

Executive Report



The Washington
Comprehensive Monitoring Strategy and Action Plan
for Watershed Health and Salmon Recovery

Volume 1 of 3
Monitoring Oversight Committee • December 2002

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In 2001, Governor Locke signed into law Substitute Senate Bill (SSB) 5637, an act relating to monitoring of watershed health and salmon recovery. This law requires a Monitoring Oversight Committee develop a comprehensive statewide strategy (**Strategy**) for monitoring watershed health, with a focus on salmon recovery. The law incorporates monitoring recommendations provided by the state Independent Science Panel in its report to the Governor and Legislature in December 2000.¹ The law also requires development of a state agency action plan (**Action Plan**) that phases in full implementation of the Strategy by June 30, 2007.

The intent of the law is to promote “a framework of greater coordination of existing monitoring activities; [...] monitoring activities most relevant to adopted local, state, and federal watershed health objectives; and [...] the exchange of monitoring information with agencies and organizations carrying out watershed health, salmon recovery, and water resources management planning and programs.”

Project deliverables are represented by three inter-related documents. These are:

- Volume 1 – Executive Report – an overview of the Strategy and Action Plan.
- Volume 2 – Comprehensive Monitoring Strategy – includes detailed technical information required by SSB 5637 compiled during the project timeframe.
- Volume 3 – Action Plan – includes costs, priorities, and timelines for implementation of the Strategy by 2007.

The purpose of this Executive Report is to provide an overview of the approach, findings, and key recommendations submitted by



Stream being surveyed.

the Monitoring Oversight Committee (MOC) to the Governor and appropriate committees of the Legislature as required by Section 3(8) of SSB 5637.

Risks

Through SSB 5637 the legislature found that the benefits of comprehensive monitoring are desirable. However, if comprehensive monitoring is not feasible or otherwise not implemented, it will be necessary to accept a number of risks. These include economic, biological, and societal risks.

For example, without adequate monitoring of salmon abundance, Washington State will incur continued economic impacts due to limited ability to document when salmon populations are no longer warranted for listing under the Endangered Species Act. Also, without adequate monitoring of stream flows and setting of instream flow requirements, we risk having water shortages, water disputes, and additional salmon and other aquatic plants and animals threatened with extinction. We also risk losing Congressional and Legislative funding for salmon recovery projects if benefits cannot be demonstrated. Economic and societal values associated with watershed health will likely not be achieved.

¹ Independent Science Panel Report 2000-2: “Recommendations for Monitoring Salmonid Recovery in Washington State”

Project Organization and Approach

To fulfill the requirements of the SSB 5637, activities were managed as a “project,” which means they were guided by a project manager and reflected critical contributions from policy steering committees and technical groups. A description of key project groups follows below.

Monitoring Oversight Committee

SSB 5637 created a *Monitoring Oversight Committee* (MOC) and directed it to:

- Complete the tasks described in these reports;
- Address the monitoring recommendations of the Independent Science Panel established under Revised Code of Washington (RCW) 77.85.040(7), and of the Joint Legislative Audit and Review Committee in its report number 01-1 on *Investing in the Environment* (Section 3(2) of SSB 5637); and
- Make recommendations to individual agencies to improve coordination of monitoring activities (Section 3(5) of SSB 5637).

Legislative Steering Committee

As directed by SSB 5637, the MOC provided quarterly briefings to the *Legislative Steering Committee*. That committee provided regular advice and inquiries, and reviewed the MOC’s work on how monitoring efforts will be coordinated; the expected benefits and efficiencies from such coordination; funding sources and funding levels necessary to provide secure and steady funding for monitoring; and how state agencies are improving coordination of their monitoring activities.

Independent Science Panel

SSB 5637 required the *Independent Science Panel* to act as an advisor to the MOC, to review all its work products, and to make recommendations to the MOC co-chairs. The Independent Science Panel presented formal comments at MOC meetings throughout the process. In addition, project staff met with the Independent Science Panel on a regular basis to discuss project issues.

Stakeholders

The MOC and staff have attempted to include representatives of many monitoring programs in the development of this project: 71 individuals representing 23 different federal, tribal, state, and local agencies have been active participants. MOC staff, in cooperation with the Governor’s Salmon Recovery Office, conducted a special workshop in August 2002 to gather local advice for Washington’s Strategy. Results from that workshop are outlined in a later section of this report.

Approach

The MOC met eight times from August 2001, to November 2002. MOC members established policy and technical workgroups to accomplish tasks, and invited policy-level representatives of the National Marine Fisheries Service (NMFS), U.S. Fish and Wildlife Service (USFWS), U.S. Environmental Protection Agency (USEPA), the Northwest Indian Fisheries Commission, and a local watershed group to join their committee.

A project manager teamed with senior staff from the Interagency Committee for Outdoor Recreation/Salmon Recovery Funding Board, the Governor’s Salmon Recovery Office, and the Department of Ecology to develop work products for the MOC. Several policy and technical committees assisted in the work.

Specific Tasks

Specific Tasks

The project deliverables prepared by the MOC respond to the scope of work articulated in SSB 5637. Specific tasks addressed are:

- (1) Define the monitoring goals, objectives, and questions that must be addressed as part of a comprehensive statewide salmon recovery monitoring and adaptive management framework;
- (2) Identify and evaluate monitoring activities for inclusion in the framework, while ensuring data consistency and coordination and the filling of monitoring gaps;
- (3) Recommend statistical designs appropriate to the objectives;
- (4) Recommend performance measures appropriate to the objectives and targeted to the appropriate geographical, temporal, and biological scales;
- (5) Recommend standardized monitoring protocols for salmon recovery and watershed health;
- (6) Recommend procedures to ensure quality assurance and quality control of all relevant data;
- (7) Recommend data transfer protocols and necessary infrastructure to support easy access, sharing, and coordination among different collectors and users;
- (8) Recommend ways to integrate monitoring information into decision-making;
- (9) Recommend organizational and governance structures for oversight and implementation of the coordinated monitoring framework;
- (10) Recommend stable sources of funding that will ensure the continued operation and maintenance of the state's salmon recovery and watershed health monitoring program, once established; and
- (11) Identify actions that will be taken by state agencies to implement elements of the coordinated monitoring program.

The MOC moved aggressively to complete all of the requirements and tasks assigned in the legislation. Scientific principles have been incorporated into the Strategy through continuous dialog and input from the Independent Science Panel.

The project Team generated many recommendations. Outlined below are various general findings with key policy relevance. These include a review of other monitoring efforts, local needs, monitoring gaps, basic categories of monitoring, and guiding principles used to create the Strategy and Action Plan.

Other Monitoring Efforts

As part of project activities and to help set the context for development of the Strategy, the project team reviewed many other monitoring efforts and sought their advice and input. This review revealed the following:

- The State of Oregon is also developing a comprehensive statewide monitoring strategy for salmon and watersheds as an expansion of their previous work with coastal coho salmon. Oregon project representatives invested considerable time in sharing their work with the project. Throughout the development of the Strategy, project staff were invited to be part of the Oregon process and Oregon staff were invited to be part of the Washington process. To the extent possible, the two strategies have been developed cooperatively. Future work is already underway to cooperatively develop Web portals in Oregon and Washington.
- The U.S. Forest Service and Bureau of Land Management are evaluating monitoring of federal forest lands using a modified Environmental Monitoring and Assessment Program (EMAP) approach and hoping to coordinate with state actions. Project staff have met monthly with Forest Service staff, Oregon and California staff to coordinate monitoring on federal lands with state monitoring strategies. The states have asked the Forest Service and Bureau of Land Management to consider adjusting the scale of their ongoing monitoring to provide answers about federal lands for each state and/or national forest so that their monitoring can be more useful to the states.



Washington State Department of Ecology

Counting Smolt.

More recently, coordination meetings held in Portland have included other agencies, such as the Bonneville Power Administration (BPA), and have broadened into addressing proper protocols on a regional basis. It is important that Washington continues to be an active player through a monitoring council or other coordinating position capable of speaking on behalf of Washington government.

- USEPA has been funding a pilot status and trend monitoring project for water quality, habitat and biological indicators both in freshwater and marine areas of Washington using their national EMAP

General Findings

program. The current funding of this pilot EMAP in Washington will soon expire. USEPA is interested in having Washington join Oregon in applying EMAP to state supported monitoring efforts. USEPA has participated actively in the various task groups and has offered the services of their Corvallis, Oregon, office. The Corvallis office was very helpful in designing an EMAP approach for Washington that will provide information at the necessary scale and with acceptable precision. If Washington implements the EMAP sampling approach to habitat, water, and fish, USEPA has indicated they will continue to assist us in refining our sampling approach and in analyzing data.

- The Northwest Power Planning Council (NWPPC) has been actively exploring how to fund appropriate monitoring and establish protocols that would be usable and applicable throughout the Columbia basin. Project staff have provided progress reports to the Council during the Strategy development process, and have coordinated with and encouraged Council staff participation in developing the Strategy. The Strategy contains specific recommendations for how the Council could better coordinate with the Salmon Recovery Funding Board, and with other Washington monitoring activities.
- At the regional and watershed level within Washington, several groups are attempting to develop monitoring strategies within their own areas and watersheds. There has been an ongoing dialog and coordination with the Upper and Lower Columbia River Salmon Recovery regions during the development of the Strategy. The Strategy attempts to incorporate their desires and direction and combine it with the statewide perspective

necessary for a comprehensive strategy. There has also been active participation by the Hood Canal Coordinating Council and Pierce County Planning in developing this Strategy. Such watershed groups need some place to go to find answers to monitoring processes and coordination. A monitoring council, if implemented, would provide future needed coordination.



Upstream with fish trap.

- The National Marine Fisheries Service's (NMFS's) Northwest Fisheries Science Center has been an ongoing participant and advisor in developing the Strategy and encourages a consistent approach between Washington, Oregon, and the federal Biological Opinion for the Columbia River. Their participation has been important in providing guidance on what elements would need to be included in the Washington Strategy to meet the monitoring requirements of the Endangered Species Act for salmon.
- The USFWS participated actively throughout the development of the Strategy in providing assistance in monitoring requirements for threatened bull trout populations.

Local Needs

At a more local level, stakeholders were asked at the monitoring workshop, “*What should a state monitoring strategy provide that would be most helpful to your regional watershed efforts?*” The following points were emphasized:

- Provide clear guidance and expectations, oriented at watersheds and regions, of what constitutes essential monitoring. Include identification of monitoring protocols.
- Use an approach to monitoring the effectiveness of habitat restoration projects that allocates a percentage of available funds to a common monitoring funding “pool”.
- Clarify relationships between policy questions/decisions and the Strategy.
- Correlate the scale and precision of monitoring with the purposes and uses of the information.
- Provide an integrated analysis of monitoring information, but allow for local interpretation of the information.
- Provide baseline-type information so that local stakeholders can set benchmarks or performance standards.
- Respondents supported establishing intensively monitored watersheds, but wanted to start with small areas.

Existing Monitoring Gaps

Current monitoring activities are not comprehensive and are lacking in nearly every category. The MOC conducted a survey of state, federal, and local government agencies as well as Indian tribes and volunteer organizations to determine what kind of monitoring is currently

being conducted in Washington. The purpose of this task was to identify existing monitoring activities for inclusion in the Strategy, and to determine where there were significant gaps that would need to be addressed.

Of the state natural resource agencies surveyed:

- 70% responded that their monitoring is a result of statute, rule, or court order;
- 84% of the databases directly or indirectly support watershed health or salmon recovery monitoring;
- 100% of the monitoring activities are ongoing;
- Most databases are statewide in scope;
- 74% of the state agency monitoring databases are geospatially referenced (i.e., data can be used in a geographic information system); and
- 53% of the monitoring databases have been collecting data for more than 5 years.

The survey provided valuable information that identified which data components are already Internet web-accessible and which databases need additional work to make them web-accessible. Only 19% of the identified watershed health and salmon recovery data are currently viewable on the web. Overall, 35% of the databases are downloadable from the web.

Statewide, the greatest overlaps in data concern tracking fish passage barriers, barrier removal projects, and their effectiveness. The Departments of Transportation (DOT), Natural Resources (DNR), IAC, and Fish and Wildlife (DFW) all record these data.

There is little or no redundancy in data between state and local governments due to differences in scale and in the monitoring questions answered.

General Findings

The table below reports the overall status of current monitoring data for the different areas of interest:

| Monitoring | Quality |
|--|--|
| Instream flow | Poor – numerous gaps |
| Water quality | Poor – only 6 of 300 indicators measured |
| Freshwater habitat | Poor – very little ongoing |
| Nearshore marine and estuarine habitat | Fair – nearshore marine gaps |
| Enumerating spawning salmon | Good – need precision estimates |
| Enumerating juvenile migrants | Fair – not enough locations |
| Harvest | Very good – need better reporting |
| Effectiveness of projects | Poor – very little information |
| Hatcheries | Fair – implementation monitoring |
| Hydropower | Poor – no overall status available |
| Large scale ocean and climate conditions | Good – federal responsibility |
| Predators and exotic species | Fair – federal responsibility |

A table containing all existing state agency watershed health and salmon monitoring activities, and including current costs, is in the Action Plan (Volume 3).

The MOC has recommended future actions that should provide for better monitoring with substantial long term savings; however, few duplications of effort have been identified in current monitoring programs. The recommendations contained in this Strategy are a start, but more work needs to be done to fully identify the management issues.

One of the challenges of the Strategy has been to develop a method to tie different scales of interest between local watersheds and state agencies into a cohesive approach.

Types of Monitoring

All comprehensive monitoring efforts must accommodate broad spatial and temporal scales, and facilitate the integration of results across those scales. Similar to other efforts, the Strategy identified several types of monitoring. The three environmental

monitoring types presented below differ in spatial scale and intensity of effort:

- (1) **Status and trends (extensive) monitoring** – The purpose of this type of monitoring is to estimate the status of fish populations and to track over time indicators of habitat, water quality, water quantity, and other factors that impact watershed health. The spatial scale is large and varies from Water Resource Inventory Areas (WRIAs), to salmon recovery regions, to the entire state. Status and trends monitoring cannot demonstrate cause-effect relationships between actions and outcomes, but it will assess the actual condition of the environment. It is fundamental and complements other types of monitoring.
- (2) **Project effectiveness monitoring** – Most salmon or watershed projects are implemented at a small scale, with defined sets of actions intended to protect or enhance specific habitat features or habitat-forming processes. An enhancement technique may be

difficult to implement properly but very effective or, conversely, easy to implement but rarely effective. Both implementation and effectiveness monitoring are necessary to evaluate specific projects or classes of projects. Implementation monitoring is determining whether an action was implemented. It is a yes/no answer and does not require environmental data. It is usually a low cost monitoring activity. Effectiveness monitoring measures environmental parameters to ascertain whether the actions implemented were effective in creating a desired outcome. For example, did the planted trees produce shading for the stream?

- (3) **Validation (intensive) monitoring** – This type of monitoring is the only type of monitoring that can establish “cause and effect” relationships between fish, habitat, water quality, water quantity, and management actions. It pertains to evaluation of projects and programs that conduct, promote, or regulate, activities meant to protect or enhance habitat, water quality, or fish production. One example of intensive monitoring might be a case study of a watershed that examines the cumulative impacts of total maximum daily loading (TMDL) requirements for various water users on the overall water quality of the basin. Another example might study the impacts of categories of riparian habitat projects on salmon in a specific stream. The common theme of these studies is to develop an understanding of the linkage between management actions and the response in numbers of fish produced. These studies are the most complex and technically rigorous, which often require measuring many parameters to detect the variable affecting change. Once determined, the relationship between restoration actions and the numbers of fish produced may or may not be able to be directly extrapolated to other watersheds depending

upon the strength of the information obtained. However, intensively monitored watersheds can be assumed to represent the overall responses of other nearby watersheds to the same restoration treatments.

Compliance monitoring has also been addressed in the Strategy to some extent. This type of monitoring tracks compliance with established laws, rules, or benchmarks. Compliance monitoring is most often associated in the Strategy with the Clean Water Act and the Endangered Species Act. The Strategy proposes maintaining ongoing compliance monitoring and enhancing monitoring compliance with USEPA TMDL requirements and compliance with salmon harvest regulations.

Guiding Principles

Monitoring involves the deliberate and systematic observation, detection, and recording of conditions, resources, and environmental effects of management and other activities. Given the context outlined above, four “guiding principles” emerged from the project which form the basic framework for the recommendations associated with project tasks. These guiding principles are:

- Resolve important scientific, policy, and management questions using an **adaptive management approach**;
- Ensure that **monitoring information is accessible** to the public and all levels of government;
- **Evaluate and account for the state’s investments** in watershed health and salmon recovery actions; and
- **Determine trends** in fish, water, and habitat conditions.

In the Strategy and Action Plan, recommendations are associated with one or more of these four guiding principles.

Recommendations

The Strategy includes many recommendations, some of which are technically oriented or may have significant fiscal impacts, and others that are administrative or may have no or minimal fiscal impacts. Determining relative priorities is a challenging exercise and is described in more detail in the Action Plan. The recommendations outlined below are intended to reflect those deemed the highest priorities. They are organized under the guiding principles noted above.

Adaptive Management

Most state natural resource agencies have developed processes that are designed to incorporate environmental monitoring into decision making and reporting. However, these processes are not always coordinated, nor is it clear how local watershed efforts are included into an adaptive management approach. Adaptive management is a process that provides managers with the flexibility to adapt and change in response to new information. It has been defined in state law as “reliance on scientific methods to test the results of actions taken so that the management and related policy can be changed promptly and appropriately” (RCW 79.09.020).

While monitoring supports specific purposes, the challenge is designing monitoring that supports much more complex and difficult decisions across agencies and watersheds. This is particularly true for watershed health, where both monitoring and adaptive management need to occur on a number of fronts. Examples include cleanup of toxic sediments, human health hazards from contaminated fish and shellfish, stream flows for people, etc.

➤ *Recommendation: Establish a permanent Watershed Monitoring Council*

A standing oversight group should be established as soon as possible to provide a central point to sustain development, coordination, and dissemination of scientifically sound water, habitat, and salmon related data and information. This oversight body would focus monitoring activities and report on agencies’ overall implementation. It would provide the bridge between local watershed monitoring

actions and state and federal actions. A model structure and the duties of a permanent Watershed Monitoring Council (WMC) is described below.

Roles and Functions

A permanent WMC would:

- Address continuing policy and technical issues related to monitoring.
- Encourage and ensure completion of missing elements of the Strategy. The Strategy has attempted to provide a comprehensive approach to monitoring in the time provided by statute. Some elements have not been completed due to the short timeframe².
- Ensure implementation of the proposed common framework for data and information management so that there is transparency of data for other agencies and the public.
- Assist agencies in implementing their monitoring work plans, performance measures and an adaptive management framework. Assist coordinating related budget requests. Promote inter- and intra- state coordination and communications.
- Recommend governmental actions designed to consolidate, simplify, and make more efficient state monitoring.
- Provide a forum to coordinate and incorporate local watershed monitoring efforts with statewide efforts. A process should be developed to permit watershed and

² These include reaching agreement on sampling protocols for habitat and salmon indicators, data sharing protocols, establishing benchmarks, etc. for some areas of monitoring, and meeting some areas of concern expressed by the Independent Science Panel.

region staff to enter data directly into certain state databases.

- Provide synthesized statewide reporting of environmental monitoring. The Council should publish a biennial Washington State Watershed Health and Salmon report card. The report card's format could be similar to those developed by the Chesapeake Bay Program and by the State of Maryland's Environmental Indicators report.

Structure

A Council would:

- Be established by law.
- Be supported by at least one professional-level staff.
- Report to policy and funding entities as requested, as well as to the public.
- Convene on a regular schedule.
- Be funded by state appropriations, but could apply for monitoring funding from the state and federal funding entities for its activities and for the monitoring activities of others.
- Be chaired by a citizen at large with no vested interest in monitoring activities of any state agency.
- Be housed in a neutral organization that has no direct ties or interest in the outcomes of any specific monitoring report or analysis, and has a reputation for accuracy and integrity. This could be an organization such as the Office of the State Auditor, Washington State Office of the Forecast Council, Office of Financial Management, Interagency Committee for Outdoor Recreation, or the Governor's Salmon Recovery Office.

- Consist of nine voting members and other non-voting advisors. Voting members could include representatives of the: Department of Ecology, Department of Fish and Wildlife, Department of Natural Resources, Interagency Committee for Outdoor Recreation, and Puget Sound Action Team. The Governor should appoint the Chair of the WMC, two citizens at large, and a representative from the Washington treaty tribes. The USEPA, USFWS, USFS and the NMFS would advise the WMC as needed. The Independent Science Panel, or a similar entity, would provide independent periodic review of WMC products.

➤ *Recommendation: Institutionalize the State Agency Action Plan and State Watershed Health Report Card through statute*

These reports provide timely and comprehensive evaluation and reporting of results. They should include monitoring performed by each state agency and the decisions and proposed actions affected by monitoring. The results of previous monitoring should be part of each new Agency Action Plan.

➤ *Recommendation: Establish a consistent funding source*

Ongoing monitoring has used a variety of funding strategies and sources. The natural resource agencies have leveraged federal and local dollars to such an extent that current monitoring efforts would collapse if these funding sources were to cease to be available. Sources of current funding are tied to grants from the USEPA for clean water programs, Magnuson-Stevens Act funds for monitoring salmon harvest and abundance, and other local funds such as the Bonneville Power Administration (BPA) for Columbia River

Recommendations

salmon and watershed monitoring. If monitoring is to answer the questions we are faced with, it must receive consistent funding and have an equal priority with restoration projects and other kinds of activities centered on watershed health and salmon recovery.

➤ *Recommendation: Adopt monitoring protocols for indicators*
Protocols refer to the methods, tools, and processes used to collect or analyze monitoring data. For data to be comparable across geographic scales, it is important to use consistent protocols. Numerous protocols exist for monitoring various aspects of salmon recovery and watershed health. The challenge for this project has been to recommend protocols consistent with the monitoring Strategy that state or state-funded organizations, local watershed groups, and individuals could use to participate in the state's monitoring Strategy.

Although many protocols have been identified, this element was not completed in the time available. The adoption of standard protocols should be among the first items addressed by any future efforts of a monitoring council, and should be coordinated with the Oregon Plan for Salmon and Watersheds and the Columbia River's federal caucus Basin-wide Salmon Recovery Strategy.

Accessibility of Monitoring Information

Access to monitoring data, analyzed information, and reports is a critical unmet need for many partners working to restore our watersheds and salmon populations. The Joint Natural Resources Cabinet (JNRC), the Salmon Recovery Funding Board (SRFB), and the Salmon and Watershed Information Management Committee

(SWIM) have identified access to information as a gap and a primary focus point.



Washington State Department of Ecology

Sampling for insects.

The Strategy creates a structure that supports easy access, sharing, and coordination among different collectors and users of salmon and watershed data. It provides a strong monitoring foundation that leads to coordinated agency reporting, uniform monitoring protocols and data. And, it provides for mutual data entry and sharing between state agencies, salmon recovery regions, and watershed entities.

➤ *Recommendation: Establish a Washington State Natural Resources data portal as a first step to a comprehensive approach to sharing data*
An Internet portal is a web site providing access to a variety of distributed data, information, and tools. A portal will be the single place to

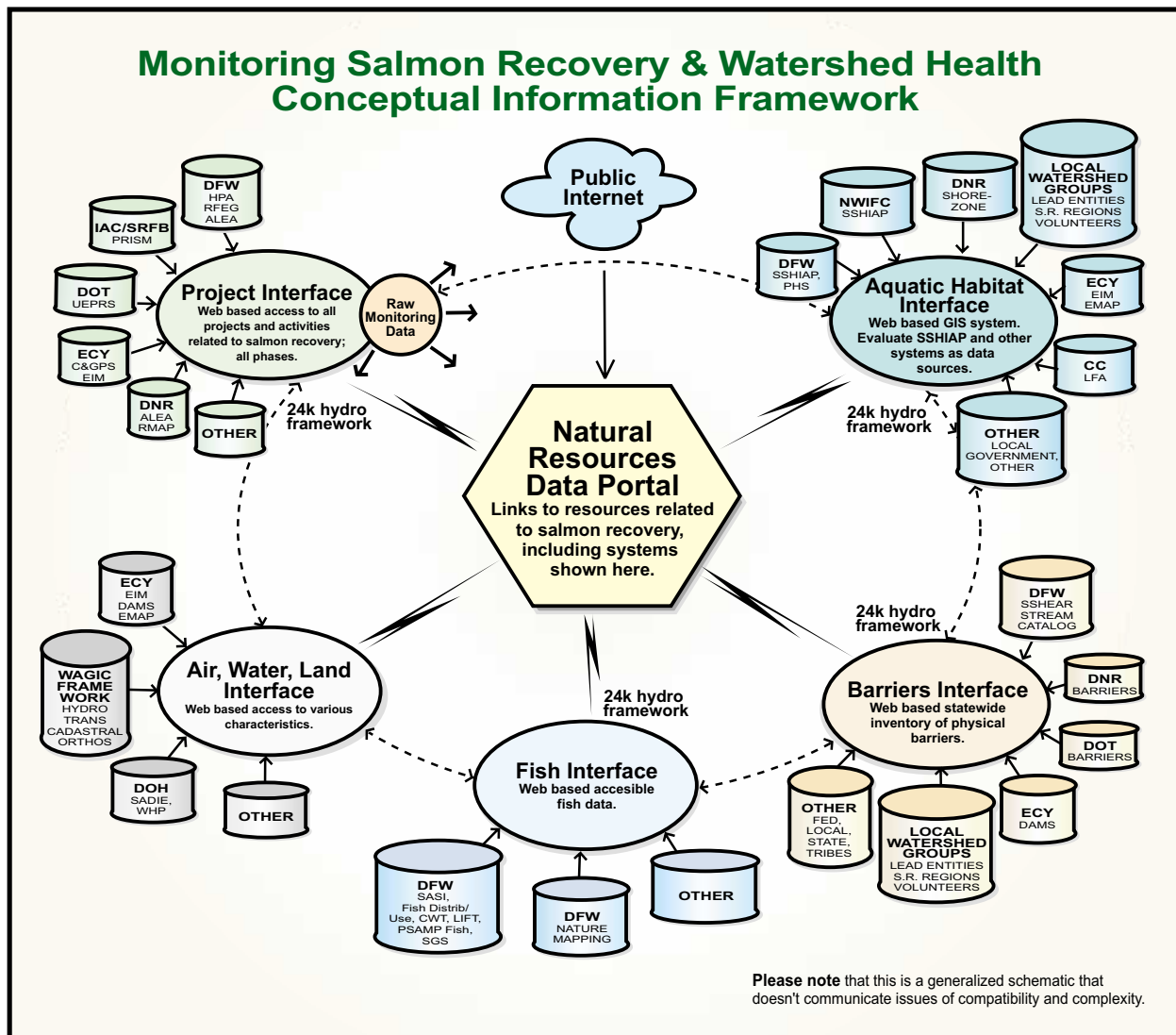
Recommendations

discover, learn about, and access available data related to Washington State watershed health and salmon recovery efforts. It can grow as data and products become available.

The portal is intended ultimately to provide:

- Access to data;
- Downloads of datasets;
- Maps and charts;
- Ad hoc queries from selected datasets; and
- Access to non-state, federal and local data resources.

An interface is a method of programming information such that data from multiple agencies can be incorporated into one report for evaluation and analysis. The goal is to provide data sharing, efficiency, and transparency. Duplication of effort can be reduced and interfaces could appear seamless to the user. Agencies could continue to maintain their own data, but unlike now, other agencies would be able to view data in one place and in one view. Appropriate filters and security would be applied.



Recommendations

➤ *Recommendation: Create a universal data entry interface as part of the portal where local, tribal, and other partners can enter data into statewide habitat, barriers, and projects databases*

The Strategy and the Action Plan provide a staged approach to achieving information sharing and the approach can be implemented as funding allows.

➤ *Recommendation: The Department of Fish and Wildlife and treaty tribes should update the Salmon Stock Inventory (SaSI) for spawner abundance data, smolt abundance data, run-size reconstructions, harvest, and productivity estimates annually on the web portal*

Currently it is very difficult to access existing annual status information for salmon populations.

➤ *Recommendation: Develop and publish annual estimates of the impact of harvest upon the rate of salmon recovery*

This recommendation results from the need to answer frequently asked questions such as “What would salmon recovery look like with and without the harvest regimes established through the Pacific Fishery Management Council and the North of Falcon processes? Would salmon de-listing and recovery take less time?” The information should be accessible via the web portal.

Accountability for Investments

The fiscal investments made by state and others involved in watershed health and salmon recovery are considerable. They range from small scale habitat protection and restoration projects to large programs that manage land, water, or other resources within and across various jurisdictions and sectors. In nearly every case it is assumed that these programs and projects have the desired effect, but this assumption is rarely evaluated by effectiveness monitoring, and even less so by complementary (cause-effect) validation monitoring. This section specifically addresses the need to understand the effectiveness of watershed health and salmon recovery investments in terms of their stated objectives and the resulting effect on salmon populations.

With the listing of several west coast salmon species as threatened or endangered under the federal Endangered Species Act, citizens, governors, numerous legislators, and other leaders have sought to obtain funding to restore salmon populations and obtain economic relief for the region through recovery of species listed under the Endangered Species Act. Washington’s Salmon Recovery Funding Board (SRFB) and the Oregon Watershed Enhancement Board (OWEB) were established to evaluate projects and issue funds. Both funding boards work closely with a network of local watershed organizations.

Habitat restoration projects typically have a “nested hierarchy” of objectives and results. The “nested hierarchy” also typically has associated monitoring at each level. For example, a riparian vegetation project might have the following series of objectives and associated monitoring.

→ Plant trees (Implementation monitoring)

→ Increase shading of stream
(Effectiveness monitoring)

→ Reduce stream temperature
(Effectiveness monitoring)

→ Increase salmon abundance
(Validation monitoring)

The Strategy has addressed habitat project implementation monitoring, effectiveness monitoring, and the response of fish populations (validation monitoring) through intensively monitored watersheds.

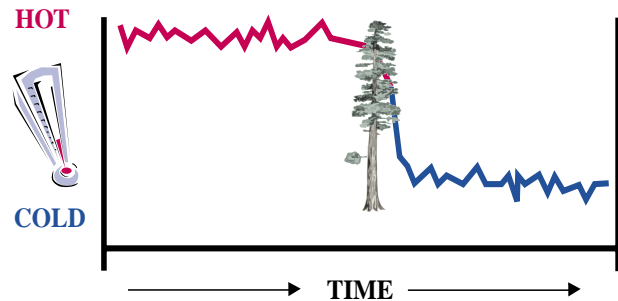
Measuring Habitat Project Implementation

The SRFB utilizes the projects tracking system known as Project Information System (PRISM). This database provides excellent information about project costs, project implementation, locations, and other budgetary information. NWPPC/BPA projects are tracked through their Fish and Wildlife budget tracking report and through the Columbia Basin Fish and Wildlife Authority (CBFWA).

➤ *Recommendation: The SRFB and the NWPPC/BPA should continue with the present strategy of monitoring 100% of projects for completion*

Measuring Habitat Project Effectiveness

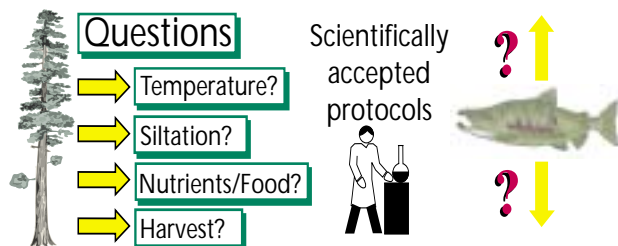
➤ *Recommendation: The SRFB and NWPPC should set aside a percentage of funds for a sampling program that measures effectiveness of the funded projects in accomplishing their habitat improvement goals*



For example, in the illustration above, was a tree planting project effective in (1) shading the stream, and (2) reducing water temperature?

Measuring Fish Response to Habitat Improvement Projects (Validation Monitoring)

The Strategy provides direct measurement of the effectiveness of habitat improvement projects in producing more salmon through monitoring of selected watersheds intensively for all key habitat, water, and fish parameters. These efforts need to be statistically validated.



For example, in the illustration, the habitat project produced a series of assumptions or questions. What variable has increased salmon abundance? Was it lower temperatures, reduced siltation, improved food availability or reduced harvest in the ocean? Which one or ones actually produced the desired outcome of more salmon?

Recommendations

➤ *Recommendation: Create one or more Intensively Monitored Watersheds (IMWs)*

IMWs are watersheds where monitoring is designed to address key questions in a disciplined scientific manner. All possible factors need to be considered: accurate measures of fish populations including spawners entering the watershed and juvenile migrants leaving the watershed, and accurate estimates of mortality factors such as marine conditions, harvest, hydro, predation, and other factors directly affecting salmon abundance and survival. Without a holistic approach, it will not be possible to determine the response of salmon to habitat restoration efforts. There are investment risks associated with this type of monitoring. Natural variation associated with fish populations and habitat could create so much “noise” that the real gain in abundance may not be detectable for a long time even when it has occurred. However, IMWs are the only way that the true relationship between habitat restoration efforts and freshwater salmon production can be established and potentially extrapolated to other watersheds.

➤ *Recommendation: Cluster selected habitat restoration projects by the SRFB and the NWPPC into IMWs*

To reduce the risk of not being able to detect a change resulting from habitat improvements, the strategy proposes that selected habitat restoration projects funded by the SRFB and the NWPPC be clustered in the intensively monitored watersheds so that the amount of habitat improved can be at a scale measurable in terms of migrant salmon produced.

Selection of IMWs should be a cooperative process between salmon recovery regions, the State, and major habitat project funding entities, such as the SRFB and the NWPPC through the BPA.

➤ *Recommendation: Implement Forests and Fish Agreement monitoring*

The Forests and Fish Agreement provides new measures that protect watershed health and promote salmon recovery and is part of a settlement under the federal Endangered Species Act. The effectiveness and intensive monitoring proposed under the Forests and Fish Agreement for private forestlands forms an essential component of the Strategy in the context of forest monitoring involving federal, state, and private forestlands.

The Strategy includes recommendations for effectiveness monitoring of water quality programs. They were ranked initially as medium priority, and appear in the Action Plan as a medium priority action item. The relative priority of recommended water quality effectiveness monitoring actions was not fully resolved by the MOC. As can be seen from the Action Plan summary table at the end of this report, water quality effectiveness monitoring is a significant proportion (42%) of the overall identified costs associated with comprehensive monitoring. Examples of water quality effectiveness recommendations include:

- Increase locations where TMDLs are monitored to meet court decree.
- Increase monitoring to support TMDLs in impaired watersheds that do not support aquatic life or recreational uses for selected indicators.

A comprehensive strategy for effectiveness of water quality programs includes monitoring waters that have substantial pollution problems and do not meet the standards of the Clean Water Act.

Trends in Environmental Conditions

Statistical design and “scientific certainty” issues are discussed extensively in the Strategy. Each section of the Strategy presents a recommended monitoring design and statistical approach. In some cases, there is little information to develop a standard for statistical certainty. Since precision and statistical certainty are major factors in determining the cost of monitoring, it is important to clarify the desired level of scientific certainty even though it may not always be achieved, due to costs and other constraints. For purposes of the Strategy and Action Plan, the desired scientific certainty is to be 90% confident that monitoring can detect a 10% change in status over time. However, much of our current Trend monitoring falls well below this standard.

➤ *Recommendation: Track status and trends of habitat, water quality, and resident trout on forestlands, agricultural lands, and urban lands statewide, by salmon recovery region, and by watershed (WRIA) using the USEPA EMAP randomized sampling protocol*

This recommendation provides annual statewide and salmon recovery region (SRR) status estimates, and watershed status estimates every five years. Trend information would be available statewide and by SRR after 3-5 years. Without this tool, the state will not be able to determine whether habitat and water quality is improving or declining across Washington.

➤ *Recommendation: Improve estimates of salmon spawner abundance*

A major foundation of salmon recovery strategies is obtaining accurate and timely spawner abundance information. Spawner surveys provide estimates of the numbers

of adult fish returning to spawn in their natal streams. The data about salmon for Washington are more comprehensive than for any other state. However, WDFW and the tribes should continue to improve monitoring to increase the scientific credibility and statistical rigor of the data. These data should be accessible via the web portal.

➤ *Recommendation: Establish instream flow studies for the state’s watersheds identified as water critical*



Department of Ecology Biologists measuring stream width.

Without determining benchmarks for water use, the State may inadvertently over-allocate water to the detriment of fish and wildlife populations and future beneficial uses.

➤ *Recommendation: Develop quality assurance and quality control (QA/QC) procedures to verify the quality of spawner abundance information*

The Strategy evaluates and critiques QA/QC procedures where they exist for each monitoring component. Where they do not exist, the Strategy proposes procedures for implementing a QA/QC program. The Strategy recommends WDFW and the tribes implement QA/QC procedures for estimating spawner abundance.

Recommendations

➤ *Recommendation: Increase the number of rivers and streams where continuous flow is measured*

Watershed planning strategies depend upon adequate measurement of stream flow. To avoid future listings under the federal Endangered Species Act and to reduce conflicts with water users, measuring flow is a necessity. Flow gauging stations provide continuous status information, and can provide trend information in 3-5 years.

➤ *Recommendation: Publish an annual wild stock spawner report*

For salmon management there is currently limited data transparency. An annual wild stock spawner report would provide confidence that spawner goals are being met in all rivers where threatened or endangered species occur. This information should be accessible via the web portal in easily understandable terms. It should detail spawner escapement ranges set as benchmarks by the National Marine Fisheries Service Technical Recovery Teams, the spawner escapement goals set as targets by court order in *U.S. v Washington* and *U.S. v Oregon*, and the actual results achieved.

➤ *Recommendation: Increase number of trap sites where juvenile migrant salmon are enumerated*

Enumeration of juvenile migrants is essential to determining whether freshwater production and productivity is increasing. It is also essential in determining the relationship of marine survival to freshwater survival. Trap sites provide annual status estimates for freshwater survival in the river trapped, and can provide trend information after 3-5 years. It is proposed that trap sites be increased to enumerate a minimum of 10% of the stocks per salmon recovery region.

➤ *Recommendation: Verify and adopt performance benchmarks for each monitoring indicator or suite of indicators*

Indicators are parameters that can be counted to measure progress toward watershed health or salmon recovery goals, milestones, and objectives. For example, the number of smolts per spawner is an indicator of salmonid productivity. Technical teams have identified indicators considered the best for measuring status of fish populations; condition of freshwater, estuarine and near shore habitats; and quality and volume of water. These indicators have been recommended by the MOC because they:

- Are cost-effective;
- Provide answers to monitoring questions in the desired time frames;
- Span the largest geographic areas; and
- Are the most sensitive to predicted change.

Indicators have been identified for all monitoring questions listed in the Strategy.

Indicators in themselves do not provide a means for evaluating results. Performance targets or benchmarks are needed to give meaning to the results. Benchmarks allow us to track progress and are often a measure of current conditions. In some cases, such as the Clean Water Act, targets are established by law. The Strategy has attempted to identify benchmarks and/or targets for each proposed or ongoing monitoring activity. Where there is not an accepted benchmark, a method for developing one has been proposed.

Action Plan and Implementation Schedule

The state agency members of the MOC have already begun taking actions to correct gaps, improve protocols, develop QA/QC procedures, and coordinate their activities. However, major gaps in monitoring cannot be addressed without additional funding sustained over a significant period. Many of these funding needs were identified through a previous exercise developing the Governor's Scorecard and the State Agencies' Action Plan.

Current Monitoring

The Action Plan has identified \$54 million per biennium in *current* monitoring activities that are crucial to measuring progress in watershed health and salmon recovery.

Needed New Environmental Monitoring

Of the 76 major action items identified, 16 can be implemented using existing structures and funding. The Action Plan identifies 60 action items requiring new monitoring at a cost of \$115.6 million. As mentioned earlier in this report, prioritization of actions was a challenge for the project. The MOC did not come to a full consensus about how to best distinguish and represent the relative priority of each action. Ranking of new actions in the Action Plan used the following criteria:

- Does the proposed action build a monitoring foundation (e.g., protocols, data)?
- Is it necessary for federal assurances under ESA and Clean Water Act?
- Is it an efficient use of existing monitoring?
- Does it give the highest return on the investment (cost/benefit)?
- Does the monitoring relate to agency mandates?
- Does the proposed monitoring fill a monitoring gap/baseline?

Of all new action items, 22 are high priority for funding at a cost of \$19.9 million,



Team taking measurements.

and are associated with various guiding principles – Adaptive Management, Accessibility of Monitoring Information, Accountability for Investments, and Trends in Environmental Conditions.

To be comprehensive as required by SSB 5637, additional medium priority monitoring actions are identified at a cost of \$95.7 million.

To the extent that the recommended elements of the Strategy are implemented in the order of their importance, comprehensive monitoring in the state will be improved. SSB 5637 called for the project to depict full implementation of the recommendations in the Strategy by 2007. To do this, a comprehensive list of new

Action Plan and Implementation Schedule

monitoring actions was developed. The Action Plan associates high priority actions with the 2003-05 biennium and medium priority monitoring actions with the 2005-07 biennium. Other implementation schedules are possible.

Due to budget constraints and other issues, it may be difficult to fully implement the actions recommended in the Strategy by 2007. The Governor and Legislature will need to evaluate the benefits and risks associated with partial or full implementation of the Strategy by 2007. If partial implementation is all that can be accommodated at this time, the Strategy can be used

as a blueprint for the future as more funds become available. If the elements of this strategy are implemented carefully, and if the high priority items are addressed, future savings and reprioritizations may be possible. If a monitoring council is established, it could work to develop a less time-sensitive approach that will meet ESA and CWA requirements on a more cost-effective basis over a longer period.

The overall costs to implement the Action Plan items as developed to meet SSB 5637 can be summarized in the table below by major categories of activity, and high and medium priority action items.

| Category | Subcategory | High Priority | Medium Priority | Total |
|---|-------------|---------------|-----------------|------------|
| Adaptive Management | | \$300K | 0 | \$300K |
| Information Sharing | | \$2,830K | \$3,953K | \$6,783K |
| Accountability For Restoration and Protection Actions | Habitat | \$2,432K | \$2,110K | \$4,542K |
| | Water | 0 | \$48,575K | \$48,575K |
| | Fish | 0 | 0 | \$0 |
| Measuring Status of the Resource | Habitat | \$5,180K | \$9,320K | \$14,500K |
| | Water | \$5,670K | \$25,250K | \$30,920K |
| | Fish | \$3,465K | \$6,540K | \$10,005K |
| TOTAL | | \$19,877K | \$95,748K | \$115,625K |

Monitoring Oversight Committee

| Member | Affiliation |
|---|---|
| William D. Ruckelshaus, Co-Chair | Chair, Salmon Recovery Funding Board |
| Curt Smitch, Co-Chair (<i>until 6/02</i>)..... | Governor's Salmon Recovery Office |
| Steve Meyer, Co-Chair (<i>as of 9/02</i>) | Governor's Salmon Recovery Office |
| Tom Fitzsimmons..... | Director, Washington Department of Ecology |
| Laura Eckert Johnson | Director, Interagency Committee for Outdoor Recreation |
| Jeff Koenings | Director, Washington Department of Fish and Wildlife |
| Doug MacDonald | Secretary, Washington Department of Transportation |
| Scott Redman | Acting Chair, Puget Sound Action Team |
| Ed Manary | Washington Conservation Commission |
| Doug Sutherland | Commissioner of Public Lands, Washington Department of Natural Resources |
| Bob Whitener | Northwest Indian Fisheries Commission |
| Elizabeth Babcock | National Marine Fisheries Service |
| Bob Wunderlich | U.S. Fish and Wildlife Service |
| Ron Kreizenbeck | U.S. Environmental Protection Agency |
| Bruce Roll..... | Whatcom County Public Works Department |

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