

Tom Karier
Chair
Washington

Frank L. Cassidy Jr.
"Larry"
Washington

Jim Kempton
Idaho

Judi Danielson
Idaho



Joan M. Dukes
Vice-Chair
Oregon

Melinda S. Eden
Oregon

Bruce A. Measure
Montana

Rhonda Whiting
Montana

February 9, 2006

MEMORANDUM

TO: Fish and Wildlife Committee

FROM: Steve Waste, Manager Program Analysis and Evaluation

SUBJECT: Washington State Recovery Monitoring Recommendations

This briefing is informational and does not require a Council decision. This is the second in a series of briefings on different monitoring activities underway in the region. It is intended to portray our experience to date, illustrate on-going work, and provide structure to the conceptual discussion of a "regional approach" to monitoring.

This briefing will address monitoring activities in Washington related to salmon recovery and watershed health. The presentation will be made by Bruce Crawford of the Washington Governor's Monitoring Forum and Steve Leider of the Washington Governor's Salmon Recovery Office. They will report on the key points that illustrate the thinking and approach embodied in the recently released "Recommendations to the Salmon Recovery Regions" developed by the Governor's Forum on Monitoring. These recommendations are an effort to build a bridge between where we are today in terms of on-going monitoring, and where and how monitoring will need to be conducted in the future to support delisting decisions.

As you will recall, the Council was briefed by Dr. Kim Kratz on the NMFS Listing Status Decision Framework at the October 2005 meeting in Eugene. To the extent possible, the recommendations from Washington incorporate the guidance issued by NOAA regarding their recommended approach to monitoring in support of de-listing. Pending the completion of the NOAA Technical Recovery Team documents, the forum has issued these recommendations to provide guidance to the people developing recovery plans in Washington.

Bruce Crawford and Steve Leider are both members of the Governor's Forum and the Pacific Northwest Aquatic Monitoring Partnership (PNAMP) Steering Committee. They have been working diligently to share the thinking and experience of Washington with the members of PNAMP and have helped guide the development of the regional framework for monitoring.

Their efforts, and the development and dissemination of “Recommendations to the Salmon Recovery Regions,” illustrate the policy commitment Washington has made to work with PNAMP and its partners to implement the regional approach to monitoring.



STATE OF WASHINGTON

OFFICE OF THE INTERAGENCY COMMITTEE
1111 Washington Street SE
PO Box 40917
Olympia, WA 98504-0917

February 7, 2006

TO: Northwest Power and Conservation Council Fish Committee

FROM: Bruce Crawford, Washington Governor's Forum on Monitoring
Steve Leider, Washington Governor's Salmon Recovery Office

Handwritten signatures of Bruce Crawford and Steve Leider.

SUBJECT: Fish Committee Briefing on February 21, 2006

Thank you for inviting us to discuss the activities in Washington regarding monitoring of salmon recovery and watershed health. We would like to use our time with you to specifically discuss the state's monitoring activities and their relationships to salmon recovery plans in Washington's portion of the Columbia River Basin, and also to explore interests and activities of the Council related to salmon recovery monitoring.

In order to assist in that discussion, please find enclosed a copy of "*Recommendations for Implementing Monitoring of Salmon Recovery*", prepared by the Governor's Forum on Monitoring and delivered to Washington's regional recovery organizations on December 1, 2005. We hope that a discussion of the context and details of those recommendations will lead to greater understanding of Washington's approach and how it may relate to the Council's interests in monitoring.

cc: William Ruckelshaus, Co-Chair Governor's Forum on Monitoring
Jeff Koenings, Co-Chair Governor's Forum on Monitoring
Bob Nichols, Special Assistant to the Governor

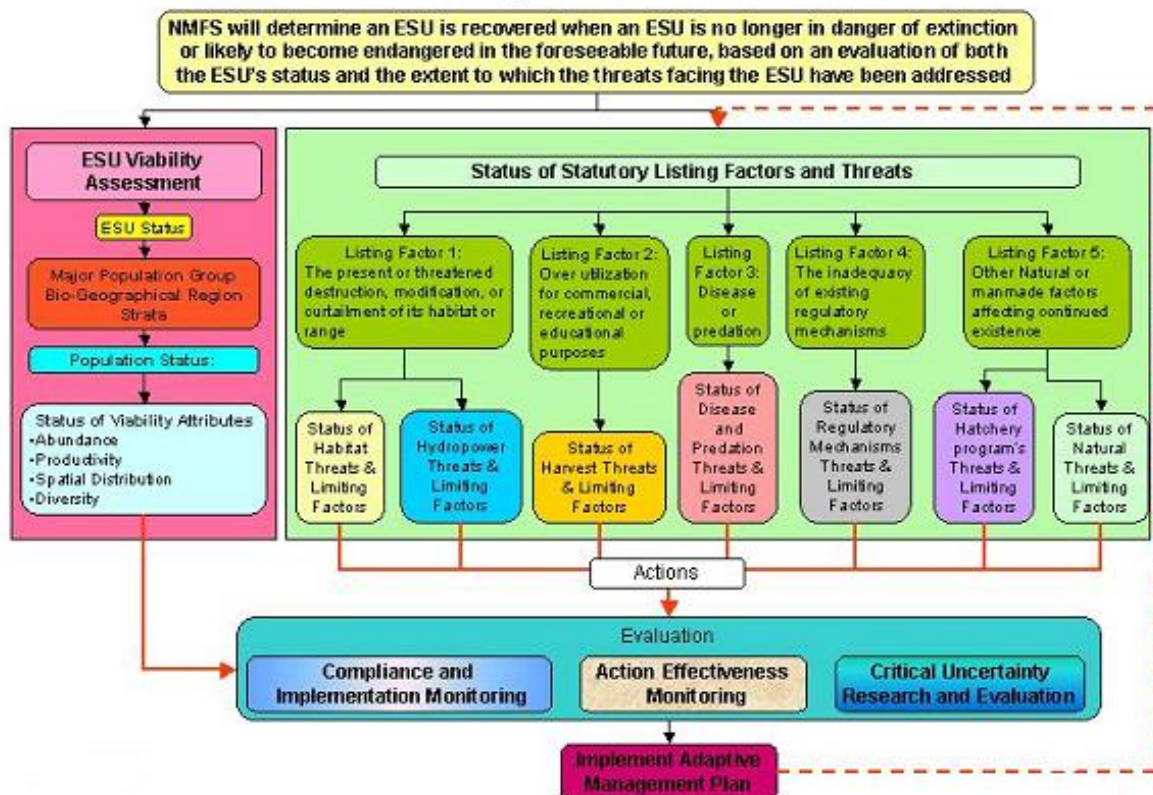
Governor's Forum On Monitoring

Recommendations to the Salmon Recovery Regions

Introduction and Background

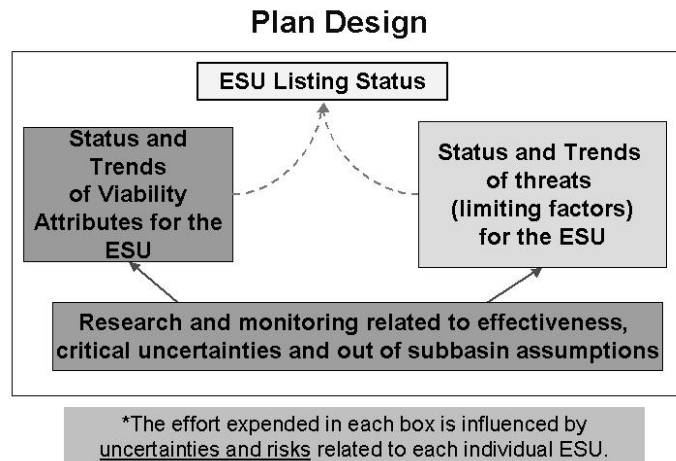
At the October 2005 FORUM meeting, the Governor's Salmon Recovery Office (GSRO) and the National Marine Fisheries Service (NMFS) provided an overview of the criteria needed for de-listing Endangered Species Act (ESA) salmon species coast-wide. The following chart provided by NMFS illustrates the two branches (biological and statutory) of the decision framework that they will use in determining when a listed species can be upgraded from "endangered" to "threatened" or is recovered. On the left are the biological factors that must be considered for salmon Evolutionary Significant Unit (ESUs) and component populations to be deemed viable (Viable Salmonid Populations criteria are abundance, productivity, spatial distribution, diversity). On the right side are statutory considerations; those threats and factors limiting survival that were the reasons for the listing. In making a determination to upgrade or de-list, NMFS must have a reasonable expectation that the listed ESU is viable and that the threats to the species have been corrected.

NMFS Listing Status Decision Framework



In view of the above and the complexity of salmon and their recovery, and given limitations of available funding for monitoring, the State of Washington will need to work with all salmon recovery partners to prioritize and sequence what is monitored and at what intensity in a statewide approach. If funding were unlimited, it would be possible to measure all of the things

shown in the diagram – everywhere, all the time – which would provide knowledge desired at all biological and geopolitical levels of interest (population, regional recovery region, ESU, etc.). Funding is limited however, and there is a need to find a balance between VSP fish monitoring and the status and trends of limiting factors and threats. Identifying what makes the most sense for Washington will not be easy. For example, some salmon recovery regions encompass more ESUs than others, have more listed fish populations, and the threats salmon face are not the same for each. As a result, monitoring of limiting factors and threats will vary somewhat from region to region.



The Salmon Recovery Regions (SRRs) should start with making sure that “fish in and fish out” is measurable for the ESUs. This should be followed by judicious monitoring of limiting factors to show that changes are occurring to remove the listing factors, and lastly by addressing local or regional management actions that may not immediately inform the state or federal jurisdictions in determining de-listing.

The following are initial recommendations for regional salmon recovery monitoring efforts. These will help meet the needs of regional salmon recovery monitoring and enhance efficient and consistent monitoring and reporting across the state.

RECOMMENDATION 1: INCLUDE ADAPTIVE MANAGEMENT

As identified in existing state and federal recovery planning guidance, implementation of regional salmon recovery plans should include adaptive management processes that clarify goals and objectives, indicators, targets, key checkpoints, and timelines and triggers for making decisions. Adaptive management provides the framework for taking action in the face of uncertainty by addressing key management decisions and questions using monitoring and analysis of information. Adaptive management, informed by monitoring, allows decisions to be made to correct or optimize actions and derive the maximum benefits for expenditures made.

Recommendation: Regional organizations working with the Forum in a collaborative process will identify similarities and differences in key management decisions and monitoring questions being faced by recovery planning partners (e.g., local, regional, state, federal). Identification of overlaps (consistency) will lead to the improved focus for coordination of efforts and sharing of information and costs. Monitoring and evaluation will drive adaptive management decisions.

RECOMMENDATION 2: ADDRESS ESU VIABILITY

Viable Salmonid Population (VSP) criteria must be demonstrated at appropriate ESU, Major Population Group (MPG), and population scales. In salmon recovery plans larger ESUs are subdivided into major population groups (MPG) based upon criteria developed by Technical Recovery Teams (TRTs). TRT ESU viability criteria call for the majority of MPGs within an ESU to be viable. NMFS and recovery planners have further recognized that, while all populations within ESUs are important, some populations in ESUs will likely be more important to the recovery of the entire ESU than others.

Recommendations:

1. Determine abundance¹ and productivity² within a statewide approach to monitoring salmon populations. The most immediate need in monitoring abundance and productivity is to fill current data gaps in juvenile and adult monitoring, such that data on both juveniles and adults are being simultaneously and continuously collected for at least one major population for each MPG within an ESU for all listed salmon statewide. Major populations are those that must demonstrate low risk of extinction in order to recover the MPG and ESU. As additional guidelines are developed by NOAA Fisheries, more details may be available as to the number of populations necessary for monitoring. For example, in Puget Sound the TRT recommended 2-4 viable chinook populations to be monitored per MPG.
2. Implement improvements in precision of fish monitoring efforts and insure that data are comparable statewide. Our goal should be to monitor productivity within each MPG with known precision and certainty and cost. Precision and certainty will need to be balanced against cost.
3. Measure diversity and spatial distribution after efforts are underway to measure abundance and productivity.

Attachment 1 identifies where juvenile and adult salmon monitoring occurs in the state by salmon recovery region, MPG, and listed species. This table is a first draft that was prepared by the Department of Fish & Wildlife (WDFW). It is currently in review outside the agency for accuracy and completeness.

RECOMMENDATION 3: MONITOR REDUCTION OF LISTING FACTORS AND ASSOCIATED THREATS AT THE APPROPRIATE (ESU) SCALE

Each SRR should concentrate on addressing through restoration actions, the major limiting factors identified by the Regional Recovery Plans for their region. Future ranking of regional restoration and protection projects should reflect these limiting factors. Recovery or upgrading will not happen unless all limiting factors are addressed for each ESU. The FORUM should ensure that "out of basin" effects are monitored through coordination with NMFS and others.

Threats to salmon viability should be addressed in the following manner in regional monitoring plans.

Listing Factor 1: Destruction or Curtailment of Salmon Habitat or Range

Habitat and Water Quality

1. Habitat and water quality status and trend information is needed to document outcomes associated with reduction of major habitat limiting factors identified by NMFS at the time of

¹Adult abundance is defined as the abundance of returning adults in the ocean prior to any harvest mortality, but includes natural marine mortality. Juvenile migrant abundance is the abundance of juvenile recruits migrating out of the freshwater environment for particular populations and streams.

² Productivity is defined as the population growth rate over the entire life cycle such as spawner: spawner ratios. However, in terms of measuring habitat response, the ratio of juvenile migrants produced per adult spawners is as important.

ESA listing and in the recovery plans that respond to them. It is needed to address related questions at local, regional, and statewide scales. Analytical methods are needed to track change and establish reference areas

2. Habitat monitoring questions to be answered include:

- a. What is the status of riparian and instream habitat at the ESU scale?
- b. What are the trends?

These questions address whether actions to protect and improve habitat within the ESU are exceeding ongoing habitat degradation.

3. Water quality monitoring questions to be answered include:

- a. What is the status of water quality at the ESU scale?
- b. What is the trend?

These questions address whether state water quality as a whole is changing within the ESU to the benefit of salmon, watershed health, and whether it meets Clean Water Act requirements and ESU de-listing requirements.

A statewide probabilistic design framework for core information is now being developed by the Salmon Recovery Funding Board via contract with the Department of Ecology. That framework is being designed to allow more intensive local and watershed-scale status/trend monitoring information to be used and/or built, as funding allows. Indicators involved will include: land use land cover, water quality index, riparian habitat, instream large woody debris (LWD), percent fines, bank erosion, stream cross sectional area and volume. Pacific Coastal Salmon Recovery Fund (PCSRF) reporting to Congress and the Office of Management and Budget (OMB) will also include results of the status and trends in habitat, water quality, and fish abundance. Regional linkages to reporting at both the local population scale and the broader ESU domain must be established early in developing coordinated monitoring plans. The Forum will provide a venue for discussions about issues associated with implementation of the framework (e.g., funding, local capacity).

Habitat and water quality recommendations:

1. Ensure that habitat and water quality status and trend monitoring in regional recovery plans is consistent with the statewide design framework.
2. Ensure that regional status and trend monitoring is compatible with reporting structures developed through the State of Salmon Report, NMFS monitoring guidance, and the PCSRF reporting requirements to Congress. The interim indicators identified by NOAA through the PCSRF for detecting status and trends of habitat limiting factors³ are located in Attachment 2.
3. The salmon recovery regions will need to work together and with the FORUM to produce a Habitat Quality Index that can incorporate indicators into a simple scoring and modeling system that is easily used and understood.
4. To ensure consistency, regional salmon recovery and watershed organizations and volunteers should be sought, trained, and assisted in order to participate in statewide status and trend monitoring. Interested organizations must commit to use the design, data collection protocols, and data handling procedures as outlined in the framework.
5. Where feasible using local funds, there may be a need for additional watershed specific monitoring to support local restoration management actions.

Water Quantity

Recommendation: Document where water quantities necessary for fish have been improved or safeguarded through adjudications, setting instream flows, water restoration projects, water right purchases, water gauging stations, etc. Also document where additional losses of instream water

³ **Limiting factor** – A factor such as habitat, hydropower, or hatcheries, that limits the ability to fully sustain salmon or steelhead. A **listing factor** is a specific factor that is identified in the federal Endangered Species Act as a reason for listing a species as threatened or endangered. There may be more than one limiting factor under each listing factor.

are occurring. This is especially important in areas of the state where water quantity has been identified as a limiting factor.

Hydropower and Other Large Impoundments

Recommendation: Standardize reporting of hydropower improvements.

- The threat of survival impacts from large hydropower operations need to be monitored and displayed by characterizing fish passage improvements and trends in fish passage survival, along with NMFS approval of any impacts to listed fish. Standardization of reporting between owners/operators of the hydropower systems on survival and improvements can be coordinated by the FORUM to ensure that SRRs understand the magnitude of in-region and out-of-basin effects. The SRRs should ensure that the information is collected.

Listing Factor 2: Utilization For Commercial, Recreational or Educational Purposes

Recommendation: SRRs should incorporate information from fishery co-managers to report on reduction of threats from over-utilization.

- The threats posed by harvest need to be monitored such that the relationships of harvest to recovery goals are clearly presented, along with the status of NMFS approval of any impacts to listed fish. Harvest monitoring responsibility rests with the WDFW and tribes and information must be accessible and understandable to SRRs and the public.

Listing Factor 3: Disease and Predation

Recommendation: The SRRs should continue to rely upon existing information to characterize progress made in addressing threats from disease and predation.

- For example, SRRs should rely upon evaluations by NOAA Fisheries, U.S. Fish and Wildlife Service, the Washington Department of Fish and Wildlife and others of the survival impacts of ecological interactions with species like the pike minnow, Caspian tern, harbor seal, sealion, and other species upon salmon recovery.

Listing Factor 4: Regulatory Mechanisms

Regional salmon recovery plans rely upon protective measures through regulations of municipal, county, state, and federal jurisdictions to reduce or avoid threats to listed species as a result of human activity.

Recommendation: The efficacy of existing regulations should be assessed. Regional salmon recovery organizations should, in coordination with the Forum, identify a process to monitor the implementation and compliance of local regulatory actions to address threats to listed species. This should include, for example, Growth Management Act, forest practice permits, local zoning, hydraulic permits, water quality, and National Pollution Discharge Elimination System (NPDES) permits.

Listing Factor 5: Other Factors Affecting Existence

Hatchery Programs

Recommendation: Ensure that hatchery program implementation comports with recovery goals.

- The implementation of current and future hatchery operations should be monitored and reported via tracking the implementation and NMFS approval of state, tribal, and federal hatchery genetic and management plans and their effectiveness verified by hatchery monitoring programs.

RECOMMENDATION 4: MONITOR IMPLEMENTATION AND COMPLIANCE

Comprehensive implementation monitoring is required in recovery plans but no statewide guidance exists for this type of monitoring. Implementation monitoring addresses all Hs, including recovery plans, habitat projects, and programmatic activities. Guidance on indicators and measures are needed so that information can be locally expressed and rolled up to the regional level, and for the State of Salmon report and reports to Congress. The recommendations under Recommendation 3 for Limiting Factor 4 addresses implementation monitoring for programmatic regulatory activities. Monitoring and evaluation will drive adaptive management decisions. By understanding how previous measures have resulted in meeting recovery goals (or not), more cost-effective strategies can be implemented.

In this larger context, a major step forward in coordination of implementation monitoring at this time includes focusing on habitat protection and restoration projects.

Recommendations:

1. For habitat protection and restoration projects, implementation and compliance monitoring will use the PCSRF data dictionary, indicators and metrics; and
2. Report information on indicators and metrics to be included in biennial State of Salmon reports.

RECOMMENDATION 5: INCLUDE EFFECTIVENESS MONITORING

Monitoring is needed to determine the effectiveness of recovery plans and the programs, projects, and other activities. Effectiveness monitoring exists for some programs (e.g., Forests and Fish), and project (e.g., Salmon Recovery Funding Board) activities. Consistent with the Comprehensive Monitoring Strategy, a key need is to determine the effectiveness of activities in terms of fish responses at the watershed scale. The Intensively Monitored watersheds (IMWs) have been established as a statewide effort to accomplish this. And where designed properly, individually targeted experimental efforts can contribute to this effort. The Salmon Recovery Funding Board (SRFB) and Pacific Northwest Aquatic Monitoring Partnership (PNAMP) have adopted, and are now implementing, IMW strategies.

Recommendations:

1. Incorporate existing IMWs for watershed scale cause-effect effectiveness monitoring into regional plans and continue to address whether existing IMW sites or other existing comparable cause and effect monitoring are adequate in supporting listed species;
2. In coordination with the FORUM, review the need for, and opportunities to, establish at least one IMW in each SRR to address priority recovery questions, and;
3. SRRs should support IMWs through selecting specific watershed restoration projects in IMW treatment watersheds to help establish measurable thresholds of change. This will mean balancing addressing factors for decline with the need to evaluate the effectiveness of restoration actions in producing more fish.

RECOMMENDATION 6: DATA SHOULD BE ACCESSIBLE FOR SHARING OUTSIDE THE REGION

The need for data access and sharing is common across local and regional efforts and is essential to reporting of information statewide. The state's Comprehensive Monitoring Strategy calls for a framework of universal data sharing and analysis through a distributed network of databases. This can reduce duplication of effort, improve efficiency, and provide consolidated

information that is not available today. It requires close partnerships among agencies and groups at every level.

Recommendations:

1. Individual entities (state, federal, local, tribal, and private) with existing databases should continue to manage their own data, but should provide non-sensitive data to others and provide metadata to the Natural Resources Information Portal (www.swim.wa.gov).
2. The salmon recovery regions should develop options and recommendations that support development and implementation of distributed systems of regionally oriented and accessible data. These options, databases, data dictionary, and protocols should be consistent with protocols and metadata as coordinated through the Washington Salmon and Watersheds Information Management Technical Advisory Committee (SWIMTAC). *(Explore use of the U.S. Bureau of Reclamation Protocol Builder developed by the BOR Boise, ID office. This database prototype is under consideration by the Pacific Northwest Aquatic Monitoring Partnership for recommended use across the Pacific Northwest region. It is currently the standard for much of the upper Columbia River.)*

ATTACHMENT 1: WASHINGTON STATE SMOLT AND ADULT MONITORING OF LISTED SPECIES
by Sub-Regional Population Grouping¹. This DRAFT table is under review.

Recovery Region	Sub-Regional Groupings		WRIsAs	Juveniles				Adults	
				Target Species	Smolt Sites	Production/ Index ²	Smolt Trapping Agency	Spawners (Stocks)	Data Quality ³
Puget Sound	Geographic Regions of Diversity & Risk	North Sound	1 to 2	Chinook	Nooksack	Index ⁴	Lummi	NF/MF Nooksack SF Nooksack Samish/MS Nooksack	Very Good Very Good Poor
		Central Sound	3 to 7	Chinook	Skagit	Production	WDFW	Lower Skagit MS/Tribs Upper Skagit MS/Tribs Lower Sauk Upper Sauk Suitttle Upper Cascade	Good Very Good Good Excellent Excellent Excellent
					Stillaguamish	Production ⁴	Stillaguamish	NF Stillaguamish SF Stillaguamish	Very Good Good
					Skykomish/ Snoqualmie	Production ⁴	Tulalip	Skykomish Snoqualmie	Good Good
		South Sound	8 to 11	Chinook	Cedar River	Production	WDFW	Cedar	Good
					Bear Creek	Production	WDFW	N Lk Washington Tribs	Good
					Green River ⁵	Production	WDFW	Green R (Duwamish)	Good
					Puyallup	Production	Puyallup	Puyallup	Poor
		Hood Canal	16	Chinook	Hamma Hamma River	Index ⁶	LLK/HCSEG/ Port Gamble/ WDFW	Mid-Hood Canal	Good
				Chum	Hamma Hamma River	Production ¹²	LLK		
		Eastern JDF	18	Chinook	Dungeness River ⁵	Production	WDFW	Dungeness	Excellent
Coastal		Ozette	20	Sockeye	Ozette River	Index	Makah	Ozette	Excellent

Lower Columbia	Meta-Population Strata	Coast	25	Chinook	Mill Creek	Production	WDFW	Mill/Abernathy/Germany	Good
					Abernathy Creek	Production	WDFW		
					Germany Creek	Production	WDFW		
				Coho	Mill Creek	Production	WDFW	Mill/Abernathy/Germany	Very Good ⁷
					Abernathy Creek	Production	WDFW		
					Germany Creek	Production	WDFW		
		Cascade	26 to 28	Chinook	Cowlitz Falls	Production	WDFW	Lower Cowlitz spring	Good
				Coho	Cowlitz Falls	Production	WDFW	Upper Cowlitz	NA ⁸
					Cedar Creek	Production	WDFW	Lewis	N/A ^{5,9}
				Steelhead	Cowlitz Falls	Production	WDFW	Upper Cowlitz winter	NA ⁸
					Kalama River	Production	WDFW	Kalama summer Kalama winter	Excellent Good
					Cedar Creek	Production	WDFW	NF Lewis summer NF Lewis winter	N/A ^{5,9} Just starting
		Gorge	29	Chinook	NONE ¹⁰			Wind Tule Fall Wind Springs ¹⁰ Wind Bright Fall White Salmon Tule Fall White Salmn Bright Fall	Good Poor Poor
				Chum	Duncan Creek	Production	WDFW		
					Hamilton Creek		USFS		
					Hardy Creek		USFS		
				Coho	Wind River ¹¹	Index	WDFW	Bonneville Tribs	Fair
				Steelhead	Wind River	Production	WDFW	Wind summer Wind winter	Good NONE
Middle Columbia	Major Population Groups	Eastslope	29 to 31	Steelhead	Klickitat River ¹¹	Index	Yakama	Klickitat summer Klickitat winter Rock Creek summer	NONE NONE NONE
		Yakima	37 to 39	Steelhead	Yakima River	Production	Yakama	Satus Creek summer Toppenish Creek summer Naches summer Upper Yakima summer	NA NA NA NA
		Walla Walla	33	Steelhead	Walla Walla	Production	Umatilla	Walla Walla summer Touchet summer	NA Fair

Snake	Major Population Groups	Lower Snake	33 to 35	Chinook	Tucannon River	Production	WDFW	Tucannon spring Snake fall	Good Good
				Steelhead	Tucannon River	Production	WDFW	Tucannon summer	Fair
					Asotin Creek	Production	WDFW	Asotin Creek summer	Fair
Upper Columbia	Major Population Groups	East Cascades	45, 46, & 48	Chinook	Wenatchee	Production	WDFW	Chiwawa spring Nason Creek spring Little Wenatchee spring White River spring	Fair Fair Good Good
					Entiat	Production	USFWS	Entiat spring	Good
					Methow	Production	WDFW	Methow spring Twisp spring Chewuch spring Lost River spring	Good Good Good Good
				Steelhead	Wenatchee	Production	WDFW	Wenatchee summer	Poor
					Entiat	Production	USFWS	Entiat Summer	Good?
					Methow	Production	WDFW	Methow/Okanogan summer	Fair

Note: Spawner data and data quality ratings were retrieved from the SaSI database.

¹ "Sub-regional groupings" (i.e. Geographic Regions of Diversity and Risk, Meta-population Strata, and Major Population Groups) were designated by the appropriate Technical Recovery Team.

² "Production" refers to sites where the total number of downstream migrants are estimated; "index" refers to sites at which an index of production (e.g. total catch, or catch per unit effort of fishing time) is made. Traps monitor naturally produced migrants.

³ Subjective rating; no formal definitions are available. In some individual stock reports, an explanation is provided regarding the assigned rating, especially for data rated "poor".

⁴ Traps operated less than 40% of the time; production estimates (rather than index counts) could be developed or substantially improved with additional monitoring.

⁵ Existing monitoring at risk due to lost funding.

⁵ Data collected but analysis has not been completed to produce production estimates due to lack of funding/prioritization.

⁷ Spawner escapement estimates with confidence intervals have been available since 2004, however only two data points are available and therefore escapement estimate ratings are currently not in the SaSI database.

⁸ Current efforts would likely be rated as "Good" to "Excellent", however data are not available above Cowlitz dams and therefore ratings are currently not in the SaSI database.

⁹ Partial escapement counts for the Lewis River are made at the Cedar Creek trap, however due to insufficient data, escapement estimate ratings are currently not in the SaSI database.

¹⁰ The smolt trap on the Wind River is located at the downstream-most viable trapping site to estimate nearly the entire Wind River production. Yet, nearly all of the listed Wind Tule Fall Chinook spawn downstream of this site. Therefore, estimation of Wind River tule fall chinook production is not viable with existing technology. Chinook production from the Wind and White Salmon Rivers includes non-listed stocks (Wind Spring Chinook, Wind Bright Fall Chinook, and White Salmon Bright Fall Chinook are not native to these systems and therefore are not part of the listed ESU) as well as listed tule fall chinook. Estimation of White Salmon tule fall chinook production would require DNA analysis. The USGS is planning to initiate trapping for chinook, coho, and steelhead on the Big White Salmon River in Spring 2006, with production estimates available in 2007. With funding for DNA analysis, the USGS trap could potentially fill the information gap for estimating listed tule fall chinook production.

¹¹ Production estimates are anticipated beginning in 2006.

¹² Listed Hood Canal summer chum production is currently estimated from the non-listed fall chum production using run timing. More accurate and precise estimates could be developed using DNA analysis at an additional cost.

Attachment 2. The following table was taken from NOAA Fisheries Pacific Coastal Salmon Recovery Fund (PCSRF) documents and reflects potential indicators to use for monitoring improvements to habitat limiting factors by Washington ESA domain. This table will need additional involvement by the SRRs, NOAA Fisheries, and the FORUM for a coordinated approach to monitoring.

Puget Sound Domain		Lower Columbia Domain		Interior Columbia Domain	
Limiting Factor	Potential Indicator	Limiting Factor	Potential Indicator	Limiting Factor	Potential Indicator
Degraded floodplain and in-river channel structure	Trend in stream depth-width ratio	Altered channel form and stability in tributaries	Trend in stream depth-width ratio	Altered channel morphology and floodplain	Trend in stream depth-width ratio
Riparian area degradation and loss of in river large woody debris	Trend in land use land cover Large woody debris	Degraded floodplain connectivity and lowland stream habitat	Trend in land use land cover	Tributary riparian degradation	Trend in land use land cover Large woody debris
Degraded tributaries and river habitat conditions	Trends in land use conversions Road crossings per mile	Loss of tributary habitat diversity	Trend in riparian vegetation and canopy cover	Excessive sediment	Trends in turbidity Trends in erosion
Degraded estuarine conditions and loss of estuarine habitat	Trends in marine nearshore vegetation	Excessive sediment in tributaries	Trends in turbidity Trends in erosion	Reduced spawning & rearing habitat	Trends in land use land cover
Degraded floodplain and in-river channel structure	Trend in stream depth-width ratio	Altered water quality	Water quality index	Degraded water quality	Water quality index
Degraded water quality	Trends in impervious surface	High water temperatures	Trends in water temperature		
High water temperatures	Trends in water temperature	Altered stream-flow in tributaries	Trends in flow and hydrology	Reduced stream-flow in tributaries	Trends in flow and hydrology
Reduced stream-flow in migration areas	Trends in flow and hydrology	Reduced access to spawning and rearing habitat	Miles of newly in habited spawning grounds	Impaired passage in tributaries	Miles of newly in habited spawning grounds