



# **Clean Water Act Monitoring Strategy for Washington State**

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# **Clean Water Act Monitoring Strategy for Washington State**

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*by*

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# Abstract

The 2003 EPA publication, *Elements of a State Water Monitoring and Assessment Program*, recommends the basic elements of a state water monitoring program and serves as a tool to help EPA and the states determine whether a monitoring program meets the prerequisites of the federal Clean Water Act (CWA) Section 106(e)(1). States are required to develop a monitoring program addressing the ten elements identified.

The first of these elements is a long-term monitoring strategy. This strategy should be state-specific, be designed from the monitoring capabilities each state already has, and include a timeline not to exceed ten years to complete implementation. The strategy is intended to be comprehensive in scope and identify the technical issues and resource needs that currently impede development of an adequate monitoring program.

The purpose of this document is to (1) describe the elements of Washington State's water monitoring program, (2) articulate the state's programmatic and resource needs, and (3) serve as a tool to help EPA and the state determine whether the monitoring program meets the prerequisites of CWA Section 106(e)(1).

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# Executive Summary

The federal Clean Water Act (CWA) gives states the primary responsibility for implementing programs to protect and restore water quality, including monitoring and assessing the nation's waters and reporting on their quality. CWA Section 106(e)(1) requires the U.S. Environmental Protection Agency (EPA) to determine that a state is monitoring the quality of navigable waters, and to the extent possible, groundwater, compiling and analyzing data on water quality prior to the award of Section 106 grant funds.

The recent EPA publication, *Elements of a State Water Monitoring and Assessment Program* (EPA, 2003), recommends the basic elements of a state water monitoring program and serves as a tool to help EPA and the states determine whether a monitoring program meets the prerequisites of CWA Section 106(e)(1). States are required to develop a monitoring program addressing the ten elements identified.

Washington State's water monitoring strategy supports the goal of the CWA to restore and maintain the chemical, physical, and biological integrity of the state's waters. The goal requires water quality data that adequately characterize the condition of the state's waters. Identifying impaired waters requires evaluating all available data associated with a waterbody in preparation for the water quality assessment. Monitoring associated with Total Maximum Daily Load (TMDL – Water Cleanup Plan) development identifies the severity and sources of impairment.

Monitoring is essential to learning what works, what doesn't, and how well the state's waters are doing relative to the goal of restoring and maintaining their chemical, physical, and biological integrity. The strategies that the state uses to achieve CWA objectives include the Water Quality Assessment, the wastewater discharge permit program, nonpoint source pollution planning, the Forests and Fish Program, financial assistance grants and loans, Water Cleanup Plan (TMDL) Program, Salmon Recovery Program, Puget Sound Water Quality Management Planning, Ground Water Management Planning, and the Underground Injection Control Program, among many others. Water quality monitoring supports these management programs by providing baseline data and specific information on the quality of Washington's waters, and by providing feedback on the effectiveness of management actions in protecting and restoring water quality.

Washington's water quality monitoring strategy recognizes numerous gaps exist simply because fully meeting all monitoring objectives statewide would be prohibitively expensive. Consequently, Washington has evolved a *tiered monitoring* strategy that focuses limited monitoring resources on the most important objectives. This approach employs different monitoring programs at different scales, each designed to meet specific objectives in the most cost-effective manner. For example, one tier may employ a rotating panel, probabilistic design for gathering coarse-scale information on waters statewide, while a second tier might use a targeted-station design to determine trends over time, or screening-level monitoring to verify suspected water quality problems. This might be followed by a third tier involving more expensive intensive studies to determine the full extent of problems, evaluate best management practices (BMP) effectiveness, or identify potential pollution sources. The overall mix of

monitoring programs may be modified over time as priorities shift and funding levels change in response to changing needs, legal mandates, and improved knowledge of water quality dynamics.

To avoid inter-agency duplication of efforts, increase state-funding cost-effectiveness, and to minimize gaps in water quality monitoring efforts, Ecology and other partner agencies are actively involved in coordinating and integrating monitoring programs through several coordinating bodies (notably the Governor's Forum on Monitoring, the Puget Sound Ambient Monitoring Program, and the Pacific Northwest Aquatic Monitoring Partnership). Monitoring objectives, sampling designs, field and laboratory protocols, and data management systems are increasingly expected to be developed as inter-agency, cooperative programs in order to secure or even maintain existing state funding. Consequently, the development of new monitoring strategies and implementation of new monitoring programs will increasingly require multiple-agency, and multiple-level (federal, state, local, and tribal), coordination and cooperation.

# Introduction

The federal Clean Water Act (CWA) gives states the primary responsibility for implementing programs to protect and restore water quality, including monitoring and assessing the nation's waters and reporting on their quality. In Washington State, the Department of Ecology (Ecology) is the delegated agency primarily responsible for implementing the requirements and provisions of the CWA. Consequently, Ecology is also the agency responsible for satisfying the majority of the water quality monitoring and reporting requirements of the CWA.

CWA Section 106(e)(1) requires the U.S. Environmental Protection Agency (EPA) to determine that a state is monitoring the quality of navigable waters, and compiling and analyzing data on water quality prior to the award of Section 106 grant funds. The recent EPA publication, *Elements of a State Water Monitoring and Assessment Program* (EPA, 2003), recommends the basic elements of a state water monitoring program and serves as a tool to help EPA and the states determine whether a monitoring program meets the requirements of CWA Section 106(e)(1).

States that seek Section 106 funding are required to develop a monitoring program addressing these ten elements.

1. Monitoring Strategy Priorities
2. Monitoring Objectives
3. Monitoring Design
4. Water Quality Indicators
5. Quality Assurance
6. Data Management
7. Data Analysis and Assessment
8. Reporting
9. Programmatic Evaluation
10. General Support and Infrastructure Planning

## Purpose of this Document

The purpose of this document is to describe Washington State's current water quality monitoring program, evaluate programmatic and resource needs, and outline the strategy Ecology will adopt to meet the monitoring goals and objectives outlined in the CWA. The document follows the format recommended in the *Elements of a State Water Monitoring and Assessment Program* (EPA, 2003).

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# Monitoring Strategy Framework

Washington State has adopted a tiered approach to monitoring in order to most efficiently meet its highest priority monitoring objectives at the various geographic and temporal scales needed for effective environmental management. This means that Ecology and its partner agencies will continue to conduct a variety of extensive and intensive, short- and long-term monitoring programs, and employ a number of monitoring designs to meet a wide range of monitoring objectives.

The overall strategy guiding Washington's water quality monitoring programs is derived from and articulated in three primary sources:

1. *The Washington State Department of Ecology 2005-2007 Strategic Plan* (Ecology, 2004a), including (1) the Environmental Assessment Program's 2005-2010 Strategic Plan, and (2) the Water Quality Program 2005-2007 Program Plan, and 2001-2013 Strategic Plan.
2. *The Ecology-EPA 2006-2007 Environmental Performance Partnership Agreement* (Ecology, 2005a).
3. *The Washington Comprehensive Monitoring Strategy for Watershed Health and Salmon Recovery* (CMS, 2002).

These three sources guide Washington's water quality monitoring strategy and provide the legal and budgetary framework by which water quality monitoring will be prioritized, funded, implemented, and tracked by the Legislature, the Governor, and EPA.

The three documents share many common elements and themes, yet they do not align perfectly in all details, priorities, or recommended implementation activities. In particular, the Washington *Comprehensive Monitoring Strategy* (CMS) addresses water quality monitoring but includes many other monitoring elements related to restoring salmon runs (e.g., fish population monitoring, and salmon restoration project implementation monitoring). The CMS also addresses and ranks priorities among all types of watershed health and salmon recovery monitoring conducted by state agencies, whereas Ecology's *Strategic Plan* and the *Performance Partnership Agreement* (PPA) focus primarily on Ecology's monitoring activities as they specifically relate to the Clean Water Act.

Consequently, Ecology is left to balance and coordinate its monitoring priorities in order to satisfy the requirements of its own *Strategic Plan*, its requirements under the CWA including the specific expectations embodied in the PPA, and the Legislature and Governor's directives as expressed in the CMS. So on-going coordination, communication, and collaboration among all monitoring agencies will be an important guiding principle and overarching strategy for Ecology. Ecology and its partner agencies will coordinate and integrate monitoring programs through several statewide and regional coordinating bodies and partnerships (see below).

## Historical Development of Washington's Monitoring Strategy

Since its creation in 1970, Ecology has developed and implemented a number of monitoring programs intended to support the agency's regulatory mandates and management objectives (Table 1) (e.g., statewide ambient monitoring, NPDES monitoring, pollution-source studies, Total Maximum Daily Load (TMDL studies), Puget Sound Ambient Monitoring Program, EMAP surveys). Historically, these monitoring programs were conducted more or less independently in response to their specific client needs and their unique (and often dedicated) funding sources. As a consequence, Ecology's monitoring strategy evolved over time into a multi-program, tiered approach to address a variety of objectives at different geographic and temporal scales. This tiered, programmatic approach to monitoring was mirrored by other state, federal, tribal, and local government agencies as they developed monitoring programs to support their individual needs for environmental data.

The resulting overall approach to statewide monitoring, then, evolved into something resembling a patchwork quilt of programs, some well developed and others less so, each with its own objectives, rationale, and approach. However, the general lack of coordination among monitoring agencies and programs, the variety of methods employed, and the different philosophies inherent in the monitoring designs chosen, led to serious concern about government inefficiencies, duplication of effort, and potential gaps in monitoring coverage. These concerns increased through the late 1990s and early 2000s as the Legislature and others grappled with declining salmon runs, budget shortfalls, and frustration over absent (or conflicting) and often costly monitoring data needed for decision making.

Beginning in the late 1990s, EPA, The National Water Quality Monitoring Council, the Government Accounting Office, and others recognized that the plethora of state and federal water quality monitoring programs and the lack of uniformity among them prevented an effective roll-up or comparison of data among states. Consequently, it was virtually impossible to objectively ascertain national or regional water quality management priorities. In response, EPA developed new guidelines for state water quality data reporting. The new approach combined the previously separate reporting requirements of Sections 305(b) and 303(d) of the CWA, resulting in the current *Washington State Water Quality Assessment* integrated report. EPA also issued a requirement for states to develop a Water Quality Monitoring Strategy to describe how they intend to comply with CWA monitoring requirements.

At about this same time, as part of a lawsuit settlement brought by plaintiffs in 1998 under the CWA, Ecology entered into a formal agreement with EPA which requires Ecology to complete nearly 1,500 water cleanup plans (TMDLs) by 2013. Within Ecology, the Environmental Assessment Program has the primary responsibility for conducting TMDL monitoring and modeling studies in the agency, and is working with the Water Quality Program to complete the required number of TMDLs by the court-imposed deadline. Ecology produced a workload model to examine the ability to meet the legal terms of the settlement. To complete this work, Ecology estimated an additional 17 FTEs and \$722K in lab costs were needed annually to conduct Water Cleanup Plan technical analyses (Roberts et al., 2001). Consequently, strategies to meet this monitoring objective are key to Ecology meeting its obligations under the federal lawsuit as well as under the CWA and PPA, and Ecology and EPA have both committed to exploring innovative approaches to meet this challenge.

# Three Primary Sources Guiding Washington's Monitoring Strategy

## 1. Ecology's 2005-2007 Strategic Plan

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Ecology's *2005-2007 Strategic Plan* adopted Washington State's "Priorities of Government" budget approach and recognizes that "data and monitoring are critical to all aspects of improving the quality of our natural resources." Within Ecology, the Water Quality Program has the primary responsibility for implementing regulatory and other management activities to protect and restore Washington's waters.

The Water Quality Program's environmental goals are:

- Prevent water pollution including aquatic habitat loss, and ensure adequate water quality and quantity to meet beneficial uses.
- Clean up water pollution to restore beneficial uses and aquatic habitat.
- Help communities make sustainable choices that reduce and prevent water quality problems.

The Environmental Assessment Program is tasked with five activities specifically related to CWA monitoring requirements:

- Monitor and assess the quality of state waters and measure streamflows statewide.
- Conduct environmental studies for pollution identification and control.
- Assure environmental laboratories provide quality data.
- Measure contaminants in the environment by performing laboratory analyses.
- Improve quality of data used for environmental decision-making.

In support of Ecology's *Strategic Plan*, the *Water Quality Program 2005-2007 Program Plan* and the *Environmental Assessment Program 2005-2010 Strategic Plan* describe specific near-term (2005-2007) and longer-term (2007-2010) strategies and actions needed to implement the agency's monitoring priorities.

## 2. The Ecology – EPA 2006-2007 Environmental Performance Partnership Agreement

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The *Environmental Performance Partnership Agreement (PPA)* commits EPA and Ecology to work together on a number of topics salient to water quality monitoring. Significant examples include elements:

- 3B (streamlining TMDLs)
- 3C (TMDL workload planning)
- 3K (innovative approaches to temperature listings)
- 3N (approval of revised water quality standards)

Two elements in the PPA relate specifically to the development of a statewide monitoring strategy, committing both agencies to continue working together to “articulate a coordinated strategy to help Washington track performance of its water quality programs.”

1. *Element 3AH* requires Ecology to “complete and begin implementation of a statewide monitoring strategy based on the *Elements of a State Monitoring Program*. The strategy is intended to guide monitoring priorities and budget allocations in the 2005-2007 biennium.”
2. *Element 3AI* commits Ecology and EPA to work together to “articulate a coordinated strategy [to] help Washington track performance of its water quality programs.” “Issues to address as part of the strategy design will include the way in which monitoring is conducted, the way in which water quality segments are defined, and the way that TMDL and nonpoint BMP effectiveness monitoring are done and reported. This strategy will guide the prioritization and management of monitoring resources. Changes to the strategy will be developed through a collaborative process between the two agencies.”

### 3. Washington’s Comprehensive Monitoring Strategy

In 2001, the Legislature passed and the Governor signed Substitute Senate Bill 5637, “an Act Relating to Monitoring of Watershed Health and Promoting Salmon Recovery.” The intent of the legislation was to “better coordinate existing monitoring activities and improve data exchange most relevant to local, state, and federal watershed health.” The law required a multi-agency Monitoring Oversight Committee (MOC) to develop a comprehensive statewide strategy for monitoring watershed health, with a focus on salmon recovery. Working with a Legislative Steering Committee and seeking review from the Independent Science Panel, the MOC completed the following tasks:

- Define the monitoring goals, objectives, and questions that must be addressed as part of a comprehensive statewide salmon recovery monitoring and adaptive management framework.
- Identify and evaluate monitoring activities for inclusion in the framework, ensuring data consistency and coordination and filling of monitoring gaps.
- Recommend statistical designs.
- Recommend performance measures.
- Recommend standardized monitoring protocols.
- Recommend procedures to ensure quality assurance and quality control.
- Recommend data transfer protocols.
- Recommend ways to integrate monitoring information and decision making.
- Recommend organizational and governance structures for oversight and implementation of the coordinated monitoring framework.
- Recommend stable sources of funding that will ensure the continued operation and maintenance of the state’s salmon recovery and watershed health monitoring program.
- Identify actions that will be taken by state agencies to implement the elements of the coordinated monitoring program.

The MOC completed the *Comprehensive Monitoring Strategy* (CMS) in November 2002. The CMS represents the state's most thorough, cross-programmatic effort to coordinate and articulate a statewide monitoring strategy addressing overall watershed health (including water quality) and salmon recovery (CMS, 2002). The CMS details how the state and its partners will achieve the identified monitoring goals, and in the process address key management decisions and policy issues. It outlines a comprehensive, statewide monitoring strategy, ranks priorities, and provides a state agency Action Plan including funding estimates for monitoring priorities.

For FY 2006-2007, Engrossed Senate Substitute Bill 6090 (The State's FY 2006-2007 Operating Budget) includes a specific provision (Sec 129 (7)) requiring the Department of Ecology, the Department of Fish and Wildlife, the Department of Natural Resources, the Washington Conservation Commission, and the Interagency Committee for Outdoor Recreation to "prepare a report [by March 1, 2006] updating all previously identified activity within the comprehensive monitoring strategy... and summarizing progress to the Governor's Forum on Monitoring, and the Office of Financial Management."

## Inter-jurisdictional Coordination

Ecology works in conjunction with a number of other state, federal, tribal, and local government agencies and private interests to meet CWA monitoring objectives. Improving coordination and collaboration among monitoring agencies and partner entities in Washington State is an important guiding principle and over-arching strategy to improve the availability and use of all parties' data and effectively expand the state's monitoring resources. Three main bodies coordinate monitoring in Washington:

1. The Governor's Forum on Monitoring
2. The Puget Sound Action Team (through the Puget Sound Ambient Monitoring Program)
3. The Pacific Northwest Aquatic Monitoring Partnership

## Governor's Forum on Monitoring

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One of the *Comprehensive Monitoring Strategy's* highest priority recommendations was the creation of a permanent "Watershed Monitoring Council." In July 2004, Washington's Governor issued Executive Order 04-03 establishing the "Governor's Forum on Monitoring" (Forum). The Forum consists of senior representatives from eight state agencies (including Ecology), the tribes, the Northwest Power and Conservation Council, U.S. Environmental Protection Agency, NOAA Fisheries, U.S. Fish and Wildlife Service, and U.S. Forest Service. The purpose of the Forum is to assure that state government operations are conducted in a manner that improves coordination of the state's monitoring efforts associated with salmon recovery and watershed health. The Forum is charged with a number of tasks:

- Provide a multi-agency venue for coordinating technical and policy issues and actions related to monitoring.
- Make recommendations on biennial reporting of monitoring results and progress in watershed health and salmon recovery.
- Foster integrated analysis and reporting of monitoring information.

- Provide monitoring recommendations to the Salmon Recovery Funding Board, the governor’s Salmon Recovery Office, and appropriate state agencies (including the Office of Financial Management).
- Develop a broad set of measures that will convey results and progress on salmon recovery and watershed health.
- Develop such indicators with federal, tribal, regional, and local partners so that there is standardization of the measures used.
- Coordinate with local and regional watershed and salmon recovery groups, tribes, other states, the Northwest Power and Conservation Council, U.S. Environmental Protection Agency, NOAA Fisheries, U.S. Fish and Wildlife Service, and U.S. Forest Service.

The Forum is also directed to make recommendations on biennial reporting of monitoring results and progress in watershed health and salmon recovery, and ensure this information is conveyed in a manner easily understood by the public. In April 2005, the Forum hosted a statewide monitoring workshop to evaluate monitoring priorities related to improving the *State of Salmon in Watersheds* (SOS) Report issued every two years by the Governor’s Salmon Recovery Office. Several workgroups were formed following the workshop to further develop and recommend environmental indicators for inclusion in the 2006 SOS report.

## Puget Sound Action Team

The Puget Sound Action Team (PSAT) Partnership defines, coordinates, and implements Washington’s environmental agenda for Puget Sound. The Partnership includes a chair appointed by the Governor, directors from 10 state agencies, and representatives from tribal, federal, and local agencies with direct responsibilities and authority for conservation and restoration of Puget Sound.

The PSAT Partnership, in conjunction with the Puget Sound Council (an advisory body made up of representatives from key interests around the Sound), recently developed the 2005-2007 Puget Sound Conservation and Recovery Plan. The Plan was approved by the Washington State Legislature and signed into law by Governor Christine Gregoire. It details a \$182 million dollar work plan addressing seven core priorities representing critical threats to the Puget Sound ecosystem. The Plan also describes “The Role of Science in Puget Sound Conservation and Recovery in 2005-2007” including three strategies and 10 “Expected Results” guiding science and monitoring activities to be conducted by PSAT agencies. The Plan details budget levels for each priority by activity and agency, including funding levels specifically for science and monitoring.

PSAT also coordinates and supports the Puget Sound Ambient Monitoring Program (PSAMP). PSAMP coordinates monitoring activities of state, local, and federal member agencies in Puget Sound to (1) assess environmental status and trends, and (2) track the effectiveness of conservation and recovery actions and help set priorities for new actions.

## Pacific Northwest Aquatic Monitoring Partnership

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The Pacific Northwest Aquatic Monitoring Partnership (PNAMP) is a relatively new organization dedicated to regional coordination of aquatic monitoring efforts. This coordinating body brings together a number of federal, regional, and state agencies to coordinate water quality and aquatic habitat monitoring protocols, monitoring designs, and data models to improve and facilitate data sharing and cost-effectiveness of monitoring efforts among agencies involved in monitoring aquatic environments. PNAMP provides a forum for collaboration of the members as they work towards developing a coordinated approach to monitoring by providing a durable structure for facilitating the development of cross-party linkages. The PNAMP represents a new effort to enhance technical and policy coordination across existing monitoring programs.

PNAMP is coordinating and guiding monitoring strategies or plans in order to reduce redundancy, increase efficiency, and help meet the goals and objectives of the various entities involved in monitoring. No other monitoring forum is addressing these demands across the same regional breadth of geographic areas represented by the partners (areas across Pacific Northwest states from Northern California to Canada). PNAMP's guiding principles include the development of monitoring partnerships to promote effective and efficient monitoring, based on scientific principles including (1) peer review, using common approaches and protocols, (2) interpretation of the results of these monitoring programs in a manner that best supports resource policy and management objectives, and (3) collection and presentation of monitoring data and information such that it can be readily and reliably shared.

PNAMP has adopted a Charter to formalize the agreement among federal, state, and tribal entities to participate in the coordination of scientific monitoring programs. PNAMP has also developed a coordination plan to facilitate aquatic monitoring in the Pacific Northwest titled, "Strategy for Coordinating Monitoring of Aquatic Environments in the Pacific Northwest." In addition to adopting a monitoring coordination structure with Steering Committee guidance, PNAMP has identified and developed working groups for five key elements of monitoring: watershed condition monitoring, effectiveness monitoring, fish population monitoring, estuary monitoring, and data management. PNAMP operates with policy support and direction by member organizations, commitments of technical resources and staff time and, ultimately, funding for the coordination itself.

### Further Evolution of the Monitoring Strategy

Elements of Washington's *CWA Monitoring Strategy* will continue to develop and be refined as the state balances a host of different environmental goals and objectives (e.g., salmon recovery, watershed health, human health) against numerous agency mandates and limited funding capacity. Ecology will continue to engage EPA through the *Performance Partnership Agreement* and subsequent reviews to discuss mutual monitoring priorities. Ecology will also continue to coordinate and further integrate statewide monitoring programs through the Governor's Forum on Monitoring, the Puget Sound Ambient Monitoring Program, and the PNAMP. All three coordinating bodies are simultaneously working to determine monitoring priorities, investments, and responsibilities among agencies with different mandates (e.g., salmon recovery vs. human health risks), different scales of interest or authority (statewide, regional, or local), and different levels of funding capacity.

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# 1. Monitoring Strategy Priorities

The mission of Ecology's Water Quality Program is to "protect and restore Washington's waters." Consequently, many of Ecology's monitoring programs are rooted in regulatory requirements (especially CWA provisions) and have been refined and optimized over time to meet the agency's highest priority objectives, mandates, and management obligations in the face of on-going budget limitations.

The major strategic monitoring priorities for Ecology are:

- Meet the court-imposed requirement for completing TMDLs in accordance with the 1998 Agreement.
- Meet all other CWA requirements for monitoring and reporting, including timely completion of the state's Water Quality Assessment integrated report, required nonpoint program (Section 319) reporting, and Effectiveness Monitoring requirements for TMDLs.
- Evaluate best management practices and their effectiveness in representative watersheds.
- Meet remaining CWA expectations for monitoring including making progress towards a representative, statewide monitoring program necessary to meet Section 305(b) requirements. Acknowledge significant monitoring gaps remain with regard to the absence of monitoring directed toward lakes, reservoirs, groundwater, wetlands, and many toxic compounds. Seek opportunities to fill these monitoring gaps as competing priorities and funding opportunities allow.
- To the extent practicable, begin to implement the monitoring recommendations of the 2002 Washington *Comprehensive Monitoring Strategy* (CMS) for Watershed Health and Salmon Recovery. Meet the March 2006 target for reporting on progress toward implementing activities detailed in the CMS Action Plan.
- Honor Ecology's commitments, mandates, and obligations to coordinate water quality monitoring activities externally through the Governor's Forum on Monitoring, through periodic review of the *Performance Partnership Agreement* with EPA, through the Puget Sound Action Team (to implement the Puget Sound Conservation and Recovery Act), and with PNAMP.
- Honor commitments to support monitoring needs of other clients within and external to Ecology who have provided dedicated funding through grants or other vehicles.

Ecology's *Strategic Plan*, the *Performance Partnership Agreement*, and Washington's CMS are all consistent with the goals and objectives of the CWA. However, the CMS expands beyond the CWA and considers many additional monitoring elements focused on the goal to "restore salmon, steelhead, and trout populations to healthy and harvestable levels and improve habitats on which fish rely." The CMS summarized the state's existing monitoring programs, identified monitoring gaps, and recommended priorities for new monitoring to support improved watershed health and salmon recovery.

Recommendations were prioritized against six criteria:

1. Does the proposed action build a monitoring foundation (e.g., protocols, data)?
2. Is it necessary for federal assurances under the Endangered Species Act and CWA?
3. Is it an efficient use of existing monitoring?
4. Does it give the highest return on the investment (cost/benefit)?
5. Does the monitoring relate to agency mandates?
6. Does the proposed monitoring fill a monitoring gap/baseline?

Because the CMS evaluates cross-agency monitoring priorities, it often functions as a starting point for discussions around state funding priorities for monitoring. Consequently the recommendations included in the CMS are significant for both Ecology and EPA. By March 2006, Ecology and other state agencies must report to the Governor's Forum on Monitoring and to the Office of Financial Management (OFM) on progress toward meeting the strategic priorities listed in the CMS. This report will become the basis for tracking agency responses to the CMS priority recommendations, and could potentially lead to budget requests or other funding recommendations from the Governor's Forum on Monitoring and from OFM.

Current and recommended new monitoring activities assigned to Ecology are listed in Table 1 below. The complete priority matrix and implementation schedule for all CMS-recommended monitoring activities for state agencies is provided in Appendix A.

Table 1. Comprehensive Monitoring Strategy (CMS) Strategic Priorities Assigned to the Department of Ecology

Essential Current Monitoring Activities	Priority	Rank	Estimated Biennial Budget Level
<ul style="list-style-type: none"> <li>Monitoring water quality trends</li> <li>Stream gaging</li> <li>Monitoring habitat to establish instream flows</li> <li>Status of freshwater quality – EPA EMAP grants</li> <li>Marine sediment monitoring</li> <li>Pesticide residues (Toxics Monitoring Program)</li> <li>Salmon Index watershed monitoring</li> </ul>	Essential		\$2,272K
	Essential		\$2,082K
	Essential		0
	Essential		\$894K
	Essential		\$794K
	Essential		\$580K
	Essential		\$326K
<i>Total of all essential current monitoring activities</i>			<i>\$6,948K</i>
Recommended New Monitoring Activities			Proposed Biennial Budget Level
<ul style="list-style-type: none"> <li>EMAP status and trend of surface water quality</li> <li>Instream flow studies in critical watersheds</li> <li>Streamflow gaging in priority watersheds</li> <li>Streamflow gaging in remaining watersheds</li> <li>Instream flow studies in non-critical watersheds</li> <li>TMDL effectiveness monitoring</li> <li>Monitor impaired waters only to meet court decree</li> <li>Develop benchmark indicators</li> <li>Effectiveness of water quality improvement projects (for state grant-funded projects)</li> <li>Modify water quality index for EMAP designs</li> <li>Water quality certification compliance monitoring</li> <li>Develop Clean Water Plans scorecard for salmonid waters</li> <li>Monitor impaired waters for all standards for TMDLs</li> </ul>	High	6	\$3,060K
	High	7	\$1,050K
	High	17	\$4,620K
	Medium	27	\$17,850
	Medium	28	\$6,300K
	Medium	35	\$6,065K
	Medium	39	\$6,330K
	Medium	45-49	\$1,100K
	Medium	53	\$10,200K
	Medium	56	0
	Medium	59	\$180K
	Medium	60	0
	Medium	61	\$25,800K
<i>Total of recommended new monitoring activities</i>			<i>\$82,555K</i>

K = thousand

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## 2. Monitoring Objectives

EPA (2003) lists five core monitoring questions that states must address to meet CWA goals:

1. What is the overall quality of waters in the state?
2. To what extent is water quality changing over time?
3. Where are the problem areas and areas needing protection?
4. What level of protection is needed?
5. How effective are clean water projects and programs?

These five CWA monitoring objectives establish the foundation for Ecology's water quality monitoring objectives, as well as those found in the water quality monitoring sections of Washington's *Comprehensive Monitoring Strategy* (CMS). However, both the CMS and Ecology's Water Quality Program have added to or slightly refined these monitoring objectives:

The CMS Action Plan lists the following key monitoring questions relative to water quality and water quantity monitoring:

- How can monitoring information be effectively shared and coordinated with the public and all levels of government?
- How effective are Clean Water Programs at meeting water quality criteria?
- Where do water quality conditions not support aquatic life and recreational uses?
- Where have standards for water quantity been established?
- How effective are the state's water resource management programs for protecting and restoring instream flows?
- What is the water quality condition of surface waters?
- What are the trends in water quantity and flow characteristics?
- Where do the water quantity and flow characteristics limit salmon productivity?

Ecology's Water Quality Program has refined the basic CWA questions as follows:

- What is the water quality trend in a set of representative watersheds in the state?
- Is the water getting better or worse? Why?
- Are there sources of pollution that are not addressed by any of our best management practices (BMPs)?
- Are the BMPs we're using effective?

Table 2 compares the core monitoring questions and objectives from the CWA, the CMS, and Ecology.

Table 2. Comparison of the core monitoring questions (and objectives) from the Clean Water Act, Washington’s *Comprehensive Monitoring Strategy*, and Ecology’s Water Quality Program.

Clean Water Act	Comprehensive Monitoring Strategy	Ecology
<p><b>1. What is the overall quality of waters in the state?</b></p> <ul style="list-style-type: none"> <li>• What % of stream miles are meeting water quality standards/supporting beneficial uses?</li> <li>• What % of estuary acres are meeting water quality standards/supporting beneficial uses?</li> <li>• What % of lake acres are meeting water quality standards/supporting beneficial uses?</li> </ul>	<p><b>What is the quality of surface waters?</b></p> <ul style="list-style-type: none"> <li>• Measure status of identified water quality indicator.</li> <li>• Measure status of identified water quality indicators in agricultural, forest, and urban lands.</li> </ul>	<p><b>What is the water quality trend in a set of representative watersheds in the state?</b></p>
<p><b>2. To what extent is water quality changing over time?</b></p> <ul style="list-style-type: none"> <li>• How are the questions raised under #1 changing over time?</li> </ul>	<p><b>How are surface water quality conditions changing over time?</b></p> <ul style="list-style-type: none"> <li>• Measure the trend of identified water quality indicators at stations, representing the cumulative effects of human-caused impacts and natural conditions.</li> <li>• Assess the change in the area-wide conditions of identified water quality indicators.</li> </ul>	<p><b>Is the water getting better or worse? Why?</b></p>
<p><b>3. Where are the problem areas and areas needing protection?</b></p> <ul style="list-style-type: none"> <li>• Where are the impaired waters of the state? What are the causes and sources of impairment?</li> <li>• Where are the waters that are currently of high quality (reference sites?)</li> </ul>	<p><b>Where do water quality conditions not support aquatic life and recreational uses?</b></p> <ul style="list-style-type: none"> <li>• Identify waters where aquatic life and recreational uses are impaired due to surface water quality conditions.</li> </ul>	
<p><b>4. What level of protection is needed?</b></p> <ul style="list-style-type: none"> <li>• For impaired waters, what beneficial uses are attainable (use attainability analyses)?</li> <li>• What should the effluent limits in NPDES permits be to meet water quality standards?</li> <li>• For impaired waters, what are the appropriate wasteload allocations?</li> </ul>		<p><b>Are there sources of pollution that are not addressed by any of our best management practices (BMPs)?</b></p>
<p><b>5. How effective are clean water projects and programs?</b></p> <ul style="list-style-type: none"> <li>• Are waters with Section 319 projects (or categories of projects) improving?</li> <li>• What % of waterbodies listed as impaired on the 2000 303(d) list have been restored?</li> <li>• Are impaired segments meeting water quality standards?</li> <li>• In watersheds with approved TMDLs: <ul style="list-style-type: none"> <li>• Is water quality improving?</li> <li>• Are interim and/or final TMDL targets being met?</li> <li>• Are additional implementation measures needed?</li> <li>• Are point source dischargers meeting their NPDES limits?</li> </ul> </li> </ul>	<p><b>How effective are Clean Water Programs at meeting water quality criteria?</b></p> <ul style="list-style-type: none"> <li>• Measure effectiveness of Clean Water Programs in meeting water quality goals.</li> </ul>	<p><b>Are the BMPs we’re using effective?</b></p>
	<p><b>How can monitoring information be effectively shared and coordinated with the public and all levels of government?</b></p>	

### 3. Monitoring Design

Washington State will continue to implement essential current monitoring programs to provide the data needed to support its priority monitoring objectives. Ecology's current monitoring programs are based largely on designs using targeted fixed stations, targeted short-term stations, intensive studies, effectiveness and verification monitoring, and random (probabilistic) sampling in a tiered approach that provides monitoring data and information at multiple geographic and temporal scales. Monitoring data will continue to be used primarily to support water quality assessments, to develop Water Cleanup Plans (TMDLs), and to provide data and information to inform specific management questions.

In practice, many of the water monitoring programs conducted in Washington can be used to address more than one monitoring objective. For example, the primary use of routine monthly samples collected by Ecology's ambient monitoring program is to describe trends in water quality over time (Hallock and Ehinger, 2003). However, these data are also used for status reporting (under CWA Section 305(b)) and to identify waters for management action (under CWA Section 303(d)).

Different monitoring designs are needed to address different monitoring objectives, or to address the same objectives at different geographic or temporal scales. These different types of monitoring are not mutually exclusive, nor are they independent. Table 3 compares the five core CWA monitoring objectives to Ecology's major monitoring programs.

The following pages evaluate and describe the state's monitoring design for each of the five core CWA questions. A catalog of state monitoring programs is attached as Appendices A and C.

Table 3. Alignment of Ecology’s major water quality monitoring programs to the five core Clean Water Act monitoring objectives.

Clean Water Act	Ecology Monitoring Program
<p><b>1. What is the overall quality of waters in the state?</b></p> <ul style="list-style-type: none"> <li>• What % of stream miles are meeting water quality standards/supporting beneficial uses?</li> <li>• What % of estuary acres are meeting water quality standards/supporting beneficial uses?</li> <li>• What % of lake acres are meeting water quality standards/supporting beneficial uses?</li> </ul>	<ul style="list-style-type: none"> <li>• Marine sediment monitoring program</li> <li>• Several federally-funded EMAP-style projects have been conducted, but funding has expired. A BPA-funded project is underway in the Wenatchee basin thru 2008.</li> </ul>
<p><b>2. To what extent is water quality changing over time?</b></p> <ul style="list-style-type: none"> <li>• How are the questions raised under #1 changing over time?</li> </ul>	<ul style="list-style-type: none"> <li>• Freshwater river and stream ambient fixed stations</li> <li>• Marine ambient water quality fixed stations</li> <li>• Marine sediment fixed stations</li> <li>• Ambient bioassessment reference stations</li> </ul>
<p><b>3. Where are the problem areas and areas needing protection?</b></p> <ul style="list-style-type: none"> <li>• Where are the impaired waters of the state? What are the causes and sources of impairment?</li> <li>• Where are the waters that are currently of high quality (reference sites?)</li> </ul>	<ul style="list-style-type: none"> <li>• Freshwater annual basin targeted stations</li> <li>• Marine annual targeted stations</li> <li>• Ambient bioassessment annual targeted stations</li> <li>• Invasive aquatic plants monitoring</li> <li>• BEACH program</li> <li>• Toxics in fish tissue studies</li> <li>• Intensive studies (including TMDL studies)</li> <li>• Integrated water quality assessment</li> </ul>
<p><b>4. What level of protection is needed?</b></p> <ul style="list-style-type: none"> <li>• For impaired waters, what beneficial uses are attainable (use attainability analyses)?</li> <li>• What should the effluent limits in NPDES permits be to meet water quality standards?</li> <li>• For impaired waters, what are the appropriate wasteload allocations?</li> </ul>	<ul style="list-style-type: none"> <li>• Intensive studies</li> <li>• TMDL studies</li> <li>• NPDES monitoring</li> </ul>
<p><b>5. How effective are clean water projects and programs?</b></p> <ul style="list-style-type: none"> <li>• Are waters with Section 319 projects (or categories of projects) improving?</li> <li>• What % of waterbodies listed as impaired on the 2000 303(d) list have been restored?</li> <li>• Are impaired segments meeting water quality standards?</li> <li>• In watersheds with approved TMDLs: <ul style="list-style-type: none"> <li>• Is water quality improving?</li> <li>• Are interim and/or final TMDL targets being met?</li> <li>• Are additional implementation measures needed?</li> <li>• Are point source dischargers meeting their NPDES limits?</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Freshwater river and stream ambient monitoring</li> <li>• Marine ambient monitoring</li> <li>• Stream ambient bioassessment monitoring</li> <li>• Invasive aquatic plant monitoring</li> <li>• BEACH monitoring</li> <li>• Toxics in fish tissue studies</li> <li>• Discharge monitoring reports</li> <li>• TMDL effectiveness monitoring studies</li> <li>• Intensively monitoring watersheds</li> <li>• Forests and Fish effectiveness monitoring</li> </ul>

\* Targeted stations result in a biased assessment of overall water quality condition.

# 1. What Is the Overall Quality of Waters in Washington State?

Ecology is required to report on the status of all waters under CWA Section 305(b), and other state, regional, and federal reports seek similar assessments for their waters of interest (e.g., the Puget Sound Update Report, Washington’s State of Salmon in Watersheds Report, Georgia Basin – Puget Sound Environmental Indicators Report, and the National Coastal Condition Report).

A complete census of the condition of all waters would be prohibitively expensive and logistically impractical. However, an *estimate* of the status of all waters of interest can be calculated if the sampling design is based on a statistically valid, representative (un-biased), and sufficiently large sample of those waters. The size of the sample actually required depends on the variability of the sampled population, the frequency of sampling, and the confidence required of the estimate. The diversity and variability of waters across Washington State means that a large (and proportionately expensive) number of randomly-placed stations would be required to actually provide a reliable, representative characterization of all the waters of the state. Sampling randomly-chosen sites also presents significant access and other logistical problems, further increasing costs.

While randomly-located stations are required to estimate the overall status of waters, such stations rarely contribute to site-specific management recommendations.

## Core Questions

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- What is the overall quality of waters in the state? (EPA)
- What is the quality of surface waters? (CMS)
- What is the water quality trend in a set of representative watersheds in the state? (Ecology)

## Key Measures

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- What percent of stream miles are meeting water quality standards/supporting beneficial uses? (EPA)
- What percent of estuary acres are meeting water quality standards/supporting beneficial uses? (EPA)
- What percent of lake acres are meeting water quality standards/supporting beneficial uses? (EPA)
- Measure status of identified water quality indicator (CMS)
- Measure status of identified water quality indicators in ag, forest, and urban lands (CMS)

## Current Ecology Monitoring Programs

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Ecology’s rotating-panel, spatial sediment monitoring program (part of Puget Sound Ambient Monitoring Program) is the only permanently established monitoring program in the state based

on a design intended to provide a statistically valid, un-biased, representative estimate of environmental condition over a broad area. Using a rotating panel design, Ecology's Sediment Monitoring Program will completely sample Puget Sound over an eight-year period, and then be able to develop an overall estimate of the percent of estuary acres impacted by poor quality sediments.

Since approximately 1994, Ecology has conducted several limited-duration monitoring projects based on EMAP-style (probabilistic) monitoring designs funded by various federal grants. These one-to-five-year projects have been conducted to collect representative data at various state, regional, and basin scales. Several projects were funded as part of larger national programs (e.g., the NOAA-funded Puget Sound sediment monitoring program sampled 300 random sites in Puget Sound from 1997-1999 for inclusion in NOAA's National Status and Trends program; EPA's Western Coastal EMAP Pilot was designed to provide statistically valid water, sediment, and fish-tissue data from estuarine and coastal waters for inclusion in the National Coastal Assessment Reports). Other projects included the Western Rivers and Streams EMAP project (~ 50 freshwater sites sampled from 2000-2003 to provide a statewide estimate of freshwater conditions), REMAP basin focus projects, and BPA-Wenatchee Basin.

All of these projects have been completed (or will be completed by 2006) with the exception of the BPA-funded Wenatchee basin EMAP-style program funded through 2008.

## Gaps

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With the one exception of the Puget Sound Ambient Monitoring Program (PSAMP) sediment monitoring program, no statewide monitoring programs currently exist that meet the criteria for providing a statistically valid, un-biased, representative assessment of overall water quality condition for rivers, streams, or marine waters in the state. Similarly, there are no monitoring programs in the state focused on assessing the overall condition of lakes, wetlands, or groundwater.

Ecology does not routinely use biological measures to assess attainment of beneficial uses, and samples only a small sub-set of the 340 water quality indicators adopted in state or federal regulations. Consequently, water quality condition is only partially assessed.

## Strategies

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### 2005 – 2007

*Ecology will:*

1. Complete the 2006 Water Quality Assessment based on all available, credible data. (PPA 3AC)
2. Develop a framework (a Quality Assurance Monitoring Plan - QAMP) for a statewide monitoring program incorporating a random (probabilistic) sample design for wadeable and non-wadeable freshwater rivers and streams, including water quality and salmon habitat measures. Ecology will work collaboratively with EPA-Corvallis, the Washington

Department of Fish and Wildlife, the Washington Conservation Commission, regional salmon recovery boards, and local representatives to develop the sampling design, recommend methods and protocols including data management and data transfer procedures, and provide an initial statewide sample draw. The intention of the QAMP is to provide a scaleable, statewide, probabilistic monitoring design for freshwater rivers and streams that can be implemented by interested agencies or monitoring entities at any level (local, regional, or statewide, including regional salmon recovery boards and citizen volunteers). Entities choosing to use the monitoring framework (the QAMP) will avoid the costs of developing individualized sampling plans and protocols while building databases that are comparable and transferable for use at different scales. Funding to develop the QAMP was provided in FY 2006 by the Salmon Recovery Funding Board (\$142,000 grant to Ecology from SRFB). Funding to implement the monitoring program has not been provided. (*SRFB grant*)

3. By March 2006, inventory and report on the status of all recommendations included in Washington's *Comprehensive Monitoring Strategy*, including recommendation # 6: EMAP sampling of freshwater habitat, water quality, and trout (including lakes and marine waters - \$3,060K proposed – high priority). Recommendations will be presented to the Governor's Forum on Monitoring, and to Washington's Office of Financial Management, for tracking purposes and for possible consideration in the 2007-2009 budget process. (*CMS*)
4. Maintain the PSAMP sediment monitoring program at current levels. (*EAP Strategic Plan; PSAT*)

## **2007-2010**

*Ecology will:*

1. Complete the 2008 and 2010 Water Quality Assessment. (*WQP Strategic Plan*)
2. Use the formal, multi-agency monitoring forums and coordinating bodies (Governor's Forum on Monitoring Forum, PSAT, PNAMP) to work with local, tribal, and other-agency partners to coordinate statewide monitoring efforts, resolve conflicting priorities, encourage data sharing, and encourage local implementation of the probabilistic monitoring program based on the QAMP developed in FY 2006. (*EAP Strategic Plan*)
3. Review and revise, as needed, monitoring elements listed in the Ecology-EPA *Performance Partnership Agreement*.
4. Complete the installation of additional continuously-recording, moored sensors in Grays Harbor and selected (targeted) sites in Puget Sound (to begin in FY 2006). These moorings will greatly increase marine data collection, thereby improving Ecology's marine modeling capabilities. Improving estuarine and coastal modeling capabilities is another approach to describing and predicting water quality conditions across large spatial (and temporal) scales.
5. Continue to engage new monitoring technologies and partnerships, including remote-sensing opportunities, to expand the temporal and spatial coverage of Ecology's monitoring programs.

> 2010

*Ecology will:*

1. Update this document (*Clean Water Act Monitoring Strategy*) to reflect on-going revisions and updates to the three guiding strategic initiatives (CMS, *Ecology Strategic Plan*, and PPA) as well as track progress made toward on-going requirements (e.g., required Water Cleanup Plans) and recommended improvements (e.g., funding a statewide, probabilistic monitoring program).
2. Engage EPA through the *Performance Partnership Agreement (PPA)* development process, especially relative to the current commitment to clarify priority tracking and monitoring needs (PPA element 3AI). EPA and Ecology will also jointly contribute to the broader, statewide discussions of monitoring through both agencies' participation and representation on the Governor's Forum on Monitoring, the Puget Sound Ambient Monitoring Program, and the Pacific Northwest Aquatic Monitoring Partnership (PNAMP).

## 2. To What Extent Is Water Quality Changing Over Time?

Ecology conducts monitoring programs that can be used to evaluate trends at targeted stations in freshwater rivers and streams, marine waters, and marine sediments. Trends can be determined for individual sites, or for a population of stations, depending on the monitoring design.

The frequency of sampling and the length of time required to detect a trend is based on the variability and independence of the environmental indicator being measured. Trend analyses can be site-specific, or analyses can focus on broad-area changes using random or probability-based monitoring focused on a broad spatial scale.

### Core Questions

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- To what extent is water quality changing over time? (EPA)
- How are surface water quality conditions changing over time? (CMS)
- Is the water getting better or worse? Why? (Ecology)

### Key Measures

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- Is the percent of stream miles, estuary acres, and lake acres meeting water quality standards changing over time? (EPA)
- Measure the trend of identified water quality indicators at stations representing the cumulative effects of human-caused impacts and natural conditions. (CMS)
- Assess the change in the area-wide conditions of identified water quality indicators. (CMS)

### Current Ecology Monitoring Programs

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Ecology conducts several ambient monitoring programs appropriate for determining long-term trends at targeted sites in freshwater rivers and streams, marine waters, and marine sediments. These programs allow evaluation of trends at their specific station locations. For the freshwater river and stream program, it is generally assumed that trends at targeted downstream stations likely reflect changes in natural conditions and the cumulative (downstream) effects of all basin inputs. For marine waters and sediments, most stations have been targeted for generally well-mixed portions of estuarine embayments. Therefore, trends at those stations are assumed to reflect overall changes in the condition of waters and sediments typical of those well-mixed locations.

Since these monitoring programs (not including marine sediments) are *not* based on a random sampling design, they can not strictly answer the core questions associated with this objective, or provide statistically valid data for the key measures (other than the first CMS measure limited to measuring the trend of identified water quality indicators at stations representing the cumulative effects of human-caused impacts and natural conditions). To evaluate a trend in the statewide percent of waterbodies meeting water quality standards, or to assess changes in the area-wide conditions of identified water quality indicators, requires a statistically valid, random (probabilistic) monitoring design.

The following monitoring programs support trend evaluations at targeted sites (Ecology assumes targeted sites generally reflect larger basin downstream cumulative inputs or typical embayment conditions):

- River and Stream ambient monitoring
- Marine Water ambient monitoring
- Marine Sediment long-term monitoring
- Stream biological monitoring (reference stations)

## Gaps

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There are no existing, statistically-valid monitoring programs appropriate for measuring statewide or regional trends in the overall quality of freshwater rivers and streams, marine waters, or marine sediments.

There are no monitoring programs focused on assessing the overall condition of lakes, reservoirs, groundwater, or wetlands.

Ecology does not routinely use biological measures to assess attainment of beneficial uses, and samples only a small sub-set of the 340 water quality indicators adopted in state or federal regulations. Consequently, water quality condition is only partially assessed.

## Strategies

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NOTE: To strictly meet this monitoring objective, a statistically-valid, random sampling design is required. Therefore, all of the strategies listed under the previous objective, *What Is the Overall Quality of Waters in Washington State?*, are germane to this objective as well, in so much as the key measures for this objective simply derive from repeated assessment of overall conditions (required for the first objective). Therefore, to fully meet this monitoring objective, the strategies developed to estimate statewide or broad-area status must first be implemented.

### **2005 – 2007**

*Ecology will:*

1. Complete the 2006 Water Quality Assessment based on all available, credible data. (PPA 3AC)
2. Develop a framework (a Quality Assurance Monitoring Plan) for a statewide monitoring program incorporating a random (probabilistic) sample design for wadeable and non-wadeable freshwater rivers and streams, including water quality and salmon habitat measures. Ecology will work collaboratively with EPA-Corvallis, the Washington Department of Fish and Wildlife, the Washington Conservation Commission, regional salmon recovery boards, and local representatives to develop the sampling design, recommend methods and protocols including data management and data transfer procedures, and provide an initial statewide sample draw. The intention of the QAMP is to provide a scaleable, statewide, probabilistic monitoring design for freshwater rivers and streams that can be implemented by interested agencies or monitoring entities at any level (local, regional,

or statewide, including regional salmon recovery boards and citizen volunteers). Entities choosing to use the monitoring framework (the QAMP) will avoid the costs of developing individualized sampling plans and protocols while building databases that are comparable and transferable for use at different scales. Funding to develop the QAMP was provided in FY 2006 by the Salmon Recovery Funding Board (\$142,000 grant to Ecology from SRFB). Funding to implement the monitoring program has not been provided. (*SRFB grant*)

3. By March 2006, inventory and report on the status of all recommendations included in Washington's *Comprehensive Monitoring Strategy*, including recommendation # 6: EMAP sampling of freshwater habitat, water quality, and trout (including lakes and marine waters - \$3,060K proposed – high priority). Recommendations will be presented to the Governor's Forum on Monitoring, and to Washington's Office of Financial Management, for tracking purposes and for possible consideration in the 2007-2009 budget process. (*CMS*)
4. Maintain the Puget Sound Ambient Monitoring Program sediment monitoring program at current levels. (*EAP Strategic Plan; PSAT*)

### **2007-2010**

*Ecology will:*

1. Complete the 2008 and 2010 Water Quality Assessment. (*Water Quality Program Strategic Plan*)
2. Use the formal, multi-agency monitoring forums and coordinating bodies (Governor's Forum on Monitoring, PSAT, PNAMP) to work with local, tribal, and other-agency partners to coordinate statewide monitoring efforts, resolve conflicting priorities, encourage data sharing, and encourage local implementation of the probabilistic monitoring program based on the QAMP developed in FY 2006. (*EAP Strategic Plan*)
3. Review and revise, as needed, monitoring elements listed in the Ecology-EPA *Performance Partnership Agreement*.
4. Complete the installation of additional continuously-recording, moored sensors in Grays Harbor and selected (targeted) sites in Puget Sound (to begin in FY 2006). These moorings will greatly increase marine data collection, thereby improving Ecology's marine modeling capabilities. Improving estuarine and coastal modeling capabilities is another approach to describing and predicting water quality conditions across large spatial (and temporal) scales.
5. Continue to engage new monitoring technologies and partnerships, including remote-sensing opportunities, to expand the temporal and spatial coverage of Ecology's monitoring programs

### **> 2010**

*Ecology will:*

1. Update this document (*Clean Water Act Monitoring Strategy*) to reflect on-going revisions and updates to the three guiding strategic initiatives (*CMS, Ecology Strategic Plan, and PPA*) as well as track progress made toward on-going requirements (e.g., required Water Cleanup Plans) and recommended improvements (e.g., funding a statewide, probabilistic monitoring program).

2. Engage EPA through the *Performance Partnership Agreement* (PPA) development process, especially relative to the current commitment to clarify priority tracking and monitoring needs (PPA element 3AI). EPA and Ecology will also jointly contribute to the broader, statewide discussions of monitoring through both agencies' participation and representation on the Governor's Form on Monitoring, the Puget Sound Ambient Monitoring Program, and the Pacific Northwest Aquatic Monitoring Partnership (PNAMP).

### 3. What Are the Problem Areas and Areas Needing Protection?

Areas or sites having problems are primarily identified through the Water Quality Assessment process, based on data obtained from one of Ecology's monitoring programs or submitted by external entities. Suspect sites may be targeted for further verification monitoring or intensive studies to confirm or evaluate suspected conditions.

Areas needing protection (to preserve pristine or near-pristine conditions) may be identified as reference sites having minimal anthropogenic influence. Reference sites may be targeted for verification monitoring to confirm their condition. In Washington, most reference stations are located in areas having little previous human impact (e.g., parks or wilderness areas) or in areas remote from direct human influence.

#### Core Questions

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- Where are the problem areas and areas needing protection? (EPA)
- Where do water quality conditions not support aquatic life and recreational uses? (CMS)

#### Key Measures

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- Where are the impaired waters of the state? (EPA)
- What are the causes and sources of impairment? (EPA)
- Where are the waters that are currently of high quality (reference sites?) (EPA)
- Identify waters where aquatic life and recreational uses are impaired due to surface water quality conditions. (CMS)

#### Current Ecology Monitoring Programs

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Ecology conducts Intensive Studies, including Water Cleanup Plans (TMDL studies) to help determine the exact location of water quality standards violations. While typically triggered by a Category 5 listing, intensive (TMDL) studies usually begin by evaluating the extent and severity of water quality problems.

Ecology conducts several programs primarily designed as screening-level efforts to identify or verify suspected problems, or to verify that problems do not exist. These programs generally rely on short-term, targeted station monitoring. Programs include:

- River and Stream ambient monitoring "basin station" program
- Marine Water ambient monitoring "basin station" program
- Stream biological monitoring (targeted annual stations)
- Invasive aquatic plant monitoring
- BEACH Program
- Washington State Toxics Monitoring Program
- Intensive studies

## Gaps

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Annual project requests, requests for targeted stations, and data verification requests by regional clients greatly outstrip available monitoring resources. Consequently, in any given year only a small fraction of suspected problems can be addressed.

There are no monitoring programs focused on assessing the overall condition of lakes, reservoirs, groundwater, or wetlands.

Modeling capacity needs to be expanded to provide tools for characterizing, predicting, and representing water quality conditions and problems, especially in estuarine basins and coastal waters.

Ecology does not routinely use biological measures to assess attainment of beneficial uses, and samples only a small sub-set of the 340 water quality indicators adopted in state or federal regulations. Consequently, water quality condition is only partially assessed.

## Strategies

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### 2005 – 2007

*Ecology will:*

1. Complete the 2006 Water Quality Assessment based on all available, credible data. (PPA 3AC)
2. Ecology's Environmental Assessment Program will solicit requests for screening-level station locations through its annual project planning process involving (especially) the Water Quality Program, Water Resources Program, Watershed Leads, and Toxics Cleanup Program. (*EAP Strategic Plan*)
3. By March 2006, inventory and report on the status of all recommendations included in Washington's *Comprehensive Monitoring Strategy*, including recommendations # 39 and 61: (impaired Waters Monitoring – \$32,130K/biennium – medium priority). Recommendations will be presented to the Governor's Forum on Monitoring, and to Washington's Office of Financial Management, for tracking purposes and for possible consideration in the 2007-2009 budget process. (CMS)
4. Complete the installation of additional continuously-recording, moored sensors in Grays Harbor and selected (targeted) sites in Puget Sound (to begin in FY 2006). These moorings will greatly increase marine data collection, thereby improving Ecology's marine modeling capabilities. Improving estuarine and coastal modeling capabilities is another approach to describing and predicting water quality conditions across large spatial (and temporal) scales.
5. Continue to engage new monitoring technologies and partnerships, including remote-sensing opportunities, to expand the temporal and spatial coverage of Ecology's monitoring programs. (*EAP Strategic Plan*)

6. Develop a strategy for addressing marine TMDLs, and make recommendations on how to proceed to address future marine TMDLs. (*WQ Program 2005-2007 Program Plan element E4*)

## **2007-2010**

*Ecology will:*

1. Complete the 2008 and 2010 Water Quality Assessment. (*Water Quality Program Strategic Plan*)
2. Use the formal, multi-agency monitoring forums and coordinating bodies (Governor's Forum on Monitoring, PSAT, PNAMP) to work with local, tribal, and other-agency partners to coordinate statewide monitoring efforts, resolve conflicting priorities, encourage data sharing, and encourage local implementation of the probabilistic monitoring program based on the QAMP developed in FY 2006. (*EAP Strategic Plan*)
3. Implement a TMDL studies program for marine basins in Puget Sound and the coastal estuaries. (*EAP Strategic Plan*)
4. Continue to develop and improve state-of-the-art pollution transport and fate models. (*EAP Strategic Plan*)
5. Target new monitoring programs and develop new tools to better forecast and predict changes in water quality and streamflow that anticipate the most important environmental changes likely to result from continued human development, global climate change, regional weather perturbations, and other environmental changes including environmental management and restoration efforts. (*EAP Strategic Plan*)

## 4. What Level of Protection Is Needed?

A key element of Ecology's Water Quality Program mission is to "restore" Washington's waters. Ecology conducts environmental studies to address known or suspected problems at individual sites or across regional areas. Intensive studies are often used to better define the scope of environmental problems, or to evaluate cause-and-effect relationships between environmental conditions and management actions. These directed studies are often requested by Ecology's Water Quality Program staff or Watershed Leads during an annual project planning process used by Ecology's Environmental Assessment Program (EAP) to prioritize workload requests and allocate staff resources. Studies span the range from routine sampling for conventional parameters like bacteria, to more complex analyses for toxic chemicals like dioxins in fish or pesticides in groundwater. Many of the studies are Water Cleanup Studies (or TMDLs) which calculate the total maximum daily load of a pollutant a waterbody can assimilate without causing violations of water quality standards.

As part of a lawsuit settlement brought by plaintiffs under the federal Clean Water Act, Ecology entered into a formal agreement with EPA which requires Ecology to complete nearly 1,500 water cleanup plans by 2013. Within Ecology, the Environmental Assessment Program has the primary responsibility for conducting TMDL monitoring and modeling studies in the agency, and is working with the Water Quality Program to complete the required number of TMDLs by the court-imposed deadline. Workload projections developed by Ecology indicate that current staffing is insufficient to complete the required TMDLs. Consequently, strategies to meet this monitoring objective are key to Ecology meeting its obligations under the federal lawsuit as well as the CWA and PPA, and Ecology and EPA have both committed to exploring innovative approaches to meet this challenge.

### Core Questions

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- What level of protection is needed? (EPA)
- Are there sources of pollution that are not addressed by any of our best management practices? (Ecology)

### Key Measures

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- For impaired waters, what beneficial uses are attainable? (EPA)
- What should the effluent limits in NPDES permits be to meet water quality standards? (EPA)
- For impaired waters, what are the appropriate wasteload allocations? (EPA)
- Which best management practices for nonpoint sources result in meeting beneficial uses?

### Current Ecology Monitoring Programs

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- Intensive studies
- Water Cleanup Plans (TMDL studies)

## Gaps

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Ecology is required under the CWA to develop Water Cleanup Plans for all waters listed on the 303(d) list under Category 5. TMDLs and other directed environmental studies typically require significant resources to complete, and the number of listed waterbodies which must be addressed significantly outstrips existing staff and funding resources.

There is insufficient knowledge of how effective different best management practices (BMPs) are in cleaning up impaired waters. Evaluating BMPs in representative watersheds is an important approach to recommending effective water quality cleanup strategies.

## Strategies

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### 2005 – 2007:

*Ecology will:*

1. Jointly with EPA, implement Ecology's TMDL redesign for streamlining and standardizing TMDL production work. (*PPA element 3B*)
2. Jointly with EPA, meet at least once per year to conduct workload planning and evaluation for the development and implementation of TMDLs. (*PPA element 3C*)
3. Jointly with EPA, work to identify and implement innovative approaches for addressing temperature listings with reduced rigor or other jointly agreeable innovative ideas. (*PPA element 3K*)
4. Jointly with EPA, complete other elements of the *Performance Partnership Agreement* (PPA) expected to improve the efficiency of Ecology's TMDL development efforts. (*PPA*)
5. Continue to evaluate more cost-effective, streamlined approaches to conducting TMDL studies for conventional pollutants, temperature, and toxics. (*EAP Strategic Plan*)
6. Implement intensive monitoring studies or directed research projects to improve our knowledge of the effects of various land-use practices, restoration activities, BMPs, and other management actions on the function of targeted waterbodies, using objective measures of watershed health. (*EAP Strategic Plan*)
7. Coordinate with client programs through EAP's annual project planning process or other mechanisms to develop specific studies and investigations that support their management priorities. (*EAP Strategic Plan*).
8. By March 2006, inventory and report on the status of all recommendations included in Washington's *Comprehensive Monitoring Strategy*, including recommendations # 39 (increase monitoring to support TMDLs focusing only on standards needed to meet the TMDL court decree - \$6,330K proposed – medium priority), and 61 (increase monitoring to include all standards for TMDL support - \$25,800K proposed – medium priority). Recommendations will be presented to the Governor's Forum on Monitoring, and to Washington's Office of Financial Management, for tracking purposes and for possible consideration in the 2007-2009 budget process.

9. Scope statewide ambient toxicity monitoring system. (*WQ Program 2005-2007 Program Plan element A6*)
10. Ecology's Water Quality Program will support the Whole Effluent Toxicity (WET) test regulatory system, data management, eliminate WET test backlog, implement test reviews using CETIS (due June 30, 2006), develop herring test, and implement protocol for risk assessment of treatment chemicals and invasive species management. (*WQ Program 2005-2007 Program Plan element A6*)
11. Ecology will develop a strategy for addressing marine TMDLs, and make recommendations on how to proceed to address future marine TMDLs. (*WQ Program 2005-2007 Program Plan element E4*)

### **2007-2010 and beyond**

*Ecology will:*

1. Implement a TMDL studies program for marine basins in Puget Sound and the coastal estuaries. (*EAP Strategic Plan*)
2. As Persistent Bioaccumulative Toxin (PBT) chemical action plans are funded by the Legislature, design and implement monitoring strategies to evaluate their success. (*EAP Strategic Plan*)
3. Continue to develop and improve state-of-the-art pollution transport and fate models. (*EAP Strategic Plan*)
4. Work with client programs and agencies to link effectiveness monitoring study findings into the adaptive management feedback loop. (*EAP Strategic Plan*)

## 5. How Effective Are Clean Water Projects and Programs?

Effectiveness monitoring evaluates whether water quality management activities have achieved the desired effect or goal. This is a key step in any adaptive management strategy as it allows management decisions to be evaluated and refined to achieve the desired results. Effectiveness monitoring can be focused on entire programs, individual projects, or specific practices or methods. Effectiveness monitoring often involves two steps: 1) determine whether specified management measures or practices were in fact implemented (implementation monitoring), and then 2) determine whether the desired environmental results or outcomes were achieved. Success may be measured as changes from existing (or baseline) conditions or standards, or as progress toward desired outcomes.

Some effectiveness monitoring efforts may be directed toward demonstrating BMP effectiveness. Rather than address every water quality problem as though it were unique, certain categories of problems might lend themselves to a standard BMP prescription. If supported with reliable monitoring data demonstrating the effectiveness of the practice in typical landscape settings (e.g., typical west-side urban, agricultural, or forested watersheds), this could become a powerful tool to more quickly achieve clean water goals in less time while avoiding time-consuming and costly intensive studies.

Real-time adaptive management monitoring has been used successfully in a number of areas to refine and improve restoration and clean-up activities as they are being implemented. For example, as the Nooksack River Cleanup Plan is being implemented, on-going follow-up monitoring identifies “hot spots” that are referred for action. Likewise, in the Lower Yakima watershed, turbidity measurements have provided valuable feedback to clean-up activities.

Ecology works closely with local partners (e.g., tribes, conservation and reclamation districts, counties, cities) wherever possible to collaborate on effectiveness monitoring projects.

### Core Questions

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- How effective are clean water projects and programs? (EPA)
- How effective are Clean Water Programs at meeting water quality criteria? (CMS)
- Are the BMPs we're using effective? (Ecology)

### Key Measures

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- What percent of waterbodies listed as impaired on the 2000 303(d) list have been restored? (EPA)
- Are waters with Section 319 projects (or categories of projects) improving? (EPA)
- Are impaired segments meeting water quality standards? (EPA)
- In watersheds with approved TMDLs: (EPA)
  - Is water quality improving?
  - Are interim and/or final TMDL targets being met?

- Are additional implementation measures needed?
- Are point source dischargers meeting their NPDES limits?
- Measure effectiveness of Clean Water Programs in meeting water quality goals. (CMS)

## Current Ecology Monitoring Programs

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Ecology conducts three monitoring programs specifically focused on effectiveness monitoring.

- Water Cleanup Plan (TMDL) Effectiveness Monitoring
- Intensively Monitored Watersheds
- Effectiveness monitoring of Forest Practice Rules

Several other monitoring programs provide options for targeting annual or other short-term stations to evaluate the effectiveness of management actions. These programs include the short-term monitoring components of the:

- River and Stream ambient monitoring program
- Marine Water Ambient Monitoring
- Stream biological monitoring
- Invasive aquatic plant monitoring
- BEACH Program
- Washington State Toxics Monitoring Program
- Discharge Monitoring Reports

## Gaps

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The number of completed TMDLs and other projects for which effectiveness monitoring is needed or appropriate greatly outstrips Ecology's available resources.

There is no monitoring strategy associated with the developing municipal stormwater program to evaluate the effectiveness of stormwater management programs and to determine if stormwater is getting better or worse.

## Strategies

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### 2005 – 2007

*Ecology will:*

1. Complete the 2006 Water Quality Assessment based on all available data meeting Ecology's quality criteria. (*PPA element 3AC*)
2. Develop a report when it submits its latest revision of the Water Quality Assessment that tallies and justifies the number of waterbodies that have moved from Category 5 to Categories 1-4, as well as the number of waterbodies delisted. (*PPA element 3AJ*)
3. Design and implement an effectiveness monitoring program that meets our CWA Section 319 and TMDL needs. (*WQ Program 2005-2007 Program Plan elements B7 and E6*)

4. Develop a reporting template with regions and other state agencies to report on milestones from the nonpoint plan: reductions in nitrogen, phosphorus, and sediment; miles of riparian areas improved; and miscellaneous accomplishments. (*WQ Program 2005-2007 Program Plan element B8*)
5. By March 2006, inventory and report on the status of all recommendations included in Washington's *Comprehensive Monitoring Strategy*, including recommendation # 53 (target effectiveness monitoring to assess effectiveness of all state-grant-funded, water quality improvement projects - \$10,200K proposed – medium priority). Recommendations will be presented to the Governor's Forum on Monitoring, and to Washington's Office of Financial Management, for tracking purposes and for possible consideration in the 2007-2009 budget process. (*CMS*)
6. Implement intensive monitoring studies or directed research projects to improve Ecology's knowledge of the effects of various land-use practices, restoration activities, BMPs, and other management actions on the function of targeted waterbodies, using objective measures of watershed health. (*EAP Strategic Plan*)
7. Conduct forest practices monitoring under the Forests and Fish Agreement in order to provide Clean Water Act assurances to state and private landowners. (*EAP Strategic Plan*)
8. Work with local governments and other stormwater permit stakeholders to collaboratively develop an integrated stormwater monitoring program. The goal of this program would be to evaluate proposed stormwater management practices to determine the pollutant removal effectiveness, operational feasibility, and compliance with state and federal environmental laws. (*Ecology stormwater program*)

## **2007-2010**

*Ecology will:*

1. Complete the 2008 and 2010 Water Quality Assessment. (*Water Quality Program Strategic Plan*)
2. Use the formal, multi-agency monitoring forums and coordinating bodies (Governor's Forum on Monitoring, PSAT, PNAMP) to work with local, tribal, and other-agency partners to coordinate statewide monitoring efforts, resolve conflicting priorities, encourage data sharing, and encourage local implementation of the probabilistic monitoring program based on the QAMP developed in FY 2006. (*EAP Strategic Plan*)
3. Work with client programs and agencies to link effectiveness monitoring study findings into the adaptive management feedback loop. (*EAP Strategic Plan*)

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## 4. Water Quality Indicators

Ecology routinely measures a small number of indicators to provide information on the fundamental attributes of the aquatic environment and to assess water quality standards attainment or impairment of beneficial uses. Water quality indicators routinely measured by Ecology primarily include physical and chemical measures. However, additional indicators may be added especially when there is a reasonable expectation that a specific pollutant may be present in a watershed, when core indicators indicate impairment, or to support a special study such as screening for potential pollutants of concern.

Ecology will monitor supplemental indicators selected according to site-specific or project-specific criteria. There are 340 water quality indicators that have numeric criteria promulgated in state rule or federal regulation. These include 28 toxic substances in water with numeric criteria in state rule (Chapter 173-201A-040 WAC), and 47 toxic substances in marine sediments with criteria promulgated in state rule (Chapter 173-204-040 WAC). Numerous pesticides currently being used have no numeric criteria in state rule. In addition, federal regulations have adopted criteria for freshwater trophic state indicators and toxic substances for protection of human health.

Supplemental indicators include additional physical and chemical measures, as well as habitat, biological, and ecological endpoints. Supplemental indicators are often important to help assess attainment of beneficial uses, identify causes and sources of impairments, and target appropriate source controls.

The following core indicators are routinely measured by Ecology for assessing the support of aquatic life uses:

- Dissolved oxygen
- Temperature
- pH
- Turbidity
- Streamflow

Core indicators for assessing support of recreational swimming uses are:

- Fecal coliform bacteria
- E. coli (included in BEACH program and some TMDLs)

Core trophic state water quality indicators measured for assessing support of aquatic life and recreational freshwater uses include:

- Total phosphorus
- Total nitrogen
- Chlorophyll-a
- Water clarity

Core trophic state water quality indicators measured in marine waters include:

- Dissolved inorganic nitrogen
- Ammonium ion

Supplemental indicators measured as part of Ecology's ambient bioassessment monitoring, some freshwater EMAP monitoring, and for some special or intensive studies:

- Stream benthic communities
- Periphyton assemblage
- Aquatic vertebrate assemblage

Habitat indicators useful for assessing the support of aquatic life uses are:

- Geomorphic index (including floodplain lateral connectivity)
- Riparian cover and condition
- Large wood
- Pools
- Stream substrate

Other information necessary for classification and stratification purposes needed are:

- Eco-region
- Gradient
- Elevation
- Area and relief
- Stream order
- Channel type
- Valley bottom and containment
- Hydro layers

Ecology and Washington's Puget Sound Action Team have developed indices which combine several indicator measurements into a single rating:

- *River and Stream Water Quality Index (WQI)*. The WQI is a unitless number ranging from 1 to 100 that is intended to represent general water quality. A higher number indicates better water quality. For constituents with established water quality standards (based on criteria in Washington State's Water Quality Standards, Chapter 173-201A WAC), the index expresses results relative to levels required to meet these standards. For constituents without specific standards, results are expressed relative to expected conditions in the appropriate region. Multiple constituents are combined and results aggregated over time to produce a single score for each sample station. For the past several years, Ecology's Environmental Assessment Program has produced an annual report on the condition of Washington's waters using the WQI information.

The WQI is also used as a performance measure for the *State of Salmon in Watersheds* report produced by the Governor's Salmon Recovery Office.

- *Marine Water Quality Gradient of Concern.* Multiple indicators of marine water quality are combined to produce a relative scale. The “gradient of concern” ranks stations from low to very high, based on the summed value of five indicators of environmental status.
- *Sediment Quality Index.* This is a weight-of-evidence index used to characterize the sediments throughout Puget Sound based on the “sediment quality triad” of chemical contaminant and toxicity levels, and the composition of the invertebrate assemblages living in the sediments.

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## 5. Quality Assurance

Most of the monitoring activities conducted by Ecology identify the primary use of the data in a Quality Assurance (QA) Project Plan. Ecology's Executive Policy 1-21 states that "A Quality Assurance Project Plan is prepared for each environmental study/activity that acquires or uses environmental measurement data." It further states that "This policy applies to environmental data collection studies/activities conducted or funded by Ecology." The *Guidelines for Preparing Quality Assurance Project Plans for Environmental Studies* (Ecology, 2004b) describes 14 elements to be addressed in a plan and provides supporting information and examples relevant to the content of each element.

Quality assurance and quality control responsibilities for management and staff are described in the *Quality Management Plan* (Ecology, 2005b). EPA's approval of the *Quality Management Plan* delegates to Ecology the authority to review and approve QA Project Plans prepared in that agency.

*Washington State's Water Quality Assessment* has specific quality assurance requirements identified in Water Quality Policy 1-11. Policy 1-11 directs the reader to several sources for guidance on how to develop the proper QA Project Plan.

- Washington State Department of Ecology:
  - *Guidelines for Preparing Quality Assurance Plans for Environmental Studies*, publication 04-03-030 (available at [www.ecy.wa.gov/biblio/0403030.html](http://www.ecy.wa.gov/biblio/0403030.html)).
  - *Sediment Sampling and Analysis Plan Appendix: Guidance on the Development of Sediment Sampling and Analysis Plans Meeting the Requirements of the Sediment Management Standards*, December 1995 Draft.
- Washington State Department of Natural Resources:
  - *Timber/Fish/Wildlife Monitoring Program Method Manual for the Stream Temperature Survey*, TFW-AM9-99-005, DNR publication 107.
- U.S. Environmental Protection Agency:
  - *The Volunteer Monitor's Guide To Quality Assurance Project Plans*, EPA 841-B-96-003.

In 2004, the Washington State Legislature passed the Credible Data Act (engrossed substitute Senate Bill 5957) with the intent to ensure that credible water quality data are used as the basis for the assessment of the status of a waterbody relative to the surface water quality standards.

The Act requires Ecology to use credible information for:

- Determining whether any water of the state is to be placed on or removed from any Section 303(d) list.
- Establishing a Total Maximum Daily Load (TMDL) for any surface water of the state.
- Determining whether any surface water of the state is supporting its designated use or other classification.

The Act further states that data interpretation, statistical, and modeling shall be those methods that are generally acceptable in the scientific community as appropriate for use in assessing the condition of water.

In collecting and analyzing water quality data for any of these purposes, the Credible Data Act specifies that data will be considered credible if:

- Appropriate quality assurance and quality control procedures were followed and documented in collecting and analyzing water quality samples.
- The samples or measurements are representative of water quality conditions at the time the data were collected.
- The data consist of an adequate number of samples based on the objectives of the sampling, the nature of the water in question, and the indicators being analyzed.
- Sampling and laboratory analysis conform to methods and protocols generally acceptable in the scientific community as appropriate for use in assessing the condition of the water.

## 6. Data Management

### Environmental Information Management System

The Environmental Information Management System (EIM) is Ecology's main database for environmental monitoring data. EIM contains records on physical, chemical, and biological analyses and measurements. Supplementary information about the data (metadata) is also stored, including information about environmental studies, monitoring locations, and data quality. EIM contains 1.7 million environmental records from over 10,000 monitoring locations throughout and adjoining Washington State. EIM provides access to data from over 400 studies including information about where samples were collected, study details, and data quality. EIM allows the ability to search for environmental monitoring data by navigating a map, as well as plot the locations of search results to a map. For a particular parameter, EIM allows filtering the data by specifying the sample matrix and the unit of measure in which the user wants the results displayed. The EIM database is accessible over the internet to assist data-sharing between Ecology and external users.

### Watershed Assessment Tracking System

*Washington State's Water Quality Assessment* uses the Watershed Assessment Tracking System (WATS) to manage the five category listings of waterbody segments in the state. The WATS database contains over 34,000 records of water quality data including water, sediment, and fish tissue and habitat mediums. Data come from a variety of Ecology sources as well as sources outside of Ecology. The WATS database will also be used to manage data for the Total Maximum Daily Load (TMDL) tracking program.

### Water Quality Permit Life Cycle System

Ecology's Water Quality Permit Life Cycle System (WPLCS) contains information about individual permits issued under [National Pollution Elimination System and State Wastewater Discharge permits](#). Permitted facilities may be covered under individual municipal or industrial discharge permits, or under one of a variety of wastewater discharge [general permits](#), which include the [stormwater industrial and stormwater construction permits](#).

The WPLCS database includes information related to permits managed by [Ecology's four regional offices](#) as well as permits managed on a statewide basis. These include about 35 major dischargers handled by Ecology's Industrial Section, and the stormwater industrial and stormwater construction permits managed by the Stormwater Unit.

This database holds huge amounts of information on a wide variety of aspects of permit management, including permit lists and facility information, the discharge monitoring reports (DMRs), permit limit information, and other management information.

Some of the most commonly requested information (permit lists / facility information) is posted online, and updated on a monthly basis. Further data requests may be made under the Freedom of Information Act.

## Grants Reporting and Tracking System

The Grants Reporting and Tracking System is the main reporting vehicle for the CWA Section 319 program. This system has historically focused on limited aspects of Section 319 program implementation, most notably to generally identify where and how Section 319 money is spent. EPA has recently expanded the required reporting elements of the Grants Reporting and Tracking System to ensure a balance of the need to provide good quality information on the results being achieved by the Section 319 program with the need to avoid onerous and duplicative reporting burdens for states. The key performance measures for the Section 319 program are “*report load reductions for nutrients and sediment.*” (PPA element 1G).

## Laboratory Information Management System

The Laboratory Information Management System contains analytical data for samples analyzed by Ecology’s Manchester Environmental Laboratory.

## Sediment Quality Information System

Ecology’s publicly-accessible Sediment Quality Information System (SEDQUAL) is used by federal, state, and local regulatory organizations, academic institutions, and other environmental stakeholders to assess sediment toxicity in the natural environment. The system consists of a database component, a user interface component, and integrated GIS components. The database contains over 8,500 sample collection stations, nearly 13,000 sediment sample records, more than 688,000 chemical analysis records, 141,000 benthic infauna analysis records, and nearly 36,000 bioassay analysis records. The user interface provides powerful query and analysis tools which make data retrievals and sediment quality analysis functions faster and easier than ever before. A “*built in*” GIS interface provides basic, read-only spatial analysis features.

## Natural Resources Data Portal

The Washington State Natural Resources Data Portal was recently developed to provide a searchable catalog with simple links to datasets and their associated metadata (i.e., general description about the data). Washington’s Data Portal is a place to discover, learn about, and access information related to Washington State natural resources. The initial phase of the portal has been developed to include simple links to datasets and their associated metadata, reports, studies, and other information.

## Pacific Northwest Water Quality Data Exchange

The states in EPA Region 10 are undertaking a number of related information management projects that collectively seek to facilitate the aggregation of and access to a comprehensive source of data related to water quality in the Pacific Northwest. With these projects, the states plan to apply the concepts embodied in the National Environmental Information Exchange Network and will combine actual network implementation where appropriate, with extension of the network principles to allow a wide range of data sources to be included. The resulting information interchange mechanisms are known as the Pacific Northwest Water Quality Data Exchange. The project includes voluntary monitoring groups, watershed councils, tribes, state, and federal agencies, and the government of British Columbia. Together, these organizations will make up the Exchange Consortium.

The Exchange has developed a template to facilitate the exchange of information about water quality between various monitoring groups in the Consortium. The Exchange has also developed a supporting “directory services” mechanism that will provide query methods to discover the location, content, and quality of available data. The recommendations from this project are being used to inform further activities to develop and implement the Exchange. These activities will be supported by the general implementation of the Network infrastructure by participating organizations.

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## 7. Data Analysis and Assessment

Ecology's primary means of reporting on the status of water quality is through the development of *Washington State's Water Quality Assessment*. EPA has provided guidance to the states detailing requirements for this report. Ecology's Water Quality Program has adopted Policy 1-11 that describes the methods Ecology will use to assess information to evaluate attainment of water quality standards. The Policy includes criteria for compiling, analyzing, and integrating data on ambient conditions with project implementation information.

### Compiling Existing Sources of Data and Information

Ecology encourages all interested parties to submit data for the water quality assessment. Data are specifically solicited from many sources including federal, state, and local government agencies, tribal governments, watershed planning councils, businesses, academic institutions, not-for-profit groups, and private citizens. Ecology also publicizes a "call for data" period and assesses all data from all sources that are received.

### Data Quality Requirements

Ecology's policy specifies the quality assurance requirements that must be met by all data used for the assessment. Sampling and analysis must be conducted under a documented Quality Assurance (QA) Project Plan or other quality assurance procedures that Ecology determines to be equivalent for providing high quality data. Documentation must be provided with all data submitted for assessment indicating that the objectives of the QA Project Plan or equivalent quality assurance procedures were met. If this documentation (or other equivalent assurance) is not provided, the data are not to be used in the assessment. If Ecology determines there are flaws in quality assurance planning or implementation that significantly reduce confidence in any submitted data, including in data previously provided during earlier assessment cycles, then those data are not to be used as a basis for placing a water segment on the CWA Section 303(d) list, known as Category 5.

### Data Review, Verification, and Validation

Once the measurement results have been recorded, they are examined to ensure that:

- Data are consistent, correct, and complete, with no errors or omissions
- Results for quality control (QC) samples accompany the sample results
- QC results indicate that acceptance criteria were met
- Data qualifiers are properly assigned where necessary
- Data specified in the sampling design were obtained
- Methods and protocols specified in the QA Project Plan were followed

Data review involves examination of the data for errors or omissions. Data verification involves examination of the QC results for compliance with acceptance criteria. Laboratory results are reviewed and verified by qualified and experienced laboratory staff and documented in the case narrative. Data validation involves detailed examination of the complete data package using professional judgment to determine whether the procedures in the methods, standard operating procedures, and QA Project Plan were followed. Validation is the responsibility of the project manager, who may wish to arrange for a qualified specialist to conduct the validation and document it in a technical report.

Once the data have been verified and validated, they are examined to determine if the management quality objectives (MQOs) have been met. MQOs are established for precision, bias, and required reporting limit. An experimental design for preliminary estimation of precision and bias and the use of control charts provide the best way to determine whether MQOs have been met. Results of QC samples analyzed during the project can also provide an indication as to whether the MQOs have been met

## Data Quality Assessment

At this point in the process, the project manager knows whether the data are complete and meet requirements for precision, bias, and required reporting limit and whether the procedures to ensure representativeness and comparability were performed correctly. Assuming that the data are satisfactory, the project manager must decide whether they can be used to make the determination or decision for which the project was conducted (i.e., whether the data quality objectives [DQOs] have been met).

This step may be as simple as noting that no contaminants were found in any of the samples, that all the DQOs were met, or that the data are suitable for archiving in a database for comparison with data to be obtained in the future.

However, good planning requires that a procedure be described for demonstrating statistically that the decision based on the data has an acceptable probability of being the correct decision. Computer models may also be used to interpret data and meet the DQOs.

EPA's Data Quality Assessment process involves the following steps:

1. Review the DQOs and Sampling Design
2. Conduct a Preliminary Data Review
3. Select the Statistical Test
4. Verify the Assumptions of the Statistical Test
5. Draw Conclusions from the Data

## Data Analysis Procedures

Ecology's policy specifies assessment criteria for different media and indicators. Specific assessment criteria are described for toxic pollutants in sediment, water, and edible fish tissue, fecal coliform, temperature, dissolved oxygen, and other pollutants. In addition to assessing data using numeric standards, the assessment of water quality can be based on narrative information. For example, a listing may be based on narrative information showing that fish stocks are adversely affected by pollutants in the water, or based on information that the waterbody has a swimming, fish, or shellfish advisory issued by the Washington State Department of Health, by local health departments, or by advisories from other appropriate agencies. Impairments can also be caused by non-pollutants, as legally defined. Examples of non-pollutants are: Physical habitat alterations (e.g., stream channelization, loss of spawning gravels, reduced pool/riffle ratios, loss of large woody debris), physical barriers to fish migration (e.g., dams and culverts), loss of habitat due to invasive exotic species, flow alterations (e.g., low flows and flashier systems), and impaired biologic communities.

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## 8. Reporting

### Water Quality Assessment Report (2004)

Ecology's primary means of reporting on the status of water quality is through the development of *Washington State's Water Quality Assessment*, based on EPA's guidance, which integrates Clean Water Act requirements for both Section 305(b) water quality reports and Section 303(d) list of impaired waters. Ecology's Water Quality Program has adopted Policy 1-11 that describes the methods used for assessing information to evaluate attainment of water quality standards. The Policy includes criteria for compiling, analyzing, and integrating data on ambient conditions with project implementation information.

In preparing the assessment, Ecology evaluates data from *all* sources that are received during the "call for data" period. This includes not only data from Ecology's freshwater and marine ambient monitoring program and other Ecology studies, but also data from a wide array of entities external to Ecology who collect and submit data, including:

- Federal, state, and local government agencies
- Tribes
- Quasi-governmental entities, such as watershed planning councils
- Businesses
- Academic institutions
- Not-for-profit groups
- Private citizens

Ecology uses the *Water Quality Assessment* report to assign waterbody segments into one of five categories (see descriptions below). All waters in Washington State (except on tribal reservation lands) fall into one of the five categories describing our knowledge of the status of that waterbody.

1. **Category 1:** Waterbody segments belong in Category 1 (*Meets Tested Standards*) if the available data show attainment of the water quality standard for the parameter for which a waterbody segment has been tested or studied.
2. **Category 2:** Waterbody segments belong in Category 2 when some credible data create significant concerns of possible impairment to characteristic uses, but fall short of demonstrating impairment.
3. **Category 3:** Waterbody segments belong in Category 3 when there are no data, or no usable data, regarding any water quality standard or characteristic use. This category will include all waters in Washington (except on tribal reservation lands) that lack sufficient information for placement in any other category. Ecology plans to prepare summary data on this category of waters, but not individual descriptions of each waterbody segment in this category. Individual segments in this category can be identified as all segments not on reservation lands and not appearing in other categories.

4. **Category 4:** Waterbody segments belong in Category 4 when some water quality impairments are not appropriate for a 303(d) listing, either because the impairment is already being addressed or because a TMDL is not the appropriate way to deal with it. This category is further divided into three subcategories:
  - 4A – Waterbody has a TMDL that has been approved by EPA.
  - 4B – Waterbody has a pollution control plan that meets similar criteria to a TMDL
  - 4C – Waterbody is impaired by a non-pollutant (e.g., aquatic habitat degradation not caused by a pollutant)
5. **Category 5:** Waterbody segments belong in Category 5 when data indicate there are water quality impairments in accordance with Water Quality Policy 1-11. This category is also referred to as the “303(d) List” of impaired waters. These waters require the preparation of water cleanup plans, or TMDLs, in accordance with the CWA.

*Washington State's Water Quality Assessment* can be found on the Ecology's website at [www.ecy.wa.gov/programs/wq/303d/2002/2002-index.html](http://www.ecy.wa.gov/programs/wq/303d/2002/2002-index.html).

## Condition of Fresh Waters in Washington State

EPA recognizes that it is neither necessary nor practicable for states to census all waterbodies in order to develop a general assessment of the status of state waters. Instead, EPA encourages states to develop and implement probabilistic monitoring programs for statewide water quality assessments and to include reports of these assessments with their integrated reports. Although Ecology does not have funding for a statewide, probabilistic monitoring program, Ecology will submit its *Condition of Fresh Waters in Washington State* report as a general assessment of Washington's waters based on the Stream Water Quality Index (WQI) recommended by the *Comprehensive Monitoring Strategy* (CMS). This report answers the same basic questions posed by EPA in the national monitoring strategy, albeit drawing from non-random, targeted stations that mostly reflect downstream basin conditions and cumulative watershed inputs.

## Puget Sound Update

Ecology and its partner agencies contribute to the *Puget Sound Update* report, which summarizes data and studies from across the Puget Sound Ambient Monitoring Program as well as other contributors. The *Puget Sound Update* is published biennially by the Puget Sound Action Team (PSAT, 2002).

## Other Reports

Ecology publishes monitoring program summaries, Water Cleanup Plan (TMDL) Technical Reports, watershed plans, NPDES studies, nonpoint source studies, Quality Assurance Project Plans, and numerous other documents every year in an extensive bibliography accessible to the public on Ecology's internet web site ([www.ecy.wa.gov/pubs.shtm](http://www.ecy.wa.gov/pubs.shtm)). In addition to these reports,

Ecology contributes specific data or summary information to a variety of regional and national water quality and environmental indicator reports, including (for example):

- State of Salmon in Watersheds Report
- EPA's National Coastal Condition Report
- Georgia Basin/Puget Sound Environmental Indicator Report

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## 9. Programmatic Evaluation

### Performance Partnership Agreement (PPA)

Ecology conducts biennial reviews of its water management and monitoring programs through development of the *Performance Partnership Agreement* (PPA) with EPA. This agreement identifies clear environmental priorities and desired results. The purpose of the PPA for the 2005-2007 biennium is to:

- Establish mutual environmental goals, strategies, activities, and performance measurements.
- Maintain a core level of environmental protection for all of Washington's citizens.
- Measure environmental progress using indicators that are reflective of environmental conditions, trends, and results.
- Allocate Ecology and EPA Region 10 resources to the highest environmental priorities of the state.
- Establish a joint work plan for administering the federal grant dollars that EPA Region 10 provides to Ecology.

Ecology will provide a status report to EPA on all PPA commitments by August 31 and February 28 of each year (*PPA element 7B*). Ecology and EPA will also meet annually to discuss key issues and progress in meeting the commitments of the PPA (*PPA element 7C*).

### Washington's Government Management, Accountability, and Performance (GMAP) Process

In February 2005, Governor's Executive Order 05-02 established the Government Management, Accountability, and Performance Process (GMAP) as an accountability and performance management tool to be used by all state agencies. GMAP requires each agency to:

- Develop clear, relevant, and easy to understand measures that show whether or not programs are successful.
- Demonstrate how programs contribute to the priorities that are important to citizens.
- Gather, monitor, and analyze program data.
- Evaluate the effectiveness of programs.
- Hold regular problem-solving sessions within the agency to improve performance.
- Allocate resources based on strategies that work.
- Regularly report to the Governor on their performance.

Ecology will hold regular GMAP forums to quarterly review the performance and effectiveness of all Ecology programs, including the Water Quality Program and the Environmental Assessment Program. Monitoring elements will be regularly included in the reviews.

## Comprehensive Monitoring Strategy (CMS) Review

Engrossed Senate Substitute Bill 6090 (the state's FY 2006-2007 Operating Budget) includes a specific provision (Sec 129 (7)) requiring the Department of Ecology, the Department of Fish and Wildlife, the Department of Natural Resources, the Washington Conservation Commission, and the Interagency Committee for Outdoor Recreation to “*prepare a report [by March 1, 2006] updating all previously identified activity within the comprehensive monitoring strategy... and summarizing progress to the Governor's Forum on Monitoring, and the Office of Financial Management.*”

This report is intended to address the full suite of monitoring priorities listed in the CMS Action Plan (Appendix A), assess progress and impediments to progress in meeting the state's monitoring priorities, and potentially shape future budget requests.

## Puget Sound Ambient Monitoring Program (PSAMP) Reviews

The multi-agency Puget Sound Ambient Monitoring Program (PSAMP) was designed by the Monitoring Management Committee in 1988 with implementation beginning in 1989. The program underwent a comprehensive review by a panel of national experts in 1995 (Shen, 1995), which led to numerous program revisions including the creation of a Management Committee. Since 1996, the Management Committee has intermittently reviewed various components of PSAMP in an on-going effort to optimize PSAMP's monitoring efforts. In the summer of 2005, the Management Committee, in response to direction from the Puget Sound Action Team (PSAT) Partnership and the Puget Sound Council, led reviews of PSAMP's monitoring efforts focused on three key topic areas: nearshore habitat, toxics, and hypoxia. Recommendations will be compiled and presented back to the PSAT Partnership for possible action in the fall of 2006.

## Ecology's Annual Monitoring Project Planning Process

Ecology's Environmental Assessment Program undertakes an annual project planning process to prioritize monitoring project requests from Water Quality Program regional and headquarters staff, and watershed leads statewide. The annual process leads to staff and laboratory funding allocation decisions and determines, to a large degree, which specific TMDLs, intensive studies, annual monitoring station locations, etc. will be implemented the following year. This process constitutes a *de facto* review and evaluation of Ecology's monitoring priorities, as well as current monitoring staff and laboratory resource allocation decisions. The draft project list undergoes several internal reviews, including presentation before Ecology's Watershed Advancement Group for agency-wide concurrence prior to implementation.

## 10. General Support and Infrastructure Planning

The majority of Ecology's water monitoring resources are housed in the agency's Environmental Assessment Program. The program's mission is to "measure and assess environmental conditions in Washington State." Within Ecology, the Environmental Assessment Program assumes the lead role in most water quality monitoring efforts and operates the majority of water quality monitoring programs in support of other client programs (especially the Water Quality Program).

The Environmental Assessment Program has a staff of approximately 125 FTEs (Figure 1). Approximately 41 FTEs support general ambient monitoring programs (including freshwater, marine, and stream hydrology monitoring programs), while about 42 FTEs conduct various types of intensive or directed environmental studies (e.g., TMDLs, special pollution source studies, groundwater studies, toxics studies). The program also operates Washington State's Manchester Environmental Laboratory (~ 30 FTEs). Quality Assurance functions account for four FTEs (including the agency Quality Assurance Officer), and another eight FTEs implement Ecology's Laboratory Accreditation Program (Figure 1).

Core water quality monitoring functions are organized by "sections" and "units" within the Environmental Assessment Program structure:

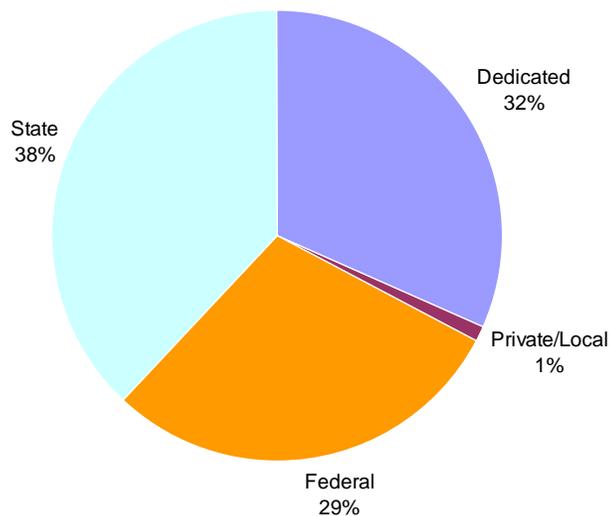
- The *Stream Hydrology Unit* has 13 hydrologists and environmental specialists. The unit provides streamflow information in support of statewide planning and management efforts including watershed planning, water resources management, and flood plain management. Streamflow data are also used for development of Washington State's Water Quality Assessment, Water Cleanup Plan studies, and ambient freshwater monitoring studies. Accurate and timely streamflow data are critical in defining and implementing salmonid recovery efforts.
- The *Coastal and Estuarine Assessment Unit* includes 12 oceanographers and environmental scientists who conduct two major marine monitoring programs: the ambient marine water quality program, and the Puget Sound Ambient Monitoring Program (PSAMP) marine sediment monitoring program.
- The *Water Quality Studies Unit* performs scientific studies to develop Water Cleanup Plans (TMDLs) for "conventional" parameters (dissolved oxygen, pH, bacteria) in fresh waters, and estuaries. This unit has 14 staff working primarily on Water Cleanup Plan studies. Unit staff also provide assistance to water quality permit writers on technical mixing zone issues. Staff also review Quality Assurance Project Plans written by grant recipients and provide technical assistance to Water Quality Program staff.
- The *Nonpoint Studies Unit* includes 12 environmental scientists who conduct monitoring for three programs: Water Cleanup Plans, Groundwater Studies, and Salmon Recovery Projects. Four staff work primarily on Water Cleanup Plans. The unit also includes a team of five licensed hydrogeologists who conduct groundwater investigations. Three staff focus on salmon recovery projects.

- The *Toxics Studies Unit* conducts a range of statewide monitoring activities dealing with toxic compounds (metals, organics, and pesticides) in water, sediment, and tissue. The major activities conducted by this unit include the Washington State Toxics Monitoring Program, Water Cleanup Plans for toxic pollutants, pesticide monitoring in salmon habitat, and other focused toxic studies on sediment, water, and tissue.

As part of the Environmental Assessment Program, the Operations Center provides logistical support for field operations of all types. It provides boats, vehicles, and monitoring equipment, and operates as a staging area for field sampling events. The Operations Center also houses tools for the repair and fabrication of monitoring equipment, and provides wet laboratories for bench-top analyses of field samples and calibration of sampling instruments.

The Manchester Environmental Laboratory is a full-service, fully-accredited laboratory that supports all of Ecology's environmental sample analysis needs. The laboratory analyzes submitted samples and provides a full range of chemical and physical laboratory analyses in support of Ecology's environmental monitoring programs and directed studies.

Dollars by Fund Source



Dollars by Activity

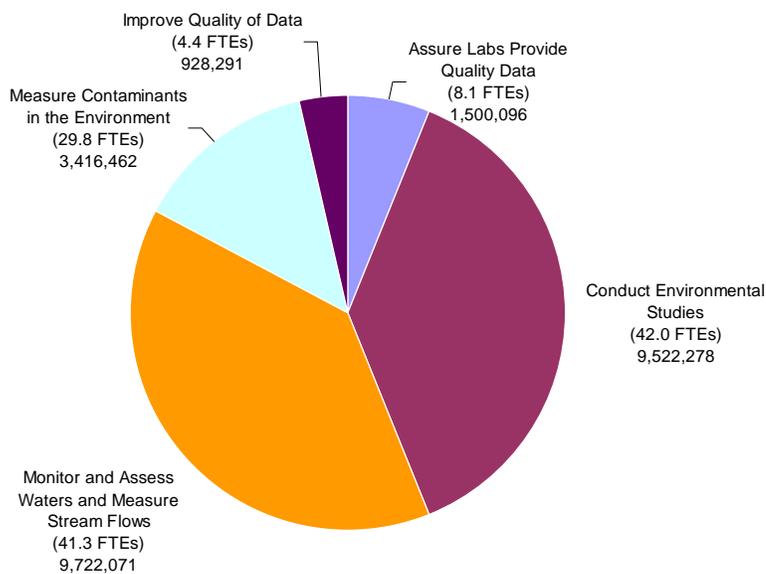


Figure 1. Environmental Assessment Program dollars by Funding Source and Activity, Fiscal Year 2006-07.

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# Acronyms and Abbreviations

ANS	Washington's Aquatic Nuisance Species Management Plan
BEACH	Beach Environmental Assessment Communication and Health Program
BMP	Best Management Practices
BPA	Bonneville Power Administration
CMS	Washington's Comprehensive Monitoring Strategy (CMS, 2002)
CWA	Federal Clean Water Act
Ecology	Washington State Department of Ecology
EAP	Environmental Assessment Program
EMAP	Environmental Monitoring and Assessment Program
EPA	U.S. Environmental Protection Agency
FERC	Federal Energy Regulation Commission
Forum	Governor's Forum on Monitoring
FTE	Full-time Equivalent
FY	Fiscal Year
HCP	Habitat Conservation Plans
K	Thousand
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollution Discharge Elimination System
PNAMP	Pacific Northwest Aquatic Monitoring Partnership
PPA	Performance Partnership Agreement
PSAMP	Puget Sound Ambient Monitoring Program
PSAT	Puget Sound Action Team
QA/QC	Quality Assurance / Quality Control
QAMP	Quality Assurance Monitoring Plan
RCW	Revised Code of Washington
SRFB	Salmon Recovery Funding Board
TMDL	Total Maximum Daily Load – Water Cleanup Plan
USGS	U.S. Geological Survey
WAC	Washington Administrative Code
WQI	Washington's Water Quality Index
WRIA	Water Resources Inventory Area

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# **Appendix A.**

## **Monitoring Action Items (in priority order) from Washington's *Comprehensive Monitoring Strategy***

### Implementation Schedule

The action items developed in response to SSB 5637 were prioritized using the following six monitoring criteria.

- (1) Does the proposed action build a monitoring foundation (protocols, data, etc.)?
- (2) Is it necessary for federal assurances under ESA and CWA?
- (3) Is it an efficient use of existing monitoring?
- (4) Does it give the highest return on the investment (cost/benefit)?
- (5) Does the monitoring relate to agency mandates?
- (6) Does the proposed monitoring fill a monitoring gap/baseline?

Each monitoring action proposed received a numeric score for each of the six categories. The highest priority action items shown below received the highest combined score for all of the six categories and are ranked as High. The items occur essentially in the order they were ranked from 1-76.

## High Priority Action Items

Line Item	Priority	Action Proposed	Action Agency	Annual FTE's	General Fund State	Other Funds	Total Funds
1	High	Create Watershed Monitoring Council	TBD	1.0	250	0	250
2	High	Combine status reports into Watershed Health report card	TBD	0.0	50	0	50
3	High	Continue State Agency Action Plan	TBD	0.0	0	0	0
4	High	SRFB/NWPPC effectiveness monitoring and EMAP interim protocols for Restoration Projects	SRFB, NWPPC	TBD	0	TBD	TBD
5	High	Update annually specific components of SaSI	WDFW	?	165	0	165
6	High	EMAP sampling of freshwater habitat, water quality, and trout Lakes Marine	ECY, WDFW		2.060 300 700		2,060 300 700
7	High	Conduct instream flow studies for critical watersheds	ECY	5.5	1,050	0	1,050
8	High	Develop intensively monitored watersheds	WDFW	?	800	0	800
9	High	Develop annual harvest impact analysis	WDFW	?	300	0	300
10	High	Wild Stock spawner report	WDFW	0.0		0	0
11	High	Restores 9 juvenile trapping sites	WDFW	?	1,200	0	1,200
12	High	Universal Data Interface Feasibility Study FY2004	IAC/SRFB	0.0	500	0	500
13	High	Design, develop, and implement pilot interface for habitat and project data. FY 2005	IAC/SRFB, WSDOT	0.0	500	0	500
14	High	Data coordinator position	IAC/SRFB	1.0	200	0	200
15	High	Build Phase 1 of Web Portal	IAC/SRFB	0.0	200	0	200
16	High	Development of precision and variance estimates	WDFW	?	800	0	800
17	High	Install gauging stations in priority watersheds	ECY	5.0	4,620	0	4,620
18	High	Implement 5 additional trapping sites	WDFW	?	1,000	0	1,000
19	High	Conduct barrier census on state and private lands	DNR	4.0	1,820	0	1,820
20	High	Forest and Fish effectiveness and compliance monitoring	DNR, WDFW, ECY, Tribes	10.2	1,632	0	1,632
21	High	Forest and Fish information systems	DNR	5.6	1,430	0	1,430
22	High	Intensification of nearshore sampling	DNR	0.0	0	300	300
		<b>TOTAL</b>		<b>43.3</b>	<b>19,577</b>	<b>300</b>	<b>19,877</b>

TBD= To Be Determined

The following table indicates the implementation priority order for funding and implementation of remaining monitoring activities in order to implement comprehensive monitoring in accordance with SSB 5637.

## Medium Priority Action Items

Line Item	Priority	Action Proposed	Action Agency	Annual FTE's	General Fund State	Other Funds	Total Funds
23	Medium	Design, develop and implement interface to habitat and project data. FY 2006	IAC	0.0	500	0	500
24	Medium	Design, develop and implement interface to fish and barriers data. FY 2007	WDFW, DOT, DNR, IAC	0.0	800	0	800
25	Medium	Statewide sampling of nearshore marine habitats Phase 1	DNR	?	2,400	0	2,400
26	Medium	Develop QA/QC procedures	WDFW	?	150	0	150
27	Medium	Install gauging stations in remaining watersheds	ECY	10.0	17,850	0	17,850
28	Medium	Conduct instream flow studies in remaining watersheds	ECY	32.0	6,300	0	6,300
29	Medium	Conducts barrier requirements study	WDFW	?	500	0	500
30	Medium	Sample ESA stocks for DNA profile - Phase 1	WDFW	?	1,268	0	1,268
31	Medium	Develop volunteer program	WDFW	?	200	0	200
32	Medium	Conduct harvest compliance monitoring annually	WDFW	?	100	0	100
33	Medium	Build Phase 2 of Web Portal	IAC, DIS	?	450	0	450
34	Medium	PRISM update	IAC	?	223	0	223
35	Medium	TMDL effectiveness monitoring	ECY	51.0	6,065	0	6,065
36	Medium	Mass mark remaining coho and chinook production	WDFW	?	2,850	0	2,850
37	Medium	Conduct habitat connectivity census	WDFW, Tribes, DOT, DNR, IAC	?	200	0	200
38	Medium	Build Phase 3 of Web Portal	IAC, DIS	?	0	0	0
39	Medium	Monitor only standards needed to meet TMDL court decree	ECY	24.0	6,330	0	6,330
40	Medium	Design, develop and implement interface to air/water/land data. FY 2009	ECY, DIS, IAC	?	500	0	500
41	Medium	Phase 2 of nearshore EMAP monitoring	DNR	?	1,200	0	1,200
42	Medium	Update nature mapping database	WDFW, UW	1.0	80	0	80
43	Medium	Design, develop, and implement interface for data entry by local, tribal, and private agencies. FY 2008	DNR	0.0	800	0	800
44	Medium	Performance benchmarks for indicators of biological health in estuaries	ECY	2.0	220	0	220
45	Medium	Performance benchmarks for indicators of biological health in unwadeable streams and rivers	ECY	2.0	220	0	220
46	Medium	Performance benchmarks for indicators of biological health in wadeable streams and rivers	ECY	2.0	220	0	220
47	Medium	Performance benchmarks for indicators of wildlife health from fish tissue consumption	ECY	2.0	220	0	220
48	Medium	Build on-line HPA process	WDFW	?		480	480
49	Medium	Performance benchmarks for indicators of biological health in lakes	ECY	2.0	220	0	220
50	Medium	Establish quality of chinook spawner escapements	WDFW, Tribe	?	400	0	400

Line Item	Priority	Action Proposed	Action Agency	Annual FTE's	General Fund State	Other Funds	Total Funds
51	Medium	Monitor effectiveness of Nearshore marine projects	DNR, PSAT, PSAMP	?	1,100	0	1,100
52	Medium	Adopt metadata standards	All agencies	?	0	0	0
53	Medium	Monitoring of projects local funds	Local Govt	0.0	0	10,200	10,200
54	Medium	Conduct recreational fish hooking mortality estimates	WDFW	?	260	0	260
55	Medium	Conduct commercial net dropout estimates	WDFW, Tribes	?	400	0	400
56	Medium	Update Water Quality Index in 2003	ECY	0.1	0	0	0
57	Medium	WDFW and ECY will conduct effectiveness monitoring of hydro	ECY, WDFW	?	340	0	340
58	Medium	Conduct inventory of nearshore bathymetry	PSAMP, DNR, PSNERP, USGS	?	2,000	?	2,000
59	Medium	ECY Water Quality certification compliance. ECY Shoreline Mgmt Permit compliance. DFW Hydraulic Project permit compliance	ECY, WDFW, PSAT, CTED, DOT	?	690	0	690
60	Medium	Develop clean water plan report	ECY	0.0	0	0	0
61	Medium	Monitor all standards for TMDL support			25,800		25,800
62	Medium	Sample remaining stocks for DNA profile Phase 2	WDFW	?	832	0	832
63	Medium	Provide estuarine habitat quality report	PSAT, DNR	?	?	?	?
64	Medium	Agencies report on federal guidelines implemented	ECY, WDFW, DNR	0.0	0	0	0
65	Medium	Funding assistance tracking	IAC, WDFW, CC, DNR, OFM, DOT	?	?	?	?
66	Medium	Ecology EIM Grantee Data Entry	0	0	200	0	200
67	Medium	QA/QC plan intensive monitoring	ECY, WDFW	0.0	0	0	0
68	Medium	Project clustering	SRFB, NWPPC	0	0	0	0
69	Medium	Grant contract metadata requirements	SRFB, NWPPC	0	0	0	0
70	Medium	Standardize habitat project definitions and categories	SRFB, NWPPC	0	0	0	0
71	Medium	Develop prioritized restoration project types	SRFB, NWPPC	0	0	0	0
72	Medium	EMAP interim protocols for restoration projects	SRFB, NWPPC	0	0	0	0
73	Medium	Develop online data sharing agreement	Natural Resource Agencies	0	0	0	0
74	Medium	Adopt data transfer protocols	Natural Resource Agencies	0	0	0	0
75	Medium	Adopt spatial data format	Natural Resource Agencies	0	0	0	0
76	Medium	Conduct barrier census on all remaining lands	DNR	0.0	3,180	0	3,180
<b>TOTAL</b>				<b>45.4</b>	<b>85,068</b>	<b>10,680</b>	<b>95,748</b>

# Appendix B.

## Monitoring Programs Conducted by Ecology

### Status and Trend (Ambient) Monitoring

#### River and Stream Ambient Monitoring

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Ecology's river and stream monitoring program will continue to rely predominately on a fixed station monitoring design. Ecology currently collects samples monthly from 62 long-term (core) and ~20 annual basin monitoring stations.

The 62 core stations were all selected using a "*judgmental sample survey monitoring design*" (EPA, 1997) which is based on the nonrandom selection of sampling sites to infer estimates of overall water quality for these basins. Core stations are generally located in a downstream reach of a mainstem river (often at bridge crossings for efficient sampling). Data from these stations are used to assess overall condition or status of their respective basin, and to evaluate long-term trends. A few core stations are located in upper watersheds to reflect un-impacted conditions. Many core stations have been sampled for extended periods (some for over 40 years) allowing for site-specific trend analyses.

Basin stations are sampled monthly for (usually) one year, and new station locations are chosen each year to support Ecology's five-year watershed management process or to target specific concerns identified by Ecology's regional office staff. Ecology also records continuous temperature data at about 60 stations to determine compliance with current and proposed water quality standards.

#### Marine Water Ambient Monitoring

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Ecology collects monthly water quality profiles and discrete samples from ~ 35 monitoring stations distributed through each of the five major marine basins in Puget Sound, and from Willapa Bay and Grays Harbor on the Washington coast. In addition, Ecology has installed five static, continuous-recording moorings in Willapa Bay. Ecology also targets approximately 2-5 marine stations each year at the request of regional office staff or other monitoring partners.

Beginning in 2005, marine ambient monitoring has been enhanced with the installation of additional continuously recording moored sensors. This approach has several advantages over the monthly sampling regime. First, Ecology will shift a portion of its current network from relying solely on discrete samples collected monthly via float-plane, to a system that will yield improved temporal data resolution: water measures collected several times/day (almost continuously) vs only once/month. This significantly improved data resolution will improve our ability to differentiate human from natural (e.g., ocean, climate variation) variability. Ecology will deploy at least one profiling mooring in south Hood Canal to record water quality variables

(with depth) to better track daily/hourly variation in phytoplankton blooms, physical stratification, and oxygen depletion in areas of critical need.

As part of this shift, Ecology plans to couple the improved, higher-resolution monitoring from continuously-recording moorings with computer modeling efforts to better depict the condition of marine physical, chemical, and biological processes. This coordinated monitoring-modeling approach will be used to improve the overall assessment of Washington's marine water quality. This approach will also incorporate historical data from the University of Washington, Washington Department of Fish and Wildlife, the National Ocean Data Center, and other agencies.

## Marine Sediment Monitoring

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Ecology maintains a network of ten long-term, fixed marine sediment stations (sampled annually for infaunal community structure and every fifth year for chemical contaminants) to estimate trends in chemical contamination and benthic community structure. Annual analyses of benthic communities at some of these stations date back to the 1960's with research conducted by the University of Washington and others. Ecology also collects samples from an additional 30-40 sediment stations each year using a probabilistic (random), rotating panel design. Stations are selected from one of eight estuarine regions defined by the Puget Sound Ambient Monitoring Program (PSAMP) according to their unique hydrologic, bathymetric, and geological features. A *Sediment Quality Index* is used to characterize sediments based on the composition of the benthic invertebrate communities, chemical contaminant, and toxicity levels.

## Stream Biological Monitoring

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Traditional measurements of chemical and physical components for rivers and streams do not always provide sufficient information to detect all surface water problems. Biological evaluation of surface waters provides a broader approach because degradation of sensitive ecosystem processes is more frequently identified.

Ecology monitors biological condition at 10 long-term reference stations each year, and targets 20 new stations each year for biological sampling with the help of Water Quality Program regional staff. So far, Ecology has collected stream benthic macroinvertebrates from about 200 streams in Washington State. This monitoring has provided a large base of information describing biological characteristics of reference and degraded conditions.

One of the goals of Ecology's monitoring program is to develop biocriteria using benthic macroinvertebrates, and to apply these biocriteria appropriately within the framework of the CWA. Two types of numeric biocriteria, based on biometrics and predictive modeling, are being developed for use throughout Washington State. When used alone or together, these criteria can give a statistically defensible case for determining the overall condition of a stream or waterbody.

Ecology will evaluate the utility of biocriteria for future water quality assessment reports and to assist with Water Cleanup Planning and implementation. Washington's *Comprehensive*

*Monitoring Strategy* identifies the need to develop biological criteria for streams, rivers, lakes, and estuaries.

## Invasive Aquatic Plant Monitoring

Ecology has been monitoring the occurrence and distribution of aquatic plants in lakes and rivers throughout the state since 1991. The program's main objective is to track aquatic plant community changes, concentrating on invasive non-native species such as Eurasian milfoil. Other objectives are to provide technical assistance on aquatic plant identification and control of invasive species, and to conduct special projects evaluating the impacts of invasive non-native species and their control. To date, aquatic plant (macrophyte) data have been obtained from approximately 450 lakes across Washington. Monitoring locations are targeted each year based on requests or problems identified by regional office staff and local cooperators.

## Beach Environmental Assessment, Communication, and Health (BEACH) Program

EPA initiated the Beaches Environmental Assessment, Communication, and Health (BEACH) Program in response to the passage in 2000 of the BEACH Act. The Act amends the Clean Water Act and authorizes EPA to appropriate funds to states for the development of monitoring and notification programs to provide a more uniform system for protecting the users of marine waters.

In Washington, a BEACH Coordinator manages the development and implementation of the Program including facilitating the Inter-agency BEACH Committee. The committee includes Ecology, the state Departments of Health, Fish and Wildlife, and Natural Resources; the Parks and Recreation Commission; the Puget Sound Action Team; the Interagency Committee for Outdoor Recreation; King and Kitsap counties; the City of Edmonds; and the SurfRider Foundation.

The monitoring program focuses on sampling for indicator bacteria at about 70 public marine beaches in Washington State. While federal funding for the BEACH Program is targeted for marine beaches, Ecology has augmented this program with separate funding to monitor ~ 5-10 freshwater swimming beaches annually to provide companion information for the BEACH Program. Ecology implements the BEACH program collaboratively with the Department of Health and with the assistance and cooperation of local county health jurisdictions. The information is communicated to the public on the Department of Health's BEACH website and by signs posted on the beaches.

## Washington State Toxics Monitoring Program

The Washington State Toxics Monitoring Program (WSTMP) was developed to address continuing concerns about toxic compounds in Washington's aquatic environments and freshwater fish. Historical monitoring efforts identified many areas where levels of contamination were high enough to harm humans and wildlife, sometimes resulting in fish consumption advisories issued by the state Department of Health. The WSTMP has conducted

exploratory monitoring to identify occurrences of toxic contamination in freshwater environments and freshwater fish tissue. In 2001, edible fish tissues from more than 140 fish samples were analyzed for toxic contaminants. Beginning in 2005, fish will be sampled from approximately 20-30 lakes, reservoirs, and rivers annually.

For many areas of Washington, information is lacking about current levels of toxic contaminants in surface waters and edible fish. The WSTMP was developed to gain and communicate needed information by conducting exploratory monitoring to identify occurrences of toxic contamination in freshwater environments and freshwater fish tissue.

Edible fish tissue and water samples from lakes were analyzed for toxic substances. The goal of the WSTMP is to provide information to resource managers and the public about the status of toxic contamination in surface water and edible fish tissue from freshwater lakes, rivers, and streams that have not yet been monitored or where relevant data are more than ten years old.

## Lake/Reservoir Monitoring

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Funded largely by federal grants, Ecology conducted a citizen-volunteer-based lake monitoring program from 1989–1999. During that period, data were collected from over 180 lakes with the help of about 250 volunteers. However, the program was terminated when previously dedicated federal CWA Section 314 funding was eliminated. Ecology does not currently have a lake or reservoir monitoring program focused on overall lake health. However, Ecology does monitor bacteria levels at 5-10 lake swimming beaches each year as an adjunct to the federal BEACH monitoring program, and both the toxics (fish tissue) monitoring program and the invasive aquatic plant program target lakes.

## Groundwater Monitoring

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There is currently no state-level program to monitor ambient groundwater water quality trends over time in Washington. With the support of Section 104(b)(3) grant monies, Ecology is currently evaluating the technical issues and resource requirements necessary to establish a permanent state ambient groundwater monitoring and characterization program. A pilot study to test the proposed technical approach (a series of focused status studies in high demand areas, with a gradual build-out of a trend monitoring network of index wells) is currently underway in a priority study area identified by Ecology's Southwest Regional Office. The pilot study is scheduled to be completed in December 2005. No long-term funding source has been identified to date to support a state groundwater program beyond the completion of the pilot study.

## Wetland Monitoring

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Washington's Wetlands Function Assessment Project is a statewide effort to develop relatively rapid, scientifically acceptable methods of assessing how well wetlands perform functions such as improving water quality, reducing floods, and providing wildlife habitat. The methods are being developed for different wetland types in Washington State. The project is coordinated by Ecology with funds from EPA. Two wetland assessment methods have been developed to date: (1) Methods for assessing functions in Depressional wetlands located in the Columbia Basin of

Eastern Washington and (2) Methods for Assessing Functions in Riverine and Depressional Wetlands Located in the Lowlands of Western Washington.

Washington State does not have numerical water quality standards for wetlands, and the standards developed for lakes and streams are not appropriate for monitoring wetlands. The state has developed methods for assessing wetland functions that could be used to help define standards at different geographic scales and then to monitor the current status.

Ecology has developed a database to track wetland permits issued under the state and federal clean water acts. This database could potentially be used to track permit compliance and the success of any mitigation efforts, but there are no resources currently allocated for this purpose or to update the database. The state has completed a three-year project to evaluate the effectiveness of wetland mitigation at randomly selected sites in Washington (Johnson et al., 2002).

## Intensive Studies

### Water Cleanup Plans (Total Maximum Daily Load studies)

Under the CWA and implementing federal regulations, Ecology is required to develop Water Cleanup Plans (called Total Maximum Daily Loads or TMDLs) for impaired waters listed under Category 5 of the Water Quality Assessment (the 303(d) list). Ecology conducts scientific studies to develop Water Cleanup Plans for indicators of use impairment (e.g., dissolved oxygen, pH, bacteria, fine sediment, and turbidity) for both fresh waters and estuaries. In conducting these studies, Ecology staff use all appropriate and available existing data, supplemented as necessary by additional monitoring or directed studies. Data of interest include water quality parameters, streamflow, biological integrity, land use/vegetative cover, and meteorological data needed for developing water quality models.

Water Cleanup Plan projects typically consist of multiple, several-day surveys over the course of several months to a year or more. Field studies may range in duration from a few months to over a year. Water Cleanup Plan studies may focus on conventional pollutants, or they may be conducted for a variety of metals and organic compounds. The most complex toxic Water Cleanup Plans may require sampling a wide range of media including surface water, storm water, effluents from municipal and industrial facilities, suspended particulates, bottom sediments, bottom cores, and resident fish. Since many of the waters identified on the CWA Section 303(d) list have diffuse sources, Water Cleanup Plans are usually conducted on a broad watershed scale.

In January 1998, Ecology, EPA, Northwest Environmental Advocates, and the Northwest Environmental Defense Center signed a Memorandum of Agreement to address all 666 polluted waters on the 1996 Section 303(d) list over a 15-year period. The agreement was developed in conjunction with a legal settlement between EPA and environmental interest groups who sued EPA over delays in completing TMDLs. Ecology produced a workload model to examine the ability to meet the legal terms of the settlement. To complete this work, Ecology estimated an additional 17 FTEs and \$722K in lab costs would be needed annually to conduct Water Cleanup Plan technical analyses (Roberts et al., 2001).

## Intensively Monitored Watersheds

Ecology and the Washington Department of Fish and Wildlife are cooperating on a program to intensively monitor water quality, habitat conditions, and salmon response in paired sets of watersheds at four key locations in Washington (Hood Canal, Lower Columbia River, northern Olympic Peninsula, and the Wenatchee River basin). The main objective of this approach is to understand the complex relationships between management actions, habitat conditions, and fish (salmonid) responses. The cause-effect relationships between management actions and salmon response is needed to assess the effectiveness of regulatory actions applied to restore salmon. Concentrating and integrating monitoring and research efforts at a few locations may enable enough data on physical and biological attributes of the system to be collected to develop a comprehensive understanding of the factors affecting salmon production in fresh water.

## Water Quality Grant Projects

The Washington State Joint Legislative Audit and Review Committee (JLARC, 2001) made recommendations for the development of outcome-based performance measures for 12 natural resource-related and environmentally based grant and loan programs. The Washington Legislature passed a law (House Bill 1785) that requires Ecology and others to follow these recommendations. Part of the process of implementing the law involves “...*developing recommendations for a monitoring program to measure outcome focused performance measures.*” Ecology has recently changed its Water Quality Grant applications to meet the statute by requiring applicants to conduct monitoring of identified project outputs and report those data in Ecology’s EIM database.

## **Effectiveness Monitoring**

### Water Cleanup Plan (TMDL) Effectiveness Monitoring

Ecology’s workload model for Water Cleanup Plans (Roberts et al., 2001) assumes a collaborative effort with local governments to reduce some of the fiscal burden on Ecology. The effectiveness evaluation may also include validation monitoring to assess the performance of a model or standard used to establish Water Cleanup Plan goals. The investigation may also question whether the underlying management assumptions and models are correct.

### Effectiveness Monitoring of Forest Practice Rules

Ecology is participating in a monitoring program to evaluate the performance of the riparian management prescriptions recently adopted as Washington Forest Practices Rules. The program combines passive monitoring elements to evaluate the effect of existing prescriptions, with an active monitoring approach that compares the effectiveness of alternative treatments. This riparian area monitoring will evaluate the response of key aquatic and riparian indicators to the implementation of the forest practice rules across the state. Eight watershed health indicators are monitored at sites selected using the sample survey design. This design allows data analysis at

both the site scale and over broad regional areas. This action item has been fully implemented by funds from Washington's Interagency Committee on Outdoor Recreation.

## Discharge Monitoring Reports

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Wastewater treatment facilities that have a federal discharge permit must sample its discharges and submit Discharge Monitoring Reports (DMR) to Ecology and, in some cases, to EPA. The permit holder is responsible for reporting any violations and taking corrective action. The primary purpose of the DMR is to determine whether the wastewater treatment facility is in compliance with the requirements of its National Pollution Discharge Elimination System (NPDES) discharge permit. Beside its use in determining compliance, the DMR indicates how well a plant is operating and provides information on plant performance for a variety of interests. DMR data can show trends in area growth, collection system quality, and changes in the nature of influent for city planners and engineers. Ecology reviews the submitted DMRs to determine the appropriate management response.

## **Random (Probability-based) Monitoring**

### Marine Sediment Monitoring

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Since 1997, Ecology has used a random (probabilistic) sampling design to estimate the condition of sediment quality in eight sampling regions throughout Puget Sound as part of Puget Sound Ambient Monitoring Program (PSAMP). From this sampling, a baseline of simultaneously sampled sediment chemistry, toxicity, and invertebrate assemblage data is being compiled for Puget Sound.

### Estuarine Quality Monitoring

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Ecology implemented Washington's portion of EPA's Western Coastal Environmental Monitoring and Assessment Program (EMAP) from 2000-2005. The study was designed by EPA and implemented nationwide to assess the health of the nation's estuaries. The Washington component of the Western Coastal EMAP focused on measuring a broad suite of estuarine indicators throughout Puget Sound, the outer coastal estuaries, and offshore (continental shelf), in both intertidal and subtidal habitats. In the marine water component, water column measurements were combined with information about sediment chemistry and toxicity, benthic organisms, and data from fish trawls to describe current environmental condition. EPA's funding for Washington's EMAP ended in 2005.

### Freshwater River and Stream EMAP Monitoring

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Ecology has conducted several studies using a random (probability) sampling design mostly supported through EPA's Environmental Monitoring and Assessment Program (EMAP).

From 2000-2005, Ecology participated in EPA's EMAP. The Western EMAP pilot applied and evaluated tools developed from the national EMAP to monitor and assess wadeable rivers and

streams across 12 western states. Since 2000, over 400 randomly-chosen sites have been sampled in Washington, Oregon, and Idaho. There were two components to the Western EMAP pilot: (1) Statewide scale surveys (160 sites in Washington, Oregon and Idaho), and (2) Focused area surveys, with more intensive sampling efforts, implemented (in Washington) in the Wenatchee River watershed.

The Regional EMAP (REMAP) was conducted to test the applicability of the probability design approach to answer questions about ecological conditions at regional and local scales. Using EMAP's statistical design and indicator concepts, REMAP projects were conducted at smaller geographic scales and in shorter time frames than the national EMAP program. In Washington, Ecology has conducted REMAP projects in the following areas: Cascades and Coast range ecoregions, and in the Chehalis, Yakima, and Wenatchee river watersheds.

Currently (2005-2008), Washington has obtained funding through the Bonneville Power Administration (BPA) to sample the Wenatchee basin using a probability monitoring design for wadeable rivers and streams.

## Freshwater River and Stream Statewide Probabilistic Framework Development

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Washington's *Comprehensive Monitoring Strategy* (CMS, 2002) Action Plan identified the lack of a statewide, probabilistic monitoring program as the most important water quality monitoring gap in the state, and ranked the implementation of such a program as one of its highest priority recommendations. In FY 2006, the Salmon Recovery Funding Board (SRFB) provided a one-time grant of \$142,000 to Ecology to develop a statewide probabilistic monitoring framework for freshwater rivers and streams that could be used by state, local, or private entities monitoring at different geographic scales (statewide, salmon-recovery region, and WRIA scales).

Ecology will coordinate the development of this framework with the Washington Department of Fish and Wildlife, the Washington Conservation Commission, and with representatives from regional salmon recovery boards, local governments, and other interests. The SRFB grant will enable a Quality Assurance Monitoring Plan to be developed. However, funding to implement this program following completion of the QAMP has not yet been secured.

## Streamflow Monitoring

### Statewide Stream Gaging Network

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Ecology measures continuous streamflow at 74 fixed stream gaging stations using automated, telemetered gages, and instantaneous streamflow at 46 fixed stations using manual stage height readings. Ecology also operates 51 stand-alone stations and 22 manual stage heights stations that are typically operated for up to or less than one year. Washington's *Comprehensive Monitoring Strategy* recommends additional stream gages be installed on ungaged mainstem rivers and major tributary streams in priority (i.e., salmon-critical) watersheds first, but in all watersheds eventually.

## Instream Flow Studies

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Ecology is required by law to adopt regulations and manage water uses in order to protect streamflows. If streamflow standards are not established, there is a risk that water rights can be issued beyond the capacity of the stream to support the needs of salmon. Since consideration of streamflow standards is a key component in water management, planning groups around the state are working on this issue. Locally-based watershed planning efforts are occurring under Washington's Watershed Planning Act (ESHB 2514). Currently, 42 of the 62 Washington watersheds are planning under the Watershed Planning Act, and 33 of these have elected to address streamflow standards.

A joint work plan was developed that describes how Ecology and the Department of Fish and Wildlife resources will direct statewide, streamflow standard setting priorities through 2010. Working with local governments and in conjunction with Tribes and the Department of Fish and Wildlife, Ecology will prioritize and set flows in rule in those watersheds, assessing streamflow standards and making streamflow standard recommendation in priority watersheds. State funds targeted to developing and setting streamflow standards include \$2.1 million for watershed planning units doing streamflow standard work under the Watershed Planning Act and \$0.6 million for setting streamflow standards in other priority watersheds.

## Water Quality Assessment Program

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*Washington State's Water Quality Assessment* identifies two categories of waters where further monitoring is needed to determine the status of waters.

1. Water Quality Policy 1-11 highlights the importance of Category 2 (*Waters of Concern*) as a list on which to focus monitoring efforts. This category is intended to help Ecology, other agencies, and the public to be aware of, track, and investigate the identified water quality concerns. Where possible, Ecology will use this category as a factor in determining priorities for monitoring as well as grant funding (including Centennial Clean Water Fund and CWA Section 319 grants, and State Revolving Fund loans). Ecology will encourage grantees and partner agencies to pursue opportunities to conduct additional monitoring and sampling, incorporate the waterbody into existing studies, or find other means to verify data resulting in Category 2 listings.
2. Category 3 (*No Data*) identifies waters for which usable data has not yet been collected and thus target locations where new monitoring may be helpful. In accordance with EPA's 2006 guidance (EPA, 2005), Washington will attempt to acquire data or schedule monitoring of Category 3 waters on a priority basis in order to assess attainment and move these waters into Categories 1, 2, 4, or 5.

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# Appendix C.

## Monitoring Programs Conducted by Other Agencies

### River and Stream Monitoring

#### Limiting Factor Analysis

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Washington's Salmon Recovery Act of 1998 (Engrossed Substitute House Bill 2496) directed the Washington Conservation Commission, in consultation with local government and treaty tribes, to invite private, federal, state, tribal, and local government personnel with appropriate expertise to identify limiting factors for salmonids. Limiting factors were defined as "*conditions that limit the ability of habitat to fully sustain populations of salmonids.*" This information is currently being used to guide funding entities in prioritizing habitat restoration and protection projects. Identifying habitat limiting factors required a set of criteria to be used to compare the significance of different factors and consistently evaluate habitat conditions in each watershed (i.e., WRIA) throughout the state. For factors that had a range of criteria, one or more of them were used. Where no criteria could be found, a default criterion was used, with the expectation that it will be modified or replaced as better data become available. Currently, reports of the factors limiting salmonids have been prepared for 45 watersheds in Washington State.

#### U.S. Geological Survey

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The U.S. Geological Survey (USGS) conducts monitoring for the National Water-Quality Assessment (NAWQA) Program. Data collected from NAWQA are used to summarize the status and trends of the surface water and groundwater quality, describe the processes affecting water quality and aquatic ecology, and provide timely results to watershed managers, policy makers, and the public.

The USGS also operates and maintains the National Streamgaging Network collecting long-term streamflow data from about 7,000 streamgages nationwide. Although the National Streamgage Network is operated primarily by the USGS, it is funded by a partnership of 800 agencies at the federal, state, tribal, and local levels.

USGS also manages the National Streamflow Information Program which was created in response to Congressional and stakeholder concerns about (1) a loss of streamgages, (2) a disproportionate loss of streamgages with a long period of record, (3) the inability of the USGS to continue operating high-priority streamgages when partners discontinue funding and (4) the increasing demand for streamflow information due to new resource-management issues and new data-delivery capabilities.

## U.S. Forest Service

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The U.S. Forest Service conducts monitoring of aquatic resources in support of two broad scale plans: (1) the Northwest Forest Plan (i.e., Western Washington) and (2) Pacfish/Infish Biological Opinion (PIBO). Both plans require implementation and effectiveness monitoring of management activities that address issues with the Endangered Species Act. The individual forest plans also have implementation and effectiveness monitoring of best management practices. Each national forest produces a Forest Plan Monitoring Report each year that covers all the implementation and effectiveness monitoring accomplished.

## Habitat Conservation Plans

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Habitat Conservation Plans (HCPs) are administered by the National Oceanic and Atmospheric Administration (NOAA) Fisheries and the U.S. Fish & Wildlife Service. Most of the HCPs are focused on the conservation of salmonids. These include programs administered under the Endangered Species Act, the Federal Power Act, the Clean Water Act, and the Magnuson-Stevens Act, among others. The HCP program provides policy and technical expertise to non-federal entities that want to develop HCPs.

Monitoring is a mandatory element of all HCPs and is part of the permittee's implementation obligation. The scope of a monitoring plan is directly related to the significance of the HCP's biological impacts. Monitoring data are needed to ensure proper compliance with an HCP and to determine whether biological goals and objectives are being met. Monitoring serves not only to ensure compliance and gauge the effect and effectiveness of HCPs, it also informs choices under the adaptive management provisions and assists in redefining biological goals. Applicants work with the Services to determine the level of monitoring appropriate for their specific HCP.

Four HCPs have been issued by NOAA Fisheries in Washington for the protection of anadromous salmonids. In particular, the monitoring currently being conducted for the HCP issued to Simpson Timber Company, which includes a Water Cleanup Plan, will provide future information on the effectiveness of the HCP and Water Cleanup Plan in meeting water quality standards.

## Forests and Fish Report

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The Forests and Fish Report (FFR, 1999) is the result of negotiations between landowners, federal and state agencies, local governments, and some tribes. It contains recommendations to enhance forest practices in the state to improve water quality and fish habitat. The Forests and Fish Report was submitted to the Washington State Forest Practices Board and enacted into legislation. The legislation required the Board to adopt regulations consistent with the report. In 2001, the Board approved a comprehensive set of new forest practice rules based on the report. These new rules establish an adaptive management program.

One of the most important new elements of the adaptive management program was the development of specific resource-based resource objectives. Performance targets were identified for each resource objective. Performance targets are measurable criteria that define specific

measures for forest conditions and processes. An effectiveness monitoring program has been implemented based on these predefined and measurable performance targets.

## Watershed Planning Act

Washington's Watershed Planning Act established a watershed management process to assess availability of water, develop streamflow standards, protect water quality, and restore fish habitat (Chapter 90.82 RCW). The primary intent of the statute was to assist Ecology, tribes, and local governments in addressing Endangered Species Act and Clean Water Act concerns. The Legislature provided funding to:

- Organize the planning unit and determining the scope of planning to be conducted.
- Conduct watershed assessments.
- Develop a watershed plan.

Currently, 33 "Planning Units" have formed in local areas around the state to develop plans for 42 of the state's 62 Water Resource Inventory Areas (WRIAs). Some of these Planning Units are nearing completion of their plans, and many other plans will be completed in the next two to three years. Many questions still remain regarding how these plans will be implemented and whether funding will be available to carry them out. Plans prepared in different WRIAs may be very different from each other, in terms of the recommended actions, level of detail, and expectations regarding the implementation process.

In 2001, the Legislature authorized creation of a committee to review these issues. The "Phase 4" Watershed Planning Implementation Committee prepared a report presenting recommendations for implementing the plans, including monitoring needs (Ecology, 2002). These needs are above and beyond those addressed in the Assessment Phase (Phase 2) of developing a watershed plan. Some Planning Units may identify monitoring and data management as an important need. In other WRIAs this may not be an issue. The Committee identified several general recommendations with regard to monitoring, data management, and related issues. During the 2003 Session, the Legislature amended the Watershed Planning Act (Second Engrossed Substitute House Bill 1336) which requires Ecology to prepare annual reports to the Legislature on two specific performance measures. Both of these performance measures are process outputs related to setting streamflow standards.

## River Basin Characterization

A fundamentally new approach to evaluating the role of water in river basins was developed by Ecology, the Washington Department of Fish and Wildlife, and the Washington Department of Transportation to address the need for a basin-level assessment tool. The approach provides information to address both sub-basin and site specific problems with salmon habitat, flooding, water use, and water quality. The approach integrates watershed process calculations around the common theme that natural system processes create and maintain functions important to residents.

The results of the characterization include:

- A picture of natural processes in the basin and a description of how they have been altered.
- Sub-basins ranked by their potential for process alteration.
- Identification of multiple process problems.
- Recommendations for further activities.

Recently, the Department of Transportation began implementing this approach for a more formal, scientific approach to watershed assessment and the identification of alternative mitigation sites. Direction was given by the Transportation Efficiency and Accountability Committee created by the Environmental Permit Streamlining Act. A Watershed-Based Mitigation Subcommittee was charged with formalizing and testing a methodology that focuses on increasing environmental benefits, reducing mitigation costs, and enhancing the public participation process through the use of comprehensive watershed characterization to help identify potential mitigation opportunities.

The new evaluation process and underlying assumptions were tested on a pilot project at State Route 522 in WRIA 7. This project was used to develop and test watershed-based methods and concepts and gave valuable insight into the application of the methodology, the availability of data, and the time needed to complete steps. The methodology is now being used to address potential impacts of the project to widen Interstate 405 between the Cedar River and the junction with Interstate 90 in the Lake Washington watershed. Unlike the pilot project, this test will produce a list of potential mitigation sites in the watersheds of the rivers and creeks that are impacted by the project. The current Watershed-Based Mitigation Subcommittee calls for the technical team to use the methodology for at least three more transportation projects. Along with the work of the technical team, the Subcommittee is beginning to explore how we can most effectively integrate this new watershed mitigation approach into Washington's interagency policy.

## Reservoir Monitoring

### Federal Energy Regulation Commission

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Monitoring of non-federal hydroelectric facilities is currently being accomplished on a project-by-project basis as negotiated settlements have been reached with Federal Energy Regulation Commission (FERC) licensees. The Electric Consumers Protection Act of 1986, which amended Section 10 of the Federal Power Act, requires FERC, before licensing, to consider each proposed hydropower project's consistency with relevant state or federal comprehensive plans for developing or conserving a waterway. On April 27, 1988, the Commission issued Order No. 481-A, establishing that FERC will accord Federal Power Act Section 10(a)(2)(A) comprehensive plan status to any federal or state plan that:

- Is a comprehensive study of one or more of the beneficial uses of a waterway.
- Specifies the standards, the data, and the methodology used.
- Is filed with the Secretary of the Commission.

There are at least 78 Comprehensive Plans filed with FERC pursuant to Section 10(a)(2)(A) of the Federal Power Act affecting Washington State as of April 2002. Among the federal plans in the FERC library are: (1) watershed plans and related environmental assessments prepared by the U.S. Army Corps of Engineers districts and the U.S. Department of Agriculture's Natural Resources Conservation Service, (2) plans for the protection of migratory waterfowl and unique ecosystems published by the U.S. Fish and Wildlife Service, and (3) land and resource management plans (and related environmental impact statements) prepared by the national forests and the Bureau of Land Management.

Examples of state-prepared plans for FERC are studies of water quantity, water quality, and fish management. Under 18 CFR, Section 4.38, each license application must identify relevant comprehensive plans and explain how and why a proposed project would, or would not, comply with such plans.

There are 54 private or locally owned and operated hydroelectric projects registered with FERC for Washington State waters. These projects range from major facilities such as Priest Rapids (that generates 1,755 megawatts) on the Columbia River, to small hydroprojects such as a micro hydro on Burnham Creek in Pacific County (that generates 23 kilowatts). Current monitoring occurs as part of compliance with license requirements. Licenses are issued for 50 years, so any changes to licenses have long-lasting effects.

## Federal Hydropower Projects

In addition to private and local hydropower projects, there are another ten hydro projects located on the mainstem Columbia and the Snake rivers that do not have FERC licenses because they are federally funded and federally operated entities. The U.S. Army Corps of Engineers (Corps) operates nine dams on the lower Columbia and Snake rivers, and Chief Joseph Dam in the upper Columbia River. The Corps has created a Fish Management Division to evaluate fish passage operations at the dams and to act as a liaison with state agencies. The Corps is charged with monitoring fish passage, water quality, and streamflows at their facilities.

The U.S. Bureau of Reclamation operates Grand Coulee Dam and approximately 180 other projects in the 17 western states. The Columbia Basin Project began with funds provided for Grand Coulee Dam pursuant to the National Industrial Recovery Act of June 16, 1933. The project was specifically authorized for construction by the Rivers and Harbors Act approved August 30, 1935. The Columbia Basin Project Act of March 10, 1943 (57 Stat. 14) reauthorized the project, bringing it under the provisions of the Reclamation Project Act of 1939. All fish are blocked from further upstream passage, so monitoring is focused upon flow and water quality requirements such as dissolved gas. Because Grand Coulee is so large, it is a major player in regulating flow on the Columbia River and providing flows for fish passage throughout the system.

## Bonneville Power Administration

The Bonneville Power Administration (BPA) was created in 1937 to market power produced by Bonneville and Grand Coulee dams constructed in 1938 and 1941 respectively. Today, BPA

markets the power generated at 30 federal dams, one nonfederal nuclear plant at Hanford, Washington, and some nonfederal power plants, such as wind projects. The BPA funds about 500 fish and wildlife projects each year, from repairing spawning habitats to studying fish diseases and controlling predators. Projects for BPA funding are identified by the Northwest Power Planning Council's fish and wildlife program and are reviewed by an independent scientific review panel. The BPA is required to protect and rebuild species listed under the federal Endangered Species Act. In recent years, they have been required to release billions of gallons of water, once stored for winter power, from reservoirs each spring and early summer to speed the migration of young fish to the ocean and forego generation to spill water to help juvenile fish traverse the dams more safely.

## Northwest Power Planning and Conservation Council

The Northwest Power and Conservation Council (NWPPCC) was created by Congress to give the citizens of Idaho, Montana, Oregon and Washington a stronger voice in determining the future of key resources common to all four states, namely, the electricity generated at and fish and wildlife affected by the Columbia River Basin hydropower dams. The NWPPCC is intended to:

- Assure that the Pacific Northwest has an adequate, efficient, economical, and reliable power supply.
- Provide participation and consultation of Pacific Northwest states, local governments, consumers, customers, all users of the Columbia River System (including federal and state fish and wildlife agencies and Indian tribes), and the public.
- Ensure development of regional plans and programs related to energy conservation, renewable and other resources, facilitating the planning of the region's power system, and providing environmental quality.
- Protect, mitigate, and enhance fish and wildlife, including related habitat and spawning grounds, of the Columbia River and its tributaries.

The Fish and Wildlife program of the NWPPCC must:

- Complement activities of the federal and state fish and wildlife agencies and treaty tribes.
- Be based on the best available science.
- Use the least costly but most effective means of achieving biological objectives.
- Be consistent with the legal rights of treaty tribes.
- Provide improved survival of anadromous fish and sufficient flows between facilities.

## **Estuary Monitoring**

### Puget Sound Water Quality Management Plan and Local Watershed Action Plans

The Puget Sound Water Quality Action Team, with advice from the Puget Sound Council, is mandated to implement and periodically update the Puget Sound Water Quality Management Plan. Implementation of the plan is guided by biennial work plans that coordinate all water quality programs within the Puget Sound basin. The watershed planning program in Puget

Sound was developed as a result of the Puget Sound Water Quality Act and the Puget Sound Water Quality Management Plan. Guidelines for the planning process are promulgated in Chapter 400-12 WAC.

Several implementation committees are active in the Puget Sound, including the Stillaguamish Implementation Review Committee, Puyallup Watershed Council, North Whidbey and South Central Whidbey plans, Lower Hood Canal Watershed Council, and the Key Peninsula/Gig Harbor/Island Watershed Council. In addition, Island County is beginning work on a watershed plan for Camano Island, and Kitsap County is implementing the five plans for that county through their Storm and Surface Water Management program, in cooperation with the Kitsap County Health District and Kitsap Conservation District.

There have been no efforts to evaluate the overall effectiveness of these planning efforts statewide. However, there have been local efforts by Clallam County and Kitsap County to evaluate success of individual plans. These evaluations focused on environmental outputs, not environmental outcomes. Although both counties conduct routine water quality monitoring, there has been no effort to explain observed conditions with the management activities resulting from the watershed plans.

## [Washington State Department of Natural Resources](#)

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The Washington State Department of Natural Resources (WDNR) Nearshore Habitat Program monitors long-term changes in eelgrass abundance and distribution in Puget Sound, as part of the Puget Sound Ambient Monitoring Program (PSAMP) (Berry et al., 2003). Eelgrass is used as an indicator of estuarine health because it responds to many natural and human-caused environmental variables. Changes in abundance and distribution of this resource are likely to affect many other species that depend on this unique and important habitat.

To monitor eelgrass (*Z. marina*) abundance and measure change over time, a sampling design is used that extrapolates results from randomly selected sites over geomorphological strata, regions, and the Puget Sound study area. Most sites are randomly selected and sampled for five consecutive years. This design optimizes the joint goals to accurately estimate the correct status of the population and to accurately and precisely estimate changes over time. In addition to randomly selected sites, six core sites were targeted for long-term monitoring. A series of indicators are recognized to be important indicators of *Z. marina* plant and bed condition: abundance (*Z. marina* area), minimum and maximum depth, and plant characteristics (density, leaf width, and leaf length). Data on bed patchiness and water quality are also collected.

## [Shellfish Closure Response Plans](#)

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The Food Safety and Shellfish Program of the Washington State Department of Health (DOH) is mandated to protect the health of shellfish consumers. To this end, DOH operates two fixed-station sampling networks. The first network monitors the level of biotoxin (PSP and Domoic Acid) in mussels sampled biweekly from sentinel cages or scraped off substrate at 69 points throughout Puget Sound and the coastal estuaries. When biotoxin levels in the mussels from

individual areas exceed the appropriate FDA action levels, DOH informs the public and orders a halt to commercial harvest.

DOH also operates a second network to support the classification of commercial shellfish areas. At present, there are 94 actively classified growing areas. DOH uses standards and guidelines set by the National Shellfish Sanitation Program (NSSP, 1999) to classify them. Initial classification is based on analysis of water quality, meteorology, hydrography, and an intensive survey of shoreline and uplands for fecal pollution sources. An area cannot be approved for harvest if there are significant pollution threats, despite acceptable water quality. DOH samples stations in conditionally approved areas 12 times a year. *Restricted* and *Approved* areas are sampled six times a year. Every three years, DOH reviews growing area conditions, and issues a report that may confirm or recommend adjustment of the classification of the growing area.

The Puget Sound Water Quality Management Plan directs key state and local agencies to quickly complete a shellfish closure response plan following a downgrade. State law also calls for local governments to form a shellfish protection district within 180 days of a downgrade. As part of the restoration project, DOH modifies the existing monitoring program to track the results of watershed remediation activities. DOH also uses data from routine monitoring to report status and trends in growing areas throughout Puget Sound for the Puget Sound Ambient Monitoring Program (PSAMP).

The change in classification of commercial shellfish areas can be considered an outcome-based performance measure since any reclassification is based on comparing the monitoring data to the criteria mandated in state rule. However, other factors like changes in land use or movement of wildlife populations not associated with efforts of the shellfish closure response plan may also influence the outcome.

DOH also monitors fixed water quality stations in 94 classified shellfish growing areas to measure ambient bacteria levels. In addition to these programs, many other agencies, tribes, and local governments operate fixed station monitoring programs. This information is often provided to (or acquired by) Ecology to effectively expand Washington's monitoring resources.

## Coastal Monitoring

### Coastal Ocean Remote Sensing

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Analysis of water chemistry and physical properties are collected by the National Oceanic and Atmospheric Administration (NOAA) at Pacific Ocean sea buoys. NOAA also conducts continuous high-resolution monitoring of terrestrial features such as vegetation changes, flooding, wild fires, volcanic eruptions, and ash cloud transport. The program continuously monitors coastal ocean areas for harmful algal blooms, coral reef deterioration, fisheries management, and pollution changes.

## Wetland Monitoring

### Washington State Department of Transportation

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The Washington State Department of Transportation (WSDOT) provides compensation for wetland impacts by restoring, enhancing, and/or creating wetlands. These mitigation projects are monitored to ensure their successful establishment. Monitoring may involve conducting vegetation surveys and assessing wetland hydrology, soil, and/or other habitat components specified by individual mitigation plans. Compliance monitoring of these compensatory mitigation efforts and provision of internal feedback comprise the two-fold mission of WSDOT monitoring efforts. Compliance monitoring provides a means for tracking the development of all WSDOT mitigation projects over time, and for determining compliance with permits issued by federal, state, local, or tribal jurisdictions. Monitoring staff also provide important internal feedback. By reporting on the development of mitigation projects, monitoring results provide an essential link in the internal adaptive management process, empowering regional WSDOT environmental managers to make sound decisions regarding present and future mitigation projects.

Monitoring begins the first year after planting of the mitigation site and continues annually for what is typically a period of 5 to 10 years. WSDOT biologists conduct monitoring activities from May to September with the help of graduate students and upper level undergraduates enrolled in an 11-week internship entitled Wetland Ecology and Monitoring Techniques. WSDOT wetland monitoring methods are used to collect data on vegetation, wildlife, benthic-macroinvertebrates, soil, and water, and a photographic record is kept of each site. Monitoring reports are completed annually and submitted to the U.S. Army Corps of Engineers, Washington State Department of Ecology, and other appropriate state and federal resource agencies and local governments.

## Monitoring that Addresses Multiple Waterbody Types

### Salmon Recovery Act

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Washington's Salmon Recovery Act (Chapter 77.85 RCW) was passed to address salmonid habitat restoration in a coordinated manner, and to develop a structure that allows for the coordinated delivery of federal, state, and local assistance to communities for habitat projects. The Salmon Recovery Act requires a limiting-factors analysis to be carried out with the assistance of state fish biologists. This analysis is used to identify viable habitat restoration projects and to guide the distribution of funding.

The Salmon Recovery Act also requires that monitoring data provided by lead entities, regional fisheries enhancement groups, and others to be entered into the databases of SASSI (Salmon And Steelhead Stock Inventory) and SSHIAP (Salmon and Steelhead Habitat Inventory Assessment Project). Information pertaining to habitat preservation projects funded through the Washington Wildlife and Recreation Program, the Conservation Reserve Enhancement Program, and other conservancy programs related to salmon habitat are also required to be entered into the SSHIAP

data base. The Salmon Recovery Act also requires Washington to develop a statewide strategy for salmon recovery and to prepare a biennial *State of the Salmon* report. These biennial reports contain the “Salmon Recovery Scorecard” which is used to evaluate the success of management activities implemented from the Salmon Recovery Act.

## Statewide Strategy to Recover Salmon

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In 1999, the State of Washington Joint Natural Resources Cabinet published the statewide strategy to recover salmon (JNARC, 1999). To evaluate success of the recovery strategy, the state uses the Salmon Recovery Scorecard published in the biennial *State of the Salmon* report. The Scorecard essentially is the state's business plan for salmon recovery. It's a performance management system for tracking data, measuring progress, and changing course where needed. However, of the 18 indicators tracked on the scorecard, only one is an outcome indicator related to nonpoint pollution sources. Scorecard element E-2 tracks the percentage of WRIsAs that have acceptable levels of Ecology's Water Quality Index (WQI).

The WQI is represented by numbers ranging from 1 to 100, indicating the general water quality at each station. The higher index numbers are indicative of better water quality. Multiple constituents of the water quality measured are combined, and the results are aggregated to produce a single score for each sample station. The WQI was calculated for the long-term monitoring locations in each WRIA sampled by Ecology in 2002. Results show that 5% of the WRIsAs are in poor condition, 61% are fair, and 34% are considered in good condition.

## Aquatic Nuisance Species Management Plan

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The purpose of the Washington State Aquatic Nuisance Species (ANS) Management Plan is to coordinate all ANS management actions currently in progress within Washington, and to identify additional ANS management actions, especially those relating to ANS animals. The development of a state management plan is called for in Section 1204 of the National Invasive Species Act of 1996, which provides an opportunity for federal cost-share support for the implementation of state plans approved by the National Aquatic Nuisance Species Task Force. Management actions are undertaken and funded by the responsible state agencies. The Washington State Plan published in December 1998 was developed by the Washington State Aquatic Nuisance Species Planning Committee.

Several agencies are responsible for current efforts to monitor for ANS populations already present in Washington. The Washington State Aquatic Nuisance Species Planning Committee continues to revise the monitoring program to quickly detect new ANS introductions or the spread of those already present. They are working to collect accurate information about which ANS are present, where they are present, and an estimate of their population numbers and/or densities. The Committee has established the following “Strategic Action”: Monitor waters that are vulnerable to new ANS introductions and track the distribution of existing ANS populations. Survey Washington lakes, rivers, estuaries, wetlands, and coastlines on a periodic basis to establish an accurate assessment of the presence of non-native species that have become, or have the potential to become, nuisance species, and make these data available statewide.

## Tribal Monitoring

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A survey of existing environmental monitoring programs and their associated databases was conducted during 2001-2002. The survey was designed to meet data inventory needs for Washington's *Comprehensive Monitoring Strategy* (CMS, 2002). The statute required the identification and evaluation of all existing state and non-state monitoring activities. Most of the monitoring reported by tribal governments has a geographic focus at the watershed level and, to a lesser degree, upon the area within the jurisdictional boundaries. More information on monitoring programs conducted by tribal governments is available in Crawford et al. (2003).

## Local Government Monitoring

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Most of the monitoring conducted by local governments has a geographic focus at the watershed level and, to a lesser degree, upon the area within the local government's jurisdictional boundaries. Only 26% of local governments surveyed for the CMS (2002) had been monitoring for more than five years. More information on monitoring programs conducted by local governments is available in Crawford et al. (2003).