycling, the cost of recycling should be cheaper than landfilling.

Costs: To amend the MFS will take approximately two years and require two FTE's to complete. It will cost approximately \$250,000 to accomplish. These costs will be met by redirecting current resources from lower priorities to this project.

At the local level, implementation of any amended regulations will depend upon what is added or modified. As an example, the last amendments to the MFS in October 1985 resulted in an estimated \$32 million (1986 capital costs) of annual impact for 20 years for current landfills to comply with the amended MFS.

Summary: The advantage and gains of expending funds for reviewing and amending the MFS will be to reduce the possibility of future environmental degradation from solid waste landfills and increase the potential for

waste reduction and recycling Failure to do so could continue to add local landfills to potential future cleanup sites. Currently, ten municipal landfill sites are on the list for cleanup at a cost of between \$5-40 million per site.

2. Constraints to Implementing the Action

Technical: None

Institutional: The present solid waste statute (RCW 70.95) gives Ecology the responsibility to update the minimum standards for solid waste handling. This statute is currently being reviewed in a study by Eastern Washington University to evaluate how other states are organized to administer solid waste programs.

Political: Controversy will occur in amending the MFS. While some reasons will be technical disagreements, the major issue will be cost to landfill owners and operators and to users of landfills indirectly. Political concerns will come from local government, private operators, and possibly the public, again related to cost.

3. Roles and Responsibilities

Implementation: The department would be responsible for amending the MFS. In the public participation process, other state agencies, local governments, special interest groups, and the public would assist the department in the amending the regulation.

Accountability: The local health departments would be accountable for implementing the MFS once they are amended.

Schedule: Once the determination is made to amend the MFS, it will take approximately two years to complete. Major milestones would include hiring staff, convening an advisory group, drafting amendments, public review, and the hearing process.

B. Proposed Action:

"Enact an 'audit law.' Survey industry on what hazardous substances they produce or use, and how they plan to deal with releases." (See D. below)

C. Proposed Action:

"Review existing authority to amend for performance based standards." (See D. below)

D. Proposed Action:

"Develop a program that focuses on hazardous spill prevention and containment."

All three of above action ideas (B, C, and D) are embodied in House Bill 2494 which passed both the House and Senate in the 1990 session and is now law. This bill significantly enhances the agency's preventative capability. Among other things, this bill requires both marine vessels and on-shore facilities which store or transport large quantities of petroleum related products to submit contingency plans to Ecology for review and approval, and requires Ecology to have unannounced drills with these entities. Since these action ideas have been implemented, no further assessment is recommended at this time.

E. Proposed Action:

"Enhance the effectiveness of the hazardous waste regulatory program by increasing resources for hazardous waste compliance inspections, technical assistance, and permitting activities to hazardous waste management facilities."

One of the major areas requiring increased compliance, technical assistance, and permit review is in the development of a federally required "Corrective Action" program prior to December 31, 1992. A corrective action program in Washington State will require, at a minimum, 20 staff in order to address the approximately 100 sites requiring closure during the next decade.

1. Gains and Costs for Taking Action

Gains: Over 100 hazardous waste sites are slated for closure during the next decade. The Corrective Action program will insure that the sites are closed and monitored according to stringent environmental standards as set forth by the U.S. Environmental Protection Agency. This enhanced regulatory effort will assist in preventing future Superfund cleanup sites from occurring, as well as increase implementing corrective actions to existing cleanup sites. Economic losses to the public for cleanup costs would be reduced. Also, economic losses to generators from liability claims could be reduced or eliminated.

Costs: To implement this action, funds would be needed by the department to develop the new program.

Expenditure

FTE:	20.0
Staff:	\$ 1,400,000
Environmental Investigation and Laboratory Services; also include Safety Equipment:	\$ <u>250,000</u>
Total:	\$ 1,650,000

Potential funding sources for these costs include Federal Grant Funds, the State Toxics Account, the Hazardous Waste Assistance Account, and/or the State General Fund.

Summary: The potential savings to the environment and financially to the public could be substantial compared to allowing these sites and future sites to go unattended for cleanup.

2. Constraints to Implementing the Action

Technical: None

Institutional: The department would need to develop legislation and apply to the EPA for authorization.

Political: Since authorization would transfer responsibility of the program to the state from EPA, it is assumed there would be no controversy, other than the cost of the program.

3. Roles and Responsibilities

Implementation: The legislature is responsible for considering and acting on the authorization/funding request that would initiate the action. Ecology would be responsible for preparing and developing the program.

Accountability: The Department of Ecology will be accountable for implementation if funding is provided by the legislature.

Schedule: It is anticipated that it would take between one to two years to develop an adequate program.

F. Proposed Action:

"More dumping enforcement. Make those who dump trash on state or private lands clean it up and pay fine. Now dumpers are just required to clean it up."

With local health departments having the primary enforcement responsibility, more time will have to be spent enforcing

existing local ordinances. In order to assist local health departments, Ecology has been giving financial assistance to them. These funds are specifically earmarked for enforcement activities related to solid waste and will need to be increased for local health to spend more time on enforcement.

Since current penalties and fines for illegal disposal of solid waste are minimal and do not act as a significant deterrent, Ecology should evaluate current statutes and recommend a more appropriate penalty/fine level.

1. Gains and Costs of Taking an Action

Gains: Through increased enforcement and higher penalties, the amount and frequency of illegal dumping should decrease. The biggest ecological and human benefits would be seen where large volumes of waste are being illegally disposed and threatening environmental resources.

Costs: At present, Ecology is giving up to \$25,000 per health department, based on a 50 percent grant match, for enforcement. The department has contracted with Eastern Washington University at Cheney to study the current enforcement program in the state including financial assistance, current organization, and penalties. Upon completion, costs recommendations for implementation will be reviewed.

Summary: No firm data is yet available to compare gains to costs.

2. Constraints to Implementing the Action

Technical: None

Institutional: Upon completion of the Eastern Washington University study, Ecology will develop recommendations on such enforcement issues as: How is compliance and enforcement working? Are penalties adequate? Is program organized appropriately? What are the funding needs? The solutions may involve changes in or additions to responsibilities of the state or local government.

Political: Recommendations from the above study may have political impacts.

3. Roles and Responsibilities

Implementation: Ecology will be responsible for reporting the findings of the enforcement study being prepared by Eastern Washington University. Ecology may also be responsible for implementing certain recommendations coming out of the study.

Local government would be responsible for certain recommendations coming out of the enforcement study. Amended legislation the legislature would have a role.

Accountability: Ecology, depending on the final study recommendations, would probably have a role to ensure/encourage implementation.

Political: Any political controversy will depend on the stringency and costs of the final recommendation from the study.

Schedule: The enforcement study is due June 1990. A timeframe for implementing the recommendations would be premature without the final study.

G. Proposed Action:

"Ban disposal of sewage sludge. Require beneficial use. Require counties to develop plans identifying areas suitable for sludge utilization. Fund regional sludge management projects."

The above action ideas are critical issues that need to be thoroughly discussed and considered in terms of implementing them into law or regulation. Since the department is in the beginning efforts of developing a state solid waste plan, these action ideas will be integrated into this effort so they may receive full review and consideration.

1. Gains and Costs of Taking an Action

Gains: By thoroughly reviewing and discussing the management of sewage sludge within the context of the State Solid Waste Management Plan, all interested parties will get their concerns heard and factored into the resulting recommendation. Through this planning process will evolve proposed management methods for proper handling of sludge which will be protective of public health and the environment.

Costs: Since the State Solid Waste Plan is currently underway, the above sludge issues will become an element to the plan resulting in no new costs. Upon completion of the plan, new costs for implementing sludge recommendations may be needed.

2. Constraints to Implementing the Action

Technical: None

Institutional: None

Political: Sludge management is very controversial so it is expected that there will be some tough issue to address, i.e., Not In My Back Yard. The plan is being developed with the assistance of an advisory committee representing the various interest groups. There will be an active public participation process to assure full public input during the development of the plan.

3. Roles and Responsibilities

Implementation: Ecology will have the lead (with assistance of a contractor) in preparing the plan. An advisory committee as mentioned above will provide interest group input into the development of the plan. The public will have considerable input through the planning process.

Accountability: Ecology has the accountability to develop the Solid Waste Management Plan.

Schedule: The planning process is currently underway and it is expected that completion will occur December-January 1991.

III. Manage Residues Safely

A. Proposed Action:

"Reduce (the) disincentives (that prevent) environmentally sound disposal practices. Create more neighborhood toxics collection centers, for example, in fire houses, or even mobile pickup drives."

Establish more convenient collection options for proper household hazardous waste (HHW) disposal. All counties in Washington are committed to enhance their local HHW collection options once they receive approval of their local hazardous waste management plan. Providing accelerated technical and financial assistance directly for the household hazardous waste collection options recommended in local waste management plans will increase convenience for HHW disposal as well as fit within the "bigger picture" of local hazardous waste management plan implementation.

1. Gains and Costs of Taking an Action

Gains: Human health risk reduction will result from increasing convenience for HHW disposal. More convenient collection options will reduce the amount of HHW in storage, tossed in the trash, poured down drains, or dumped outdoors. A spinoff risk reduction potential will result from the "safe use" and "more careful buying" information that is always a component of collection program education efforts. The human health risk potentials that will be reduced include:

- a) Reduction of long-term storage of HHW in basements and garages reduces the risks of exposure. Storing HHW increases risk for hazardous substance exposures in the home, particularly to children and individuals with chronic respiratory problems. Some studies indicate that health risks may be associated with chronic low-level exposure to hazardous substances. The Seattle Poison Center reports that nearly 25 percent of their calls concern poisonings from hazardous products stored in the home. Fire fighters risk exposure to hazardous substances when they enter a burning home that contains hazardous products.
- b) Reduction of accidents to sanitation workers. HHW in the municipal waste stream increases the risk of accidents on the job and chronic exposure to hazardous substances for sanitation workers. Worker exposure is difficult to measure. In King County, 50 days of work were lost due to six incidents affecting 13 workers over a two-year period.

- c) Reduction of hazardous substances in drinking water. HHW in solid waste landfills that do not have liners or leachate collection systems may eventually leach into ground water. A large percentage of Washington residents depend on ground water for their drinking water.

Environmental risk reduction will be achieved by increasing convenience for HHW disposal. The risks that will be reduced include:

- a) Less HHW will go to landfills. This will reduce the amount of hazardous chemicals in leachate. Liners and leachate collection systems will suffer less degradation from hazardous substances which reduces the risk of leachate escaping into the environment. Another risk reduction potential achieved by not sending HHW to landfills relates to the predicted changes to the percentage of HHW going to landfills. The proportion of HHW that is disposed in the solid waste stream will increase if more convenient collection options are not available because as recycling programs are implemented, greater portions of solid wastes will be diverted from landfills, thereby increasing the concentration of HHW in landfills.
- b) Less HHW will go to sewage treatment plants. Certain constituents of HHW in the liquid waste stream can disrupt sewage treatment processes, or contribute to environmental contamination of local waters, land, or air. Sewage treatment decreases the concentration of some hazardous chemicals in the effluent discharged to local receiving waters, but the environment still receives most of those chemicals via other routes. Certain pollutants like heavy metals and organic chemicals can disrupt the biological treatment process, causing plant failures. The use of sludge resulting from wastewater treatment processes is limited due to its heavy metals content. A decrease in HHW going down the drain will decrease the risk potential for these situations.
- c) Less HHW will be flushed into septic systems. Hazardous chemicals flushed into a septic tank system usually pass through the system untreated, percolates through soils, migrates to ground water, thereby threatening drinking water supplies.
- d) Less HHW will wind up going down storm drains. Studies on stormwater runoff show significant levels of heavy metals and organic chemicals. Reducing the amount of HHW in storm water will reduce non-point source pollution of lakes and streams.

Economic risk reductions will be achieved in the following ways:

- a) Decreasing the amount of HHW going to landfills decreases the risk of creating a future contaminated hazardous waste cleanup site and therefore decreases the potential cost of cleaning up the site. There are currently ten municipal landfills that are identified Superfund cleanup sites in Washington. Additional municipal landfills are under investigation as potential contaminated sites. The estimated cleanup costs for each identified landfill ranges from \$5 to \$40 million.
- b) Reducing HHW in the solid waste stream will reduce certain cost potentials to local governments. Less money will be needed to repair damaged equipment, to meet leachate contaminant limits, and to meet any future waste exportation prohibitions.
- c) Reducing HHW in the liquid waste stream will reduce cost potentials to local governments. As effluent limits are set for hazardous chemicals under NPDES permit limitations, less money will be needed to remove or treat hazardous chemicals in residential wastewater. Reducing HHW in the liquid waste stream will reduce the amount of heavy metals such as mercury in wastewater treatment sludge. This will improve sludge quality and make it more acceptable for more economically beneficial uses than is currently allowed.
- d) Decreasing the amount of HHW that winds up in storm water will decrease the cost for meeting probable future storm water discharge standards.

Several additional benefits may be gained by increasing the convenience of HHW collection options. The include: (1) fosters an ethic of personal responsibility for waste management decisions among the public; (2) empowers citizens to contribute to the solution of an environmental problem; (3) waste minimization education can be included in publicity about collection options. This in turn may reduce the amount of HHW generated; and (4) local governments will have more tools to respond to a problem that they have been fighting for years.

Costs: To implement this action idea, funding for capital costs (such as design, site preparation, construction, and equipment) and operating costs (such as staffing, publicity, and disposal), would be needed by local governments. Funding would be needed by the department for enhancing current financial and technical

assistance staff and for tracking progress in better management of HHW.

Expenditure:

Local Govt (biennium needs): \$23,000,000*
Ecology: (biennium needs): 900,000

(Seven (7) FTEs for financial, technical, permitting, engineering, and education assistance. \$250,000 per biennium for waste stream analysis.)

Estimated biennial total: \$23,900,000

*(A detailed cost breakdown for local government needs is available.)

Potential funding sources for these costs include the State and Local Toxics Accounts and the State General Fund.

Summary: The potential benefit to public health, environment, and future Superfund liability and cleanup costs carries a large price tag. However, the cost to clean up a single contaminated municipal landfill averages \$22 million. However, existing funding sources for HHW programs do exist and will be enhanced. To date, about \$9,900,000 has been awarded in grants to local governments to do local hazardous waste planning, collection events, and pilot projects. At least \$3,100,000 has been funded directly by local governments to match the \$9,900,000 in grants. The Local Toxics Control Account will continue to provide ongoing funding for HHW programs and local governments will continue to explore and establish more stable local funding sources. Consequently, because existing funding sources are already in place and directed at local hazardous waste programs, the cost for implementing this action idea will be considerably less than the estimated \$23,900,000. Additional research and analysis will define what the adjusted biennium funding requirements would be for implementing this action idea.

2. Constraints to Implementing the Action

Technical:

- a) Estimated accurate statewide costs for different types of collection methods and their respective participation rates is practically impossible. Accurate data that has statewide application do not

exist. Better cost estimates could be done if there was time and resources for careful research and economic modeling. The difficulty in estimating costs is due to HHW collection programs being relative new. Therefore, long-range projections of waste generation rates and participation rates can only be guessed. It is difficult to predict the impact of aggressive waste reduction education on short-term waste generation rates. The base cost for fixed facilities varies widely because of differences in facility design and capacity; design and capacity are dependent on local conditions. The base cost for mobile collection units has limited application because it is based on data from one mobile unit. The disposal costs for each collection method vary tremendously because they are directly proportional to participation rates--which vary with each different collection method, population size of the service area, and square miles of the service area. If this action idea is pursued, more precise cost calculations must be done.

- b) Few counties have the technical expertise to quickly establish and bring on-line HHW fixed facilities. For those counties who will select to establish facilities, training and technical assistance from Ecology will be necessary, unless facility operation is contracted out to a hazardous waste firm.

Institutional:

- a) Until funds are received by local governments, whether in the form of grants or local sources, this action idea cannot move forward. Once funds are received, there will be a lag-time before collection services will be available. Collection events will require several months of planning time, fixed facilities will require 6 to 12 months, and mobile collection units will require several months for construction.
- b) Awarding grants from the Local Toxics Control Account will require lead time to develop a specific grant program. Currently, work is being done to have a new grant program available in 1991 that will fund implementation of local hazardous waste management plans. This new grant program could be used for this action idea.
- c) Regulations for HHW fixed facilities will be drafted in 1991. Until the regulations are written, local governments may be reluctant to construct HHW facilities that may not meet future standards.

- d) Some local governments may be resistant to accelerating HHW collection programs. These local governments may be more committed to implementing HHW education programs or other higher priority programs recommended in their local waste management plan.

Political:

- a) Allocations of funds to the Local Toxics Control Account grant programs can be based on political agendas rather than environmental priorities.
- b) Siting HHW collection and storage facilities is sometimes very controversial.

3. Roles and Responsibilities

Implementation: Ecology will be responsible for continuing to provide grants from the Local Toxics Control Account for local hazardous waste "prevention" activities. Ecology will also increase technical assistance to local governments by hiring four "field" project FTEs for three years, and three permanent FTEs. One of the permanent FTEs will enhance the existing grants program in order to assist in program development and grant administration. One permanent FTE will do program development, coordination, and management. One-half of a permanent FTE will enhance and accelerate waste reduction education and policy activities; the other 0.5 FTE will be responsible for tracking implementation and measuring results.

Local governments will be responsible for all aspects of establishing HHW collection locations. Local governments will also be responsible for identifying local funding sources to supplement grant funding from the Local Toxics Control Account. Waste reduction education will be another local responsibility.

Citizens will be responsible for allowing collection units and/or facilities to be located and/or sited in their communities. Citizens will also be responsible for source separating and safely transporting their HHW to a collection location.

Private industry will be relied upon to provide the equipment for packaging and transporting collection of moderate risk waste streams to permitted hazardous waste facilities.

The legislature will be responsible for continuing to authorize taxation of hazardous substances.

Accountability: Ecology and local government would ensure implementation if funding is provided by the legislature.

Schedule: (1) Re-calculate local government costs; (2) accelerate state grant program development; (3) accelerate local government hazardous waste management plan completion and review; (4) identify stable local funding sources; (5) hire and train new Ecology staff; (6) develop grant agreements; (7) local governments hire new staff; (8) increased collection options are designed and funded; (9) mobile HHW collection units and HHW collection events are enhanced above current levels; (10) fixed HHW facilities are permitted and contracted; and (11) more citizens have convenient options for environmentally sound HHW management.

B. Proposed Action:

"Co-package with hazardous products the appropriate disposal medium. Conspicuously feature information in the product's label on proper product disposal and the environmental consequences of improper disposal."

1. Gains and Costs of Taking an Action

Gains: The waste stream includes products which contain hazardous substances. If purchasers understand how to properly dispose of a product, negative environmental impacts will be reduced.

The extent of reduction is uncertain, since firm figures about the total amount of hazardous substances in the waste stream in Washington State are not available. Although the waste streams at municipal landfills have been studied, the figures are not conclusive. (Morgan) (Study results vary widely; and no study has been made using a comprehensive list of products containing hazardous substances.) In addition, the figures available do not take account of products that may be disposed of illegally.

Waste oil figures provide a useful example. Some 140,000 tons of waste oil are potentially available in Washington. Subtracting what is known to be recycled, and what has been found in municipal landfills, some 78,580 tons are being disposed of in environmentally unsound ways. (Shepard)

Costs: Instituting a labeling program would involve costs to manufacturers (for altering and possibly increasing the size of their labels); to purchasers (if the cost of the labeling program drives up the price of some products); and to state government (to the extent that

oversight or regulation is necessary). Should people begin to avoid certain products on the basis of new understanding about them, then manufacturers would suffer losses.

Furthermore, many of the products sold in Washington are manufactured for national consumption. Manufacturers could incur additional costs if they segregate products destined for sale within Washington, or if labels affixed to all their products cause people in other states to alter their buying habits.

From the standpoint of Ecology, one professional staff person would be required to plan, develop and implement a labeling program.

Expenditure for Two Years:

FTE:	One (1)
Staff:	\$ 50,000
Travel:	\$ 2,000
Goods and Services:	\$ <u>2,900</u>
Total:	\$ 54,900

Summary: Firm data are not available to make a definitive statement of gains as compared to costs. We understand that West Germany and Canada have eco-labeling programs to recognize products that are "environmentally friendly." (Watson) Data from those efforts may be useful, if they can be obtained.

Even without firm data, one can speculate that the mere presence of information about the environmental effects of a product, and the means of proper disposal, may cause people to reflect on the impact of using these products. This in turn may prompt people to make conscious choices which will influence market demands and lead to a diminishing use of environmentally harmful products.

2. Constraints to Implementing the Action

Technical: None.

Institutional: Presently, there is no comprehensive list of products containing hazardous substances in Washington State. (The Model Toxics Control Act defines categories of "hazardous substances" for taxing purposes, but may not be inclusive enough for this action plan.)

An important early task for the assigned staff person would be to produce an acceptable list. Alternatives may include the following:

- a) Use the Washington Hazardous Substance List. Even though it is not all-inclusive, it exists and has been accepted by the Washington Retailers' Association and independent retailers. (Huether) Furthermore, using this list eliminates the cost of creating a new list and gaining acceptance for it.
- b) Create a list that is determined by generic categories of hazardous substances. Generic categories used by the State of Iowa are: pesticides, caustic household cleaners, motor oils, motor oil additives paints, thinners (except water), lacquers, degreasers, petroleum-based fertilizers, solvents, etc. This generic list includes chemicals that do not fit within the definition used to create the Washington Hazardous Substance List. However, it would include products that fulfill the product description but that do not contain a hazardous substance. An exemption policy could be established which would allow a product not to be labeled for special disposal if it were proven by the manufacturer that it did not contain a hazardous substance.
- c) Create an advisory committee consisting of the hazardous chemical manufacturers, local and state government and consumer and environmental representatives to develop a hazardous substances definition pertinent to this action.

Once the list of products is developed, appropriate wording for labels would have to be developed. Ecology staff would work with various interest groups to craft appropriate wording.

Once launched, the program would require continued maintenance and adjustment to accommodate new or changed products, and new information about hazardous substance effects.

A further refinement might involve a rating or ranking of products in terms of how safe and environmentally benign they are. The Environmental Protection Agency has a "seal-of-approval" project underway to give consumers an idea of the comparative risks of product alternatives. (EPA) The Washington Toxics Coalition is developing a set of criteria for such a ranking. (Dickey)

Political: A key question is whether the labeling program would be voluntary or mandatory. Washington's program for labeling shelves where automotive oil is sold has not been implemented in many retailing establishments; this may be due to the lack of associated enforcement.

To require labeling involves legislative action. However, whether a voluntary or mandatory, some interest groups would undoubtedly oppose such a program, while others would embrace it. A program of education and persuasion would be essential.

Whether voluntary or mandatory, the choice of words used in labeling would be a sensitive matter. Labeling left to the discretion of the manufacturer may differ greatly from labeling sought by a consumer group, for example. Ecology would have to provide oversight of the words and definitions, in order for the program to be meaningful. That oversight role is in itself possibly controversial in some quarters.

3. Roles and Responsibilities

Implementation: Ecology would provide leadership in convening interest groups, providing research, drafting guidelines or legislation, and launching and maintaining the program.

Industry and consumer groups would play a continuing and vital role in an advisory capacity. They would also be relied on to help persuade and educate members of their sectors about the program and its importance.

Accountability: Ecology. The action item relates directly to mandates to lead in state efforts to reduce wastes and to and properly dispose of hazardous substances.

Schedule: Hire a new FTE for the coming biennium. That individual would scope out a plan for the labeling effort.

IV. Develop Incentives for Sound Disposal

A. Proposed Action:

"Provide resources to assess the effectiveness of alternative and innovative treatment technologies which may be used to clean up sites contaminated with hazardous substances. These resources could be used to conduct site or waste-specific treatability, field pilot, or full demonstration studies."

1. Gains and Costs of Taking an Action

Gains: The age-old habit of burying wastes dies hard. Today, new methods of treating and disposing of hazardous wastes are being tried but are not always well evaluated or well understood. Individuals and firms facing cleanups do not have ready access to information which would help them determine the best treatment option for particular local circumstances. A program to assess the effectiveness of various approaches would provide important information to potentially responsible parties, or to Ecology in addressing orphan or abandoned sites.

Costs: Costs would vary widely depending on the approach chosen. The agency could seek funding for R&D efforts--a very expensive option. Or the agency could work toward incentives for private industry, academia, or a non-profit foundation to conduct R&D efforts and publicize the results.

A more practical approach, with near-term payoff, would be for Ecology to compile and make accessible existing information, from research already conducted.

Ecology already has a staff member engaged in compiling existing information on waste treatment technologies and developing summary information. At this time, the audience for this information is limited to Ecology staff working on cleanups of contaminated sites. To bring the summarize up to date and maintain them would require half a staff person. The effort to publicize the availability of the information, and package it for external consumption, would also require half a staff person.

Expenditures (annual):

FTE:	One (1)
Staff:	\$ 50,000
Travel:	\$ 2,000
Goods and Services:	\$ <u>2,900</u>
Total:	\$ 54,900

Potential funding sources for these costs include the State Toxics Account and/or the State General Fund.

Summary: Assessing treatment technologies will cost money, regardless of the approach chosen. Government will incur a cost from administering such an expanded effort.

Environmental benefits are anticipated, however, because the availability of information on treatment options will enable those pursuing cleanups to make their decisions more quickly. In addition, if it is known which method results in a higher degree of cleanliness, higher environmental objectives can be achieved.

The downside for those doing cleanups is that they may be compelled to pursue higher levels of cleanups by technologies that turn out to cost more than less effective methods.

2. Constraints to Implementing the Action

Technical: There are no technical constraints, but there are technical challenges in evaluating data gathered by different methodologies.

Institutional: None

Political: A full-blown, government-funded R&D effort would be controversial due to the expense. Lesser levels of effort at basically staff costs alone would not be controversial.

3. Roles and Responsibilities

Implementation: Ecology would have the lead role in designing a pro-active program to evaluate treatment technologies. Necessarily, representatives from industry, academia, local government, and the environmental community should be involved.

Accountability: Ecology

Schedule: The coming biennium. The first milestone would be the hiring of a staff person to begin the scoping process.

B. Proposed Action:

"Provide economic incentives to responsible parties who accomplish destruction of wastes found during cleanup of contaminated sites."

1. **Gains and Costs of Taking an Action**

Gains: Often, cleanup activities involve transferring contaminants from one environment to another (from soil to air, for example), or from one location to another (from the site to a hazardous waste land disposal facility). To the extent that the wastes can be obliterated, the public health and the environment benefit.

The question is whether incentives can be developed which will lead responsible parties to seek destruction of wastes rather than transfer to another medium or location.

Information is readily available on the economics of pollution control tax policy. Information is also available on the various waste treatment technologies. In the short timeframe of this research, however, we did not find information on economic incentives which related specifically to destruction of wastes.

The primary focus of this action plan would be a research program directed at learning what other states and other countries are doing to provide incentives for waste destruction. Depending on what is learned, the follow-up steps might include working with industry and other interest groups to develop a legislative package.

An important piece of the development effort would be to see if the costs to the state (in terms of taxes foregone, if the incentive relates to taxation), is outweighed by the economic benefits of reduced risk to public health and the environment.

Costs: The initial cost of this alternative would be one professional staff member for one year of research.

Expenditures (annual):

FTE:	One (1)
Staff:	\$ 50,000
Travel:	\$ 4,000
Goods and Services:	\$ <u>2,900</u>
Total:	\$ 56,900

Potential funding sources for these costs include the State Toxics Account and/or the State General Fund.

2. **Constraints to Implementing the Action**

Technical: It would seem that no "technical" constraints stand in the way of developing economic incentives for

waste destruction. The challenges would be primarily political and institutional.

Institutional: Options for tax incentives to benefit the responsible parties might include the following:

- a) Exemption on sales taxes on purchases of equipment needed for waste destruction.
- b) A tax credit of an amount to be determined against the net income assessment of the corporation business tax.

In addition, incentives might be developed for the marketplace, to encourage particular industries by giving a tax exemption for interest on bonds to finance projects to develop waste destruction technologies and equipment.

Tax incentives are not the only kinds of economic incentives possible. A research effort should look beyond them, to other ideas.

An important component of an economic incentive program will also be arriving at a definition of what constitutes destruction of hazardous waste, and who is to make the determination on if the remedial action at a site meets the destruction.

If the economic incentive program involves taxation, Ecology staff might conceivably play a role in concurring that a particular remedial action meets the legal requirement. If so, roles and responsibilities vis-a-vis the Department of Revenue would have to be carefully spelled out, as in any inter-agency effort.

Political: Depending on what type of legislative recommendations are made, some controversy may appear.

3. Roles and Responsibilities

Implementation: Ecology should take the lead in initiating the research effort and in convening discussions with interest groups and the Department of Revenue, when appropriate.

Accountability: The Hazardous Waste Investigations and Cleanup Program should take responsibility for the effort for Ecology. That program already has one staff member who is responsible for researching state-of-the-art cleanup technologies and providing technical summaries and training for staff. The proposed effort should be associated with that individual for maximum efficiency and transfer of information.

Schedule: The project should get underway at the start of the new biennium, with a developed proposal and schedule by the end of one year.

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Pesticides



State of Washington
July, 1990



Washington Environment 2010

Action Plan - PESTICIDES

27 June 1990

I. Introduction

The use of synthetic chemicals for pest control began in the 1940s, when the discovery of organic compounds such as dichloro diphenyl trichloroethane (DDT) began a revolution in pest management. These new compounds made it feasible to control many pests and pathogens for which no effective control measure was previously available. Many of the early organochlorine pesticides had detrimental environmental effects and presented risks to human health. Most of these compounds have been removed from the market and replaced with less persistent, although in some cases more toxic, chemicals.

Pesticides are widely used in the state of Washington principally for crop protection, vegetative management, and residential needs. Pesticides include both natural and synthetically derived chemicals that are specifically developed and employed to destroy some type of biological or botanical agent. Because of this and early problems with organochlorine compounds, there is great suspicion that such compounds might have serious effects on non-target species.

The specific risk to both human health and the environment from pesticides is difficult to determine. Many avenues of exposure or contamination may occur. It would be prudent to increase our knowledge of the extent of exposures and contamination events as well as attempt to reduce these as they become known.

The 2010 Vision Statement describes a new sense of environmental awareness, knowledge, and responsibility that has resulted in an approach to managing our natural resources in a sustainable fashion. Appropriate, minimal, and safe use of pesticides would help preserve the diversity and the long-term sustainability of those resources, and our quality of life.

Several ideas on reducing usage and human exposure to pesticides have been offered via the Environment 2010 public meeting process. These ideas encompass the concepts of improved stewardship, product usage and disposal, education of specific sectors of the population, enhanced regulatory activities, and research needs:

1. Develop and promote alternative technology to conventional pesticide use. This idea would include encouraging research in biological and mechanical pest control methods, development of pest resistant crop strains, etc.
2. Develop improved pesticide equipment and application techniques.
3. Significantly expand waste pesticide disposal opportunities.
4. Increase product stewardship by manufacturer and dealer.
5. Increase compliance monitoring and enforcement. Improve resources in existing program areas, and enhance food product and environmental monitoring.
6. Support federal efforts in sustainable agriculture programs by developing and disseminating information suitable for local crop production.

7. Educate homeowners on proper/appropriate use of pesticides and fertilizers. Disseminate information on the results of inappropriate use of lawn, garden and household pesticides, for example. This idea is also addressed by the 2010 Environmental Education subteam.

Action Idea 1. Develop and promote alternative technology to conventional pesticide use, such as encouraging research in biological and mechanical pest control methods, or development of pest resistant crop strains.

Risk reduction/resource enhancement

Farmers and society could benefit from safer and more economical methods of controlling pests. Problems associated with dependence on extensive insecticide use were recognized in the 1950s, and researchers developed concepts leading to integrated pest management (IPM). IPM is an ecological approach to pest management that takes into account the biology of the pest and its interaction with the environment. IPM programs are available for industrial and homeowner pest problems as well. IPM focuses on a central concept of economic threshold, where the mere presence of a pest population does not necessarily indicate an economically damaging situation where benefits exceed the cost of control. The IPM strategy for agriculture relies on natural mortality factors such as weather, natural enemies, and crop management. Control tactics are designed to disrupt these factors as little as possible. Although IPM may include the use of chemical pesticides, it considers all available options to achieve the greatest control with the least possible hazard. Decreased pesticide use is often associated with IPM, but is not a mandatory component of the system. Such programs usually decrease pesticide use, but many increase the number of pesticide applications in light of better knowledge of pest populations.

An example of IPM in the urban environment is found in efforts to control cockroaches. Cockroaches carry viruses and bacteria that can cause hepatitis, polio, typhoid fever, plague, and salmonella. Attempts to control the cockroach consume one third of the pest control budget for urban sites, but because of its growing resistance to many pesticides, the cockroach is not likely to be eliminated from homes and other buildings in the near future. Cockroach control with IPM involves estimating the extent of the pest population, then using a range of techniques to achieve tolerable levels. Insect habitats are modified by lowering the temperature, removing food, eliminating moisture, reducing clutter, filling hiding spaces, and utilizing appropriate pesticides when necessary.

Virtually all of the new pest control strategies, including IPM, require greater understanding of target pests, their life cycles, conditions that affect them, and more. Monitoring for populations of pests and their predators is essential via visual inspection (performed by a trained individual), several types of insect traps, weather monitoring stations, and possibly units to collect and/or count fungal spores.

Cultural controls for insects include modifying the pest habitat through use of physical modifications, increases in ecosystem diversity, crop rotations, adjusting the times of planting and harvest, precise usage of water and fertilizer, improved sanitation, and modified cultivation and tillage practices. One of the more innovative methods of insect control involves pest-vacuuming. This technology has been an outstanding success attacking specific pests in specific crops, such as lygus bug control in strawberries. Plant pathogens may be controlled using crop rotations, alteration of soil pH, sanitation and adjustment of the timing of planting and harvest to avoid peak periods of the pathogens and complement genetic resistance of the plant. Cultural practices are currently the most

effective alternative to herbicide use. Cultivating, rotary hoeing, increasing the density of the crop plant to crowd out weeds, intercropping, timing of planting, to give the crop a competitive advantage, and transplanting seedling crops plants to give them a head start on weeds are effective measures.

Natural biological controls, such as antagonists, predators, and self-defense mechanisms, suppress many pests. Natural enemies, such as parasites, predators, and insect pathogens, are partially or entirely effective on most potential pests. Augmentation of indigenous natural enemies (such as mass release of natural enemies in the target field) is an important biological control technique. However, the technique of introduction of biological control agents has not been very successful with plant pathogens because of the great complexity of microbial communities. More information is needed concerning the ecology, classification, and physiology of biological control organisms or the underlying mechanisms affecting the interactions among beneficial microorganisms, pathogens, and plants. Few weeds are controlled biologically in agriculture, though future opportunities in this area are numerous. USDA and some states have instituted biological control coordination programs to expand the use of IPM and promote the widespread adoption of biological control across commodities and user groups.

Plant breeding, the science of manipulating a plant's genetic composition, has been a very effective control method for insects, mites, and particularly plant diseases. Modern genetic technology will speed the development of resistant crops. Genetic resistance is the single most important defense against plant disease and the proven alternative to chemical control when available. Weed-tolerant crops and crops that produce substances toxic to weeds are approaches that have received little research attention, because naturally occurring phytotoxic allelopathic chemicals may not be safer than use of synthetic herbicides. Emphasizing research in genetic technology and transfer of this technology into commercial products is becoming more and more important as chemical control options decrease.

Other techniques addressed in current research include: 1) the use of insect diseases to control insect pests; 2) rearing and releasing sterilized insect pests or breed genetically altered pest species that can mate with pests to produce offspring unable to reproduce, feed, or perform other functions necessary for survival; 3) introduction of devices that emit synthetic insect hormones that disrupt normal functions such as breeding, growth, and molting; 4) stimulation of the plant's defense system with chemicals or by inoculation with an avirulent form of a pathogen; and 5) development of herbicide-resistant crops, which may offer opportunities to substitute safer herbicides for more dangerous herbicides currently in use. Transferring this research from the laboratory to a commercial product is problematic, and requires additional efforts to make alternative pest control products available to users in a timely manner.

Costs

Most direct costs would be incurred by organizations performing research and development of the alternative pest control strategies. Commercializing successful pest control strategies and promoting their use would rest with companies marketing the product. Products developed by for-profit companies will be necessarily more expensive to the producer, because of patenting and costs incurred by marketing, etc. Some of the products developed with public funding that remain in the public domain will be of lesser cost to the producer.

As alternative methods of pest control are employed, the use of synthetic pesticides would likely decrease. However, costs for the remaining pesticide uses might increase, since the economy in the pesticide industry is heavily influenced by the amount of government intervention (i.e., regulatory burden and registration costs). Companies that produce and sell pesticides would increase their prices to cover costs, which would increase food production costs. In addition, pesticide producing companies would allow registration of some pesticides used on minor crops to expire. The effects of this could be far-reaching, if no effective pest control alternatives are available for use on minor crops, which include almost all crops grown in the state of Washington except wheat and corn. Costs of minor crop foodstuffs would increase and be passed on to the consumer.

Development of a technology transfer organization that promotes the creation and transfer of commercially promising agriculture biotechnology from the research laboratory to the marketplace could be quite expensive. Other states have gone this route, most notably Iowa and North Carolina, at a cost of millions of dollars. In Washington, a less expensive alternative would be to shift the focus of the Washington Technology Center (WTC) to include agriculture biotechnology and capture the technology transfer need in this area. Currently, WTC funds and equips top researchers at the University of Washington and Washington State University and unites them with private industry collaborators in seven program areas, including advanced materials, compound semiconductors, computer systems and software, manufacturing systems, medical and veterinary biotechnology, and microsensors.

A biocontrol program within WSDA designed to complement existing USDA efforts would require approximately \$500,000 to cover pest inventory, database development, material purchase, collection and distribution, and personnel.

Other Factors

Implementing IPM for some crops in some regions may be difficult. Some plant diseases are more consistently a problem in hot areas with high humidity. Also, fruit and vegetable crops have a high unit value, and the loss of even a small share of the crop could be costly. Additionally, blemish-free produce often receives a higher price under federally regulated grower-operated grading systems. Low tolerance levels for insects or their fragments in high-value canned and processed foods encourages prophylactic pesticide applications. IPM benefits for high-valued crops may not be impressive since such crops involve a very low economic threshold that may not reduce the number of pesticide applications.

Institutional constraints are few, since USDA is providing greater emphasis to its biological control program. On the federal level, and within Cooperative Extension, the program framework exists. Washington State Department of Agriculture may require amendments to existing statutes to develop a program in biological control.

Politically, the concept of developing alternatives to pesticides is very popular, as the public is concerned about reports of the misuse and overuse of pesticides. For example, the concern is raised regarding the safety of the food supply. Farmers would most likely be willing to reduce the amount of pesticides used in food production, providing an efficacious and economical alternative is available.

Roles and Responsibilities

Implementation: USDA, via funded research in alternative technologies. USDA APHIS is planning to create a "National Bio-Control Institute" that will promote and expedite biological control by facilitating the processes of collecting bio-agents, clearing quarantine, and distribution the agents. Commodity Commissions could promote the use of alternative pest control technologies and provide research funding. Technology transfer organizations should assist in developing and promoting the use of alternative methods of pest control. Cooperative Extension should train users in IPM and promote alternatives to pesticides for urban and rural uses. Washington State Department of Agriculture should develop a program emphasizing biological control to monitor insect populations, facilitate introduction of materials, maintain a database, and work with other state agencies, university researchers and USDA.

Accountability: Washington State Department of Agriculture

Schedule: Pesticides have been used for more than 50 years and research in alternatives has just begun. Therefore, an optimistic estimate of 25 years might elapse before the widespread use of alternatives to pesticides in agriculture and other arenas. A biological control program within WSDA could be developed within 2 years, depending upon funding.

Action idea 2: Develop improved pesticide equipment and application techniques.

This action idea is relevant to several other action ideas in this and other packages, but it also stands alone as a way to improve current conditions. This discussion will be limited to field pesticide use, both agricultural and industrial. Uses of disinfectants, sanitizers, wood preservatives, livestock treatments, medical uses (i.e. head lice, ticks), seed coating, and uses within structures, such as termite control, grain and stored commodity fumigation, and chamber fumigation of objects like mattresses, are not within the scope of this document.

Risk reduction/resource enhancement potential

We examined several components of this action idea. A discussion of each of these components follows.

Reduction of drift or off-target movement through improved equipment and techniques

Pesticide drift may have many negative results. It may result in property damage, either directly, as in the loss of desirable plants due to herbicide drift from a neighboring property, or less visibly, as in the presence of an unacceptable insecticide residue in a crop adjacent to an application. It may result in health concerns for people who are involuntarily exposed to direct drift or to residues remaining from a drift incident. It will result in some degree of environmental contamination for which no benefit is derived. Allowing pesticides to drift is considered a violation of regulations in this state and carries substantial monetary penalties. Enhancing enforcement efforts, as described in another action item, would presumably reduce its incidence. However, improved equipment would also help to reduce drift by reducing the potential for it to occur.

In general, it is desirable to produce a large spray droplet. Large droplets are heavier, and they tend to fall with less off-target movement. This principle is exploited in invert emulsion applications, where a pesticide is suspended in a thick, mayonnaise-like foam, which has comparatively little tendency to drift. Large droplets also contain more diluent. If a droplet falls for any distance, it will grow smaller due to evaporation. This is particularly true in arid regions, such as much of eastern Washington. Evaporation makes the droplet smaller, increasing probability for it to drift. If effectively all of the solvent evaporates before the droplet reaches a dry target, the pesticide will often be ineffective, as solvent is necessary for the pesticide molecules to penetrate into the target or to act upon its surface. In recent years, one branch of pesticide product technology has been devoted to thickeners, additives which increase the size of spray droplets. The pesticide industry has taken the lead in developing this technology, as it usually involves modifying the formulation of the product or producing an independent product to be mixed into the spray tank.

In general, drift is reduced when the force with which spray droplets are expelled from the nozzle is reduced. Force shatters spray droplets, producing small, light "fines" with vectors in many directions, with a large potential for off-target movement. However, reducing expulsion force (generally measured as pressure at the nozzle) tends to reduce coverage of the target. Complete coverage of target vegetation is often necessary whether the target is a

weed to be controlled or a crop to be protected. Coverage is particularly important if the pesticide is a protectant which must remain on the outside of the plant - only those areas which are covered are protected. High expulsion force and the resulting small droplets are one way of maximizing coverage. An example of this type of equipment is the air blast sprayer or speed sprayer in almost universal use in orchard and fruit crops. Such force is necessary to distribute adequate pesticide into the canopy from the ground.

The method of application which has received the most attention in this region is aerial application. Because of the area which can be affected by fixed wing aircraft or helicopters in a short period of time, aerial application has potential to cause widespread problems from single instances of pilot error or equipment inadequacy. Examples of factors that can affect potential to cause drift include boom length (whether or not the spray boom extends beyond the rotor width or the wingtip is particularly important), the angle, in relation to the air stream, at which the nozzles are mounted on the boom, the configuration of the nozzle and related parts, and the pressure at the nozzle. Each aerial rig is unique, as the models of machines used vary widely in their configurations and in the air vortices and currents they create about them. In addition, there is an almost infinite number of combinations of components possible for construction an application rig, and each applicator creates or modifies his/her own equipment. For many years, the state department of agriculture has attempted to determine, by observation and regulatory experimentation, configurations which showed the least tendency to cause drift. In recent years, the WSU Agricultural Research Center and Cooperative Extension Service have conducted more formal research into drift reduction.

Increasing pesticide effectiveness by increasing the amount of pesticide which reaches the target

Although this appears to be the converse of reducing drift, as discussed above, research has so far been unable to show an exact mathematical relationship between deposition and drift. Intuitively, it seems obvious that increasing spray deposition on the target would decrease the amount of spray available to move off target, and this document proceeds on this assumption. However, it is very difficult to construct an experiment to test this hypothesis under anything approaching field conditions, and unequivocal evidence for it is not available at this time.

In addition to the presumption of drift reduction, there is another benefit from increasing deposition. Evidence indicates increased deposition is correlated with increased pesticide effectiveness for a range of application rates generally near recommended use rates. It is logical to conclude that in some circumstances increased deposition would allow the user to reduce application rates without sacrificing effectiveness. In fact, it appears that a 10% or more reduction in amount of pesticide applied could be achieved by switching to newer technologies such as recovery and recirculation sprayers. (Such technologies are, of course, not available for some types of application.) This reduction would be environmentally beneficial by reducing the total pesticide loading of an area. The reduction in pesticide cost would be beneficial to the user; however, the cost of the pesticide may represent as little as 10% of the total costs (labor, equipment, materials) of application. The increased cost for the newer application equipment would probably overwhelm this savings.

Much of the research into equipment improvement is conducted by the agribusiness and industrial service firms most likely to benefit directly from increased equipment sales. Most of the rest is conducted by extension services in various states and may be funded from the private or the public sectors. The WSU Cooperative Research and Extension Service has run a very successful program of voluntary fly-ins for aerial applicators. In this program, a specific field analysis of deposition patterns was performed for each ship. Each pilot was able to determine what was wrong with the deposition pattern and to experiment with different equipment configurations to give a better pattern. In addition to giving options for increasing deposition, this program gave information necessary to even out the deposition pattern, so that streaking of heavy or light rates of application could be reduced. The procedures used in the fly-ins have been modified for use on some ground rigs, with similar results.

Increasing effectiveness by increasing coverage

The drawbacks to increasing coverage by using increased equipment pressure were discussed earlier. Coverage may also be increased by increasing the dilution of the spray mix, and applying more of the dilute mix per unit of area. For instance, instead of aerially applying the usual 3 - 5 gallons of spray mix per acre, a pilot might apply the same amount of pesticide active ingredient per acre in 10 gallons of more diluted spray mix. However, in the case of aerial application this quickly becomes cost prohibitive, as the extra weight of diluent requires many more loadings and much more fuel. This is more acceptable for ground rigs, which typically deliver between 30 and 400 gallons of mix per acre, but even then the weight of diluent represents a significant cost. Spray additives can be another way to increase coverage, by increasing the tendency of the droplets to adhere to the target or to spread out in a flat film once they contact the surface. Another promising technology involves imparting an electric charge to spray droplets which causes them to be attracted and to adhere to foliage surfaces.

Decreasing applicator and mixer-loader exposure through development of cost-effective closed or near-closed systems

In general, the greatest human exposure to pesticides is incurred by people working directly with the concentrated material. The largest group of such people in this state is those who work in application. Evidence indicates the greatest exposure in this group tends to be during mixing and loading operations, even in situations where prescribed protective gear is worn. This exposure can be reduced by technology which isolates the user from virtually all contact with the concentrated material (that is, by using closed systems). Closed (or nearly closed) systems have been developed for liquid pesticides. In one system, a sealed container of liquid concentrate is loaded onto the rig. A mechanism opens the container and pumps the concentrate at a preset rate into a stream of diluent. After mixing, the dilute solution is applied by the rig. Such machinery is limited. It is highly expensive to purchase and to maintain, and it is useful only on large acreages of the same crop or site. Another variant of this type of technology is the enclosing of pesticide powders in water-soluble bags. Several pesticide manufacturers market some products in this form. However, the amounts of pesticide are premeasured, and this limits flexibility in the amount of area that can be treated.

Research into closed equipment systems has been pioneered in California and in the Midwest. It appears more practical to adapt that portion of research and development which is applicable to Washington conditions, rather than attempt to fund a parallel effort, as this type of equipment development is very costly. Development of innovative packaging to reduce exposure should be a manufacturing industry responsibility.

Reducing the amount of pesticide applied by more effective placement

The popular conception of pesticide use is a broadcast application. In some circumstances, for instance in solid planted field crops, this is necessary. However, selective placement of pesticide often reduces the total amount of product needed without sacrificing effectiveness. This has obvious environmental benefits, and the reduced material cost is attractive to the user. This is not a new idea. Banding pesticide in the row is standard procedure for many crops. Spot spraying, which targets individual problem areas, is the usual technique in many industrial and roadside operations. A more recent innovation is wiper application equipment, which allows applications onto specific targets (for instance, onto weeds which are taller than the crop). Such developments are often a combination of extension research and industry efforts.

Costs, roles, and responsibilities

From examining these components, it appears that pursuing three types of actions would be productive:

1. Development of new technology (or modification of equipment and methods already developed for other areas). Adaption of more closed system technology to local conditions is a need. Development of alternative technologies to the speed sprayer and to aerial application would have great benefit in reducing potential for off-target pesticide movement in some areas. This is difficult, as these types of equipment are cost effective and perform well. However, in the case of speed sprayers, it may be particularly timely. The tree fruit industry has moved away from large trees, relatively widely spaced, to dwarf and semi-dwarf rootstocks and shorter trees planted close together. This may allow for more targeted applications through booms that extend over the top and sides of a row. This type of project is best suited to the university community, particularly the agricultural engineering department of WSU, and it should be publicly funded. At this time, no cost estimates are available.

2. Introduction of improved, existing equipment into wider use. Application equipment is very expensive, and the replacement rate for many users in the private and the public sectors is remarkably slow. Comparative field testing of existing equipment under local conditions would provide smaller users (that is, the majority of users) with information to make an informed choice and some degree of confidence that the investment would be cost effective. The WSU Cooperative Research and Extension Service has the expertise to do this; however, financial support for it is needed. It appears that an annual budget of \$75,000 would support such an effort.

3. Supporting the existing "fly-in" program at WSU with particular emphasis on testing and modifying ground rigs. This program has demonstrated its effectiveness. Some of the costs of doing this can be supported with user fees paid by the owner of the rig, but fees must be kept within the reach of the smaller operator, who would also bear the cost of transporting the rig to a testing site. To be effective, this program would need public support at an estimated level of \$90,000 annually.

Action Idea 3. Significantly expand waste pesticide disposal opportunities. Additional resources for ongoing pesticide inspection, collection, and disposal projects would be one mechanism of addressing this goal.

Background

The Washington State Department of Agriculture (WSDA) conducted a project for the Identification, Collection, and Disposal of unusable pesticide formulations in five counties during the last two years. The purpose of the existing program is to significantly reduce the backlog of waste pesticide which has accumulated over the last 40 years, and to educate farmers and other pesticide user groups in waste reduction and proper pesticide management. The public response and large volume of pesticide waste collected has been overwhelming. This demonstrates a large need to continue, and expand opportunities for the public and industry to economically and legally dispose of hazardous waste pesticide formulations. A program goal is to give all farmers the opportunity to participate. Once farmers have been given the opportunity to dispose of their backlogs of waste pesticide, they should assume responsibility for disposal of any waste generated in the future. The state role should be to provide technical assistance and education.

To understand the scope of the problem, it's necessary to understand the origin of the wastes. Many pesticides become unusable when their registration and legal uses are suspended or canceled due to health concerns. Other pesticides purchased for a particular use may become obsolete as farming practices, cropping patterns or commodity markets change. Pesticides can also deteriorate or be damaged during storage, from their exposure to improper temperature and moisture conditions.

During long-term or improper storage, container labeling can become lost, damaged, or illegible. As farms, including storage sheds, are sold or transferred, the unknown pesticides can simply become inherited as wastes.

The volume of waste pesticide formulations occurring in Washington State is significant. The Department of Agriculture has disposed of 42 tons of pesticide wastes collected in only five counties during their project. Twenty-three tons were collected in August 1988, in Yakima County alone. Estimates from an October 1989 survey of Yakima County farms estimates that between 138 and 184 tons of pesticide wastes are still stored on Yakima County ranches and farms.¹ The Yakima County example may not be representative of all county situations, but considering the types of pesticide use activities that occur in Washington's other 38 counties, the potential statewide volume of pesticide waste formulations is staggering.

The potential for harm to health, resources, and environment is significant and there are numerous documented impacts resulting from the release of waste pesticides.

¹Estimates from the Yakima County Hazardous Waste Management Plan, Agricultural Survey Preliminary Results, January 1990.

Risk reduction/resource enhancement

Pesticide wastes accumulated in lieu of legal disposal are destined to become problems. When the packaging or container deteriorates, the pesticides can be released to surrounding soils; subjected to migration by surface water, and expose resources connected to the surface water; contaminate shallow ground water; become available to foraging animals including humans.² Pesticide waste storage facilities subjected to fire can cause significant health and environmental hazards-toxic fumes may be released during burning, and pesticide residues not destroyed by the fire can either migrate to surface water drainage areas (e.g., storm drains, earby creeks or rivers), or be transported inadvertently by becoming mixed with and released as part of the large volume of fire-fighting water.³ Pesticide wastes not accumulated in lieu of legal disposal are often disposed of illegally. There are numerous reports, or allegations of on-farm "landfilling" of unwanted pesticides and their containers into ditches, ravines, or adjacent non-cropland. Waste pesticides have been illegally disposed of, or abandoned along public access areas, rivers, and streams. The potential health, environmental, and resource risks from either intentional or inadvertent release of pesticide wastes is obvious. Pesticide waste releases cause economic as well as environmental impacts. Abandoned or orphaned waste disposal locations become the cleanup responsibility of state government. Even when a responsible party can be identified, legal, administrative, and enforcement activities impact government budgets. One disposal site on the shore of the Okanogan River cost the Department of Ecology over \$30,000 to clean up.

Besides reducing health and environmental risks, expansion of legal disposal opportunities have some additional benefits.

- It promotes a partnership approach to problem solving, involving local and state agencies, growers, producer-commodity associations, farm bureaus, agri-chemical manufacturers and dealers. Disposal of unusable pesticide formulations is a responsibility and challenge shared by industry as well as government.
- Development and implementation with participation from the "partners" increases awareness about pesticide waste problems/risks.
- Promotes education about methods for preventing the generation of pesticide wastes.

²Transients were found to have been using a storage shed for shelter in one location, where pesticide-treated grain and other pesticides had become spilled.

³A waste pesticide storage facility in one location was recently destroyed by fire. The actual health impacts of the fire is unknown, but no imminent dangers are suspected.

Measurement of success

It is difficult to quantify the effectiveness of a pesticide disposal program because the extent of the problem is not well quantified. Baseline data is not available for the amount of waste pesticides currently being stored on farms statewide, though there are indications that it is a considerable amount. We can measure the amounts of waste pesticides collected and the numbers of farmers who participate in the program. This should be a reasonable indicator of success. Since waste pesticides have been identified as a threat to the environment, any reduction in the amount of material and number of people storing it should result in less risk to the environment.

Any waste pesticide disposal program would create an awareness of the issues by its very existence. The organization of collection events generates publicity and causes people to become aware of disposal issues. Any program should include an education and information distribution element. It can be assumed that a strong educational effort aimed at waste reduction and proper pesticide management would be effective and result in further reduction of risk to the environment. The amount of education conducted (e.g., talks given, workshops, fact sheets distributed, etc.) could also be used as a measurement of the effectiveness of the overall program.

Costs

A. Current Costs

The project has been funded with revenues drawn from a tax on the sale of hazardous substances (including pesticides) in Washington State, under the authority of the Model Toxics Control Act. \$600,000 was the cost of waste identification and collection in five counties.⁴ Of that amount, approximately \$300,000 was for contractors' services in the packaging, transportation and disposal/destruction of the pesticide wastes. \$300,000 of administrative costs were incurred by WSDA for project planning, contract administration, coordination, and implementation.

Additional administrative costs were incurred by participating county governments, and by the Department of Ecology for regulatory and technical support of the pilot project. Those "hidden" administrative costs should be anticipated in planning the project expansion.

B. Future Cost Allocation Options

When the WSDA began this effort in 1988, it was their intent to eventually allow every county to participate. Due principally to resource constraints, the project has

⁴Because there are no reliable estimates of the statewide pesticide waste volume, it is difficult to project costs for a statewide disposal program. However, past project contractor costs averaged approximately \$1,400 per waste generator (farmer). There are approximately 37,000 farmers in Washington.

been available to only five counties in two years. At the current project level, it could take ten years to reach all of the 25 counties that have requested participation in the project. The preferred option is to accelerate funding so that the state-sponsored project could be completed within five to seven years. Based on current project costs of approximately \$1,400 per participant and an estimated 18,000 future participants,⁵ an additional \$25.2 million will be needed. The \$1,400 figure represents contractor costs only (packaging, transportation, and disposal) and does not include agency administrative expenses. Under this cost scenario, greater participation by the industry partners will be needed in the financing and sponsorship of projects. The following options, or some combination of the options, will help to expand the current project for the identification, collection, and safe disposal of hazardous waste pesticides.

- Status quo with increased state revenue appropriations. The state (WSDA) would continue as the project sponsor, assumes responsibility as generator of the hazardous waste, and continues the project as a free service to farmers.
- Status quo, except farmers finance a nominal share (10%-15%) of project contract costs. Fees could be assessed on a unit-cost basis or possibly as a percentage of total expenses.
- Status quo except farmers and other industry partners (producer and trade associations, pesticide manufacturers, dealers) finance a significant portion (70%-100%) of project contract costs. The state would provide technical assistance/guidance regarding waste designation, packaging, transportation, and disposal to individual growers or associations. Growers or their associations would make arrangements with hazardous waste transportation/disposal contractors for disposal. A centralized collection location or a "milk-run" pickup could be arranged. Growers, their associations, or other sponsors would finance the contract work.
- A grant program might be developed to assist industry associations or local governments to help them sponsor a portion of their own disposal projects. The program might be fashioned similar to what is established for household waste projects, where the grant finances administrative and technical assistance costs. Disposal costs would be paid by the participants. This approach would likely require legislative authorization. All pesticide waste generators need encouragement to assume responsibility for proper disposal of their wastes and this option could provide some incentive, particularly for commercial entities that are presently excluded from the current disposal program.

The most preferred approach is for growers and other partners to share more in the responsibility for proper pesticide waste management and disposal. The current project is an excellent service and the environmental benefits cannot be overemphasized.

⁵For cost estimation only, it is assumed that approximately one-half of all 37,000 farmers have hazardous waste pesticides to dispose of. (One-half of all farmers responding to the Yakima County survey reported having pesticide wastes on their farms.)

However, the project also helped identify an overwhelming volume of hazardous pesticide wastes needing disposal.⁶

It is simply not practical for state government to accept all responsibility for remaining hazardous waste pesticides. State government must, however, participate as a partner in pesticide waste solutions, with the earnest involvement of growers and their associations, pesticide manufacturers, and dealers.

Other factors

There are no technological constraints for expanding pesticide waste identification, collection, and disposal projects. There may be future institutional or political implications, however.

Institutional Constraints

- Although the project has been conducted in a professional manner and without any health/environmental incidents, some potential concerns have been identified about how an expanded statewide program might comply with hazardous waste regulations. A review of the regulations applicability to a statewide project will evaluate the need for any possible additional institutional requirements (e.g., hazardous waste or transportation permits or variances). If additional regulatory needs are identified, they should be easily incorporated into an expanded project.
- The project is conducted presently under the authority of Chapters 15.58 and 17.21 RCW. The laws do not presently provide for a user-fee or other cost-share approach. Legislation must be changed to authorize a change in project cost structure for the WSDA program.

Political Factors

- There is potential controversy about continuation of this state-funded project, exclusively for farmers. A key to the current project (particularly in getting the farmers participation) is that the state (WSDA) assumes responsibility as generator of the farmers' hazardous waste, on behalf of the participating farmers. Other hazardous waste generators do not enjoy that exclusion, and assume all costs and generator responsibilities/liabilities for themselves -- consistent with the hazardous waste regulations.
- Also, there could be opposition to an expanded statewide project because of the liability to Washington State. There was no major concern heard about state liability for the current project disposal of 42 tons of hazardous waste pesticides. With an expanded statewide project, however, concerns about state liability could increase.

⁶Even after 23 tons of pesticides were removed from Yakima County in 1988, a 1989 survey of Yakima County farmers estimates approximately 150 tons remain.

Roles and responsibilities

As with the current project, WSDA should take the lead for implementation. Continued project planning, contract administration (for collection, packaging, transportation, disposal), coordination with support groups and participants, and implementation will be WSDA's main role. Throughout planning, coordination and aside from the project itself, WSDA should develop and implement an education/outreach program addressing pesticide waste management problems and preferred waste reduction and management practices.

As with the existing project, the Department of Ecology should provide both regulatory (hazardous waste) and technical assistance. Monitoring of project implementation, and assistance in obtaining permits or variances will be provided. Ecology will complement WSDA's outreach efforts by continued education about the regulations and preferred management practices for hazardous waste pesticides.

The support of local governments (city or county) will be key for providing local planning and facility assistance, and with public information.

Industry groups will serve as a focal point, or conduit for project outreach to the individual participants. Key industry leaders (commodity associations, farm bureaus, and dealers associations) should participate in sponsoring/planning projects and securing/raising private revenues to help support project costs. Services-in-kind such as education/outreach about pesticide waste problems and solutions could be provided by this group also.

Schedule

The current WSDA project (described as the status quo option) should expand and continue until all counties have had the opportunity to participate. With an adequate commitment of resources, this could be completed in five to seven years.

Once farmers have been given the opportunity to dispose of their backlogs of waste pesticide, they should assume responsibility for disposal of any waste generated in the future. The state role should be to provide technical assistance and education.

Action Idea 4. Increase product stewardship by manufacturer and dealer.**Risk reduction/resource enhancement potential**

Agrichemical manufacturers and dealers are beginning to respond to growing public concern over chemicals in the environment by developing a sense of product stewardship. Such companies are concerned that products are developed, manufactured, distributed, used, and disposed of safely and properly to protect human and animal health as well as the environment. The concept is to respect the needs of company employees and the communities in which business is conducted, where it extends to customers in particular and the public as a whole. To be effective, product stewardship must be pro-active and part of every employee's job and every transaction for the company. This philosophy should be instilled into customers and an assessment made of their conduct.

Examples of "closing the product stewardship loop" are seen in a few chemical companies, notably Dow, Monsanto, and Van Waters & Rogers (through Chem-Care company). These companies have emphasized education on the proper handling of chemicals from the manufacturer to the user, and include proper disposal services. Van Waters & Rogers have targeted disposal services for generators producing "less than truckload" quantities of hazardous wastes, since these generators receive the least amount of attention from the larger treatment and disposal companies. Monsanto has developed a series of educational modules for dealers including videos and support materials addressing a range of environmental, safety and training concerns. They seek to assist dealers in maintaining compliance and developing environmental awareness.

Recovery and reuse of pesticide containers has historically been ignored as an element in product stewardship to be borne by product manufacturers and their distributors, although there are some examples of successful container recycling programs in the Northeast. EPA labels on most pesticide containers direct that product containers be punctured to avoid reuse which would pose a serious health threat to anyone contacting or consuming products subsequently stored in the container. This precludes container recovery and reuse in most cases, however. The diversity of products classed as pesticides can create a serious management problem if containers are reused for a product other than that originally contained. An example would be reuse of a picloram (herbicide) container for malathion (insecticide). The cross contamination could kill a crop of green beans, or produce a food product with unauthorized pesticide residue of picloram.

Collection and disposal of pesticide containers and wastes are perceived to be a part of product stewardship. Manufacturers and their dealer/distributors should participate more in costs, and/or physical disposal of pesticide containers and wastes. Illicit disposal poses serious risks to environmental recovery, and use of containers and/or product should take preference over disposal. Reuse, use, and disposal of pesticide containers and wastes are issues that should be addressed. An example of innovation in addressing the container disposal problem is seen in the Partek Corp. of Vancouver, WA, collection and melt-down of triple-rinsed plastic pesticide containers and their production of non-food package items at their recycling facility. Other companies have recycled metal pesticide containers and produced reinforcing bars and fenceposts.

While container disposal is a problem, it is of a magnitude several times less than the problem of disposal of pesticide wastes. Pesticide wastes may be concentrated or diluted with water or an oil carrier (diluent). Concentrate wastes are usually the result of containers having illegible labels or no labels. Collection and label use of concentrate products by others is the most environmentally beneficial method of disposal. Other disposal methods such as landfill, incineration, and storage create potential threats to the environment. Diluted pesticide wastes are the result of the partial last tank of mix (product + diluent). Disposal of diluted pesticides is a problem when the last tank is only partially used. More accurate anticipation of the quantity needed for the application would reduce generation of diluted wastes. Currently, most pesticide users either store the diluted product until the next use (often a 12-month period), or make a labeled application that was not needed, but was legal. Equipment is being developed to conduct rinsing and disposal of rinsate while in the field for aircraft and on-ground applications. This addresses the concern of rinsate disposal, and reduces potential point source contamination.

Recycling of pesticide containers, use of returnable and/or refillable containers, use of water soluble packaging for dry formulations, redistribution of distressed or unneeded products, chemical deactivation of active ingredient, concentration of wastes by filtration or other methods, education on safe and proper waste management, are all potential actions that could be taken by manufacturers and/or their distributors. Special packaging for homeowner needs should be addressed as well. Manufacturers have made some progress in these areas, as reusable minibulk containers (60 - 600 gallons) are produced according to standards and guidelines ensuring standardized packaging with physical integrity. Most tanks are leased to the dealer/retailer and users leave a deposit when utilizing the equipment. The containers are designed to address safety and ease of handling to simplify application and reduce worker exposure. Use of these minibulk containers will eliminate hundreds of thousands of pounds of one-way plastic containers from the environment annually.

For dry pesticide formulations, some innovative packaging options are currently available. Water soluble packaging of wettable powders addresses the need for container disposal and worker safety. The packets are made from polyvinyl acetate (PVA), but only certain formulations of PVA are compatible with certain formulations of chemicals. For granular products, refillable bags and rigid plastic containers with matched automatic valves are available for a few products.

Overall gains associated with product stewardship would range widely. Non-renewable resources used in production of products (pesticides) and containers would be protected. Threats to sensitive environmental elements would be minimized. Potential human exposure to contaminated containers of disposal sites would be mitigated. The extent to which manufacturers and dealers embrace the philosophy of product stewardship will have the greatest effect on degree of environmental "gain" resulting from this action idea.

Costs

Manufacturer manpower and evaluation costs are in the millions of dollars, and extra time is required to implement a product stewardship program correctly. However, in the long run it is justifiable. It may cost \$20 - 30 million and take 5 - 10 years to develop a new product. If that product is later lost due to carelessness or oversight, millions can be lost in sales in one year. Additionally, if health or environmental problems occur, the costs may further increase.

Other factors

Technical factors: Current technology will support all proposed actions.

Institutional constraints: Under the 1988 FIFRA amendments, EPA has significantly expanded authority to regulate storage, transportation, and disposal of pesticides, containers, rinsates and contaminated materials. EPA has developed a set of options encouraging or requiring the return, refill, and reuse of pesticide containers, the development of pesticide formulations that facilitate removal, and the use of storage delivery systems to reduce the number of disposed containers. By late 1991, EPA will establish regulations for the design of pesticide containers conducive to safe storage and disposal, with full compliance by December 1993. Further, by 1991, EPA will establish regulations and procedures that may call for triple rinsing and equivalent residue removal standards, procedures that can be implemented for residue removal, and reuse/disposal of rinse-water containing residues. EPA is no longer required to accept and dispose of suspended and cancelled pesticides at government expense. The agency may require registrants and distributors to recall and dispose of suspended and cancelled pesticides.

Political factors: Industry believes stewardship program management should be in the hands of the private sector, but the federal government is gearing up to develop criteria and regulatory programs to ensure product stewardship.

Roles and responsibilities

Implementation: Pesticide manufacturers should develop education/outreach programs on proper container/product management, including workshops and brochures/videos. Development of reusable containers should be a high priority, especially small volume reusable sizes. Dealers should be discouraged from offering discounts for buying large volumes of product (to reduce overpurchasing). Dealers should facilitate recycling/collection programs and serve as a clearinghouse for waste exchange (sharing of viable product). EPA should continue to work with manufacturers to develop appropriate criteria and program elements for product stewardship programs. Cooperative Extension and the Washington State Department of Agriculture should encourage and assist local dealers in education and recycling programs.

Accountability: Washington State Department of Agriculture

Schedule: 2 - 5 years for program development.

Action idea 5. Increase compliance monitoring and enforcement. Improve resources in existing program areas, and enhance food product and environmental monitoring.

As the regulation of pesticides in the U.S. has matured, it has become increasingly clear that environmental consequences will occur, even from responsible use and disposal of the resulting wastes in compliance with current legal requirements. As the regulatory scheme for pesticides is refined in this state and others, the potential for environmental harm decreases. Monitoring is necessary to determine how successful these efforts have been - which attempts have been fruitful, and (more importantly) which have not. It is the factual basis for determining responsible environmental policy. However, a strong compliance program with routine enforcement actions is necessary to carry out these policies. Other than the occasional detection of a pesticide misuse incident, food residue monitoring will have little direct impact on environmental quality (although it may have important effects on public health). However, food residue monitoring and pesticide law enforcement are both necessary to ensure that pesticide use is taken seriously. In essence, the most important products of these programs will never be known - the contaminations that did not occur.

This action idea can be considered in three portions: routine, long-term environmental monitoring for pesticides in many media, programs existing to enforce the pesticide and waste disposal laws, and food safety programs. Three state agencies have major responsibilities in these areas: Ecology, Health and Agriculture.

Food Product Monitoring for Pesticides

Risk reduction/resource enhancement potential

Responsibility for this function rests with the Food Safety division of the Washington State Department of Agriculture. Monitoring and enforcement of pesticide residue limits is considered a major priority of this program; however, this division also has substantial responsibilities in other public health areas, such as monitoring for and control of pathogenic organisms in food. In pursuit of the goals of the entire program, the sanitarians and other field personnel inspect 1329 dairies, 55 milk product plants, 962 food processors, 321 warehouses, 296 grain elevators, 75 wineries, and 285 custom meat facilities within the state and obtain approximately 13,000 samples for routine monitoring of food supply as well as evidence for legal proceedings. The current workload exceeds available resources, and an expanding population and public concern dictate that the workload will increase sharply over the next decade.

In comparison with other states relative to population and to facilities inspected, Washington appears to rank in the lower 25% of the nation. This is particularly dismaying when it is considered in light of the unique needs of this state - the unusual number of food warehouses and retail establishments whose primary business is food imported from areas with a lesser level of regulation, the major seafood industry which includes such unusual items as geoduck and sea cucumbers, the honey extraction and bottled water industries, and the major agricultural production and food processing industries of the state.

Costs, roles, and responsibilities

The Department of Agriculture program is in pressing need of additional funding. Various licenses and associated fees are currently set by statute, and increasing these fees would allow for some cost recovery. However, the public health benefits of the program make it a legitimate candidate for additional general fund money. The Department of Agriculture will submit a greatly increased budget request for the 1991 -1992 biennium, which will address the entire program, including sanitation enforcement and pathogenic organism monitoring. We suggest the following enhancement for the pesticide portion alone: 7 additional sanitarians, at an annual cost (including salaries, benefits, travel, and equipment) of \$350,000.

In addition, the food safety and pesticide programs of the Department of Agriculture share a single laboratory, which lacks equipment to detect some of the more recently introduced pesticides at levels necessary to an enforcement program. This laboratory is currently handling a seasonal workload at its maximum capacity. It would be unable to handle the additional workload generated by increased numbers of pesticide investigators or sanitarians. Other laboratories within the state system do not currently have the specialized expertise to assume a portion of this workload efficiently. The following additional resources are suggested: purchase of a mass spectrometer and other needed equipment at a one time cost of \$500,000 and a maintenance cost of \$50,000 annually and 3 additional chemists at an annual cost of \$150,000.

Increased Enforcement of the Pesticide Laws

Risk reduction/resource enhancement potential

Control and regulation of most aspects of the pesticide laws is performed by the pesticide management division of the department of agriculture. Increases in various license and registration fees and some increases in general fund support which occurred in the 1989 - 1990 biennium have recently increased the program by approximately 50%. Increased visibility to the general public, which had been largely unaware of its function, increased public concern over pesticide issues, heightened awareness of the program's responsibility in farm worker safety and the hiring of Spanish speaking staff, and newly available information on groundwater and potential for some pesticides to enter it, have all served to obligate the increased staff to capacity already.

The Department of Ecology has authority over the regulation of hazardous wastes, including those wastes which result from pesticide contamination (i.e., some of each of the following: leftover formulation or product, containers, residual field-strength tank mixtures, spills, and wash waters). In a list of 552 hazardous waste sites statewide (Department of Ecology's Hazardous Waste Investigations and Cleanup data) about 18% of the sites are believed to have been contaminated by pesticides. Pesticide contamination has been confirmed at 45 sites statewide. In addition, there is a large group of generators or potential generators (particularly farmers) of pesticide related hazardous waste. Enforcement efforts for this group have been confined to complaints and blatant violations. The expense of additional efforts for preventing contamination, directed at this group,

would be justified in savings from the costly processes of cleanup of contaminated sites and related enforcement.

Costs, roles, and responsibilities

The Department of Agriculture has statutory responsibility over the regulation of pesticides. It appears that the greatest utility would be obtained with increased laboratory capacity, which is discussed below in the context of the food safety program, increased enforcement staff, specifically two investigators and one support staff person for eastern Washington, and a bilingual, Spanish-speaking person to work in several pesticide program areas in western Washington. Total annual cost for these would be approximately \$220,000.

The Department of Ecology has primary responsibility for the control of hazardous wastes associated with pesticides. To implement a more comprehensive approach to the program, Ecology should augment existing education and outreach activities (particularly by development of better guidance and design standards for wastewater management facilities), invite affected industries to participate in designing and implementing voluntary compliance measures, and implement a phased program of inspections and enforcement. Ecology estimates that \$295,000 would be needed for the first year of the program.

Environmental Monitoring for Pesticides

Risk reduction/resource enhancement potential

There are several environmental monitoring efforts in this state that measure concentrations of pesticide residues in fish and shellfish tissue, surface and groundwater, and sediments. Each of these efforts meets important needs. However, these programs are not coordinated to yield coherent information on state-wide trends in pesticide concentrations in the environment. There is a pressing need to evaluate the structure and function of existing pesticide monitoring programs. Standard analytical and reporting protocols are needed to assure that data collected by different programs are comparable.

An example of a program which might be modified and enhanced is the 1989 agricultural chemical pilot study by the Department of Ecology that evaluated pesticide concentrations in groundwater in three counties. There are currently no plans to continue monitoring groundwater in areas identified as contaminated in this study, although this would serve as an evaluation of efforts to correct the problems identified. For instance, some years prior to this study the soil fumigant EDB (ethylene dibromide) was banned; yet, residues were found in Whatcom County groundwater. How long will residues remain? Scheduled periodic monitoring of selected wells would permit estimates of the rate at which this problem abates.

Another example is fish/shellfish monitoring. This is most extensive in Puget Sound, but even here there are no plans for routine, ongoing monitoring of aquatic organisms in a way which would permit good estimates of trends in pesticide concentrations. Furthermore, existing programs in the Departments of Health and Ecology generally analyze only for largely obsolete chlorinated hydrocarbon pesticides or (in other programs) highly specialized

contaminants such as TBT (tri-butyl tin, an antifouling paint constituent). Throughout the rest of the state, fish and shellfish monitoring is limited, site specific and short-term. Evaluating general trends in environmental conditions using these scarce and fragmented data is unsatisfactory.

Costs, roles, and responsibilities

This responsibility normally resides with the Departments of Ecology and Health. Costs could be separated into two components: a one time expense to evaluate existing monitoring and to plan an adequate system, and a continuing program to fill the most critical gaps. Cost figures for these activities are estimated as follows:

YEAR 1:

1 FTE for surface water, sediment, fish and shellfish	
1 FTE for ground water	
Total cost	\$120,000 for salaries, benefits, supplies

SUBSEQUENT YEARS:

3 FTE's for coordination and implementation	
Personnel	\$180,000
Equipment	\$30,000
Chemical analyses	\$240,000
Total	\$450,000

Action idea 6. Encourage federal efforts in sustainable agriculture programs by developing and disseminating information suitable for local crop production.

This action idea is related to idea #1 in this package, which addresses alternative technology to pesticide use. However, it differs from idea #1 in several significant ways. Most importantly, the concepts of sustainable agriculture are directed specifically at crop production. Although this approach may have some spin-offs in the form of new methods that can be adapted for urban or roadside sites, for purposes of this discussion we have considered exclusively agricultural concerns. Conversely, sustainable agriculture systems will undoubtedly utilize some of the techniques discussed in idea #1, if they are suitable to the specific locality and crop being produced. However, sustainable agriculture is a philosophical orientation and a system of production, not a list of techniques to replace pesticides. For this reason, this document treats it separately.

Definitions of sustainable agriculture abound to the point that the term is in danger of losing all meaning. Rather than vote for one definition over others, we have chosen to list some underlying approaches for its strategies:

- diversity of crops and livestock on individual farms for increased biological and financial stability
- selection of appropriate varieties
- preference for farm-generated or locally produced resources
- minimizing use of certain off-farm inputs, such as irrigation water, particularly that drawn from non-replenished sources, and fossil fuels
- minimizing loss of nutrients from farms
- increasing the soil's ability to store applied nutrients
- enhancing conditions favorable to natural control of pests
- year round protective cover on the soil

Some of the techniques include multiple-species cropping systems, such as crop rotations and interplanting, cover crops, green manures, mechanical cultivation to control weeds, tillage which leaves substantial crop residues on the surface, disease and pest resistant breeds and varieties, livestock production systems emphasizing disease prevention, pest management strategies using natural enemies and natural mortality factors, composting animal manures, minimizing use of synthetic fertilizers to a level that the crop can use efficiently and only to meet nutrient deficits that cannot be met by other means (such as planting legumes), and minimizing use of pesticides. Other techniques which may play a more controversial part in sustainable agriculture - depending on the ideological orientation of the definition used - include use of the products of biotechnology (as modified crops or livestock or as modified inputs) and irradiation (as a substitute for chemical agents which increase storability). For purposes of this paper, we envision sustainable agriculture as a system which utilizes a combination of many methods to achieve acceptable levels of agricultural production with the minimum environmental insult.

Whatever the definition, this is not organic agriculture. The sustainable agriculture movement owes a great deal to the techniques and ethics of the older organic movement. However, one of the basic organic tenets (and the basis for marketing of organic products) is the production of food virtually free from pesticide residue. (Currently, many organic

growers utilize a limited number of naturally occurring pesticides. These products are very short lived and, if used appropriately, are extremely unlikely to result in detectable residues in the end product.) However, in many situations, the use of a pesticide may be of less environmental concern than the alternative techniques available. For instance, use of a fungicide for disease control or a herbicide for weed control may be preferable to field burning, which may result in a decline in soil organic matter, air contamination, or danger of wildfires. In another example, the use of a residual herbicide may be preferable to certain mechanical operations, when the cost of soil compaction, possible increase in soil erosion, and air pollution from use of fossil fuels is taken into account. In a third example, the current use of pesticides to ensure the uninfected and uninfested condition of fruit tree nursery stock, certified and foundation seed fields, or vegetable seed crops is preferable to attempting to control stock- or seed-transmitted pests after it is released for crop production. Planting uncontaminated, uninfested, and uninfected seed or stock leads to enormous savings in pest control in the subsequent crop. The environmental cost of treating such crops may be well worth the eventual environmental savings. (These examples are, of course, not valid for all situations, as this process is highly site and crop specific.) We envision sustainable agriculture as a matrix for evaluating both hidden and obvious costs and tradeoffs to alternative actions, and as a means of finding the least costly. It appears that sustainable agricultural techniques will reduce the amount of pesticides used in agriculture by an unknown factor. It will not eliminate them.

Initial endorsement of sustainable agriculture seems to be a federal responsibility. As long as federal crop subsidies are calculated on a basis of maximum yield per acre per unit of time, many growers of subsidized commodities are not in a financial position to go to three or four year crop rotations (that is, reducing the number of years when they grow the higher priced crop) or to cease using large amounts of purchased inputs like fertilizer. The anticipated federal 1990 Farm Bill is likely to readjust the way subsidies are determined. The nature of the changes will have a profound influence on the direction and rate of adoption of sustainable agriculture practices, and these changes are speculative at this time.

In addition, the traditional source for research funding of projects of this magnitude is federal. Funding for some projects has been furnished for some time. For instance, the tri-state, Pacific Northwest land grant university based STEEP project (Solutions to Environmental and Economic Problems) has been funded by USDA for 15 highly productive years. However, sustainable agricultural techniques are highly site-specific, and much more research needs to be done on a local basis. We view the role of Washington state government as enhancing and expanding the federally funded research effort and as serving as a conduit for information to the growers. The appropriate agency appears to be the WSU Cooperative Research and Extension Service, as the information network already exists to serve the agricultural population.

Gains and Costs of Implementing Idea #6

Environmental Gains and Costs

Relative to pesticides, it appears that implementation of the techniques of sustainable agriculture would reduce agricultural pesticide use by an unknown factor. Even if sustainable agriculture becomes the norm, the shift in techniques must be gradual, and we are not likely to ever know the exact extent of pesticide reduction, since indirect factors (such as regulatory and economic pressures on the chemical industry) will cause concurrent reductions in pesticide availability. In addition, reliable baseline figures are unavailable at this time, although a project to generate this data is currently under way at the Washington State Department of Agriculture.

It should be noted that implementation of sustainable agriculture will not substantially reduce the amount of disinfectant and public health and cleanliness related (such as mattress fumigation or lice control) pesticide use. Although use of such products has potential for environmental harm, they appear to be secure in public opinion. Also, a switch to sustainable agriculture would not greatly affect the amount of urban or roadside pesticide use or the amount of wood preservatives applied. According to the Puget Sound Water Quality Authority pesticide issue paper, the amounts of these other uses exceed agricultural uses, which the Authority estimates to be only 10% of pesticide use in the Puget Sound basin.

Sustainable agriculture would have environmental benefits beyond those associated with pesticides. However, these are beyond the scope of this paper.

Economic Gains and Costs

Usable data to evaluate the economics of sustainable agriculture is virtually nonexistent at this time. Sustainable agriculture as a government endorsed concept (that is, as a subject for which public research funding is available) is new. Many projects are in process, particularly at land grant universities, which will result in economic information.

(a) to the grower

The financial results to the grower of converting to sustainable operations has been studied to some extent. Most of the information currently available is arranged in individual case studies, such as the eleven case studies in the National Research Council Board on Agriculture sponsored Alternative Agriculture (1989). Such cases may or may not be representative of the potential of the areas or crops in their region. They support a conclusion that conversion to many sustainable practices is cost effective to the grower. (This is hardly surprising, as most "conventional" growers already utilize some of these methods, particularly crop rotation and resistant varieties.) The inference may be drawn from this, that other such methods could be profitably used, if they were developed and available. With the exception of production units dependent on federal subsidies as they are now calculated, it would seem that individual farms could, over time, convert to sustainable operations without financial disaster.

(b) to domestic markets

Case studies evaluating financial results for the grower utilize current market conditions. Current market conditions are based on practices designed for maximum yield per acre and unit of time. If sustainable practices were to become the norm, overall U.S. production of some crops (notably federally subsidized grains) would decline. If the use of chemical agents to modify post harvest physiology and to control post harvest pests (such as rodents, weevils, storage rots) declined, the storability of many commodities, particularly fresh fruits and grains, could be adversely affected. Ultimately, this would raise production costs of food. Domestically, this may result in somewhat higher food prices at the consumer level. Decreased storability could result in shorter fresh market seasons for many fruits and vegetables and greatly increased imports of fresh produce from the southern hemisphere. Decreased storability may also result in loss of some east coast fresh produce markets, which are dependent on storage of the product. It would also result in a need for more on-site and local processing facilities. Construction and operation of these seasonal facilities is likely to be expensive, although they would provide much needed capital to rural areas.

(c) to international markets

In general, any decrease in U.S. grain production tends to cause the world grain prices to rise, although production in other areas of the world would doubtless adjust and, to some extent, compensate. Much of the wheat crop for Washington state is soft white wheat intended for export to the prosperous areas of Asia. Decreased storability would result in losses in this premium price market. This state exports substantial amounts of fruit and other perishable commodities at premium prices. These markets could be jeopardized by decreased storage life. In addition, movement toward sustainable agriculture has brought considerable pressure to lower quality and grading standards. This is directly counter to international market demands to tighten standards for higher quality. This state exports substantial amounts of premium grade, luxury foodstuffs and has actively courted foreign markets. Lowering quality standards would jeopardize these trade relationships. On the other hand, reduced residues from less post-harvest pesticide use may enhance the consumer acceptance and international marketability of products.

Roles and Responsibilities

The implementation of sustainable agriculture would require adjustment of the thinking of many groups of people. Growers would have to learn not only new technology but a new way of evaluating success on other than a yield-per-acre basis. An adjustment in agricultural support industries - away from sale of maximum amounts of product and towards sales of services (for instance, field scouting) would need to occur. New markets to replace those that have been lost must be found. Research and development of new methods and new ways to evaluate tradeoffs must be done. Then this information must be disseminated in the agricultural community.

This is not a change that can be mandated by regulatory action. If it is implemented, it must be done gradually, so that minimum disruption to food supply, food prices, and

markets occurs. If the information is available and if the early entrants into farming with sustainable practices are successful (and if the federal subsidy situation changes), then the economics of farming will furnish motivation to change practices.

The role of the state is one of research and education. In agriculture, this is the traditional task of Washington State University and its Cooperative Extension Service. This would require expansion of research funding to replace support formerly supplied by industrial interests and expansion of existing networks for information dissemination. Washington State University will present a budget request, which will deal with establishing a Center for Sustainable Agriculture in its College of Agriculture and Home Economics, to the legislature in the 1991 session. Unfortunately, this information is not now available.

Action idea 8. Educate householders on proper and appropriate use of pesticides and fertilizers.Risk reduction/resource enhancement

Experience suggests this action idea has great merit. However, the extent of risk reduction that could be expected from implementing it is not quantifiable at this time. To understand the extent of the situation, efforts are under way to generate accurate pesticide use data in many categories, including household use; however, at this time the only figures available are gross estimates based on limited and often speculative information. The Environmental Protection Agency has estimated that nearly 1.5 billion pounds of pesticide active ingredients (including disinfectants and wood preservatives) were used nationally for urban/suburban purposes in 1984. Of this, an estimated 230 million pounds of insecticide, herbicide, fungicide and rodenticide active ingredients were used nationally. The U.S. General Accounting Office estimates 70% of the usage of these four types of pesticides can be attributed to industrial, commercial, and governmental purposes, leaving 30% for home and yard sites. In a 1990 issue paper, the Puget Sound Water Quality Authority concluded that urban usage is responsible for the highest usage of pesticide products in the Puget Sound area. The Puget Sound area is not necessarily typical of the state as a whole; however, it appears that urban pesticide use is a significant component of the total use in the state, and that much of this usage is in the hands of householders.

Householder access to pesticide (and, to a lesser extent, fertilizer) products is controlled at the points of production and distribution - the more toxic pesticides are not allowed to be registered for sale to the general public, packaging them in consumer-sized containers is forbidden, their distribution is limited to licensed, commercial channels, and the ability to purchase them may be confined to licensed purchasers. In general, pesticide products registered for distribution on the general, consumer market are comparatively dilute (often to the point of ready-to-use), packaged in smaller containers, and bear label directions expressed in terms familiar to a household user. (For instance, consumer labels may give dilution instructions in units such as teaspoons per gallon of finished solution, rather than pounds of active per hundred gallons of diluent.) However, once registration has been granted and a label text approved for a consumer pesticide product, access to it is seldom restricted. The consumer product may be sold virtually anywhere, including grocery stores (the main distribution point of disinfectants), discount houses, and pet stores. The purchaser is often ignorant of many of the properties of the product, use information is often not available from the point of sale, and the only information to which the user normally has easy access is the registered label. Because labels are limited in size and written for a national audience, they do not contain many items of information that would be helpful for environmentally responsible use. In addition, they are seldom read by the user.

The technical definition of the term pesticide has very little meaning or relevance to the general, non-agricultural public. Pesticides, including herbicides and disinfectants, are a portion of the toxics found in almost all households. In many situations, there is no apparent reason to differentiate between pesticides and other household toxics. For this reason, the majority of the strategies discussed in this document address or could be adapted for household toxics in general. A few of the strategies are more suitable for

education of the gardening population. These are, of course, more likely to address pesticides and fertilizers, but they are unlikely to result in modification of householder handling of disinfectants or toxics found within the home. We conclude that a combination of several approaches managed on a local basis would be most productive for educating this population.

We conclude there are two concerns which must be addressed in educating household users:

- 1) information on alternatives and environmental effects must be made easily available
- 2) an ethic of environmental responsibility must be instilled, which will motivate people to utilize this information.

We have deferred the question of instilling an environmental ethic to the reports on awareness and education also found in this document. This is an issue central to all environmental protection.

Specific strategies include:

- 1) Establishment of a clearinghouse for educational materials targeted toward the householder audience. This is not a new idea. Such a clearinghouse already exists among agencies which deal with water quality in the King County area (Metro, Puget Sound Water Quality Authority, Seattle-King County Health Department, and others). This could serve as a model for regional clearing houses which maintain statewide communications. We do not envision the clearinghouse as a means to generate educational materials so much as a means to evaluate and disseminate them and to avoid duplication of efforts among agencies at all levels of government and non-profit service. The education subcommittee has put forward a similar, and more far-reaching suggestion for a clearinghouse of all environmental education materials to be located in the Office of Environmental Education within the Office of the Superintendent of Public Education.
- 2) Expansion of the existing programs within the Washington State University Cooperative Extension Service, such as the Master Gardener program. Technical expertise and significant educational materials already exist within the Extension Service. In addition, the Extension Service has built credibility and information networks in many urban areas of the state. However, these programs are underfunded to the point that potential clients are mostly unaware of the information which is already available and the services this organization offers. It is notable that, in addition to the yard and ornamental expertise represented by the agents and research network in areas such as horticulture and agronomy, the home economics programs are potential points of contact on disinfectants and other household toxics, and the 4-H programs are opportunities for youth environmental education.
- 3) Establishment or modification of already-existing model programs for control of household toxics. An example applicable to the western portion of the state is the "Sound Gardening" program funded by the PIE (Public Involvement and Education) fund of the Puget Sound Water Quality Authority. These types of programs have been produced by agency and non-profit organization activity funded (at least partially) by competitive grants.

4) Delivery of easily comprehended messages and information at the point of sale. Since a significant amount of consumer pesticide and fertilizer sales occur in stores that do not specialize in gardening and/or do not have staff knowledgeable about environmental consequences (i.e chain discount stores and groceries), some source outside the outlet would probably be needed to select and maintain the information. This may be an opportunity for business-volunteer organization partnerships, with technical aid from an organization such as the Cooperative Extension Service.

Costs

The clearinghouse strategy is discussed earlier in this document in the action agenda associated with education. Costs for a clearinghouse associated with urban pesticide use alone would be smaller, but the overall environmental benefit would be much less. Including pesticide subject matter in the overall clearinghouse should result in a negligible difference in costs.

Expansion of existing programs within the Cooperative Extension Service would require addition of a full-time Cooperative Extension employee to carry out coordination and promotion activities statewide. It would also require additional funding for the Master Gardener and home economics programs at a level of \$200,000 per year. This funding is necessary to make these services uniformly available and accessible throughout the state.

Competitive grants modeled on the Puget Sound Water Quality Authority PIE-Fund could be funded at a variety of levels, depending on the anticipated scope of the projects.

Development and delivery of appropriate and accurate information at the point of retail sale appears to be most appropriate as a business-volunteer organization partnership. This would involve costs to the participants in time, transportation expenses, display and storage space, and reduced sales potential for some products. Direct governmental expenses would include those for development and selection of appropriate materials (a comparatively minor item, since appropriate materials are often already available from the Cooperative Extension Service), printing or other production costs to make adequate amounts of these materials available, and part time services of a Cooperative Extension Service employee to coordinate and help organize the program.

Other Factors

Institutional constraints are few. All of the functions proposed for the Cooperative Extension Service are well within its established mission and the willingness (given funding to do the job) of its administration and personnel. The additional function proposed for the Office of the Superintendent of Public Instruction is an expansion of the traditional role of K - 12 education, but (once again, given adequate funding) it is compatible with that agency's educational mission and expertise, particularly in light of its expanding role in environmental education.

Roles and Responsibilities

Implementation and accountability were discussed above. As with all educational efforts, the schedule for implementation and the intensity of the programs are greatly dependent on the level of funding available.

Environment
2010
Action
Agenda:

Action
Strategies
Background
Analyses

Package
Eleven:

**Global
Warming**



State of Washington
July, 1996

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INTRODUCTION

Global climate change, for the purposes of this report, are that set of concerns related to greenhouse effect, global warming, ozone depletion, and sea level rise. Ozone depletion is not unrelated to global climate change. Chlorofluorocarbons (CFCs), the primary cause on ozone depletion in the upper atmosphere, act as greenhouse gases in the lower atmosphere.

This Washington Environment 2010 Global Climate Change Action Strategies Analyses report addresses integration issues such as consultation and coordination, adaptive response, and sea level rise. Chlorofluorocarbons (CFCs), substances which are of concern with respect to both global greenhouse effect and ozone depletion, are addressed in detail in the Air Resources report. Carbon dioxide emissions, the principal cause of global greenhouse effect, has its main sources in Washington State in motor vehicle emissions, and is addressed in detail in the Conservation report and the Air Resources report. This final draft of this report summarizes pertinent sections of those reports and review how they fit into the bigger picture of global climate change response.

During the past two years, heightened attention to global climate change issues has arisen in Washington State.

The Shorelands and Coastal Zone Management Program, Washington Department of Ecology, initiated a sea level rise response project in 1988, including a Sea Level Rise Task Force.

The Washington State Energy Office began incorporating global greenhouse effect and carbon dioxide emissions considerations in energy conservation programs.

The 1989 Washington legislature adopted SJM 8011, a memorial to Congress and the President, stating the legislature's concern over global warming.

The Northwest Sea Level Rise Conference, sponsored by Ecology's Shorelands Program, was attended over 170 people in December 1989.

The US Environmental Protection Agency, in cooperation with a number of other federal, Washington, and Oregon agencies, is in the process of initiating a 2-year Pacific Northwest Global Climate Change Case Study to address scientific, adaptive response, and policy questions.

A global warming act (SHB 2957) was introduced to the 1990 Legislature. The Act would address global warming by requiring the State Energy Office to prepare a plan for reduction of greenhouse gases in energy production; through energy efficiency and conservation; and through minimizing vegetation removal during development and road construction.

Global warming and ozone depletion was ranked as a mid-range threat by the Technical Advisory Committee and Public Advisory Committee -- a compromise ranking for a high risk threat, but one with high uncertainty. The public, however, has tended to rank global climate change as a high risk threat.

Few specific action ideas were submitted, however. Those action ideas are listed and reviewed in Appendix A.

PROBLEM STATEMENT

We know that the chemistry of the atmosphere is changing rapidly. Scientific theory predicts that these changes will result in global warming due to the greenhouse effect of certain gases, particularly carbon dioxide, methane, nitrous oxide, and chlorofluorocarbons, as well as other species. This warming will include other climate changes which are expected to have profound effects on agriculture, forestry, ecosystems, sea level, water resources, energy use, transportation, and many other aspects of human life.

Average annual temperature in the Pacific Northwest is projected to increase by 3° to 5°C with a doubling of carbon dioxide. Greater temperature increases are expected for the Columbia basin than for western Washington. Precipitation is expected to increase in all seasons of the year; more precipitation will occur as rainfall and less as snowfall.

In general, peak streamflows are expected to occur earlier in the season, likely shifting from a spring snow melt peak runoff to a winter precipitation peak runoff. Secondary effects include a potential for greater frequency of winter river flooding; declines in salmon natural production, and thus greater reliance on hatchery production; and upsets in the timing of water deliveries in the Columbia Basin, and thus upsets in the negotiated allocation of water to hydropower, irrigation, fisheries, and other user groups.

As the climate warms, "climate zones" will shift to more northerly latitudes and higher elevations. In simple terms, the range of most plants and many animals will shift north and up. In fact though, the issue is more complex than this; plants and animals do not exist as isolated species, but as integral parts of communities or ecosystems. Our understanding of ecosystems is imperfect, and unpleasant surprises can be expected.

A sea level rise by 2100 of 0.6 to 3.5 m (1.8 feet to 11.3 feet) was estimated in 1983 to occur due to global warming of the oceans (and thus expansion) as well as the melting of snow and ice. Current estimates are in the range 0.5 to 2.0 m. Subsidence in Puget Sound will aggravate global sea level rise; uplift along the ocean coast will temporarily moderate sea level rise. Secondary effects include a greater frequency and intensity of coastal flooding; losses of coastal wetlands, intertidal, and shallow water habitats; aggravation of existing coastal erosion and landsliding; added sea water intrusion of coastal aquifers; and higher water tables in coastal areas.

Global climate change issues are synonymous with high uncertainty. This need not be a deterrent to setting policy or taking action. Many of the remedial measures make good sense for other reasons, e.g. energy conservation not only reduces carbon dioxide output, but also improves our nation's international economic competitiveness.

In fact, there is a model for planning and engineering design in the face of high uncertainty, one that has worked well in practice, and with which we have become quite comfortable. This model is the hydraulic design storm -- the 50 year event, the 100 year event, etc. Through time, a generally accepted practice has evolved whereby hydraulic structures such as culverts and bridges are designed to withstand or pass storm discharges of varying volumes depending on what is at risk and how much risk we are willing to accept. For low risk (high-risk-tolerance) situations a 25 or 50 storm event is the design standard; for progressively higher risk (lower-risk-tolerance) situations the 100 year or 500 year storm event is the design standard. We accept this with little question, even in the face of weather records often spanning less than 100 years.

It is likely that we will come to accept a similar approach to planning and designing for sea level rise acceleration. For example, in high-risk-tolerance situations, a sea level rise scenario of 0.5 m by 2100 may become the standard. For progressively lower-risk-tolerance situations, progressively greater sea level rise scenarios would be applied. For example, a coastal highway can be relatively easily raised if the sea level rise design projections are found to have been set too low. Conversely, repeated remediation of a coastal hazardous waste site may be judged too risky from a financial and public health stand point, thus warranting a higher design standard.

WASHINGTON ENVIRONMENT 2010 VISION AND GLOBAL CLIMATE CHANGE

The Washington Environment 2010 Vision of a Sustainable Future statement addresses global climate change only indirectly. Following is an analysis of how the proposed Global Climate Change Action Plan addresses the Environment 2010 Vision.

Awareness

The Public Education and Involvement component of the proposed action plan could enhance citizens' awareness of the environmental and personal choice tradeoffs necessary for global climate change response.

Knowledge

Three of the four elements of the proposed action plan, Coordination and Consultation, Public Education and Involvement, and Adaptive Response, are designed to enhance the information available to people and institutions in Washington State. The Coordination and Consultation element is aimed at initiating communications between state and federal agency staff. The Public Education and Involvement element is aimed at translating and transferring technical information to the lay public. The Adaptive Response element is aimed at development of the basic information and techniques needed for action at the state and regional level.

Responsibility

Three of the four elements of the proposed action plan, Coordination and Consultation, Public Education and Involvement, and Adaptive Response, are designed to provide knowledge to enhance the ability of people and institutions in Washington State to intelligently make responsible choices. The remaining element, Revegetation, is designed to provide citizens with one means of taking individual responsibility.

Cooperation

The Coordination and Consultation action element is designed to initiate cooperation between state agencies in addressing global climate change. The Public Education and Involvement element could provide business and industry with the information necessary to initiate appropriate voluntary programs.

Creative Leadership

The global climate change issues will provide the State's leaders with one of their most challenging demands for creativity.

Diversity

The Public Education and Involvement plan element could provide the vehicle for government to act as a facilitator of wise resource use by the public for the desired balanced, diversified character of our natural communities.

Stewardship

Carbon dioxide, the leading cause of greenhouse effect, is presently the only major, unregulated pollutant. The principal sources of CO₂ emissions in Washington State are motor vehicles and energy systems. The 2010 Vision implies CO₂ emission reductions through energy conservation and a reduction in motor vehicle use. Energy conservation is analyzed in the Conservation report and those results are summarized in this report. Transportation systems, an aspect of growth management, has been deferred to the Growth Strategies Commission, and is not addressed by

Environment 2010 or by this report. Carbon dioxide uptake is not addressed by the 2010 Vision statement, but was an action idea suggested at 2010 public meetings, and is addressed by this report.

Chlorofluorocarbons (CFCs), a greenhouse gas in the lower atmosphere and an ozone depleting gas in the upper atmosphere, are analyzed in the Air Resource report and those results are summarized in this report.

Following is a draft global climate change vision statement:

Washington State has implemented a comprehensive global climate change response program addressing needed research on issues particular to the Northwest; preventive measures and adaptive responses appropriate to state and local government and individuals; coordination and consultation between Washington State agencies, adjacent states, and federal agencies; public education and involvement; and policy development. The program includes greenhouse gas emissions; ozone depleting gas emissions; ecological effects on natural and cultured biological systems; hydrologic effects including flooding; sea level rise; and human health.

PROPOSED ACTION PLAN

This proposed action plan was developed originally by expanding upon the 2010 action idea (Appendix A) within the context of existing and contemplated programs such as the Shorelands and Coastal Zone Management Program's sea level rise response project and the US Environmental Protection Agency's Pacific Northwest case study. Following the 2010 Public Advisory Committee retreat in March, 1990, modifications were made, and additional action ideas were added. This action plan focuses on integration and adaptive response; specific mitigative measures addressed in the Air Resource and Conservation reports are summarized in this report. Finally, this action plan is a simple skeleton of what is necessary to initiate a comprehensive global climate change response program for Washington State. It is a good first step; it is necessary to remember that much more will be necessary in the future.

1. Coordination and Consultation

Communication between all levels of government about global climate change issue is a necessary first step to initiating comprehensive action. The Public Advisory Committee recommended that this action idea include inter- and intragency coordination and consultation across the international - federal - state - local levels of government. Presently, there is little organized communication, only informal, infrequent conversations between some individuals working on various aspects of global climate change.

The US Environmental Protection Agency, in cooperation with a number of other federal, Washington, and Oregon agencies, is initiating a 2-year Pacific Northwest Global Climate Change Case Study to address scientific, adaptive response, and policy questions. The Shorelands and Coastal Zone Management Program, Department of Ecology initiated an interagency Sea Level Rise Task Force in 1988 as part of its Sea Level Rise Response Project; in 1990 the task force will be expanded to include other levels of government plus citizen and business representatives as a part of Shorelands' Sea Level Rise Policy Alternatives Study.

- 1.1 Washington State resource and energy agencies participate in the regional Pacific Northwest Global Climate Change Case Study Advisory Committee as appropriate.

To date, the Washington State Energy Office and the Shorelands Program, Washington Department of Ecology have participated.

- 1.2 Expand the scope of the Sea Level Rise Task Force to form a Washington State global climate change coordination committee. This body shall strive to achieve international, federal, and local government links as well as interagency communication.

This concept is consistent with a measure introduced in the 1989 Legislature by Senator Dick Nelson.

2. Public Education and Involvement

Environmental education issues specific to global climate change will be addressed; eventually the 2010 process will integrate these specific ideas with the generic issues being addressed by the Environmental Education Subcommittee.

2.1 Cooperative development by Washington Superintendent of Public Instruction, Washington Sea Grant, Washington Department of Ecology, Washington State Energy Office, and others, of curriculum materials on global climate change, energy conservation, ozone depletion, etc., for use in public schools. Understanding the nature of the processes of greenhouse effect, global climate change, and ozone depletion shall be stressed.

Work in this area has already been initiated by SPI and Sea Grant, and an informal agreement to cooperate has been extended by the Shorelands Program, Washington Department of Ecology.

2.2 Cooperate in the development of the international global climate change symposium *Local Responses to the Threat of Global Warming* which emphasizes "what citizens can do" as both individuals and as private organizations.

Work in this area has already been initiated by Washington Environmental Council with assistance from the Washington State Energy Office. The key to success is acquisition of major funding grants from private foundations, as well as technical assistance from WSEO and Ecology.

3. Reforestation

Tree planting is possibly the universal first thought on global climate change response, and has been recommended by many participants at the 2010 Symposium.

3.1 Washington State resource agencies cooperate with private, local citizen groups in tree planting programs.

Programs such as this have been carried out on a volunteer, cooperative basis between local action groups and the US Forest Service.

4. Adaptive Response

Adaptive response and contingency planning is generally regarded as a necessary. If global climate change scenarios are correct, we are already committed to future greenhouse effect and ozone depletion impacts that cannot be avoided through preventive measures. Research and planning is needed to adapt generic nationwide response strategies to the Pacific Northwest. (Preventive measures are addressed in the Conservation and Air Resource analysis reports.)

Adaptive response studies will be carried out independently and/or under the auspices of the US EPA - sponsored Pacific Northwest Global Climate Change Case Study. Specific topics have yet to be selected for the EPA study from those proposed by Battelle Memorial Laboratories.

4.1 Cooperative research and adaptive response studies could be carried out by state resource agencies in the following areas: forestry, agriculture, fisheries, shellfish, and habitat ecology.

As yet, no projects have been proposed by Washington State agencies. Weyerhaeuser Company is reportedly researching the adaptability of commercial timber tree species to aspects of global climate change.

4.2 Ecology's Sea Level Rise Response Project will continue to be carried out primarily with federal Coastal Zone Management funding.

In 1988, the Shorelands and Coastal Zone Management Program, Washington Department of Ecology, initiated a sea level rise response project. Sea level rise is an existing problem which global climate change is expected to accelerate. Shorelands has developed a comprehensive program consisting of research, inventory, public education, and policy development components using federal Coastal Zone Management funds. The 1990 reauthorization of the Coastal Zone Management Act is expected to include a requirement for states to develop sea level rise response plans.

ANALYSES

The analyses follow the standard 2010 format with one exception. Preceding each set of analyses is an introductory statement or summary of the state-of-the-knowledge. For the most part, this is information new to the 2010 process, not to be found in the risk analysis report, and useful to understanding the basis for analysis or analytical conclusions.

1. COORDINATION AND CONSULTATION

If comprehensive global climate change action is in its infancy at the national and international level, it is yet to be conceived at the state and regional government level. A necessary first step to understanding the nature and extent of the problem is communication between scientists, resource managers, and administrators. No formal or informal forum yet exists to foster this communication and self-education. This action idea seeks to initiate that needed coordination and consultation.

GAINS AND COSTS: Risk Reduction/Resource Enhancement

Coordination and consultation itself will not directly result in any risk reduction or resource enhancement. It will simply place global climate change on a footing equal to traditional resource management disciplines when they were first initiated in the 1950s and 1960s, and set the stage for carrying out research and management studies, and implementing management strategies.

GAINS AND COSTS: Costs

The annual direct costs to an agency in participating in some form of regional or statewide global climate change consultation and coordination would be a fraction of an FTE plus travel expenses, probably less than \$5,000 annually. Participation, however, implies that the agency would have some global climate change program to coordinate with other agencies. See analysis of Action Idea 4, Adaptive Response.

GAINS AND COSTS: Summary

The cost of initiating an interagency dialogue would not result in any direct effect on global climate change. This expenditure is better thought of as "start up" money rather than "operations" money.

CONSTRAINTS: Technical

There are no known technical constraints.

CONSTRAINTS: Institutional

There are no known institutional constraints to implementing an interagency coordination program; in fact, the Intergovernmental Coordination Act sanctions just such efforts. On the other hand, there is no institutional mandate for global climate change response coordination. Organizationally, few State agencies have initiated global climate change programs, therefore no need to coordinate exists. It is likely that legislative action, including funding, would be necessary before any substantial coordination program could or would be implemented.

CONSTRAINTS: Political

There are no known political constraints. The 1989 Washington State Legislature adopted SJM 8011, a memorial to the President and the Congress, stating the Legislature's concern over global climate change and their desire that the Federal government continue its research programs and

fiscal and technical assistance to the states. However, there are not yet any specific political mandates requiring state agencies to take action.

ROLES/RESPONSIBILITIES: Implementation

This action idea addresses coordination between state agencies, therefore a discussion of implementation responsibility between government, business, communities, and individuals is not applicable.

ROLES/RESPONSIBILITIES: Accountability

There is no lead agency in global climate change issues as yet in Washington state government. The State Energy Office has taken the lead with respect to energy conservation issues. Ecology's Shorelands Program has taken the lead with respect to sea level rise. SHB 2957 would in effect establish the State Energy Office as the state's lead agency.

ROLES/RESPONSIBILITIES: Schedule

No schedule or milestones are proposed.

2. PUBLIC EDUCATION AND INVOLVEMENT.

This action idea addresses public education through the public school system. The Environmental Education Office of the Superintendent of Public Instruction presently includes greenhouse effect/global warming elements in energy curriculum materials. Education of the public at large is presently handled by the news media and special interest groups. Particularly noteworthy is the recent environmental education focus of radio and television stations. This appears to be partly a response to general public interest, and partly in response to the 20th anniversary of Earth Day, April 22, 1990.

GAINS AND COSTS: Risk Reduction/Resource Enhancement

Public education will not directly result in any risk reduction or resource enhancement. Over the long term, however, education can be expected to inculcate an environmental ethic which should lead to voluntary actions and life style changes which would minimize our historically maladaptive behavior which has caused the problem.

GAINS AND COSTS: Costs

The costs of developing public education curriculum materials can of course vary widely depending on the depth and breadth of materials desired, and the degree of teacher training necessary. If development of global climate change curriculum materials were to be carried out for a single biennium at a 1.0 FTE level of effort, the total cost, including direct expenses would be approximately \$50,000.

GAINS AND COSTS: Summary

There is no generally agreed upon method for measuring the cost effectiveness of education, environmental or otherwise -- it is more of a societal value judgement or moral decision. Environmental education is generally considered to result in desirable behavior changes which in the long term will reduce the costs of cleaning up after ourselves.

CONSTRAINTS: Technical

There are no known technical constraints to the development of global climate change curriculum materials.

CONSTRAINTS: Institutional

There are no known legal or regulatory constraints. The principal institutional constraint is financial.

CONSTRAINTS: Political

The principal political constraint to development of global climate change curriculum materials on a large scale is an apparent lack of political consensus that this is an important issue

ROLES/RESPONSIBILITIES: Implementation

Curriculum materials are probably most effectively developed by the Environmental Education Office of the State Superintendent of Public Instruction. They will be implemented by local school districts. Business could play a cooperative role as does the timber industry through their assistance in the development of "Project Wild" curriculum materials.

ROLES/RESPONSIBILITIES: Accountability

None of the Environment 2010 Steering Committee agencies are particularly qualified to serve as lead agency for curriculum development. The Environmental Education Office of the State Superintendent of Public Instruction appears to be the most likely candidate.

ROLES/RESPONSIBILITIES: Schedule

No schedule or milestones are proposed.

3. REVEGETATION.

Trees remove carbon dioxide from the atmosphere through photosynthesis and keep that carbon "locked up" for the life of the tree. Carbon dioxide is returned to the atmosphere when trees are burned or when they die and decay.

Forests, which store 20-100 times more carbon per unit area than croplands, play a critical role in the global carbon cycle. The US Environmental Protection Agency has tentatively found that an active forest management program to [1] maintain high amounts of standing biomass, [2] reduce tropical deforestation, and [3] aggressively reforest surplus agricultural or degraded lands, offers significant potential for slowing atmospheric buildup of CO₂, N₂O, and CH₄.

Global deforestation, principally in tropical areas, causes 10 to 30 percent of the global increase in atmospheric carbon dioxide. The carbon content of moist tropical forests, such as Amazonia, averages 155 to 160 tons of carbon per hectare (t C/ha), or 420 to 435 tons per acre, substantially more than other global ecosystems. Globally, forests in temperate regions are essentially in balance in terms of carbon cycling, with annual growth rates roughly equal to rates of timber harvest and deforestation for urban growth and other land uses. In Washington, however, conversion of forest land to other uses is being carried out at a rate of about 50,000 acres per year.

An urban tree is considered to be about 15 times more valuable than a forest tree in terms of reducing CO₂ emissions. Trees break up urban "heat islands" by providing shade, which reduces cooling loads (air conditioning) in warm weather by reducing buildings' heat gain, and cuts heating loads in cool weather by slowing evaporative cooling and increasing wind shielding.

Tree planting and tree maintenance would be mandated by SHB 2957 for multiple purposes including global warming reforestation and energy conservation.

GAINS AND COSTS: Risk Reduction/Resource Enhancement

Reforestation on a small scale, particularly urban tree planting, can arguably be characterized as having more symbolic value than mitigative value. Regardless, no single effort can mitigate for global carbon dioxide increase. Reforestation can make a significant contribution to the cumulative effect of energy conservation, transportation efficiencies, and other greenhouse gas management initiatives.

Two distinct forms of reforestation could be carried out. First, reforestation in urban areas and of small rural-residential tracts could be carried out on a citizen volunteer basis. This includes both individual actions and small scale civic programs. Second, large scale reforestation of "abandoned" agricultural lands and former commercial timber lands could be carried out.

Secondary benefits could include reduced erosion and stream sedimentation in reforested watersheds.

GAINS AND COSTS: Costs

Small scale urban reforestation would presumably be carried out by volunteer labor. Douglas-fir seedlings raised to 2 years for transplantation are valued at \$130/1,000 by DNR. Distribution of seedlings to volunteers would probably be most cost effective if handled through annual "Arbor Day" events such as Pilchuck (Everett) Audubon Society's *Trees For Life* celebration. In the past, the US Forest Service has donated seedlings, and Pilchuck Audubon has coordinated the event.

Large scale reforestation would presumably be carried out by major landowners, both private and public. The total cost per acre for reforestation ranges from \$303 to \$460; this includes site preparation, planting (approximately 300 trees/acre), and plantation management (fertilizer and pesticide applications) for 5 years. After five years, little or no management is necessary until at twenty years, precommercial thinning is usually practiced. If the goal was to be mitigation of the 50,000 acres of timber lands presently lost each year, the cost would be \$15 to 23 million annually (assuming no land acquisition costs).

GAINS AND COSTS: Summary

The relative cost effectiveness of all means of carbon dioxide reduction and mitigation should be explored for Washington state.

CONSTRAINTS: Technical

There are no known technical constraints to implementing a reforestation program.

CONSTRAINTS: Institutional

There are no known institutional constraints to implementing a reforestation program; that is, there are no laws which would inhibit or prohibit reforestation. In fact, the Washington Department of Natural Resources already practices reforestation through its assistance program to its farm forestry clientele. On the other hand, there is no institutional mandate for enhanced reforestation outside the context of the Forest Practices Act. It is likely that legislative action, including funding, would be necessary before any substantial program could or would be implemented.

CONSTRAINTS: Political

Legislative action would likely entail controversy over spending priorities. Opposition could come from interests with competing needs for state funding; that is, potentially every other interest in the state. There is small but apparently not yet politically significant support for global climate change response.

ROLES/RESPONSIBILITIES: Implementation

This is an issue which could be implemented equally by business, individuals, and all levels of government.

ROLES/RESPONSIBILITIES: Accountability

The Department of Natural Resources is the logical lead agency given their existing role in commercial and industrial reforestation. SHB 2957 would in effect establish the State Energy Office as the state's lead agency for greenhouse effect response. No recommendation is made.

ROLES/RESPONSIBILITIES: Schedule

No schedule or milestones are proposed.

4. ADAPTIVE RESPONSE.

This section analyzes new opportunities for adaptive response. Ecology's Shorelands Program is already carrying out a sea level rise response project, therefore that issue is not analyzed: Environment 2010 action ideas are new or expanded initiatives. The Environment 2010 Fish and Wildlife Subcommittee considered adaptive response for fish and wildlife resources and judged that action is still premature. This analysis focuses on adaptive response studies for forest resources.

GAINS AND COSTS: Risk Reduction/Resource Enhancement

This action idea simply proposes development of an adaptive strategy, therefore there would be no direct, immediate effects such as an increase in forested acreage. The anticipated benefits of developing a global warming forestry adaptive response strategy would include: [1] a better understanding of present forest ecology, [2] an improved ability to tailor present forest management practices to local micro climate conditions, and [3] an improved ability to respond to future climate changes.

GAINS AND COSTS: Costs

The costs of carrying out an adaptive response project can obviously vary greatly. Ecology's Shorelands Program is conducting its sea level rise response project for less than \$100,000 annually. The proposed US Environmental Protection Agency Pacific Northwest global climate change case study is budgeted at approximated \$1 million annually for three years.

GAINS AND COSTS: Summary

The costs and benefits of development of a global warming adaptive response for forest management should be viewed in a broader context of the costs and benefits of forest management research for both present and future conditions. As such, adaptive forest management research would be integrated into existing programs.

CONSTRAINTS: Technical

In one sense there are no technical constraints on conducting studies of adaptive strategies for Washington's forest resources. All that is necessary is to select the assumptions on future climate, and to apply those assumptions to what is known about the silvics (life history, characteristics, and ecology) of commercial forest trees, and to deduce future ranges of species and future forest composition. Therein lies the rub -- our certainty of future climate, particularly with regard to precipitation patterns, is low, and our understanding of silvics and forest ecology is incomplete.

CONSTRAINTS: Institutional

There are no known institutional constraints which would preclude carrying out adaptive response studies. On the other hand, there is no institutional mandate, and lacking a mandate, it is unlikely that action would be taken given the competition for funds to carry out mandated programs. Legislative action is therefore considered necessary.

Any substantially larger scale reforestation than is presently practiced would require a commensurately larger scale of nursery operations. For this, a lead time of 3 to 4 years would be required.

CONSTRAINTS: Political

There does not appear to be any political consensus in Washington state that the time has come to invest state funds in global climate change response planning.

ROLES/RESPONSIBILITIES: Implementation

See accountability below.

ROLES/RESPONSIBILITIES: Accountability

The lead state agency for forest adaptive response should be the Department of Natural Resources. Cooperators could include the US Forest Service, the US Environmental Protection Agency, and industrial timber companies.

ROLES/RESPONSIBILITIES: Schedule

No schedule is proposed; if adopted, a forestry adaptive response study would span a number of years.

INTEGRATION WITH AIR RESOURCE AND CONSERVATION ACTIONS

The Air Resource and Conservation action packages both contain action ideas which would result in decreases in carbon dioxide emissions through reductions on vehicle miles traveled, improved traffic flow, improved vehicle fuel milage and performance, vehicle registration ("gas guzzler") fees, building insulation standards, and general energy conservation. In addition, the Air Resources action package includes an element addressing CFC emissions.

The reader is referred to the Air Resource and Conservation reports for an exposition and analysis of action ideas in those areas.

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APPENDIX A

CROSS-RESOURCE GLOBAL WARMING ACTION IDEAS

Following is a list of specific action ideas which address global warming. The commentary identifies the proposed means of addressing the ideas. Paragraph numbering is keyed to the original Environment 2010 action idea numbering.

9. Global warming of several degrees appears inevitable even if the combustion of all fossil fuels were to cease today. Study ways of coping with the effects of warmer temperatures in the Northwest, such as reforesting with trees that can survive warmer temperatures.

This action idea is addressed above by proposed action plan elements 1.1 and 1.2 Integration; 3.1 and 3.2, Revegetation; and 4.1 and 4.2, Adaptive Response.

36. Airplane designers (such as Boeing) should be required to develop fuels and technologies which contribute less to this problem, just as cars have target fuel economies.

This action is recommended to the US Environmental Protection Agency and the US Congress for evaluation and action. Just as motor vehicle corporate average fuel economy (CAFE) standards have traditionally been addressed at the national level, so too could be aircraft fuel technologies and economy standards. Alternatively (or additionally) this idea could be referred to the Conservation Subcommittee which may address motor vehicle fuel economy standards

Environment
2010
Action
Agenda:

Action
Strategies
Background
Analyses

Package
Twelve:

**Knowledge
Building**



State of Washington
July, 1996

ASAC
Information Management Subgroup

Development of an Integrated Environmental Information System

Introduction

Package Identification, Problem Statement

A. The effective implementation of Environment 2010 requires an ability to assess and report the current and continuing condition of the state's environment, according to commonly-agreed-upon environmental indicators. This provides a basis for judging the real effectiveness of any programs designed to manage environmental conditions and for informing the public and policymakers about status of the environment. An informed public will more likely show willingness to be involved, and to respond to environmental concerns. In preparing the first State of the Environment Report, it became clear that there are limitations of several sorts in gathering and presenting comprehensive information on the state of the environment. They include:

1. That needed information on environmental indicators is currently not collected in a systematic way;
2. That where such information is collected, it is collected according to varying and inconsistent standards and formats across the various environmental and natural resources agencies; and that
3. There is a consequent inability to gather and present comprehensive information on environmental indicators to management and the public in a useable fashion.

As a result, it is very difficult for environmental/natural resource managers to know whether progress is being made on environmental problems comprehensively, and therefore, whether current responsive strategies are effective.

B. The Vision Statement under the "knowledge" heading, foresees a 'state-of-the-art system of collecting and disseminating environmental information,' making state residents among the most environmentally aware in the nation. That information is to be reliable, accurate, accessible, and comprehensible, and is widely distributed through varied channels. The system proposed here would be designed to address these needs by putting in place a comprehensive program for the collection and management of appropriate environmental information; the packaging of that information in such a way as to be most useful to program staff, policymakers, and the public, and distributing the information through convenient outlets statewide. A particular component of the package calls for a public accessibility of data gathered through the package, which suggests the development of a system element which packages, for easy public

consumption, parts of the information available through the system which would be of public interest. Another component provides for public involvement in the collection and reporting of data, highlighting the public access/involvement portions of this package.

C. The ideas in this package are all organized around the development of an information system designed to provide public understanding of environmental conditions, and to equip the Department of Ecology to respond to them. The ideas are as follows:

- A statutory requirement for biennial production of the State of the Environment Report.
- Creation of public monitoring sites and survey stations.
- Creation of a publicly-accessible data collection and management system.
- Development of an integrated environmental information system which focuses on environmental quality indicators; facilitates data sharing; and is supported by an adequate monitoring system. This system would eventually need to be linked to other appropriate systems which collect data on the environment, such as those at other state agencies, universities, local governments, and similar institutions.

II. Gains and Costs of Taking an Action

A. Risk Reduction and Resource Enhancement Potential

1. The development of a comprehensive environmental information system can serve as the critical infrastructure for the environmental and natural resource policy-making and regulatory process. A progressive information system which presents reliable, accurate data on the condition of the environment, and on environmental regulatory activities has the potential to reduce the risk of an ill-informed policymaking process which can make poor decisions about priorities, strategies, and techniques. The result of such limitations can be that environmental agencies aggressively pursue problems which have only a small environmental impact, while not focusing resources and energy on more critical problems. In addition, in the absence of an effective system to support operations activities such as monitoring, enforcement, education, and permitting, we risk dedicating unnecessary amounts of staff time and resources towards supporting and maintaining mechanisms to gather and present information on the status of operational activities, limiting our abilities to free operational staff for more purposeful work. The ultimate cost of not developing an effective information system is twofold:

- a. Limitation on the ability of policymakers to make appropriate, informed decisions about strategic direction.
 - b. Limitations on the productivity of operations staff in carrying out program activities.
2. The development of the proposed system could be quite effective in providing decisionmakers with needed information to support appropriate decisions, and to enhance operational activities. Because the primary products of this effort would be qualitative in nature - that is, a better informed policy process and more effective operations, any measurement will be necessarily subjective. Inquiries to policymakers on the usefulness of the system and the comparison of policymaking before and after the development of the system would be one possible tool. Another would be a comparison of accessibility of needed information to agency operations staff before and after installation of such a system. Both these approaches require subjective judgment in conducting any measurement. There is no hard data currently available to support such judgments. As an alternative measure, a survey of key managers, system users, and agency could be conducted to capture general impressions about the ability of the system to support policymaking and operations effectively.
 3. This proposed system will enhance the ability of the involved environmental resource agencies to protect public health and the environment in a cross-media fashion, by facilitating access to needed information on the status of the resources, and the status of operational activities designed to protect or enhance the resource. The result should be a greater ability to control air pollution, protect wetlands, restrict water pollution, and respond to the various needs related to environmental resource protection and enhancement.

B. Costs

The Department of Ecology is currently engaged in a planning effort which will define specifics about the nature of an environmental information system, addressing the needs identified through the 2010 process. The product of that process will provide a characterization of specific system architecture, and associated capital and operating costs.

The Department of Ecology is currently spending upwards of \$5 million annually on information systems, it is estimated. This is managed in many different parts of the agency, resulting in many different systems, not coordinated with each other.

Current analysis suggests that operating costs for the proposed system would be no greater than costs currently expended within the agency for information management - that is \$5-6 million. These costs would be for staff to support activities such as planning, data administration, application programming, operations, and program liaison. Additionally, equipment, supplies, training, and travel would be supported. One-time capital costs, for purchase of system hardware, system software, connections, local area networks, and associated equipment, would be in the range of \$1.5-2 million.

Other Factors

Technical Factors

- A. This proposal depends heavily on available computing technology, as well as the skill of applications development staff. There are no problematic limitations on the availability of technology to build the system, though some choices must be made in the emphasis desired in the capacities of the system: in essence, do we need a system which specializes in recording and manipulating numerical data; is word processing to be its primary feature; will spatial representation/analysis be emphasized; will modeling of environmental resource systems be needed?

B. Institutional Constraints

There are no limitations in existing law in developing this system; however, procedures for major system development required by the Department of Information Systems would need to be complied with. Regarding organizational structure, the existing pattern of systems throughout the agency has limitations in the ability to support agencywide needs and the State of the Environment reporting requirements; the proposed system would attempt to improve on these limitations. The system would need to be developed to provide for involvement/participation by other natural resource agencies eventually to maximize its utility.

- C. The development of this system entails no particular controversy in the traditional political sense, in that its character is not based on a set of philosophical assumptions of a controversial nature. Any controversy which might occur would be related to systems development issues - that is, what hardware platform, centralized v. distributed, prioritization of applications. The primary focus of political support or opposition would be centered on budget issues, as they make their way through the agency/legislative process.

Roles/Responsibilities

A. Implementation Responsibilities

Primary responsibility for development of this system would fall on the Information Services Division of the Department of Ecology, with

cooperation needed from other state resource agencies, local government, and institutions which collect relevant environmental resource information.

- B. The Department of Ecology's Comprehensive Planning/2010 staff would have primary responsibility for follow-up in encouraging implementation. This responsibility fits well with existing programs of the agency, in that encouragement to carry through on this system generally fits within the agency's overall direction and plans.

Washington Environment 2010
Action Plan Analysis of
Biennial Production of a State of the Environment Report
March 1, 1990

Introduction/Description of Idea

This paper analyzes the concept of a legislative mandate for production of a state of the environment report on a biennial basis. The mandate and report represent an ongoing commitment to the initiative of Washington Environment 2010.

Conceptually, the mandate and report incorporate interagency cooperation for report production, selection of key indicators of environmental quality for ongoing measurement and analysis, and use of geographic information system technology for data base correlation and presentation.

The mandate would institutionalize the progress in environmental management made by the 2010 project and would insulate that progress from changes in the political climate.

The following sections of this document discuss the gains and costs of such a mandate, the technical/political feasibility of the idea and the roles and responsibilities of various actors should the mandate occur.

Gains and Costs of Taking the Action

Risk Reduction/Resource Enhancement Potential

The Washington Environment 2010 project demonstrated that production of a state of the environment report provides the basic vehicle for measuring/communicating risks to human health and trends in our natural resources. State of the Environment Report production also allows the development of data based risk control strategies and translation of environmental trend data into a format useful to the public and natural resource agency policy makers.

Report production has no direct risk reduction or resource enhancement value. It is however the basic tool for assessment and reporting of progress in these areas. As such, production of the state of the environment report informs the public and informs the senior executive management decision making processes in natural resource agencies. This document empowers state government to review the effectiveness of public policy in the environmental arena. It also empowers state government to ensure that limited public funds are spent on the most serious risks to human health, the most critical threats to ecological values and the most seriously degraded of our natural resources.

The non-dollar costs of failing to prepare a state of the

environment report can be best characterized as "opportunity costs."

Our society is experiencing a wave of renewed interest in wise stewardship of the environment. This "new environmentalism" is characterized, in part, by a search for new methods of environmental regulation and more sophisticated approaches to resolution of environmental problems. Examples include an emphasis on market incentives to augment command and control strategies for polluters and a commitment to environmental education for nurturing of individual and corporate environmental ethics.

These changes result, at least in part, from an awareness that while the first 20 years of the environmental movement were dedicated primarily to the control of pollution emitted from single sources, the next 20 years will be dedicated to control of "area sources" of pollution.

Examples of single sources include industrial smokestacks and publicly owned sewerage treatment works discharge pipes. Examples of area sources include woodstoves, cars and agricultural chemical applications.

Single sources of pollution are well suited to command and control strategy regulation and single point monitoring. Area sources demand more subtle regulatory strategies and more complex monitoring networks.

As the problem of maintaining/improving environmental quality has changed, the technology available to society for dealing with the problem has evolved. Fortunately, information management technology has been at the forefront of this evolution.

With the advent of third/fourth generation programming language, relational data base management systems and geographic information system technology, regulators can collect, combine and sort environmental data in ways not even conceived of a decade ago. This evolving capability creates a tremendous opportunity to inform the public policy decision making process at the most senior levels of management.

Data alone is not enough however. Data must be translated into information in a format that is accessible to the public and decision makers. The state of the environment report is a primary vehicle for translating the wealth of environmental data into accessible information and thereby, capturing the management opportunity created by advances in information management technology.

The non monetary cost of not implementing a state of the environment report is a failure to respond to the shift from point source to area source regulation and a failure to capture the opportunity to align current information management technology with executive strategic planning and decision making processes. The net result of failure will be continuation of less informed management decision making

practices with their attendant and escalating inefficiencies.

The opportunity to update management technique results from two events which have occurred simultaneously. These two events also make it possible for the state of the environment report to become an extremely useful tool for risk reduction and resource enhancement.

The first of these is the evolution of information management technology, described in some detail in the foregoing section.

The second of these is an emerging capability of the hard sciences to define indices of environmental quality in each of the media (e.g. air, land and water) and many of the natural resources. These measures are commonly referred to as "environmental indicators."

Historically, managers have relied upon surrogates to measure progress in cleaning up and preventing pollution. The most common surrogates have been numeric counts of activities with the underlying assumption that more activity equates to improved environmental conditions.

The logic flow of this management strategy is illustrated by the following example. Water quality permits are issued to control water pollution. The more permits issued therefore, the more pollution is controlled.

Elaborate accountability schemes have evolved based upon the counting of surrogate measures of environmental progress. There is now an emerging consensus that the underlying assumption of activity = progress may be flawed and thus this management strategy is flawed.

An emerging alternative is a management scheme which relies upon state of the art information systems and the "up-front" definition of indices of environmental and natural resource quality. The indices chosen are selected in part, for their utility in risk assessments. The term most often applied to this management technique is "management for results."

The management for results paradigm holds that once environmental indicators are defined, information systems may be aligned to collect and report data on the indicators. (In practice, this often means that initially indicators are chosen which reflect current data collection efforts.) This alignment of information systems, indicators and risk assessment creates the opportunity to refine indicators through use in consecutive comparative risk assessments and to reflect risk reduction objectives in indicator refinement.

Once data collection on indicators occurs, senior management decisions can be based upon real environmental results. Public policy making gains the benefit of a feedback loop which informs the process. Program priorities can be adjusted to reflect actual environmental conditions, scientifically measured and clearly reported.

It is this reporting function that a mandate for a

biennial state of the environment report will support. The report is the primary vehicle for informing the public and policy makers of trends against indicators and, by so doing, the report empowers policy makers to make informed adjustments in their priorities and improved evaluations of program effectiveness.

The Washington Environment 2010 State of the Environment Report successfully created a first increment of this capability, even without the use of indicators. That effort demonstrated the potential significance of the reporting exercise and created momentum which should not be lost in the ensuing months.

While a set of indicators has not been defined for Washington State, other states and the federal Environmental Protection Agency have had some years of experience with them. It is not prohibitively difficult to develop a set of indicators for Washington in time to prepare a second report in 1991.

Perhaps the most significant benefit from biennial production of a state of the environment report, other than those described above, is the potential it holds for informing the public about environmental issues and trends.

It is apparent to many that successful pollution control in upcoming decades depends as much upon personal environmental ethics as it does corporate and public environmental ethics. The 2010 Vision Statement recognizes this fact explicitly in it's "Responsibility" section.

The public, however, will need to be informed of the impact their individual actions are having on the environment of Washington. The state of the environment report is one vehicle for informing them. Additionally, the information generated through report preparation can be used to inform the public through other media. In the absence of feedback however, public behaviors cannot be expected to be modified in any lasting and meaningful way.

Costs

There are however, costs associated with report preparation. The cost estimates shown below are based on the following assumptions.

1. All information system development costs necessary to enhance the state of the environment report, beyond the information applications already used in the Washington Environment 2010 report, are assigned to the "Information" subgroup package, item number 4. None are reflected here.

2. Costs shown are direct costs only. The indirect costs of (i.e. staff time contributed by other programs and agencies)

are not shown.

3. Adoption of a legislative mandate is essentially a no cost item. All costs shown are direct report production costs.

4. All costs are state government costs.

5. There are no adverse economic effects from report preparation outside of the cost of the report !

<u>ITEM</u>	<u>COST</u>
Salary and benefit costs as follows;	
1 EP 3 (currently available and therefore, not included in total).....	\$48,630
1 assistant at EP-1 level.....	36,180
.20 Cleric's.....	5,000
Central Processing Unit Charges for Geographic Information System applications.....	10,000
Report layout, printing, mailing.....	<u>30,000</u>
	Total \$81,180

Summary of Costs and Benefits

A summary view of costs and benefits leads to the conclusion the direct costs of report preparation are reasonable in relation to the benefits to be derived.

The state of the environment report is a foundation upon which an improved environmental management paradigm can be built. The application of information contained in the report, to executive management decision making processes in our natural resource agencies, bring the promise of a new era of effectiveness and efficiency in environmental management.

Additionally, distribution of report findings to the public will reinforce the state's environmental education/environmental ethics initiative.

Other Factors

Technical Factors

As demonstrated by Washington Environment 2010, there are no technological barriers to creation of a state of the environment report. There are only issues of quality assurance and quality enhancement.

In this context, quality assurance means ensuring that the most current and complete data available is used in report

preparation. In some cases this is a matter of technological barriers, such as incompatible data base management systems. In most cases, however, it is more a matter of taking the time to identify the needed information and abstracting it, regardless of the form in which it is stored.

Quality enhancement speaks to the issue of capturing emerging technologies and applying them to report preparation. Relational data base management systems, including geocoded data bases were not available for use in the first 2010 report. There is every reason to believe that these technologies can be brought to bear on future iterations.

Institutional Constraints or Implications

This optimism assumes the full cooperation of all state agencies concerned with natural resource management. Preparation of a comprehensive state of the environment depends, in large measure, on intraagency cooperation. The 2010 experience, however, taught us that institutional barriers to information exchange do exist and can be difficult to overcome in a short time frame.

Given the current institutional and legal framework, intraagency cooperation relies upon trust and mutual respect between participating agencies. Where that trust and respect fail, report quality erodes. While this institutional situation is not fatal, it is serious enough to suggest a legal/political remedy.

Political Factors or Implications

In order for information to be successfully shared it must be properly collected, properly stored, easily transferred and there must be a willingness to share on the part of the data stewards. In order to support these prerequisites, it is recommended that the mandate include encouragement of data sharing between state agencies.

One possible vehicle for implementation of data sharing is the execution of a memorandum of understanding (MOU) between agencies. The MOU approach allows each agency to tailor it's data sharing in a manner which reflects it's particular operational conditions.

Additionally, the mandate could be accompanied by a broad executive order encouraging state agencies to cooperate in multi-agency initiatives and projects. These two actions would substantially improve the institutional/legal framework for report preparation and would result in substantive improvements in the state of the environment report.

Roles and Responsibilities

Implementation Responsibilities

Adoption of a legislative mandate and preparation of state of the environment report pursuant to that mandate, is a government function.

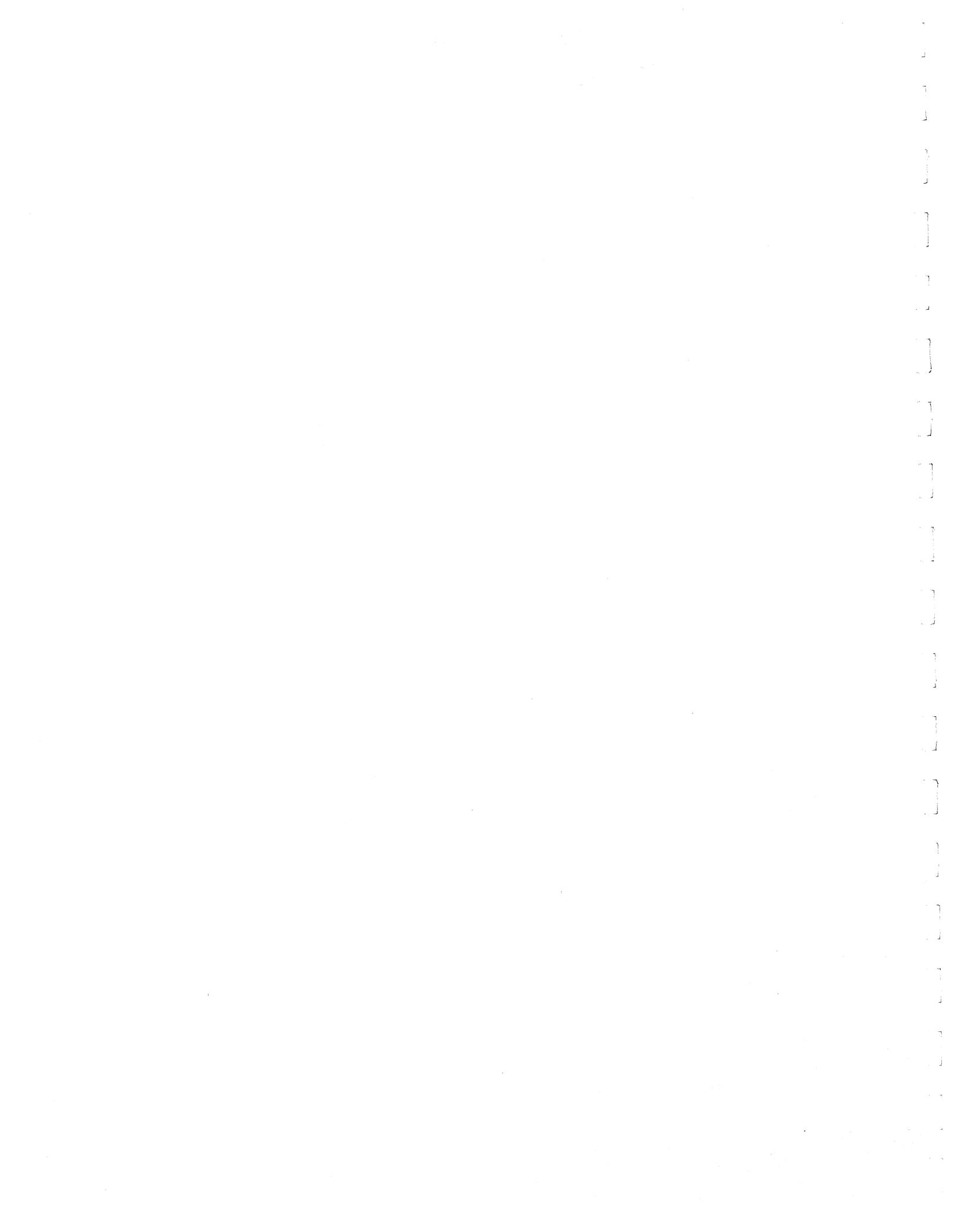
Business and the public have a responsibility to review the document and comment at every opportunity afforded by the process.

Accountability

The Washington Department of Ecology (Ecology) is the state agency with the most extensive cross media environmental quality and natural resource protection responsibility. It has a broad mandate in relation to other natural resource agencies and it's program structure makes it uniquely suited to be assigned responsibility for state of the environment report preparation. In addition, Ecology was responsible for managing preparation of the first state of the environment report as part of the Washington Environment 2010 project.

Schedule

In order to capture the momentum provided by the Washington Environment 2010 project, the mandate should occur early in the 1991 legislative session with report preparation complete before the end of the 1991 calendar year.



ECOLOGY 2010 - ACTIONS STRATEGIES ANALYSIS COMMITTEE (ASAC)
Subgroup on "Knowledge"
DRAFT - March 11, 1990

I. Action Item - Create a Data Collection and Management System Which is Accessible to the Public.

A. Factors supporting public access to environmental data:

1. Public access to environmental trends and indicators can be an important part of public education and motivation to act.
2. There is real potential for a meaningful public service by doing "community environmental profiles" or "regional environmental profiles. Information on water quality, air quality, hazardous waste sites, environmental resources and other environmental indicators would be readily accessible by the public.

B. Approaches to meet the objective of making environmental data accessible to the public.

1. Expand the use of media such as radio, television, newspapers to provide environmental data to the general public.
2. Target special interest groups and policy makers through the use of newsletters.
3. Develop computer systems dedicated to making environmental data available to the general public. Access could be made available through telephone communications or at public locations such as libraries. Target audience would be special interest groups and interested general public. This action item relates to the public access element of the Integrated Environmental Information System action item.

II. Gains and Costs of Taking an Action

A. Risk reduction or resource enhancement potential for making data accessible to the public.

1. Potentially, all human health, ecological and economic risks could be reduced through increased communication of environmental and other indicators to the public. The action idea is a general statement that much is to be gained by making information available to the public. The assumption is that the informed public will make better decisions about critical environmental issues.

Data Collection and Management Systems accessible by the Public cont.
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2. Effectiveness of this action item might be best illustrated by looking at the effectiveness of other public services and programs within the State of Washington. The Department of Ecology Woodstove Education Account is approximately \$250,000 for 1987-1989. The general public receives daily information from radio, television and newspapers about air pollution and the use of woodstoves. The Recycling and Litter Hotline Program is currently funded by 6 staff and an annual budget of \$223,000. The Puget Sound Water Quality Authority is able to target 14,000 readers each month with a 4 to 8 page issue of the Sound Waves for about \$65,000 per year. The Washington State Lottery program media budget is currently over three million dollars per year. All three of these programs are effective communication tools. The effectiveness of making environmental data accessible by the public through advanced computer systems applications and other communication tools should be determined for each environmental indicator and the target audience.
 3. Effective communication of state environmental programs and environmental indicator information could have a positive effect on public attitude toward state environmental programs and state government in general.
- B. Costs associated with stated approaches for making environmental data accessible to the public should be born by the individual programs responsible for the regulation and/or use of environmental resources. As such, sources of funds would be wide spread. Actual costs of an effective program would also be highly variable depending on the environmental resource and the target audience to be informed. Costs identified above are intended to be for illustration of the potential range of costs for various programs currently funded in the State of Washington.

III. Other Factors.

- A. There are no technical limitations or factors which would preclude making widespread use of traditional forms of media to make environmental data accessible by the public. There are, however, factors which limit the use of computer system technology to make environmental data accessible by the public. Most households do not have the same kind of access to computer technology as when compared to radio, television or newspapers. There would be fewer technical limitations for target groups and policy makers where the use of computers is a generally accepted technology.

Data Collection and Management Systems accessible by the Public cont.
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- B. There may be many institutional or social implications to overcome if the general public and decision makers are to have environmental data readily available. Implementation of reporting/disclosure requirements and the coordination of reporting to large computer (or other) systems for subsequent dissemination of environmental data would be a large undertaking. Timing is of utmost importance when dealing with many issues. Reporting of environmental trends rather than specific degradation actions would be less effective.

IV. The role of government, business, communities and others for implementing the action idea would be a function of the environmental factors/data made available to the public. Implementation of the idea in the form of policies and changes in applicable laws would be the responsibility of the Department of Ecology.

CREATION OF PUBLIC MONITORING SITES AND SURVEY STATIONS

This action idea would involve the public in helping to assess the condition of the environment. Citizen monitoring would be conducted under the supervision of experts in state agency monitoring programs, ensuring that high quality information is collected. This information can be used to improve environmental assessment within agency programs, and to help prepare the State of the Environment Report.

Benefits

Public monitoring can provide benefits in several areas. First, volunteers could collect information at little cost to the taxpayer. This information might not otherwise be available, due to limitations in agency staff and funding. A network of volunteers in different communities could monitor a wider geographic area than might be possible for state agency staff.

In addition, public monitoring programs could help create an environmental ethic and sense of stewardship for the environment in participating volunteers. Monitoring would encourage people to learn about the environment, and become involved in environmental issues. Through monitoring components of high-school and college courses, students could develop skills and knowledge leading to careers in environmental areas.

Citizens are currently involved in collecting valuable environmental monitoring data in Washington State in a variety of ways:

- n The Renier Environmental Corps is aiding state agency monitoring activities.
- n Bird-watchers from the National Audubon Society are conducting annual Christmas Bird Counts.
- o Senior citizens from Chautauqua Northwest, and volunteers from Adopt-A-Beach, are collecting samples of shellfish to be analyzed for bacteria and "red-tide" as part of the Puget Sound Ambient Monitoring Program.
- o High-school and college students are monitoring water quality in rivers and lakes.

How would it work?

State agencies that conduct monitoring would define monitoring

tasks and supervise volunteers. Agency staff would define the information needed, and decide what types of training and supervision volunteers need to ensure data quality.

Volunteer monitoring tasks would require various types of monitors with various degrees of skill. Some of the tasks would involve simple observations of the environment, while others might require more intensive training, and prior experience. For example, members of the public could keep records of observations of litter, marine debris, eagle sightings, etc. with minimal training. Other volunteers, with more training, could collect water or shellfish samples and send them to accredited laboratories for analysis. Others, with still more training, could conduct more complicated resource inventories, bird counts, or stream assessments.

Students in high-school and college courses could do their own water-quality monitoring in local lakes or streams. The students would need to use acceptable methods for laboratory analysis and their results would need to be checked through periodic comparisons with accredited laboratories, and other quality control measures.

In order to find volunteers, the state would contract with volunteer organizations, business and service clubs, or local environmental groups. These groups would find volunteers, arrange schedules, and insure and pay volunteer travel costs.

A volunteer coordinator within state government would be responsible for matching groups of volunteers with the tasks identified by agencies. The coordinator would work with agencies to define tasks that are appropriate for volunteers, to set up orientation and training for volunteers, and to ensure that volunteers are recognized for their work. The volunteer coordinator would identify and recruit appropriate volunteer organizations, and negotiate and manage contracts. The expertise of the volunteer coordinator would ease any difficulties an agency might encounter in setting up their own volunteer monitoring program.

Ensuring Data Usability

One of the chief concerns expressed about volunteer monitoring is that information collected by individuals may not meet the rigorous standards required of scientific information. On the other hand, public monitors must feel that their efforts are generating useful information; otherwise their efforts could be better spent on other activities. The approach taken here will ensure that monitoring tasks are designed to meet these standards and are conducted under appropriate supervision.

Data collected by volunteers should be reviewed for completeness.

and adequacy by agency technical staff prior to inclusion in permanent monitoring archives or databases. Archived or computerized data should be tagged so that its origin can be determined. Data collected by volunteers may lend itself to use for certain types of analyses (e.g., to determine species presence/absence), but not for use for other purposes (e.g. population modelling). The projected uses of the information should be determined during design of the monitoring task so it can be determined if volunteer involvement is appropriate, and so that steps can be taken to ensure data quality.

The results of monitoring should be available in some form to the public that helped to collect it. Existing student monitoring programs have found student congresses, computer networks, and newsletters valuable ways of sharing information. A computerized system for public display and retrieval of environmental information (Action Idea #3) could be a viable means of presenting the results of public monitoring.

Costs

There may be increased costs associated with expanding existing environmental monitoring programs to do a better job of environmental assessment. There would be savings in these costs if volunteers could be used for some of the tasks involved. However, costs for boats, airplanes, sample transport, laboratory analysis, data compilation, entry and analysis would not be reduced.

Given the wide variety of types of information to be collected, the costs really depend on the desired scope of the program. The following estimate is for a volunteer monitoring program involving 50 volunteers for about 12 hours per month (7200 hrs per year):

Volunteer coordinator:	1/2 EP-3	\$24,315
Volunteer monitoring contract:		\$25,000

		\$49,315

Additional costs to implement a public monitoring program includes agency staff time to train volunteers, compile data, and report results, and costs for equipment and supplies to support monitoring teams. Again, volunteer involvement will represent a savings over the standard costs of conducting the same monitoring.

Responsibilities

Individual members of the public would donate their time to get involved in monitoring. Community groups, business and service organizations and volunteer organizations would serve as focal

points for organizing and coordinating groups of volunteers. Businesses, foundations, and other "outside organizations" could fund volunteer groups, donate supplies for monitoring, and arrange for recognition of volunteers. State agency staff would be responsible for identifying their needs for help from the public, training and working with the volunteers, compiling and using the data collected, and recognizing volunteer efforts. A volunteer coordinator, in the Public Involvement Office at Ecology would work with agencies and volunteer groups to ensure that all goes smoothly.

rpf: 03/07/90

12

**Environment
2010
Action
Agenda:**

**Action
Strategies
Background
Analyses**

Appendix
A:

**Environmental
Economics**



State of Washington
July, 1996

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Environmental Economics

Environmental economics offers four proposals of major importance to improving environmental quality. First, there is an optimal or acceptable level of pollution and environmental quality. Second, the free market will produce too much pollution and too little environmental quality because no one takes into account environmental costs imposed on others. Third, market incentives¹ can clean up the pollution to the desired level cheaper and faster than imposing regulations² while creating less economic dislocation. Fourth, using pollution as a major tax base can enhance the efficiency and equity effects of the economy and the tax system as a whole.³

Environmental economics also provides tools that will help us to decide which policy options will be most beneficial for society. The methods described toward the end of this chapter can be used to define the costs and benefits of small or large changes in pollution reduction and environmental quality. It will be important to apply these methods appropriately as we move toward implementing the action packages and strategies of 2010. If we move too slowly or too rapidly there is a risk of failure to clean up the environment and/or serious economic hardship.

This chapter provides the background economic theory necessary to understand the conclusions of the first paragraph. It explores the relationship between the economy and the environment. Human beings use the economy and the political system to define what products are produced, and who produces and owns them. These economic decisions have an impact on the environment. Likewise, the efficiency of the economy and the environmental effort are affected by the environmental solutions that we choose. The equity or fairness of the solutions proposed is affected if we use rules or solutions that impose high costs on one group and lower costs on other groups. Each of the issues covered by the 2010 Report results from market decisions we as a society make. The way the market operates can and will be adjusted over time to encourage both significant economic growth and a healthier environment.

This chapter will describe some of the policy evaluation tools and policy options covered in the economics literature. It examines the incentives created by command and control regulations and contrasts them with market based approaches. While advocating market approaches this chapter also covers some of the drawbacks

¹ Market incentives include taxes on pollution, saleable permits, and subsidies for pollution reduction.

² Regulations in the economic literature are command and control requirements that limit pollution via technological or pollutant level restrictions. While many regulations have penalties there is no financial incentive unless an entity is out of compliance with the regulation.

³ Taxes will also require a regulation or rule making process. The Department of Revenue promulgates rules interpreting the tax statutes.

covered in the literature.⁴ In addition the policy evaluation tools available within economics are reviewed for their benefits and limitations.

For economic analysis the environment is one among many scarce goods. As the population increases and the capacity of the environment decreases relative to the demands placed on it society will be willing to pay for more environmental quality. As environmental resources become more highly valued or scarce, society will act to protect them.

Past Responses to Environmental Scarcity

There is nothing new in this struggle toward moderation of the environmental impacts of a free market. Each issue covered by the 2010 Action Items has been increasing in intensity as the scarcity of the environmental resource has become more apparent. The Clean Water Act, the Clean Air Act, and the existence of the Environmental Protection Agency are a response to the high and increasing levels of contamination of the 1950s and 1960s. Initiative 97 was a societal response to the extreme cost and the hazards of toxic materials clean up.

In the past other societies have also responded as the environment's capacity to support current uses became a scarce resource. London provides an excellent example, especially since pollution, a legal response to pollution, and excess deaths⁵ sometimes attributable to pollution have been recorded for centuries. The history indicates a long and constant struggle with environmental pollution which continues. As early as the reign of Edward I (1272-1307) a protest was recorded against the use of "sea" coal. In 1306 he banned the burning of "sea

⁴ The economic literature in the United States leans heavily toward the use of market incentives (effluent taxes and marketable permits) as the preferred methods for reducing pollution. This preference for market incentives and against regulation may be based in part on socio-economic variables. Frey et. al. have shown that incentive instruments tend to be preferred by "university-employed, theoretically inclined, politically right wing, professional economists living in a market-oriented country." Whereas "public sector employed, politically left wing, professional economists living in a country with long tradition of government involvement prefer the regulatory approach" all other things being equal. Because this chapter relies heavily on the American economic literature it carries the potential biases of market oriented, American economists. "Economists' Opinions on Environmental Policy Instruments: Analysis of a Survey," by Bruno S Fry, Fredrich Schneider, and Werner W Pommerehne, Journal of Environmental Economics and Management, Vol. 12, 1985, pp. 62-71.

⁵ Encyclopedia Britannica, Ninth Edition, Volume XXII, New York, Charles Scribner's Sons, 1987, pp 827. From 1593 on death rates were higher than birth rates and the "excess death rates" were recorded. This pattern did not reverse itself until the turn of the century.

coals" by London Craftsmen. Violation was a capital offense.⁶ One man was executed when he was found to have warm coals in his furnace. In 1578 the "company of Brewers agreed to burn nothing but wood in their brewhouses...because Elizabeth the queen 'findeth herself greatly grieved and annoyed by the taste and smoke of the sea coals.'"⁷ Edward II responded to the stench of coal burning by torturing a man.

Providing us with a model for market incentives to control environmental damage, Richard II and Henry V taxed the offending input. Coal was taxed for specific periods until 1718 when the tax was made perpetual. Over the years the tax on coal became a major tax base. By the late 1700s it raised 60% of the total revenues of the city of London.⁸ Despite the taxes burning of all fuels grew. The "black fog" in London in 1952 killed 4000 people in 4 days and raised excess deaths for months. The English Clean Air Act of 1958 was passed and of the 486 smoke control areas 25% were considered smoke free by 1965.⁹ The scarce resource air is now better protected in London. There was a long history of recognizing air as a scarce resource. Society made increasing substantive changes in the way the market uses air as the situation called for it.

The example of London parallels our own history. As the population becomes aware of problems and as the problems refuse to go away, increasingly stringent actions are taken to mitigate the costs imposed on society by pollution. Even now the Clean Air Act is being revised and strengthened by Congress. Much of the controversy is over market incentives in the proposed amendment.

The Problems

The way the economy interacts with the environment reduces the efficiency and equity¹⁰ of the economy. Property rights¹¹ and payment for the use of

⁶ The Breath of Life: The Problem of Poisoned Air, by Donald E. Carr, George J. McLeod Limited, Toronto, 1965, pp. 33.
Encyclopedia Britannica, Ninth Edition, Volume XXII, New York, Charles Scribner's Sons, 1987, pp 827.
Down to Earth: Environment and Human Needs, by Erik P Eckholm, W. W. Norton & Company, New York, 1982, pp. 93.
Killer Smog, by William Wise, Rand McNally, 1968, pp. 19.

⁷ Killer Smog, by William A. Wise, Rand McNally, 1968, pp. 19.

⁸ "A Model of the London Coal Trade in the Eighteenth Century," by William J. Hausman, The Quarterly Journal of Economics, February 1980, pp. 1-14.

⁹ The Breath of Life: The Problem of Poisoned Air, by Donald E. Carr, George J. McLeod Limited, Toronto, 1965, pp. 33, 45-50.

¹⁰ From an economists perspective equity is reduced if resources are utilized without payment to the owners of the resource. Since most environmental resources are not clearly held by any entity other than society as a whole it is not clear who should pay and who should be compensated. The number of payments

resources are the basis for allocation of goods in our market economy. Fully defined property rights are easily provided if all the costs and benefits of a product accrue to one person or company. We have to pay for other scarce resources such as labor or materials but we don't pay for the right to release toxics into the air or the water. Pollution costs are imposed on people who may not benefit from the cheaper production.

Ownership and charges for resource use are not a part of the way the economy interacts with the environment. This leads to one form of "market failure." In this case the market over produces a product the society does not want, such as pollution. Another form of "market failure" involves the market producing or saving too little of a beneficial product such as wetlands. Both have the same root causes which are covered in the material below.

Ownership and payment for the use of resources provides the basis for an extensive network of information and incentives that makes the economy work quickly and smoothly. The price of an object, alone, provides information on the cost of the resources, labor, and equipment needed to produce the good. However, the production process sometimes produces side effects such as air pollution. These side effects, called externalities, are external to the market transactions that create them. In other words they impose costs on others but the costs are not included in the price of the good. Because there is no charge for the damages imposed neither the buyer or the manufacturer are inclined to reduce these costs.

Not all externalities are negative. Some goods (undeveloped land, shellfish¹²) produce positive side effects which can not be owned or marketed. The private market does not pay for the benefits created. The producer or purchaser of the good receives nothing from society for the good or service and has no incentive to increase the benefits. If only a few people created or were affected by lack of property rights, externalities, and the resulting "market failure" it is likely that all these problems could be worked out. If there is only one polluter using a specific contaminant it is easy to determine who is having an impact.

If property rights are assigned and there are only a few people who have to agree to a solution it is more likely that they can come to an agreement. Large numbers of polluters, victims, and effects are generally involved in any real world situation. Often in the real world it is not clear which party is

and cross payments would make it impossible to account for all environmental costs imposed and provide full equity. However, compensation of society in general for the pollution costs one imposes would reduce the total costs imposed.

¹¹ Property rights are all rights and responsibilities associated with ownership of property. A common example is fee simple real estate. Shifts away from the usual rights of ownership such as the inability to sell property (e.g. permitted discharges) reduce the effectiveness of the market system for allocation of resources generally.

¹² Shellfish clean water as they feed.

responsible for contamination. It is almost impossible to reach consensus on any issue where large numbers of people are involved. The costs of time and energy involved are too high. This is especially true where property rights are ill defined. The large numbers of entities involved makes solution of the "market failure" through market transactions extremely unlikely. Environmental issues involve large numbers of people and entities, and there is a great deal of uncertainty over who should be responsible for which costs. Because of this the issues often require a political rather than a market solution.

The value assigned to environmental quality is defined in part by the ownership rights of the parties involved. Property rights define who must pay. Willingness to pay is limited by income. No such limitations apply if the individual has a right to clean air and is asked how much it is worth to him to give up a certain level of quality. The "willingness to sell" price indicated will be higher than the "willingness to pay" price for the same change in quality. This is one reason that individuals and firms can differ so widely in their ideas of what an optimal or agreeable level of pollution is. Firms have always, with increasing constraints, been able to dispose of waste into the environment. Individuals have always believed they have a right to be able to breath the air and drink the water.

Public Goods¹³

Products that benefit all of us are by their very nature difficult to own. So the private economy does not produce enough goods that benefit the public as a whole. Many private goods have public goods aspects. The owner of a wetland receives no payment for the fisheries it helps to support, the water it helps to clean, nor for groundwater recharge the wetland provides. The wetlands owner has less incentive to protect these social values than society as a whole does.¹⁴

For public goods (Eg. clean air) there is no market, no payment for resource use, and few clearly defined property rights. The value of a public good is different from the value of a private good. The private good has value primarily to the

¹³ This section does not treat environmental resources as pure public goods. With a pure public good each person would, for example, have the same exposure to environmental contaminants. Location decisions do allow people with higher willingness to pay to increase their consumption of environmental quality. The other extreme of perfect control over ones environmental exposure would make environmental quality more like a private good. This is an equally unlikely scenario because contaminants do move through the media of air and water. Benefits from wetlands, if they are provided to the owner of the land, are provided to large numbers of other people. Therefore it is the middle case of imperfect public and imperfect private goods that is discussed here. The income distribution effects of environmental benefits are dealt with at the end of this Chapter.

¹⁴ Public policy can recognize the contributions from private goods with public goods aspects and help to support them. An example of this is Bellevue's recent decision to exempt wetlands from the fee rate structure for the stormwater program.

consumer of the good. Its value is the price the consumer is willing to pay. The public good provides value to many people in society. Its value is the price that society collectively is willing to pay. For example, each property owner may value open shoreline. Given that the values taken together are high, society might be expected to behave accordingly. However, no property owner can collect from the other owners the value of the open space he provides. The owners will provide less open space than is socially optimal.¹⁵ If not for the activities of the political sector society would produce neither public goods nor enough private goods with public goods aspects.

Beyond the usual willingness to pay for the right to consume a public good consumers are also willing to pay for the option of utilizing a public good in the future. This "option value" can constitute a major portion of the value of goods such as wetlands. Citizens may not go fishing until they retire but they like to have the option of having the natural trout and salmon fisheries available for future use should they want them.

Closely akin to this is "existence" value. Citizens may be willing to pay to support something just so that they can know that it exists. Willingness to pay for activities that save a species they will never see in the wild is an example of this.

"Bequest value" is a form of option value that indicates the willingness to pay for an option one will never utilize oneself but which future generations may utilize. While there are options markets and some people hold on to objects they will leave to heirs, there is no such market for public goods. Ideally all of these values would be considered before defining an optimal level of environmental quality.

Property Rights

Our market economy relies heavily on the idea of property rights in order to function smoothly. It is clear who owns a private good such as a car and who has responsibility for maintaining it. Isolation of costs and benefits of a product to one consumer ensures sole property rights. Most property rights have some limitations as to how they can be used but who has a right to use a private good is generally clear. Property rights to environmental quality or the right to use the environment are not clearly assigned.

Two kinds of market failure result at the extreme ends of the property rights spectrum. The first is some goods are treated as "common property" and are over utilized (air). The second is that some goods with large public goods aspects are treated as private property (wetlands). When a wetland is developed the public benefits are under provided. Society as a whole would be more likely to

¹⁵ "Economic Valuation of Shoreline," by Gardner M. Brown and Henry O. Pollakowski, *The Review of Economics and Statistics*, 59, Aug. 1977, pp. 272-278. "Economic Valuation of Shoreline: A Comment," by A. Myrick Freeman, *The Review of Economics and Statistics*, 61, Nov. 1979, pp 634-635. "Economic Valuation of a Shoreline: A Reply," By Gardner M. Brown et. al., *The Review of Economics and Statistics*, 61, Nov. 1979, pp 635-636.

develop wetlands areas in a manner that would provide more public benefits and fewer private benefits.

When a property right is commonly held or unassignable it can be over utilized. An example is the question of rights to use the air. It is unclear whether the rights to use air belong to those who want to breathe, those who drive cars, or those who produce major emissions. Everyone attempts to behave as if they own the rights to the environmental capacity they desire. Prior to the Clean Air and Clean Water Acts members of society generally attempted to behave as though they owned the right to pollute. Unless there were immediate, clear health effects, missions and effluent were generated as if air and water were free goods.

Environmental problems caused by unclear definition of property rights and conflicting uses extend to all areas of the environment. Water is an excellent example of this problem. The quality of water is affected by a lack of clear property rights, even though ownership is relatively well defined in comparison with most environmental resources. In western water law, water rights may be construed to mean having the right to a certain level of water quality as well as to a specified quantity of water. "Water rights holders have a right to seek limitations on other water users who cause injurious pollution."¹⁶ Options include letting senior rights holders pursue common law remedies in court, an administrative agency that controls or prevents new or changed uses which infringe on existing water rights, lawsuits in tort for nuisance or trespass, and dependence on the public trust doctrine.^{17 18} Enforcement of these rights is costly and uncertain. Reimbursement of downstream water users for their costs related to contamination is rare. Appropriators must prove causation, deal with multiple parties, and pay for litigation. Even if an appropriator does decide to sue it is likely that the water quality interests of other water owners will not be represented. All of these problems raise the costs of protecting water quality through this means. Protection against impairment also does not protect future users.

¹⁶ Draft version 10/6/89, "Is Water Quality Control on a Collision Course With Western Water Law?" By Larry MacDonnell, Natural Resources Law Center, University of Colorado School of Law, Boulder Colorado 80309-0401, work supported by Jessie Smith Noyes Foundation. "A fundamental attribute of an appropriative water right is the ability to make a particular beneficial use of water. An appropriator has a right to expect that stream conditions -- quantity or quality -- will not be altered by newcomers to such an extent that existing uses are frustrated."

¹⁷ *ibid.*

¹⁸ "Water Pollution and the Public Trust Doctrine," by Ralph W. Johnson, *Environmental Law Journal*, 19, #3. Nonpoint "pollution can be regulated either by the courts or the legislatures under the public trust doctrine, which antedates the prior appropriation system, and which protects fisheries and water quality. Alternatively, this pollution can be controlled under the state's police powers. The 'takings' issue should not be troublesome because no one, not even prior appropriators, has or can acquire a legal right to pollute public waters."

Clearer definition of property rights could reduce the political and legal costs associated with using and protecting environmental resources including water. Requiring proof of causation and dealing with multiple parties create problems for the downstream water user trying to protect a water right. For example a shift in the burden of proof from the victim of pollution to the polluter would enhance the ability of the market itself to adjust levels of pollution. In many states either the courts or the legislatures are changing the way property rights to water function. The examples below¹⁹ provide an indication of this direction but not a comprehensive set of laws or rules to provide a water quality property right.

In New Mexico the State Engineer can condition a change of rights to protect existing rights from water quality related injury.

Colorado requires that exchanges or substituted water be of a quality and quantity to meet the requirements of use to which the exchanged water has been put.

A Montana court decision requires that wells be constructed and maintained so as to prevent the waste, contamination, or pollution of groundwater. Reasonable use for large appropriations includes a determination that includes water quality.

In California a board considers water quality control plans under the public interest criteria. Permits to appropriate must be rejected if not found to be in the public interest.

Idaho defines public interest to include water quality.

Nebraska instream flow purposes includes water quality maintenance. 14 states including Washington have special water management areas. Washington's is for groundwater.

Zoning is one way in which the public goods aspects of property rights associated with land use are controlled. The 2010 proposal for no net loss of wetlands could be facilitated by limiting rights to develop wetlands. If wetlands cannot be subdivided, if buffer strips are large, or if only ten percent of the area is allowed to be developed, the wetlands will be better protected.

¹⁹ Draft version 10/6/89, "Is Water Quality Control on a Collision Course With Western Water Law?" By Larry MacDonnell, Natural Resources Law Center, University of Colorado School of Law, Boulder Colorado 80309-0401, work supported by Jessie Smith Noyes Foundation.

Externalities²⁰

An externality is created when there is a physical side effect of the production process.²¹ Emissions from a factory may reduce health as the pollutants emitted are carried down the air shed. In normal market transactions, the buyer pays for the use of resources, labor, and equipment that other people own. When using air or water to get rid of waste the producer does not have to pay for the use of the environmental resource. The costs imposed on the public are not covered by the producer of the problem.

Emissions are allowed by the state without requiring payment for environmental and health damages. Since the producer does not have to cover those costs the price of the product is lower than it would be if it did include those costs. Consumers are able to buy more of the polluting product at the lower prices. As a result the unassisted economy produces more pollution and more of the products associated with contamination than is socially desirable.

Controlling the Problems

It is commonly held that the optimal quantity of pollution allowed for any industry or firm is the quantity which maximizes net benefits or equivalently, sets marginal²² benefits equal to marginal costs. A variety of research methods are available to determine socially optimal levels of pollution abatement. These methods are reviewed in the section on Estimation Methods.

Society may or may not choose to use the economic definition of optimal quantity as the goal or target level of pollution. Pollution quantity goals chosen by society may take into account non-economic objectives. If so the pollution level chosen as a goal need not maximize net benefits. Regardless of the pollution level chosen as a goal, there are a variety of market incentives and regulatory options available to reach any chosen goal. Regulatory options and market incentives are explored in this section.

²⁰ This section deals only with "technological externalities." Technological externalities are distinguished from "pecuniary externalities" in the economics literature. An example of a technological externality is the creation of smoke by a furnace. An example of a pecuniary externality is the drop in the price of large cars during a period of high oil prices.

²¹ There can be positive as well as negative externalities. A violinist practicing may please one neighbor (positive externality) and irritate another (negative externality).

²² A marginal benefit is the incremental change in benefits from an action. The increments chosen for analysis are supposed to be small. If marginal benefits are greater than marginal costs when a firm cuts back its emissions, then benefits to society are increased. By increasing the abatement each time the marginal benefits are greater than the marginal costs society moves toward the maximum potential benefits (net of the costs).

Institutions to Control Externalities

Once a target level of pollution is chosen, society has a variety of ways that it can influence actual pollution levels. Market incentives include taxation of pollution, marketable permits, mandatory deposit systems, and subsidies. The most common solution in this country is regulation. Regulations can require specific equipment or processes or they can limit production of pollutants. These market incentives and regulatory requirements can either be utilized together or alone. Financial incentives such as fines, penalties and fees are commonly used with a regulatory approach.

Regulation and financial incentives are means of inducing the economy to move toward the pollution levels chosen as a goal. If the optimal level is chosen on an economic basis, it is important to understand that optimality is a moving target that is often difficult to define. Who owns the rights to the air or water will change that target. This is because different ownership rights will create different measures of demand for a given level of effluent or discharges.²³ As it becomes cheaper or more expensive to reduce pollution, the optimal level will also change. As our understanding of environmental impacts changes, our perceptions regarding optimal pollution levels will also change. Even the time of year will change the socially optimal effluent levels because the quantity of water available for dilution will change.

If the world did not change, if we all had perfect information, and if industry was operating in a perfectly competitive business environment, any of the methods described below could adjust the level of pollution efficiently. However, both the cost of compliance with a given requirement and the social benefits of any given level of abatement change over time. Perfect competition does not exist. And finally, information is expensive. Given the constraints of the real world, it is important to understand the benefits and drawbacks associated with each of the options explored below.

Innovation

Innovation is the primary driver of increases in productivity over time. This includes the productive effort of pollution reduction. For that reason the impact of policy alternatives on innovation is critical.

Innovation can include changes in the processes, capital, and materials used to produce a product. Innovation can include changes in the products themselves. If these changes reduce pollution and improve environmental quality there will be room for further economic growth without massive environmental damages. Market incentives that make polluting more expensive will push innovation and the economy in this direction. Time and money will be expended on innovation up to

²³ "Willingness to Pay and Compensation Demanded: Experimental Evidence of an Unexpected Disparity in Measures of Value," by Jack L. Knetsch and J. A. Sinden, *The Quarterly Journal of Economics*, August 1984, pp. 507-521.

the point where the expected gains from innovation are maximized.²⁴ The value of the innovation to society will depend on how much the cost of reducing pollution changes.

Over time the technology for pollution reduction is improving. The cost of achieving any given level of pollution abatement is falling.²⁵ Over time, society's perception of the benefits of reduced contamination is also changing. If a company gets no benefit from changing technology in order to reduce emissions then they will not do so. Society will lose the gains which could have been made.²⁶ Likewise, if a company has no incentive to invent new ways to reduce emissions then those potential gains are lost. The regulating authority must force the company to make the desired changes in technology by changing its requirements.

Tables 1 and 2 below provide an overview of the impacts of policy options on three different situations. Cases two and three are the most realistic since technology does improve over time. Unless the regulatory authority makes perfect adjustments to the changes in opportunities for innovation and the changes in existing technology our current system of command and control regulation allows emissions which are too high and innovation expenditures which are deficient.

(Case 1) If the marginal costs or benefits of abatement do not change, any of the market incentive options will provide the theoretical optimum²⁷ level of emissions and innovation. The current command and control regulation strategy will not provide sufficient incentive to innovate, and emission levels will be too high. (Case 2) If there is a reduction in the marginal costs and the control authority does not adjust either the market incentive or the regulation it is likely that none of the policy options will produce optimal levels of innovation. Fees and subsidies will cause over investment in innovation while regulation will cause deficient investment in innovation. Emission levels will be too low under fees and subsidies and too high under direct regulation. (Case 3) If abatement

²⁴ The gains from new information may create positive externalities. In so far as this occurs the value of policy options which encourage innovation is increased.

²⁵ Many readers will balk at this. Total pollution abatement costs have been going up over time. However, most of that cost increase, above and beyond inflation, is due to the fact that the clean up levels have shifted over time. Society can still reduce the contamination using twenty year old technology. More up to date technology could achieve the old removal levels for less. Society simply chooses to reduce contamination to lower levels per unit of product than it did in the past.

²⁶ Once a company has an air permit for a certain technology it is not reviewed at the state level unless the company proposes a change in the source. This creates an industry with very different levels of emission controls and emission control related costs.

²⁷ This optimum is the level derived based on economic criteria rather than the level set by society.

costs fall and the control authority does adjust the policy, and there is a "ratchet effect"²⁸ each policy option other than fees creates deficient incentives to innovate. Fees produce excessive incentives to innovate. Emission levels under ratcheting should be at the optimal level for all policy options.²⁹

Table 1. INCENTIVES FOR INNOVATION UNDER VARIOUS POLLUTION CONTROL ARRANGEMENTS

	Effluent Fees	Subsidies	Marketable Permits	Direct Regulation
Case 1	Optimal	Optimal	Optimal	Deficient
Case 2	Excessive	Excessive	Indeterminate	Deficient
Case 3	Excessive	Deficient	Deficient	Deficient

Table 2. EMISSION LEVELS UNDER VARIOUS POLLUTION CONTROL ARRANGEMENTS

	Effluent Fees	Subsidies	Marketable Permits	Direct Regulation
Case 1	Optimal	Optimal	Optimal	Too High
Case 2	Too Low	Too Low	Indeterminate	Too High
Case 3	Optimal	Optimal	Optimal	Optimal

Timing

No matter which option is chosen, a steady movement toward goals that are described well in advance will tend to reduce the costs of obtaining any given level of environmental quality. It should be clear from the discussion above that optimal levels of pollution and innovation are difficult to obtain. It is very costly to obtain enough information to fine tune any of the proposed solutions. It is also costly for industry to respond to rapid changes in regulations and financial incentives.

²⁸ A ratchet effect would cause regulations to become more and more stringent as the cost of emission reduction drops over time and the regulations are continuously adjusted. This is typical of the regulatory process for most environmental agencies. If fees are adjusted the opposite should take place. As the costs of abatement decrease and more abatement takes place fewer costs are imposed on society and the environment. Ideally fees should be reduced in order to avoid over adjustment. The fees should continuously be adjusted downward over time. This latter scenario is unlikely if agency programs are dependent on fees as a revenue base.

²⁹ "Innovation in Pollution Control," By Paul B. Downing and Lawrence J. White, Journal of Environmental Economics and Management, 13, pp. 18-29, 1986.

Providing industry with solid information on future regulations and market incentives well in advance will go a long way toward minimizing the long run cost of achieving any given level of future pollution reduction.³⁰ With any of the proposed solutions time should be allowed for response and adjustment.³¹

Enforcement

In addition to choosing policy options such as regulation and/or market incentives the level expenditures for enforcement must be chosen. Without enforcement any regulation, tax, or marketable permit system will have significant compliance problems.³² Lack of broadbased compliance puts the companies which do comply at a serious competitive disadvantage.³³

The level of expenditures for enforcement is a major policy question whether regulation, market incentives, or both are used. Enforcement is easier and less expensive if penalties and the criteria for application of penalties are clear. With clarity less time is involved determining the penalty and in litigation later. Litigation is often so expensive that the penalty process is burdensome for both the defendant and the enforcement agency. Ecology reduced 36% of the penalties given in the last fiscal year. In many cases this was done in order to decrease potential legal costs of obtaining the penalty.³⁴ Clear criteria and mandatory penalties should reduce some of these losses.

³⁰ Having good information about the future regulatory and market environment will at the very least reduce investment in long term capital that is bound to be displaced rapidly. It may be that one of the major benefits of extended public review is to reduce the likelihood of inappropriate or unprofitable capital investment.

³¹ A good example of a well designed build up of incentives over a reasonable time horizon is the surcharge on radioactive waste passed in Public Law 99-240, the Low Level Radioactive Waste Policy Amendments Act of 1985. A surcharge of \$10 was added for out of region waste in 1986. It was doubled first in 1988 and again in 1990. The intent of the federal law is to manage radioactive waste on a regional basis. In 1993 Washington will not need to accept out of region waste.

³² Inspectors find compliance problems at 90% of the sites visited for the first time. Nearly half of these are substantive infractions resulting in some degree of hazard. Personal conversation with Hugh O'Neil, Dangerous Waste, 6/14/90.

³³ During surveys of industry regarding compliance costs this is a frequent complaint.

³⁴ In 1988 there were 192 penalties. 69 of the cases completed the appeal process and were reduced by Ecology or the Pollution Control Hearings Board (PCHB). The reduction totaled \$390,000 of the \$1,083,000 in penalties. Most of the adjustments were made based on settled agreements, some were vacated by the PCHB, and the remainder were relinquished due to bankruptcy or other collection difficulties.

Costs of applying the criteria will depend largely on the design of the regulation or the market incentive. It is simpler to determine whether a required technology is in place than it is to monitor emissions. Therefore regulations based on technological requirements should be somewhat cheaper to enforce than regulations based on performance. Likewise, it is simpler to tax permitted discharges than to tax actual monitored discharges. Random compliance monitoring costs should be comparable for taxation or regulation.³⁵

In some situations enforcement costs can be reduced by reports of violations made by others outside the enforcing agency. This rarely happens now. The incentive to report on other companies "out of compliance" with permits extends only to competitors in the same industry under a regulatory or a tax system. If marketable permits are used companies may have more incentive to report companies in other industries which are not in compliance. This is especially true if companies were able to purchase or sell permits to pollute in an exchange system that functions well. In so far as other companies do not need to comply with the permits they own, it lowers the sale value of purchased permits. Companies which own and abide by permits will lose value on those permits regardless of whether or not the noncompliant party is a competitor. Enforcement also appears to compare positively with subsidies in the case of hazardous waste.

Increased enforcement expenditure is superior to the current situation of low enforcement and high violations if the following criteria are met. The marginal social cost of illegal disposal should be relatively high. This would appear to be the case for hazardous waste illegally disposed of in Washington. If, in addition, the demand for disposal is price responsive and the probability of punishment is responsive to changes in enforcement expenditures then increased enforcement is recommended. A subsidy policy is superior if (a) the marginal social cost of illegal disposal is relatively large, (b) the price elasticity of demand for waste disposal is relatively small, and (c) the elasticity for the probability of punishment with respect to enforcement resources is relatively small.³⁶

³⁵ Emission reductions from some sources transferred as a marketable permit have proved more difficult to enforce than expected in local experience.

³⁶ Policy Options for Toxics Disposal: Laissez-Faire, Subsidization, and Enforcement," by Arthur M. Sullivan, *Journal of Environmental Economics and Management*, 14, 58-71, 1987.

Table 3: OPTIMALITY REQUIREMENTS FOR ALTERNATIVE ENFORCEMENT POLICIES

Factors Defining Optimal Policy	Current Levels	Subsidy	Enforcement Increased
Marginal Social Cost of illegal disposal	small	large	large
Price elasticity of demand for disposal	large	small	large
Elasticity of change in probability of penalty given a change in resources	small	small	large

EPA estimates that one-seventh of the toxic-waste generators discard their waste illegally. The citizens of Washington passed Initiative 97 creating a .7% tax on the value of toxic substances. The revenue generated is intended to partially cover clean up of hazardous waste sites. The expected range of costs for clean up of these sites is from \$600,000 to \$55,000,000. Almost a third of those willing to respond to a survey indicated their site fell into the high range.³⁷ This implies that the marginal social cost of illegal disposal are high. It is possible that better monitoring, inspection and enforcement could have reduced some of these costs.

Demand for disposal of inter-region low level nuclear waste disposal has been price responsive. This suggests that the price elasticity of demand for disposal of other hazardous substances may be large also. State fines and penalties are viewed as an effective tool by hazardous waste transportation, treatment, storage, and disposal operators.³⁸ The remaining question is whether increased enforcement will actually increase penalties and therefore increase compliance.

Regulation

The term regulation as used here includes command and control types of requirements that limit pollution. In general there is no financial incentive such as a fine or penalty unless the requirement is violated. The requirements combined with fines and penalties create incentives to reduce pollution but the incentives are not designed to produce least cost compliance across companies or to create innovation. Within the concept of command and control regulation, there are two main categories of regulations or rules. These are performance and technological rules.

A performance regulation provides a ceiling for emissions or effluent load per unit of time and space. Ceilings can be based on a targeted level of reduction, a percentage reduction across the board, or a level based on some estimate of optimality. Ceilings can also be used intermittently.³⁹ Technological rules may require specific technology or classes of technologies to reduce pollution. Regulations based on technological requirements may be driven by the cost of the technology as well as the needed result. For example, the cost of the technology required may be far greater for areas with serious pollution problems. Often

³⁷ Small Business Economic Impact Statement: Model Toxics Control Act Cleanup Regulation Chapter 173-340 WAC. Department of Ecology, 1989.

³⁸ "Hazardous Waste Issues in Washington State: Results of a Survey of Treatment, Storage, and Disposal Operators," Fall 1989, Social and Economic Sciences Research Center, WSU, Pullman, WA. 91% of the respondents rated fines and penalties as either very effective (47%) or somewhat effective (44%). "Hazardous Waste Issues in Washington State: Results from a Survey of Transporters," Fall 1988, Social and Economic Sciences Research Center, WSU, Pullman, WA. 85% of the respondents rated fines and penalties as either very effective (48.9%) or somewhat effective (36%).

³⁹ An example of an intermittent ceiling is the requirement that people not use wood stoves during declared periods with high air pollution.

both ceilings and technological requirements are used. Generally there are also penalties associated with non-compliance.

From the economist's viewpoint, most types of regulations require the same amount of information to define the optimal level of pollution to be achieved by the rule. The main difference is in the incentives they create for the private business. Incentives created by a regulation depend on its design.

Regulations which require a proportional reduction in the quantity of effluent create high costs for some industries and very minimal costs for others. If this kind of regulation is expected by firms they will avoid installing pollution control equipment prior to the enforcement date, since the cleaner the firms history the higher is the cost that will be imposed on them. The cost to the firm that cleans up too early will be the cost of the initial reduction plus the cost of the further proportional reduction.

Regulations which specify the technology or the quantities of emissions or effluent allowed do not create as much incentive to have a "dirty history." They also create little incentive to innovate, once the allowable emission or effluent rate has been achieved. Regulations based on specific capital requirements will create a disincentive to innovate and further reduce pollution because innovation may create an increase in future requirements.

The Clean Air Act establishes thresholds for criteria air pollutants. Below this threshold pollutants are treated as if they have a low cost to society. Above the threshold pollutants are treated as if they are very costly. The result of such a policy is to encourage and increase contaminating activities in cleaner areas, if the opportunity to build or expand in a new area exists. Eventually the incentives created will tend to spread contamination. In Washington permit applications in areas not classified as "nonattainment areas" have less stringent technological requirements. Industry is required to have "reasonable" available control technology. Within "nonattainment" areas either "best" available control technology or technology providing the lowest achievable emissions is required.⁴⁰ Permits are generally not revised once they are issued, unless a new source or an addition to the source is added by the company. The fact that regulation is triggered by a petition to add capacity create a disincentive to invest for companies or facilities with old permits.⁴¹

Washington NPDES or state permitted discharges are reviewed on a regular basis. As the costs of compliance and social costs change, the requirements can be changed. Repeated revision of rules such as the NPDES and state permitted discharges creates the "ratchet effect" in which requirements increase and change over time. The quality of the receiving water will sometimes drive the abatement effort required of permittees. This means that additional sources and discharges

⁴⁰ Over time the technology required in each classification improves. Once the lowest achievable technology has been successfully applied in an area it becomes the "best" available control technology. Over time it becomes considered the "reasonable" technology.

⁴¹ The bubble programs mitigates this latter negative incentive.

from other sources may impose costs on other dischargers. Permit trading is not allowed. Dischargers are not allowed to pay other companies to reduce their discharges. A cost savings could be achieved if a company with very high costs of reduction could pay another company to reduce its discharges.

It has been shown that regulation has both imposed costs and had an impact on prices throughout the economy. Using input/output analysis Pasurka estimates that 1977 price increases ranged from .12 percent for real estate and rentals to 6.58 percent for electric, gas, water, and sanitary services.⁴²

One benefit of a regulatory system is the ability to specify the pollutant levels or the equipment required based on spatial distribution and pollutant characteristics. The economic literature has sometimes indicated that pollution taxes would require less information to implement than a regulatory system. This may not always be the case. Given that most pollutants are persistent and move, the tax systems described below may have information requirements similar to a direct regulatory system.⁴³

Pollution Taxes⁴⁴

In economic circles it is commonly held that taxation of pollution will create positive changes in economic decisions. It is also widely believed that "the

⁴² The Short-Run Impact of Environmental Protection Costs on U. S. Product Prices, by Carl A. Pasurka, Jr., *Journal of Environmental Economics*, 11, 380-390, 1984. Other industries with high price increases are crude petroleum, petroleum refining and natural gas (3.69%), chemicals and selected chemical products (3.38%), iron, ferroalloy ores, coal, stone, clay, chemical, and fertilizer mining (2.67%), paper and allied products, except containers (2.56%), plastic and synthetic materials (2.4%), primary iron and steel manufacturing (2.35%), primary nonferrous metals and manufacturing (2%), stone and clay products (1.55%), paints and allied products (1.46%), leather tanning and finishing (1.30%), metal containers (1.34%), paper board containers and boxes (1.33%), and motor vehicles (1.32%). Of the remaining input output classifications, 53 had price increases under one percent and seven had price increases at or just above one percent. Due to substantial structural changes in the economy from 1972 to 1977, the results are not definitive but may show the relative magnitude of the price impacts.

⁴³ "Environmental Policy for Spatial and Persistent Pollutants," by Ronald C. Griffin, *Journal of Environmental Economics and Management*, 14, pp. 41-53, 1987. Griffin assumes that the primary advantage of pollutant taxes over regulation is reduced need for information. He shows that given spatial distribution and persistent pollutants the tax function may be discontinuous over time and that regulations and incentive taxes require similar information. The incentive to innovate (see discussion above), the reduction in excess burden from other tax bases (see discussion below), and price impacts however also provide advantages to the incentives approach.

⁴⁴This discussion relies heavily on *The Theory of Environmental Policy*, by William J. Baumol & Wallace E. Oates, Prentice Hall, 1975, Chapters 11 & 12.

incentive effects of our tax structure could be made more consistent with the goal of economic efficiency by substituting pollution taxes for other taxes which impose large excess burdens on our society."⁴⁵ ⁴⁶ Pollution taxes create incentives that will drive the economy to innovate and to reduce pollution.

Like any "sin tax," society taxes the activity that it wishes to discourage as opposed to taxing another tax base. A tax on emissions of toxics is an example of this kind of market incentive. If the tax is set at a very low level, it will only reduce emissions that are inexpensive to prevent. If the tax is set at a high level it will reduce emissions that are more costly to prevent as well as those that are inexpensive to prevent. By setting the tax higher or lower society can produce any given level of emission reduction. Ideally pollution taxes are designed to capture the social costs imposed by the pollution. However they can be defined to produce a given level of revenue or a given level of pollution reduction.

The efficiency of pollution taxes comes in part from the way that firms avoid the tax. Emissions will only be reduced if it is cheaper to reduce than to pay the tax. This ensures that any given level of emission reduction will be achieved at the lowest cost possible.

Additional efficiency effects come from the cost effects of the tax. Under current regulatory systems, polluters are required to reduce their pollution but not to pay for the costs the remaining pollution imposes on others. In the case of products which create pollution the product price is too low since the price doesn't account for the cost of pollution. Buyers purchase more of a product when the price is low. This shift away from the optimal quantity happens because "the market price of the product failed to account for health and ecological costs that were not borne by the purchaser."⁴⁷ Too much of the product will be purchased and produced. Because the polluter uses the environment for free, firms which do not pollute have costs and prices that are too high relative to those of polluting firms. If the tax approximates the socially optimal level this situation would be reversed. The cost of production of goods with associated pollution will rise and so will the prices. Some production will shift from polluting methods toward other methods. Some consumption will shift from products associated with pollution to cleaner products.

Further efficiency effects come from the possibility of utilizing the pollution tax revenues to reduce other taxes. A tax on pollution which is matched by a

⁴⁵ Substituting Pollution Taxation for General Taxation: Some Implications for Efficiency in Pollution Taxation, Dwight R. Lee and Walter S Misiolek, *Journal of Environmental Economics and Management*, 13, 338-347 (1986).

⁴⁶ Even if no explicit linked tax reduction is made, the pollutant tax should be deductible on the federal corporate income tax. This will cause a decrease in the excess burden from the federal corporate income tax. "The efficiency value of effluent tax revenues," D. Terkla, *Journal of Environmental Economics and Management*, 11, 107-123 (1984).

⁴⁷ *ibid.*

reduction in other taxes will reduce the tax burden on clean industry and increase the tax burden for industries dependent on polluting.

While pollution taxes are often proposed as a funding base for environmental activities there is no theoretical reason to isolate the use of revenues this way. One of the major potential benefits of a pollution tax is the reduction in other seriously over utilized tax bases. In so far as the pollution tax is used to off-set other taxes which create a large excess burden⁴⁸ it may improve the efficiency of the economy.⁴⁹ Terkla estimated an annual "efficiency value," or the value from reducing income taxes or corporate income tax and replacing it with revenue from a tax on sulfur and particulate emissions. The value of the increased incentives to work or to invest would be from .63 to 3.05 billion if the revenue were substituted for personal income tax and from 1 to 4.87 billion if the revenue were substituted for the corporate income tax. The tax estimate was calculated to achieve primary air quality standards for sulfur oxides and would generate from 1.8 to 8.7 billion depending on industry response. The efficiency value could be half of the value of the tax to society.⁵⁰

A tax on pollution will create an incentive to reduce pollution both immediately and over time. There will be an incentive to innovate and improve pollution reduction methods. The way the market incentives work depends on the way the tax is structured. Poorly structured taxes could be worse for the environment than no pollution taxes.

A tax on effluent alone will reduce contaminants in effluent but it may also create an incentive to shift some contamination from the water to the air. This could further reduce air quality. Ideally the pollution tax should be based on toxicity and environmental damage regardless of the medium of disposal. Any shifts in the medium of disposal will then be based on relative levels of environmental damage.

⁴⁸ Excess burden is the reduction in the quantity of a product that is unintentionally created by a tax. For example the tax on corporate profit may create a disincentive to invest. This reduction in investment is not one of the intended effects of the tax. The product that could have been created if investment had not been reduced is lost to society.

⁴⁹ Substituting Pollution Taxation for General Taxation: Some Implications for Efficiency in Pollution Taxation, Dwight R. Lee and Walter S Misiolek, *Journal of Environmental Economics and Management*, 13, 338-347 (1986). The pollution tax should be increased as long as the marginal environmental benefit plus the marginal tax substitution benefit are greater than the marginal pollutant reduction costs. If a tax increase will increase revenues at the point where the marginal environmental benefits equal the marginal abatement costs, then the tax should be raised to take advantage of the tax substitution benefits.

⁵⁰ The Efficiency Value of Effluent Tax Revenues, by David Terkla, *Journal of Environmental Economics and Management*, 11, 107-123, 1984. All figures in 1982 dollars.

A tax or fee that is capped at a maximum level or a tax rate which drops as the quantity increases creates an economy of scale. The large polluters have less incentive to reduce pollution than the minor polluters. This places a greater burden on small polluters. If there is no reduction in rates and no cap for large polluters the incentive to minimize pollution will remain strong for large polluters.

The current tax on toxics here in Washington is based on the value of the product rather than the toxicity of the product. This will tend to reduce consumption of products with toxics in them but will not create an incentive to reduce the toxicity of the products.

The national excise tax on tonnage of ozone depleting chemicals is adjusted based on an ozone depletion factor.⁵¹ The tax will create an incentive to reduce the consumption of the taxed chemicals in proportion with the ozone depletion factor. The rate for halons is greater than the rate for CFCs. This will tend to reduce the consumption of the halons more than the it will reduce consumption of CFCs.

One objection to using a tax to reduce pollution is the uncertainty as to the final level of contaminant reduction that will result. "Because ultimate reaction to the tax is only speculative there is a high probability that the control induced by the tax will not be adequate to meet environmental standards."⁵² It is also possible that pollution will be reduced and environmental conditions will improve beyond the minimum standards or the socially optimal level. In other words, there is a concern that the tax will be set so high that it will create a large "excess burden" in terms of reduced output of pollution and products. This is a reasonable concern with any tax base. It is a likely problem with pollution taxes because they have a positive image in the political arena.⁵³

This problem of excess burden is identical to excess burden problems for other tax bases. Every tax that is not a "sin tax" creates an excess burden beyond the revenue generated. Income taxes create a disincentive to work. Sales and excise taxes create a disincentive to purchase and produce. The Business and Occupation Tax creates an incentive to reduce production. With a "sin tax" there is an intent to cause these avoidance adjustments. In order to assure that a tax is creating the impacts the lawmakers intend it will be necessary to adjust the tax rates over time.⁵⁴ Another way to avoid a high excess burden from pollution

⁵¹ Environmental Reporter, 1/5/90, "IRS Issues Guidance Implementing Excise Tax on Ozone-depleting Chemicals."

⁵² "The post regulatory environmental protection regime," by Alvin L. Alm, Environ. Sci. Technol., Vol. 23, No. 11, 1989, American Chemical Society, pps. 1338-1339.

⁵³ "Apple-Pie Aspect of Environmental Taxes Draws Proponents Even From the Ranks of Lip Readers," Wall Street Journal, May 21, 1990, A12.

⁵⁴The tax rates should be indexed to adjust for inflation. Additional adjustments due to changes in costs and benefits will also be necessary.

taxes is to have legislation linking the tax base to levels of environmental impact.

In some cases it would be relatively simple to substitute an existing revenue base for a pollution tax base with little change in the revenue generated. An example of tax substitution designed to create appropriate incentives would be to change the way motor vehicle use is currently taxed. Designing a pollution tax that approximates the damage caused by the pollutant depends on the incentives society wishes to create. Emissions and contaminants in stormwater from motor vehicles are an increasingly serious environmental problem. A tax on auto exhaust for example would be difficult to collect. Some proxies for this include a tax on gasoline or vehicles.⁵⁵ If the annual tax on the vehicle were based on an emissions test and the change in mileage from the date of the last test, it would create an incentive to maintain the vehicle so as to reduce emissions. A tax designed to take the place of the current Motor Vehicle Excise Tax could generate the same amount of revenue and create an incentive to reduce pollution from vehicles.⁵⁶ The conservation report contains a similar proposal to use a gas sipper and gas guzzler tax to replace this tax base. Any of these taxes would increase the use of public transit and make it more cost effective.

While pollution taxes are often proposed as a funding base for environmental activities there is no theoretical reason to do this. The potential revenues from the Congressional Budget Office for taxes on nitrogen-oxides, sulfur-dioxide, water pollutants, carbon in fossil fuels, and new vehicle emissions is over 40 billion dollars.⁵⁷

Subsidies

If society pays a polluter not to pollute or pays for pollution control equipment it is a subsidy. A more hidden form of subsidy is the reduction to taxes based on reduction of pollution or the purchase of pollution preventing equipment. Subsidies are appropriate when the polluter has a right to pollute.⁵⁸ While subsidies may reduce pollution from a given level for one company they may produce other effects. Generally the subsidy is intended to reduce costs. Depending on the nature and size of the subsidy the profitability of the

⁵⁵ 2010 hearing suggestion from the public.

⁵⁶ This would be a more regressive structure since the poor tend to own older vehicles. Older vehicles have greater problems with air pollution control.

⁵⁷ "Apple-Pie Aspect of Environmental Taxes Draws Proponents Even From the Ranks of Lip Readers," Wall Street Journal, May 21, 1990, A12.

⁵⁸ Since a right to pollute is rarely granted it follows that subsidies should also be rare. An example of a right to pollute is the fact that we all breath out carbon-dioxide. Few would assert that we have no right to do so and should stop. In so far a rights to beneficial use of water reduce the carrying capacity of the water system for natural contaminants, the environmental effects (increased sediment deposition for example) may be viewed as a legal right by some.

polluting company can be increased. For some subsidy structures increased profitability may cause entry into the industry and actually increase overall pollution levels. Baumol and Oates sum up the general perception of the literature well.

"In principle, there does exist a program of subsidies that can sustain optimal levels of polluting activities. But the very character of this program suggests immediately that although it may be an interesting theoretical construct, it is virtually inconceivable that any such program would ever be adopted in practice."⁵⁹

Subsidy payments based on reduction from past levels of pollution can cause the firm to reduce pollution. The firm will reduce pollution as long as the cost per unit of reduction is lower than the subsidy granted. If companies believe that payments will be based on reduction from past levels they will have an incentive to create an exaggerated history of their pollution. Unless new entrants to the market are denied the subsidy this system can tend to create market entry.⁶⁰ The denial of subsidies to new firms will give the existing firms a competitive advantage. While denying new firms the subsidy eliminates the problem of market entry some other policy must be designed to persuade new entrants not to pollute.

Sullivan defines the circumstances involving illegal disposal of toxics under which a subsidy may be preferred to the current combination of regulation and enforcement. The subsidy policy is superior if (a) the social cost of illegal disposal is relatively large, (b) the demand for waste disposal is relatively unresponsive to prices, and (c) the probability of punishment does not respond much to the level of enforcement resources.⁶¹

One form of tax subsidy allows an expenditure, usually for equipment, to be used as a deduction or a credit.⁶² If the equipment adds to the company's costs and

⁵⁹ The Theory of Environmental Policy: Externalities, Public Outlays, and the Quality of Life, by William J. Baumol and Wallace E. Oates, pg.174, Prentice-Hall, New Jersey, 1975.

⁶⁰ The Small Business Act, Section 7(a)12 provides long term, low interest, financing assistance to small, existing, profitable businesses for planning, designing, or installing pollution control equipment. Eligible businesses must be at a financial disadvantage with respect to similar businesses because of government requirements.

⁶¹ Policy Options for Toxics Disposal: Laissez-Faire, Subsidization, and Enforcement," by Arthur M. Sullivan, Journal of Environmental Economics, 14, 58-71, 1987.

⁶² Washington used to allow a pollution control tax credit on projects approved by the Department of Ecology. While no new credits are allowed now, there are approximately 1000 facilities using the credit based on eligibility granted between 1967 and 1981. These credits currently provide little incentive for new pollution control projects. However if the existing projects are not

doesn't add to its profits the subsidy will not provide an incentive to reduce pollution. In order to provide an incentive the value of the deduction or credit must be greater than 100% of the value of the expenditure. A temporary tax subsidy however, can help to ease the adjustment process of rapid change due to legislation or rules that require large new expenditures.

Another form of tax subsidy exempts or reduces the tax on a commodity currently taxed if it is altered so as to reduce the pollution created. Reduced gasoline taxes have been suggested for oxygenated fuels here⁶³ and for unleaded fuels in England.⁶⁴

Deposit systems

Deposit systems have been successful at reducing litter. They combine the properties of the pollutant tax and a subsidy. A deposit-refund system has potential for managing other environmental problems including illegal disposal by Small Quantity Generator hazardous waste if a hazardous substance is an input for production.⁶⁵ Deposit refund systems are helpful in disposal situations where there is a low risk to being caught, a low probability of penalty, and a high cost of disposal. In such situations there is generally a high cost of enforcement by comparison with the benefits of enforcement.

The deposit need not equal the refund. The level of refund can be set to provide the incentive necessary to improve compliance to the desired level. If the refund is less than the deposit then the deposit system will also have some effects that a tax on pollution has. The existence of an unrefunded portion of the deposit will create an incentive to reduce the use of a hazardous substance.

As a practical matter it is easier for the state if the deposit is collected from either the manufacturer or from the entity bringing the item (auto bodies, hazardous substance, etc.) into the state. Enforcement and auditing requirements will be similar to a tax and subsidy system taken together.

used the credit may be revoked by the Department of Revenue upon a recommendation by the Department of Ecology. Ellen Thompson, Department of Ecology, 2/21/90.

⁶³ This 2010 report in the Air Program.

⁶⁴ "The poison in lead," The Economist, February 25, 1989, pp 17.

⁶⁵ "Deposit-refund Systems for Managing Hazardous Wastes Produced by Small Businesses" by Wendy Pratt Cuckovich and Seymour I. Schwartz, Journal of Environmental Management, pg. 145-61, 1989 Academic Press Limited. Auto body, used oil, and pesticide container programs are reviewed.

Marketable Permits

Marketable permits allow the regulatory process to determine the levels of contaminants to be permitted for a given period of time.⁶⁶ Marketable permits to create emissions or effluent would become the property of companies or entities. Within some limits these owned permits would allow the polluter to generate emissions or effluent that pollute specific areas⁶⁷ for a certain period of time. A firm that will raise pollution in a specific area could purchase the permits to emit from other potential polluters that own permits in that same area.⁶⁸ Firms will attempt to minimize the cost of pollution abatement and to reduce the number and cost of the permits they require for operation. The fact that the permits are saleable and valuable will create an incentive for permit owners to innovate and to reduce their pollution. As innovation takes place and air pollution is reduced by one company, the permit could be transferred to another company. This encourages the companies with the lowest costs for pollution reduction to reduce emissions. Companies with the highest costs to buy more permits.⁶⁹ Society obtains through these transfers pollution reduction at the lowest possible marginal and total cost.

The marketable permits process avoids the problems of excess entry that may occur under a subsidy system because new polluters must purchase permits. This raises rather than lowers the costs of new entrants. This will be less true if companies with small emissions or discharges are exempted.

⁶⁶ Transferable rights are more likely to cut the cost of pollution reduction if they are viable for a reasonable planning period of five to ten years. They can be distributed based on current permitted levels or they can be auctioned off on a regular basis with a stipulation that purchased rights must be less than current ownership.

⁶⁷ The area affected by the contamination may be a set of downstream reaches of a river or a set of subregions in an air-shed. It is important to note that multiple permits to emit air pollution may create overlapping impacts. Thus the permit to emit in one subregion may require a permit to create an impact in other subregions as well. The same holds true for water pollution. These overlapping impacts make estimation more difficult but make trading of permits more viable.

⁶⁸ A "pollution offset system" requires a significant dependence on modeling but it reduces the number of markets in which the polluter has to purchase rights by comparison to requiring that the polluter buy the rights in each area ("ambient permit system"). This may in the short run improve the probability of reducing the cost and increasing the level of pollution prevention. "A comparison of Two Marketable Discharge Permits Systems, by Albert Mc Gartland, *Journal of Environmental Economics and Management*, 15, pp. 35-44, (1988).

⁶⁹ Minimizing the cost of reaching a given level of pollution reduction is the primary argument for the sulfur dioxide allowance selling program in the clean air bill (HR 3030). *Environmental Reporter*, 12/8/89, pp. 1376.

Permits can be allocated based on past emissions or discharges, based on bidding for rights, or based on a combination of technological requirements and bidding. In limited circumstances the market power from ownership of permits could be used by a would be monopolist to limit competition and drive up the costs of rival companies. An overbuying rule can limit damage to the efficiency of the economy and the abatement program from such market manipulation.⁷⁰

Marketable permits will be difficult to use if enforcement costs are high. Compliance problems will have an impact on the value of the permits. If compliance problems have an impact on total allowed emissions and awards are based on reductions from past allowables, compliance will also have an impact on the willingness of companies to release permits for sale.

⁷⁰ "Exclusionary Manipulation of Markets for Pollution Rights," by Walter S. Misolek, and Harold W. Elder, *Journal of Environmental Economics and Management*, 16,156-166 (1989).

Cost Benefit Analysis, Technical Limits on Optimality, and Estimation Problems

New ideas and action strategies are often difficult to evaluate. Defining the optimal level of each action is even trickier. A great deal of work must be done on each of the action packages before staff can estimate the full costs and benefits as well as optimal levels. Because the product environmental quality is not a market good, there is less data on the value of each of these actions than there would be for a market commodity.

Estimating the costs of the 2010 strategies is complicated by the many changes which are expected in the next 20 years. Large population increases are expected for Washington. Massive technical changes have occurred in the last 20 years. It can be hoped and expected that this pattern of technical change will continue. It is part of the cure to our current dilemmas. Changes in patterns of living intended to solve other problems (such as increased use of transit and development around transit lines to address traffic problems) will also change the basic assumptions for any modeling of costs.

Estimating the costs and benefits for 2010 strategies is complicated by the disaggregated scope of the design. Even forecasting aggregated estimates such as Gross National Product can be challenging for a time horizon beyond five years. 2010 strategies attempt to describe programs that should be in place within the next 20 year period. In general underlying variables in a stable system can move a great deal without changing the aggregated impacts.

Both the expectation of significant change and the disaggregated scale should give the reader a sense that none of the numbers or the ranges forecast as costs or benefits in this document can be taken as absolute.

Determining optimal levels for proposals is made difficult by the early stage of this scoping document. Because of this, some of the proposals (Eg. the proposed tax on parking lots) are merely designed to keep environmental quality from deteriorating further. No improvement is likely to occur. Yet the benefits and costs will have grown. The population will have grown, the number of people benefiting from the policies will have increased, and the potential costs of continued deterioration would be quite high.

Substantial evidence suggests that the public does value environmental goods. The policy question as to how much effort should be directed where and for whom is the primary question for future cost benefit analysis. The techniques covered in the sections below are methods used to obtain evidence that can indicate the relative costs and benefits of policy options. The 2010 Report attempts to quantify some of the costs to government and to the public of following through on proposed action items. It also describes the benefits to society of the proposed projects. In some cases it has been possible to quantify the benefits in gross physical terms. For example the air proposals have attempted to quantify health risk reductions.

In some cases the evaluation has identified serious information gaps. The analysis of costs and benefits is based on the data and information available in existing reports and documents. In so far as possible staff attempted to rely on local data. However data from other regions can also be helpful in estimating

the value of environmental goods. The existing information for flood control benefits from wetlands included both a local flood control example and a study from the Charles River Basin. While the cost of the wetland property is lower here than near the Charles River, the value of damaged property here is also lower. Extrapolation can be used to provide reasonable estimates of the value of the wetlands. However, it may not be possible to approximate reasonable confidence intervals for the extrapolated value.

Sometimes the data is not collected with a specific environmental question in mind. While this may not seem serious at first glance it can create problems. Studies are often systematically designed to reduce certain kinds of bias. These design elements may introduce other kinds of bias for economic analysis. For example, studies of animal mortality extrapolated to humans may be multiplied by a factor of ten in order to set standards which are conservative in their protection of human health and the environment. This conservative design will frustrate an effort to use the extrapolation to estimate the human health costs of the relevant pollutant.

For some of the Action Packages the data was excellent and for some it was not. The conservation packages were based on very good data. The existing cost information available was good for the Wetlands analysis in the sense that both the biases and the direction of the biases were clear and easily noted. This is ideal for existing data and analysis since it allows the reader to critically review the work.

As each of the proposals is developed in more detail over time it will be important to evaluate them. The evaluation methods described below can help to define the costs and benefits of the final proposals. They can be used to determine, from an economic perspective, the optimal targets for policy implementation whether it be wetlands preservation or pollution reduction. Each method has different capabilities and problems. While these problems give cause for concern it should be noted that where multiple methods are used to analyze the same question they often give similar results. Hedonic analysis (see below) of air values gave only slightly higher results than the contingent value method for a study in Los Angeles.⁷¹ Elk hunting contingent value estimates for increased encounters are comparable though lower than actual, fees for existing private clubs.⁷² When significant resources (Eg. a proposals for taxation of pollutants) are at stake, several methods can be used to confirm results.

⁷¹ "Valuing Environmental Commodities: Some Recent Experiments," by William D. Schultze, Ralph C. D'Arge, and David S. Brookshire, *Land Economics*, Vol. 57, No. 2, May 1981, pp. 167-8 or 151-172.

⁷² *ibid.* pp. 166 or 151-172.

Market Data

Market data can often be used to estimate environmental values. Hedonic analysis of wages⁷³ ⁷⁴ or property values have been used to place a value on environmental goods as diverse as fish population size or air quality. The market cost of defensive measures taken against pollution (air and water purifiers, doctor visits, moving away from pollution sources, bottled water, noise buffers, etc.) can be used to indicate the value of reducing pollution.⁷⁵ Bartik's method could also be used to ascribe partial consumption values to wetlands from reduced flood control. Some environmental amenities such as water quality create products such as healthy fisheries which do have commercial value. This information can be used to estimate the value of commercial benefits from improved water quality.

Costs Imposed on the Private Sector

Market costs imposed on the private sector industries from a proposed action or strategy can generally be estimated by using survey information, constructing reasonable scenarios, or by direct assessment in the case of fees and taxes. The secondary impacts or distribution of these effects through the economy as a whole can be estimated by using input/output analysis and by estimating the excess burden.

Determining the distribution of the burden between final consumers and the producers can be more difficult. The more responsive one party is to price changes relative to other parties, the less his share of the cost burden will be. If the consumers can easily substitute another product for the affected product, the producer will carry most of the burden of the regulation or market incentive. If buyers do not respond much at all to changes in the price of an affected product then the producer can shift most of the costs to the consumer. Measuring the relative elasticities of demand and supply (responsiveness measures for buyers and sellers respectively) will help describe the distribution of the burden.

⁷³ "The Two-Stage Hedonic Wage Approach: A Method for the Valuation of Environmental Amenities," by David E Clark and James R. Kahn, *Journal of Environmental Economics*, 16,106-120, 1989.

⁷⁴ "Differential Net Migration Rates and the Quality of Life," by Ben-chieh Liu, *The Review of Economics and Statistics (RES)*, 57, 329-337. "A Note on Differential Net Migration and the Quality of Life," by David Larson and Walton Wilford, *RES*, 62, 157-160. "Differential Net Migration Rate and the Quality of Life: A Reply with Additional Evidence," *RES*, 62, 160-162. Both individual status and economic status were found to be less important than living conditions.

⁷⁵ "Evaluating the Benefits of Non-marginal Reductions in Pollution Using Information on Defensive Expenditures," by Timothy J. Bartik, *Journal of Environmental Economics and Management*, 15, 111-127, 1988. The technique proposed provides a lower and upper bound for the consumption value of reduced pollution.

Contingent Value Method⁷⁶

The contingent valuation method (CVM) can involve the use of surveys or experimental settings. In either case, it requires asking a respondent for their valuation of an increase or decrease in a nonmarket good. The question or experimental setting relies heavily on a full description of the situation. The setting will specify the good, the status quo level of the good, the institutional structure, how payment will be made, how decisions will be made, and choices available to the respondent. The hypothetical situations are varied in order to ask the respondent "if this happens what would you be willing to pay?"

CVM has come to be widely used. It has more broad applications than other estimation methods listed below. Users of CVM have devised a number of methods to reduce the bias that might occur from strategic bidding. When evaluating a particular CVM estimate, the following indicators of the believability of the estimate may be helpful: Consistency in the bidding, bids increase with income, bids decrease if there are available substitutes, bids increase if there are complements, bids are consistent with demographic characteristics. In other words, the bids should not appear to be random or strategic.⁷⁷

Many economists view hypothetical results with skepticism. They prefer tests which involve actual behavior rather than hypothetical values. There are several reasons for this. First is that people can easily use strategic bidding to produce systematically biased estimates of the value of the good. Individuals may wish to be "free riders" and obtain a public good with little or no cost to themselves; these respondents could be expected to systematically bias their estimates downward. Alternatively, individuals may believe that they will not have to pay and may bias their bids to try to ensure that the nonmarket good will be provided. Respondents may not know how much they would utilize an amenity that has not yet been made available to them. The value of a commodity may depend on how it is described. The value of the bid may depend on the level of media attention the commodity or amenity has received. These problems may not be easily resolved by careful structuring of the survey, instrument or experimental setting.⁷⁸

⁷⁶ Valuation of Environmental Goods, by Cummings, Brookshire, Schulze, 1986, Rowman & Allanheld, Totowa, NJ. The entire section draws heavily on this book and the work of the contributors and commentators.

⁷⁷ Valuation of Environmental Goods, by Cummings, Brookshire, Schulze, 1986, Rowman & Allanheld, Totowa, NJ., pp. 4-6. "Contingent Valuation Surveys for Evaluating Environmental Assets," by A. Randall, J.P. Hoehn and D. Brookshire, Natural Resources Journal, 23(3), 1983, pp. 635-48.

⁷⁸ Valuation of Environmental Goods, by Cummings, Brookshire, Schulze, 1986, Rowman & Allanheld, Totowa, NJ., pp. 5-9. "Risks and Perceptions in Psychology and Economics," by K. J. Arrow, Economic Inquiry, 20, 1982, pp. 1-9.

Strategic bias does not appear to be a problem with CVM. This fact may be due largely to the structure of the hypothetical setting used.⁷⁹ If the setting allowed obvious ways to strategically bias the bids it might become a problem for a given study.

There does appear to be a "starting point bias." In other words, the respondent will tend to have bids that cluster around the first pricing question offered in the CVM process. Bidding cards allow the respondent to choose their own starting points for the bidding. Alternatively a random starting point can be used in conjunction with a "bracketing and halving" method to approach the final bid. Either of these processes will shorten the iterative process for obtaining the bid and reduce the likelihood of boredom.⁸⁰

"Vehicle" bias comes from the description of how the respondent would have to pay for the good in question. The way that the respondent will have to pay allows for two forms of bias to arise. First, if respondents dislike utility bills or taxes they may bid less than they would with another payment vehicle. Alternatively, one vehicle may offer more opportunities for substitution. Some researchers argue that the vehicle for payment cannot be separated from the question of the value of the product. Public goods must be paid for by a method that allows for collective payment.⁸¹

Information bias is related in part to the vehicle bias above. The information given to the respondent may affect the bids given. Both the way in which the good will be provided and the method of payment will affect the value given. In so far as the information given reflects the way in which the good will actually be distributed, it is appropriate for the bids to be affected (Eg. White water trips in a specific canyon can be distributed by lottery, first come first served, or used as common property with the expected level of crowding). Descriptive information can enhance the ability of the respondent to determine his actual behavior. On the other hand respondents may have difficulty processing a great deal of information. In some cases the resulting bias may simply indicate the respondent's willingness to try to understand the information given in a serious and meaningful way. Pretesting should be used to attempt to balance the respondents need for information with their ability to utilize the information. It is also important not to generalize the estimates beyond the bounds of the situation described.⁸²

⁷⁹ Valuation of Environmental Goods, by Cummings, Brookshire, Schulze, 1986, Rowman & Allanheld, Totowa, NJ., pp. 206-7.

⁸⁰ Valuation of Environmental Goods, by Cummings, Brookshire, Schulze, 1986, Rowman & Allanheld, Totowa, NJ., pp. 28-31, 153, 207-208.

⁸¹ Valuation of Environmental Goods, by Cummings, Brookshire, Schulze, 1986, Rowman & Allanheld, Totowa, NJ., pp. 31-32, 154, 209-211.

⁸² Valuation of Environmental Goods, by Cummings, Brookshire, Schulze, 1986, Rowman & Allanheld, Totowa, NJ., pp. 33-34, 153-154, 208-209.

Hedonic Price Method

The hedonic price method utilizes market data to estimate the value of product attributes. It can be used with location decisions in order to determine the value of environmental amenities. If people consider the quality of the air in buying or building a home it will be reflected, if only weakly, in the value of the home. If people consider environmental quality in choosing a place to work it will be reflected in the wage rate. It has often been used for estimating the value of air quality. The technique requires multiple locations⁸³ with highly varied levels of all amenities. Housing decisions require tradeoffs between different levels of options in each house. Consumers are rarely able to make marginal decisions⁸⁴ that enhance either square footage or air quality. Also some aspects tend to be "collinear" or move together. Large homes and lots may be associated with better schools and better air since the quality of the area defines in part what is likely to be built there.

These problems may create difficulties for defining the functional equation to be estimated ("equation specification") and for the selection and treatment of the variables. The specification may change the nature of the result.⁸⁵ Care should be taken to assure that the model is reasonable rather than structured to give a specific result.

Travel Cost Method

Outdoor recreation is strongly affected by environmental quality. The travel cost method allows consumer travel behavior to be analyzed to determine recreation values. People pay for their recreation in part through travel costs. The travel costs are used as an indication of willingness to pay for recreational resources. Distances traveled and the number of visits per unit of population can be used to construct a demand curve for the recreation product. The hedonic travel cost method uses multiple origins and destinations to separate out the aspects of the recreation that consumers demand. These aspects can include water quality, visibility, fish density, and other environmental amenities.⁸⁶

⁸³ The technique can be used within a single market.

⁸⁴ Marginal decisions should be taken here to mean the choice to purchase a very small number of additional square feet (one or two) in a home or a very small improvement in air quality (fewer particulates but the same level of NOx).

⁸⁵ "The Robustness of Hedonic Price Estimation: Urban Air Quality," by Phil Graves, James C. Murdoch, Mark A Thayer, and Don Waldman, *Land Economics*, Vol. 64, No. 3, August 1988, pp. 220-233.

⁸⁶ "The Hedonic Travel Cost Method," by Gardner Brown Jr. and Robert Mendelsohn, *The Review of Economics and Statistics*, Vol. LXVI, 3, August, 1984, pp. 427-433.

Modeling: Reasoned Guessing

Due to the problems listed below it is important for the general public to realize that any proposed solution to the issues covered by 2010 will be an approximate solution and not precise optimization. This does not mean that the public should wait for long periods of time until perfect data and models are obtained to make decisions. Every actor in our economy makes significant and essential decisions based on flawed information. It means that in making choices we should attempt to obtain good information at reasonable costs in order to evaluate where we are now and how to move forward.

Economic analysis can describe an optimal level⁸⁷ of pollution that should be allowed, however the amounts will be approximations. We can only roughly describe the final impacts of fees, taxes, subsidies, and regulations. The incentives created are clear but their magnitude is not. Variations in data, changes in technical models of expected environmental impacts, property rights, and technological changes may produce significant changes in optimality conditions. Because estimates are so dependent on the assumptions and data most of the estimates in this document should be regarded as rough approximations only.

Property rights define the starting point for the economic analysis. To a large extent the property rights also define the estimated value of an action. If the idea that people have a right to clean water is the basis for the analysis the value of clean water will be large. If the right to use the water for discharge belongs to the polluter the value of clean up and protection measures will be much smaller. This is because in the latter case the people affected by contaminants must pay for the clean up and protection measures. With limited incomes their willingness to pay may be quite limited. People are less willing to sell a right. People are likely to charge more when they will lose the clean water. The vested right to use clean water or to use water for discharge defines whether "willingness to sell" or "willingness to pay" is the most accurate frame of reference. This decision will have a substantial impact on the values estimated for the water and of optimal level of pollution.⁸⁸

Scientific models of pollution impacts are also not precise at low levels of exposure. We know that wood stove and heating fires in homes produce health effects but we can not determine who will be affected. Models which use statistical information can estimate approximate changes in the environment. Economic models of environmental values are only as accurate as the scientific and technological models on which they are based.

⁸⁷ This discussion does not deal with the Theory of Second Best or whether income is appropriately distributed.

⁸⁸ "Willingness to Pay and Compensation Demanded: Experimental Evidence of an Unexpected Disparity in Measures of Value," by Jack L. Knetsch and J. A. Sinden, *The Quarterly Journal of Economics*, August 1984, pp. 507-521.

Describing the impact of a regulation or proposed action item on the economy is based on current technology and compliance costs. Forecasting costs in this rapidly changing area is challenging. We can assume that a tax on vehicle emissions will create an incentive to reduce emissions. We can not know how rapidly the technology will develop. Extrapolations are made based on the past technological change. Although, it is clear that there is a nonlinear response to basic innovation, it is not clear when the basic innovations will arrive.

Finally, the data available will limit in substantive ways the quality of any model. The need for data is one of the more intimidating problems addressed by any modeler. In some cases without adequate understanding of the scientific basis of a problem, the models will be nonsense. Good scientific data is essential for decent economic modeling.

Data, Modeling, and Estimator Biases

Defining optimal responses to externalities requires a combination of scientific and economic criteria be applied. Often very specific information is required for modeling and is not available. Good data and information are generally expensive to gather. Scientific data on actual conditions and interactions may require expensive monitoring and/or research. Defining the market and nonmarket costs and benefits of a proposed action depends on the scientific data.

Statistical modeling attempts to describe reality with mathematics in order to evaluate the potential impacts of change. Generally some variable in economics are assumed to control the movement of other variables. Fishermen are assumed to want to catch fish and to be willing to pay for better fishing. In order to have better fishing, higher water quality and habitat is required. The mathematical model attempts to describe what fishermen will therefor pay for higher water quality and additional habitat. The "estimator," frequently referred to below, is the number that attempts to describe this relationship. The discussion assumes that regression analysis estimators are used, although, other parametric and nonparametric estimation tools exist.⁸⁹ Inadequate data will cause similar problems for these estimators also. Estimates are dependent on the assumptions and data. Estimates should be accompanied by probabilities of accuracy or expressed as a range of possible values. Well researched assumptions with a high degree of accuracy will produce more reasonable estimates.

The level of accuracy should be based in part on the cost of obtaining good information and the potential cost of employing the wrong policy. In evaluating the data needed for modeling, regulation, effluent taxes or other management needs, cost should be one criteria. If the model seems to be very responsive to small data changes, and if the economic and environmental impacts of action or inaction will be severe then high expenditures on data collection are warranted. Otherwise, existing data can suffice. Analysts using existing data will need to understand the effects of the data problems covered below.

⁸⁹ Parametric statistics assumes that there are parameters that describe a distribution. There is an average or mean, and there is a variance around that mean. It is the basis of most of the analysis done in economics.

Relevant variables may be unavailable. For example, a tax system designed to tax emissions would ideally be based on actual, consistently monitored emissions. If this monitoring will be more expensive than the tax revenue generated it may be that the tax can be based on a proxy for actual monitoring data. If one is trying to forecast the potential revenue from a tax on emissions, permitted emissions may be used as a substitute for monitored emissions. This proxy variable will be less accurate especially if there are compliance problems.

If variables move together or are in some way dependent on each other "multicollinearity" may result. For example, in choosing the size of lot and kind of structure to build in a residential housing market, the developer will consider the value of the home relative to the area. Part of this decision will be related to the quality of neighboring homes, the school system, and environmental quality. In high air pollution areas, it is likely that nicer homes and better schools will be clustered in areas with lower levels of air pollution. Air quality, schools, lot and home sizes will tend to be move together, and the variables defined by them will be multicollinear. This will cause the variables to serve as proxies for each other, bias the results, and cause important variables to be insignificant.

If relevant variables are omitted due to unavailability it may create bias in the economic estimates if regression analysis is used. The omission forces other variables which are somewhat collinear with the omitted variable to serve as proxies. Inclusion of irrelevant variables creates similar bias problems although they are not as severe.

Sample selection bias comes from selecting the sample in such a way that it is weighted toward one part of the population or ignores others. Under-reporting of emissions or discharges can cause sample selection bias if it is done primarily at discrete parts of the spectrum (Eg. small quantity generators that should report and large generators that under report). It will bias the estimators.

Improper monitoring can cause measurement error bias in the estimators. Small quantity generators of hazardous waste or unpermitted dischargers who do not report create distortions in the data at the low end of the reporting range. Monitoring that does not test for some pollutant constituents will create gaps in the data. Since monitoring is generally only required if larger impacts are expected, the difficulties with these gaps may be small by comparison with the fact that often there is no monitoring. Monitoring structured so that testing takes place in situations which understate the quantities generated create distortions in the data or in other words a sample with parts missing or skewed. If the missing part of the sample is consistently in one part of the range, the estimators generated from the data will be biased.

Time series data may also have problems with "autocorrelation" if current period data values are partly a function of past period data values. This is likely with any contaminant which has a long half life. "Heteroscedasticity" can create bias if the variance in the data shifts systematically within the data range. This is likely in the case of contaminants which have been used or created increasingly over time. Finally, missing data and measurement error can create bias in the estimator.

Each of the problems listed above can be addressed using econometric techniques that will improve the data, make it more useful, and reduce the bias. As technology improves we may get better information from monitoring. As more economic studies on the value of environmental amenities accumulate it is more likely that the existing data will be a closer proxy to the needed data. Information and data will remain costly. Analysts must continue to question whether new data is justified given the cost and the likelihood that it will make a significant difference.

Income Distribution⁹⁰

The environment is often labeled as an interest of the middle class and the rich. Wealth enables people to avoid the impacts of pollution. In the case of air pollution those who can afford to purchase equipment for cleaning the air and move away from high concentrations of pollutants. In many urban areas the wealthy and the white live in areas with cleaner air than the poor and the blacks. Freeman⁹¹ show that income and race correlate strongly with suspended particulates and sulfation in Kansas City, St. Louis, and Washington D.C.. In so far as air quality improves, it will benefit both rich and poor. The physical improvement may even disproportionately benefit the poor. However, the willingness to pay on the part of the rich and therefore the value of the benefits to the rich, is likely to be higher. Programs designed to protect unspoiled areas with clean air or pristine waters will disproportionately benefit the wealthy. Uniform standards will physically provide more balanced distribution of benefits.

The burden of pollution control tends also to be regressive. The poor drive cars that are older. Older equipment will require more expenditures for emissions controls. Sales taxes are a major revenue base in Washington for both state and local government. In so far as sales taxes fund environmental activities the burden falls more heavily on the poor and the middle class. The short run economic dislocation of rapidly deployed regulations will rest on those companies that can not adjust. Both adjustment and bankruptcy will have an impact on employment. The pattern of transition costs will depend on the relative changes in employment for skilled and unskilled employees. In the long run the costs of various goods will increase relative to others. Since the poor have fewer options for substitution it is likely that this will have a regressive impact also.

Environmental policy can be designed to provide a balanced provision of benefits to all classes. A large part of the goal should be to neutralize the regressive impacts of environmental policy. Aid for dislocation caused by closures will help ameliorate unemployment impacts. A shift from a sales tax base to a

⁹⁰ The Theory of Environmental Policy, William J. Baumol and Wallace E. Oates, pps. 191-212.

⁹¹ "Income Distribution and Environmental Quality, by A. Myrick Freeman III, Pollution, Resources, and the Environment, eds. Alain C. Enthoven and A. Myrick Freeman III, Norton, 1973.

pollution tax base would trade one regressive tax base for another with obvious environmental benefits.

Costs of 2010 Action Items

The action items discussed in this report can potentially cost billions of dollars. In many cases, it was not possible to state the cost to the public or private sector for action items which require further development. However, some items stand out as being both necessary and costly. Wastewater treatment will need \$168 million per year. Stormwater programs will cost \$160 million per year. Nonpoint "best management practices" will cost \$180 million in up front costs. Insulation would cost the private sector \$600 million. Transit will cost \$5 billion over a ten year period. Acquisition of areas needing protection contains a proposal of 450 million over a ten year period.

The problem will be to come up with a billion dollars per year or to face the losses that failure entails. Several of the packages propose market incentives as a part of the package. These include the air and conservation program taxes on gasoline. The water quality proposal for nonpoint fees and permit fees. Changes are also proposed for taxation of land resources. Two of the proposals, the gasoline tax and the "parking slot tax" may raise close to a half a billion a piece. The conservation proposal to alter the auto registration and charge based on gas consumption would not necessarily create new revenue but it would reduce air pollution. Other incentive/revenue packages should be examined. The proposal to reduce idling, and the insulation proposals reduce costs to the private sector while improving environmental quality.

All these proposals will help to clean and protect the environment. They will create tremendous benefits which have not yet been quantified. They also create private sector costs and benefits most of which have not yet been estimated. As the proposals are more fully developed it will be important to estimate these costs and benefits.

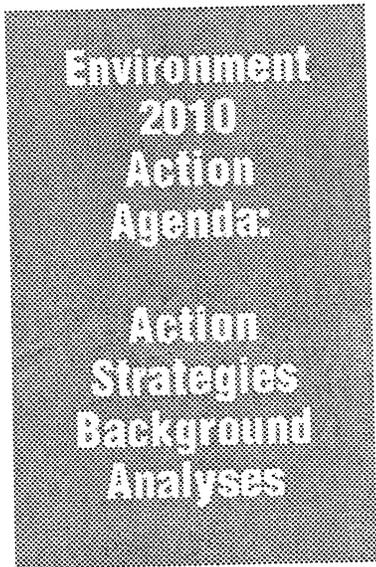
Summary

Environmental resources are a scarce commodity. They will be mismanaged by the market as long as their use is not controlled. Market incentives, especially pollution taxes and marketable permits, may be more effective than the existing pattern of regulation. Market incentives are likely to reduce the cost of achieving any given level of pollution control. Pollution taxes, if they are used instead of other high excess burden tax bases can actually enhance the efficiency and equity effects of the economy and the tax system as a whole.

Modeling and data can only provide approximate recommendations for the magnitude of the economic incentives or regulation needed. It is important to use the statistical methods carefully and to understand the limitations and biases present in any study. The extent of the modeling and data collection should depend on the cost of analysis and on the sensitivity and potential costs of making an error.

Each of the issues covered by the 2010 Report results from market decisions we as a society make. The way the market operates has adjusted substantially already. If history is any indication we will adjust further over time. Economic tools can be used to assure that this adjustment encourages both significant economic growth and a healthier environment.

Given the potential of market incentives to provide a tool for environmental management and given the revenue generating potential of pollution taxes, further study of market incentives for Washington is a good investment. Recognizing that market incentives are powerful tools the studies must be done carefully. If the legislature should act on the recommendations in the study it will create substantial changes in the way the economy operates. Poorly designed legislation could do serious damage. Research in this area, which leads to legislative proposals, should be done well or not done at all. The study should provide an opportunity to characterize and quantify the costs of environmental externalities. It should devise practical means for incorporating market incentives into a limited number of broad environmental programs such as emissions reduction, toxic wastewater disposal, and generation and disposal of hazardous substances.



Appendix
B:

**Roster of
Analytic
Subteams**



State of Washington
July, 1996

APPENDIX B

SUBTEAM ROSTER

The following is a list of the persons who were involved in the initial screening and scoping of the action ideas received from the public, and later in the actual assessment of ideas retained for further analysis. Not all the persons who were actually involved in the development of assessment papers are listed here. For a complete list of these persons, see the acknowledgements within assessment papers.

Each subteam was responsible for carefully sifting through the action ideas assigned to it by the Action Strategies Analysis Committee (ASAC), and developing recommendations for the Public Advisory Committee (PAC) and Steering Committee concerning which ideas should be retained for further analysis and assessment. Often this involved combining and restating many of the ideas received. In the end, the key elements of the majority of them were retained.

Each group was composed primarily of ASAC and PAC members, and in some cases Technical Advisory Committee members or other government employees or members of the public who had special expertise relevant to working through the ideas and conducting the assessments.

The subteam leader is underlined for each group. All the participants are to be commended for their many hours of input and hard work.

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