



Puget Sound Chinook Salmon Recovery Plan

MONITORING AND ADAPTIVE MANAGEMENT PLAN

VOLUME I

REVIEW DRAFT

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Introduction

This document is a companion to the Puget Sound Salmon Recovery Plan (“Recovery Plan”). The primary purpose of this Monitoring and Adaptive Management Plan is to support the Puget Sound region’s efforts to meet its goal of recovering self-sustaining, harvestable salmon runs in a systematic and informed manner through implementation of the Recovery Plan. Both the Recovery Plan and this Monitoring and Adaptive Management Plan focus on Chinook salmon but bull trout, Hood Canal Summer Chum and other species of salmon and wildlife will benefit from successful implementation of the Recovery Plan and adaptive management. In approval of the Recovery Plan both the Puget Sound Salmon Recovery Council and the U.S. National Oceanographic and Atmospheric Administration (NOAA) called for the development of an adaptive management plan from which to monitor the implementation of the Recovery Plan’s strategies and adapt them over time. This Monitoring and Adaptive Management Plan is intended to serve that purpose.

The Recovery Plan was built through thousands of hours of technical and policy work by people working at the watershed level as well as people focused on the whole region. And although the work is based on the best available information on salmon recovery, the adaptive management process recognizes that the Recovery Plan’s key policy and biological assumptions will need to be tested and adjusted as recovery efforts move forward. Adaptive management is the process of making decisions, implementing them, learning from the results of implementation and new science, and applying what is learned to adjust decisions in ways that improve the certainty of achieving goals. Learning through adaptive management is critical due to the uncertainties that exist in the Recovery Plan, the complex nature of salmon’s dependence on how the land and water environments produce their needed habitat, and the ever changing nature of the ecosystem.

This plan is not intended for a lay audience, but is written for the people implementing recovery actions and responsible for making salmon recovery decisions in the Puget Sound region. This includes watershed groups, state, tribal, federal, and local levels of governments and other public and private organizations that have an interest in and responsibilities for achieving salmon recovery. In the future, it will be critical to provide clear and understandable reports on the progress of salmon recovery to the public and government officials. Transparent and clear reporting will help build public understanding and support for the long term effort needed to recovery salmon in Puget Sound. The information collected under this plan will serve to inform the public as well as decision-makers.

This Monitoring and Adaptive Management (MAMA) Plan consists of three volumes. Volume I describes the governance framework within which decisions will be made about strategies and actions taken pursuant to the Recovery Plan. It includes a set of benchmarks for measuring progress across all threat factors as described in the NOAA listing of Chinook. Volume II presents a coordinated set of monitoring plans designed to collect information and data that will inform us about our progress toward the benchmarks set forth in Volume I, as well as the effectiveness of our strategies over time. Volume III contains a number of appendices including a detailed schedule for tracking key programs.

The success of the region’s efforts to restore salmon depends on actions and results at different geographic scales and biological units. Chinook salmon were listed based on their Evolutionary Significant Unit (ESU) which is basically the whole Puget Sound basin from the

headwater streams to the marine waters of Puget Sound. The Recovery Plan defines five biogeographical regions. There are 22 populations of Chinook remaining and the condition of each population needs to be improved. The 15 watersheds that support these populations are the foundation for where habitat as well as hatchery and harvest programs must work effectively together to support the improvements needed in each population. The monitoring recommendations contained in Volume II propose a baseline of information needed to make informed, adaptive decisions for salmon recovery at the ESU level about actions and priorities. Most of the baseline information will come from the 15 watershed units that comprise the Puget Sound basin. The watersheds will also need to monitoring actions and conditions to inform their management decisions. In this draft, the needs of the watersheds have not been identified. This information is critical to complete MAMA and will be developed through the review of this draft and discussion with the watersheds.

The initial focus of MAMA is at the ESU scale, the regional scale. This regional perspective considers questions at the scale of the entire ESU in a way that will support and inform local recovery strategies and actions. Measuring our progress with objective data and information from these monitoring plans is critical to ensuring that our strategies are effective and ensuring that our actions are increasingly efficient in the context of reaching recovery goals. It is also important to evaluate our results and show our progress in order to sustain long-term political and financial support for implementation of the Recovery Plan. In addition to these goals, this Monitoring and Adaptive Management Approach (MAMA) will further:

- The creation of a transparent information system that will enable the region to learn more about effective salmon recovery from the results of current recovery activities and update interested parties on the status of salmon recovery;
- Foster a regional adaptive management decision-making structure with a timeline that is as coordinated as possible between habitat, harvest, and hatchery sectors;
- Support to NOAA in its role of overseeing the recovery of Chinook salmon by providing data on Viable Salmonid Population (VSP) characteristics and the status of listing factors, consistent with NOAA's endangered species delisting framework;
- The design and implementation prioritized monitoring and scientific research that tests the critical uncertainties (both technical and policy assumptions) that form the basis of our recovery strategies and actions.

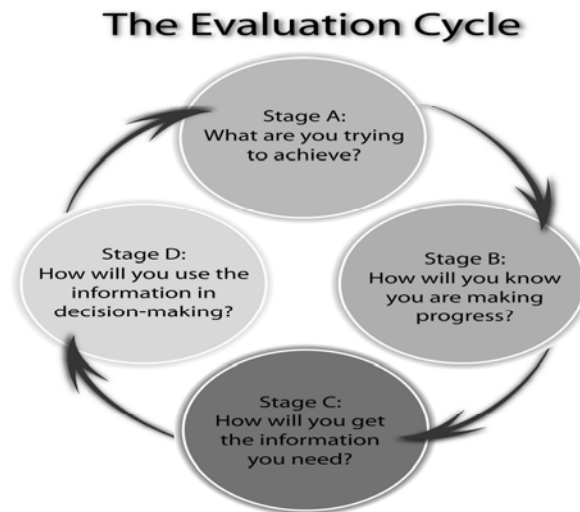
This plan strives to be consistent with evolving state and federal monitoring and adaptive management programs as well as to respect the unique needs of local watershed areas as they implement and adapt watershed plans. This draft plan will evolve as federal and state guidance develops and people begin to use the plan to monitor and track results. There will need to be an annual process for updating the MAMA.

Overall Framework

The initial work to develop MAMA was based on the Ecosystem Management Initiative (EMI) approach to ecosystem-based adaptive management developed at the University of Michigan.

EMI consists of a four-stage approach that provides a useful overview of the key components of any adaptive management approach. This overall approach is illustrated below in Figure 1.¹

Figure 1. A simplified representation of the Evaluation Cycle developed by the University of Michigan Ecosystem Management Initiative.



This process of evaluation is an iterative process that must be repeated as more information is gained through monitoring and research. As shown in Figure 1, there are four basic analytical stages to creating an adaptive management framework which drives monitoring work and decision-making about Recovery Plan strategies over time. They include:

Stage A. The first stage seeks to answer the question: “What are you trying to achieve?” In regard to Puget Sound Chinook, the Recovery Plan defines the results needed at the regional (ESU) scale as well as within each watershed area. The Plan also defines the threats to the salmon and efforts to restore their health. Strategies were identified to minimize the threats and maximize the assets for success. A “situation map” was created representing how goals/objectives, threats/assets, and strategies/actions are linked (see Volume I, Appendix A). The Puget Sound Situation Map is the general framework that introduces the specific strategies for salmon recovery and supports the text that makes up the regional adaptive management and monitoring plan.

Stage B. The second stage seeks to answer the question: “How will you know you are making progress?” This step is critical to the success of adaptive management. It requires the creation of a framework for measuring progress. This framework defines evaluation questions (sometimes called “management questions”) and metrics (also known as “benchmarks”) against which progress is measured. The benchmarks for salmon recovery are provided in the last section of this volume.

¹ Some of the language used in the following description of the EMI approach comes from their document, *Measuring Progress: An Evaluation Guide for Ecosystem and Community-based Projects* (Version 3.1, 2004), and is available for review at <http://www.snre.umich.edu/ecomgt/>.

Stage C. The third stage seeks to answer: “How will you get the information you need?” This planning work leads to the creation of monitoring plans that define the data and information that needs to be collected, describes how that data will be collected, who will collect it, where it will come from, and how it will be analyzed and turned into reports for decision-makers. This step also requires some decisions to be made as to where the data will be housed and how it can be accessed by others. This information is presented in Volume II of the Monitoring and Adaptive Management Plan.

Stage D. The fourth stage must address how information will be used in decision-making and the decision-making process. The governance structure for implementation of the Recovery Plan is described in the next section.

CHAPTER ONE

GOVERNANCE AND ACCOUNTABILITY

Roles and Responsibilities for Implementing the Puget Sound Chinook Salmon Recovery Plan

In order to effectively implement the Puget Sound Chinook Salmon Recovery Plan (“Recovery Plan”), there must be clear definition of the roles and relationships between the many organizations involved in implementing actions, measuring results and making management decisions. There must be strong leadership at all levels and these leaders must build on the relationships that were formed in creating the Plan through the Shared Strategy process. The Shared Strategy was a collaborative process that involved community decision-making that responded to both local needs and to region-wide requirements for salmon recovery under the Endangered Species Act (ESA). A short description of the tenets of the Shared Strategy process below provides the foundation for how the governance structure for adaptive management must proceed.

Shared Strategy participants recognized that no single entity can achieve the vision of recovery on its own: collective and coordinated efforts are necessary to build the support and commitments needed to achieve the results set forth in the Plan. A key tenet agreed to by all parties to the Shared Strategy was that the private, public and tribal partners would retain their legal authorities, rights, and responsibilities as they developed and now implement the Recovery Plan. Collaborative decision-making meant that each party’s concerns were heard and addressed as directly as possible along the way. Trust in this agreement meant that the various entities and government agencies at all levels were willing to use their authorities and influence to share resources and solutions on behalf of the larger effort. This approach led to openness among the participants and transparency about the process and its conclusions.

The combined results from that process are set forth in the Recovery Plan. The Plan is a necessary and important starting point but is not perfect. The same is true of the governance structure for creating the Recovery Plan. As the leaders of recovery move from planning to full implementation the governance structure must be clear and focused on the evolving mission of recovery in the context of improving the overall health of Puget Sound. Below is a description of the roles and responsibilities of each the major groups involved in recovery.

The Governance Structure

There are five major components to the governance structure of salmon recovery in Puget Sound. They include project and program implementers, watershed groups, the Recovery Implementation Science Team, the Puget Sound Salmon Recovery Council, and the Puget Sound Partnership. Each group is described below in terms of its implementation responsibilities and role in adaptive management.

Project and Program Implementers

The key to success in salmon recovery are the hundreds of project and program implementers. They include local, state, tribal and federal government agencies managing regulatory and grant programs, community and volunteer groups providing education and constructing projects, managers of hatchery and harvest programs and facilities, and many others. There are over a hundred local governments, 17 treaty tribes, 15 watershed groups, numerous agencies and hundreds of project sponsors all working to protect and improve the conditions for salmon in Puget Sound.

Role of the implementers

A. Recovery Plan Implementation roles and responsibilities

Implementers carry out specific actions, regulations, or strategies and take part in the evaluation of their effectiveness. Implementation takes many forms. It includes (1) sponsoring projects, and/or developing, constructing and monitoring projects; (2) implementing and enforcing federal, state, local or tribal regulations; (3) acting as a lead entity, which coordinates watershed planning activities and program and project development and implementation; and (4) implementing and coordinating projects, monitoring, hatchery, and harvest actions (performed by co-managers). Implementation occurs at both a regional and the watershed scale.

B. MAMA Plan roles and responsibilities

Implementers play a critical role in adaptive management by reporting on their actions, whether they were implemented successful in terms of the intended action and the likelihood that the actions will have the intended results.

Puget Sound Watersheds

There are 15 watersheds working within Puget Sound to restore Chinook salmon. Each watershed group is a collection of people, governments, and organizations that represent the connection to the local community and its knowledge about threats to and opportunities for recovery of local salmon populations. How a watershed group is structured is best left to the local participants who are responsible for the functions listed below. However, it is important that watersheds strive to fully reflect and represent a community's multiple interests and perspectives, and should include or provide linkages to local elected officials. Each of the 15 Puget Sound Watershed groups is organized differently. However, their membership generally includes:

- a lead entity coordinator responsible for providing staff support to the watershed group;
- federal, state, and local governments;
- tribes and tribal organizations;
- non-governmental organizations (NGOs) that typically include conservation, business, natural resource industry, outdoor recreation and sporting groups;
- tribes and tribal organizations; and
- other interested parties such as individuals and citizen groups.

The role of each local watershed group

A. Recovery Plan Implementation roles and responsibilities. One of the primary roles of each watershed group is to foster implementation by the many project sponsors and program administrators and adaptively manage the local salmon recovery plan set forth in the

watershed-specific chapters of the Recovery Plan. In practice, this means that each watershed must establish local priorities, assess progress, and evaluate the effectiveness of their recovery strategies in the context of ESU-level recovery and delisting. For implementation to be successful, ultimately watersheds need to expand their role to take on additional responsibilities. The list below is intended to identify the full breath of responsibilities best performed at the watershed level. **Note: Watersheds will need additional funding to perform these duties.**

- Identifying and implementing measures to ensure integration of recovery actions across habitat, harvest and hatchery management;
- Refining and fostering a multi-year salmon habitat restoration program;
- Evaluate the effectiveness of habitat protection efforts including regulation, incentives and education.
- Ensuring capital projects and other programs are on schedule and achieving results for salmon recovery consistent with the strategies in watershed chapter of the Recovery Plan;
- Providing a means for various, related programs and efforts to share data and learn from each other;
- Expanding public understanding and coordinating educational efforts to build a growing awareness of and support for salmon recovery in each successive generation;
- Cultivating community and political leadership supportive of salmon recovery;
- Supporting volunteer organizations by providing opportunities for individuals to help;
- Coordinating with other watersheds and regional groups on fundraising and legislative action, and in addressing cross-watershed issues;
- Addressing the recovery of newly listed salmon populations; and
- Maintaining local scientific expertise to refine and implement actions as well as measure results and make adjustments where necessary.

In addition to these functions, many participants in watershed planning groups also implement specific projects and programs prioritized in watershed recovery strategies.

B. MAMA Plan roles and responsibilities. In addition to the implementation responsibilities listed above, each watershed also plays a vital role in the local and regional adaptive management process. In order to measure their local progress, each watershed should adopt benchmarks for gauging progress on the strategies set forth in their local recovery plans consistent with benchmarks established in MAMA. Each watershed group will provide information to the region on the status of their local efforts and any constraints hampering their progress. Watersheds will be responsible for analyzing the data and information they collect as a result of monitoring and providing reports that inform the region about progress against regional benchmarks set forth in Chapter Two of this Plan. Watersheds will also be responsible for using the relevant findings from regional monitoring efforts and research on priority technical and policy issues in the adaptation of their plans.

Performing these tasks will be a new function and will require additional funding, training or other support to meet the reporting timelines established in this MAMA Plan. The Recovery Council, working with the Puget Sound Partnership, will have the responsibility of ensuring that the necessary support is provided to ensure effective implementation of these tasks.

Puget Sound Salmon Recovery Council

The Puget Sound Salmon Recovery Council is a regional leadership group and decision-making body responsible for ensuring implementation of the Recovery Plan. The group includes representatives from each of the 15 watersheds participating in salmon recovery in Puget Sound, as well as officials from local, state, federal and tribal governments, conservation and business interests and other NGOs. Participation on the Recovery Council is voluntary and the group makes decisions using a collaborative method, which strives for consensus and transparency in its actions. The Recovery Council relies on peer-accountability among its members to ensure that agreed upon priorities and outcomes are achieved.

A. Recovery Plan Implementation roles and responsibilities.

The Recovery Council is responsible for performing the following specific functions relative to implementing the Recovery Plan:

- Serving as the overarching organization under which salmon recovery occurs, and where adaptive management decisions are made on issues that affect salmon population groups or that have regional significance;
- Serving as the organization that is responsible for the long-term implementation of salmon recovery and where the responsibility for achieving the goal of de-listing under the ESA is held;
- Providing a forum for discussion, strategic planning, policy guidance, and resolution of issues at a regional scale;
- Maintaining and strengthening strong relationships among local, state, federal and tribal government officials and agencies, watershed groups, businesses, agriculture, forestry, community organizations, environmental, conservation groups and other NGOs across the ESU;
- Supporting watersheds by ensuring they have the funding, staffing, training, technical guidance and expertise, and dispute resolution skills and support necessary to carry out their work;
- Supporting watersheds by assisting them in creating and implementing strong monitoring and adaptive management frameworks within their local community that support their implementation work and also allow progress to be measured at both the local and regional scales;
- Supporting watersheds by creating peer-accountability pressure where needed at the local level to ensure implementation of priority strategies for salmon recovery;
- Sponsoring collaboration and learning across watersheds and the region by providing forums for discussion and by creating ad hoc work groups on topics of mutual concern or interest;
- Ensuring the implementation of regional strategies set forth in the Recovery Plan;

- Marketing salmon recovery efforts by promoting the development of a coordinated regional outreach and education campaign(s) consistent with the restoring the overall health of Puget Sound and supporting local watershed grassroots organizing; supporting the recognition of local individuals and leaders and the success of watershed groups; assisting and supporting watersheds in their efforts to reach out to people and groups outside their boundaries; and providing a coordinated outreach campaigns to legislative and congressional leaders;
- Advocating for the funding necessary to implement the Recovery Plan. This includes developing a regional fundraising strategy, and organizing and implementing a regional fundraising campaign, coupled with grassroots organizing, to ensure adequate funding of the Recovery Plan over time;
- Developing recommendations and supporting legislative decisions, as needed, to support salmon recovery work across the ESU;
- Seeking efficiencies across watersheds (e.g., monitoring and data sharing, staff training) and facilitating cross-watershed communication, project development, and problem-solving;
- Connecting the work of the region and local watersheds to other, related efforts and programs such as water quantity planning under HB 2514 and the Forest and Fish Plan; and
- Supporting the continuation of independent science teams such as NOAA’s Technical Recovery Team (or its successor), and providing a forum for their participation in and review of recovery strategies across the region; and

B. MAMA Plan roles and responsibilities. In addition to the implementation responsibilities listed above, the Recovery Council also plays a primary role in the regional adaptive management process. In order to measure overall progress on the Recovery Plan, the Recovery Council establishes the benchmarks, as set forth in Chapter Two of this Volume, for gauging progress, measures progress against the benchmarks by using the information and data collected from monitoring, and recommends adaptive actions based on the assessment of progress. The Recovery Council will make decisions about where to allocate resources and support, as well as decisions about whether strategies in the Recovery Plan should be continued, modified or abandoned over time.

Recovery Implementation Science Team

Following the listing of Chinook in 1999, NOAA appointed the Technical Recovery Team (TRT) to define the science factors for delisting of the species. The TRT provided an invaluable role in the development of the Recovery Plan by providing the best available science information at the regional scale and assisting scientists and planners in the watershed as they developed their local plans. The TRT provided a technical review of the draft recovery plan to determine its consistency with technical guidance and its ability to achieve the necessary improvements needed for all 22 populations of Chinook.

Role of the Science Team

A. Recovery Plan Implementation roles and responsibilities

The Science Team needs to continue to work with watersheds as they implement their plans. They must continue to assist watersheds as they define and refine the sequence and priority of actions. The Science Team will annually evaluate the watershed project lists for consistency with the Recovery Plan. The Science Team will provide assistance to the Recovery Council by identifying means to address key uncertainties and assist the Recovery Council in setting annual priorities to address cross watershed issues and regional questions.

B. MAMA Plan roles and responsibilities

The Science Team will provide a critical role in developing the on-going approach to adaptive management. They will evaluate the technical information provided through monitoring and research to assist the Recovery Council in determining if implementation is on track and if not, what technical issues must be addressed.

Puget Sound Partnership

The Partnership was formed in 2007 to develop an Action Agenda to restore the health of Puget Sound by 2020. In creating the Partnership, the legislature directed Partnership to provide the staff and other resources necessary to implement the Recovery Plan. These functions were previously provided by the Shared Strategy nonprofit organization. The Partnership is also required to create an accountability system for all actions needed to restore Puget Sound, and some of those actions overlap with the efforts needed to recovery Puget Sound Chinook Salmon. Accordingly, MAMA will be an important part of the overall accountability system that the Partnership must create for the 2020 Action Agenda.

Role of the Partnership

A. Recovery Plan Implementation roles and responsibilities

The Partnership will provide staff support to the Recovery Council and other regional groups, including the 15 watershed planning groups involved directly in salmon recovery. They will advocate for the funding needed to implement the recovery plan and assist in addressing other policy issues that arise over time.

B. MAMA Plan roles and responsibilities

The Partnership will monitor the overall benchmarks for salmon recovery based on the information provided by the Recovery Council. They will work together with the Recovery Council to determine what additional strategies, actions and investments are needed to ensure recovery. The Partnership will ensure that a data management system is created and supported, and that it provides transparency and accountability for this MAMA framework.

With this governance structure in mind, we next turn to Chapter Two, which contains the framework within the Puget Sound Salmon Recovery Council, 15 Watersheds, Recovery Implementation Science Team, Puget Sound Partnership and others will assess whether their strategies and actions are making a difference in the recovery of Puget Sound Chinook Salmon.² They will do this by addressing several key questions at multiple scales (ESU, major population groups and population) using information gained through various monitoring programs more fully described in Volume II.³

² This is the step referred to in the Introduction as EMI's Stage B.

³ This is the step referred to in the Introduction as EMI's Stage C.

CHAPTER TWO

A Framework for Assessing Progress toward Recovery Goals

The desired outcome of the Recovery Plan is the long-term persistence of viable populations of Puget Sound Chinook Salmon distributed across their native range. A viable salmonid population (VSP) is defined as one that is independent and has a negligible risk of extinction over 100 years. VSP is described in terms of four key characteristics: abundance, population productivity or growth rate, spatial structure and diversity.⁴ The Puget Sound Technical Recovery Team (TRT) published the *Planning Ranges and Preliminary Guidance for the Delisting and Recovery of the Puget Sound Chinook Salmon Evolutionarily Significant Unit*⁵ (“TRT Guidance”) in April, 2002, which established the first set of VSP planning range recommendations for the Chinook Salmon Evolutionarily Significant Unit (“ESU”). Those planning ranges were updated in 2005 and are published in the Puget Sound Chinook Salmon Recovery Plan.⁶

In making its recommendations, the TRT noted that the entire ESU, not a single population, is listed under the Endangered Species Act. The TRT was charged with identifying the biological characteristics of a recovered ESU as part of developing delisting and recovery criteria. The term “recovery” in this context necessarily includes enough salmon to allow for ongoing harvest pursuant to tribal treaty rights.

These biological characteristics are based on the collective viability of the individual populations, their characteristics and their distributions throughout the ESU. As a result, the Recovery Plan relies on strategies and actions taken to recover the health of individual populations, with the knowledge that recovery may be achieved using many different scenarios when viewed at the ESU scale.

The TRT Guidance recommended that an ESU-wide recovery scenario should include at least two to four viable chinook salmon populations in each of five geographic regions within Puget Sound, depending on the historical biological characteristics and acceptable risk levels for populations within each region.⁷ These five regions became known as “the five biogeographical regions” and are now commonly referred to within Puget Sound (and within this Plan) as “major population groups or MPGs. Based on the TRT Guidance, the framework set forth below describes a hierarchy of key questions (benchmarks) against which progress toward the recommended viable salmonid populations ranges can be measured.

There are two fundamental questions that need to be answered in order to determine if the Recovery Plan is achieving the desired results:

1. Is the status of each population and the entire ESU improving in terms of the recommended VSP characteristics?

2. Are the primary factors limiting the status of the population and ESU increasing or decreasing?

⁴ See, *Viable Salmonid Populations and the Recovery of Evolutionarily Significant Units* (McElhany et al., 2000).

⁵ The TRT Guidance is included in this Plan in Appendix III.

⁶ (See Recovery Plan at p. 137).

⁷ See TRT Guidance at pp. 12-14.

In addition, the Recovery Council has determined that there are three additional factors that are so important to the overall implementation effort that they should be tracked as separate benchmarks. They include:

- 3. Do the watersheds/region have the strategies and resources necessary to conduct outreach and education for elected leaders, landowners and citizens about salmon recovery work such that it sustains and increases the support and funding for the work?**
- 4. Do the watersheds/region have the resources (capacity) necessary to fully implement priority strategies in the Recovery Plan?**
- 5. Have all of the strategies and actions for populations been fully integrated across habitat, harvest and hatcheries such that they do not conflict and are sequenced to maximize the benefits for salmon recovery?**
- 6. Do the watersheds/region have adequate funding resources to fully implement priority strategies in the Recovery Plan?**

In this Plan, these six questions are referred to as “benchmarks” or the measures against which we will determine if we are making progress toward recovery. To make decisions about these general questions, the parties responsible for recovery work will need specific information about the *factors* that are linked to each benchmark.

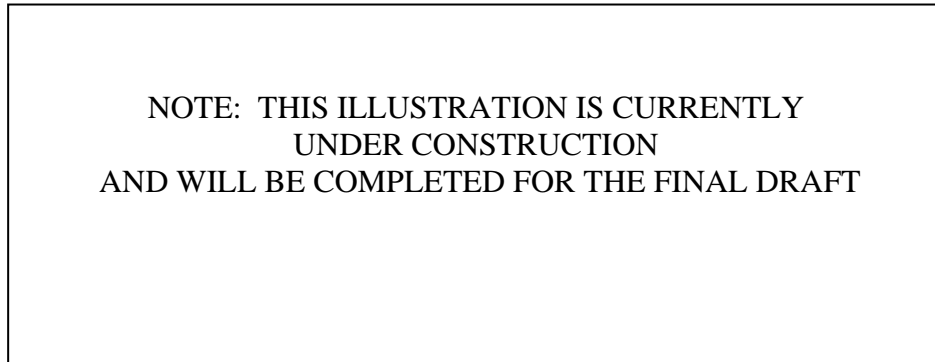
- The *factors* related to the VSP Characteristics Benchmark include: abundance, distribution, spatial structure and productivity.
- The *factors* related to the Primary Limiting Factors Benchmark include: hatcheries, harvest, habitat and hydropower, predation and disease, climate change and ocean conditions.
- The *factors* for the remaining four Benchmarks have not yet been identified, but will need to be addressed before this MAMA Plan is finalized.

For each factor described in the framework below, *management questions* have been included. *Management questions* include both policy and technical questions that, when answered, tell decision-makers about progress on that particular factor. From a policy perspective, management questions will tell decision-makers about the pace of implementation and any problems that may be arising relative to the targets that have been set. From a scientific perspective, management questions will tell decision-makers about the effectiveness of our recovery actions, and whether the fish and natural environment are ultimately responding to them.

Data will be gathered through several monitoring programs that will address these management questions. A summary of the type of monitoring that will be used to answer each management question, as well as the reporting timeframe for that information, is listed for each benchmark factor.⁸

⁸ A full description of each monitoring program is set forth in Volume II

Figure 1 - Illustration of Benchmark Framework



Principles that Guided the Creation of the MAMA Assessment Framework

The creation of this MAMA assessment framework, and the selection of benchmarks, associated factors and management questions that support it, were guided by several principles:

- The framework must be based on the best available science regarding the viability of salmonids and focus on what matters most for the long-term recovery of the species.
- It must provide for the measurement of progress for all populations, and they must also specifically allow a focus on populations at the highest risk of extinction.
- It must be clear, understandable and provide transparency about our progress to those working on salmon recovery, as well as to the federal, state, local and tribal governments and NGOs who will fund our efforts.
- The framework must produce information that is relatively easy to understand, and must be capable of being summarized into clear, compelling messages for the public and for those working on salmon recovery.
- The framework must help identify where urgent actions are needed so as not to lose populations or habitats necessary for recovery or, conversely, to allow the region or a watershed to take advantage of opportunities in a timely way.
- The framework must be capable of assessing whether support for salmon recovery is present and sustainable over time.
- The benchmarks, factors and management questions must be directly related to NOAA's Listing Status Decision Framework.⁹

⁹It is acknowledged that there are certain minimum criteria that NOAA is required to consider in performing its obligations under the Endangered Species Act. Review of the region's combined efforts under the Recovery Plan will be judged against the criteria set forth in "NOAA Listing Status Decision Framework" in order to meet the requirements of 50 CFR Section 424.11. A copy of the Framework is attached to this Plan in Volume III at Appendix 6.

- The benchmarks, factors and management questions must be supported by monitoring information, analysis and reporting that is transparent and can be independently verified.

This MAMA assessment framework presents the beginning of our adaptive management work. It will likely be refined over time.

The Framework Addresses Multiple Scales: Population to ESU

The benchmarks set forth in this plan are oriented from multiple scales, beginning with each population, next moving to the MPGs (as identified by the TRT in its determination of the 5 bio-geographical regions), and then moving to the ESU as a whole. The reader should note that the benchmarks and their associated questions are very specific at the population scale and become more generalized as the information is “rolled up” to the ESU scale, where questions are asked about the overall status of the ESU.

With respect to Benchmarks 1 and 2, the conclusions that will be drawn at the ESU scale from the rolled up information provided by all 22 populations, will be judged against the recommendations set forth in the TRT Guidance (discussed above), as to whether there are at least two to four viable chinook salmon populations in each of five geographic regions within Puget Sound. The TRT noted that there can be many different scenarios that achieve this long-term result. It is not assumed in either the Recovery Plan or this MAMA framework, that the ESU will achieve this status overnight.

Establishing the Pace of our Recovery Efforts

As noted above, this MAMA Framework establishes a system of benchmark questions that must be asked, and the information that will be collected to answer those questions, in order to know whether the recovery strategies and actions are working. Ultimately, this framework should also be able to provide information that will allow those taking responsibility for the Recovery Plan to know if the work is on track to meet the 50-year planning horizon of the Plan. This requires the consideration of the “pace” of implementation (meaning the timing and sequencing of actions).

While the Recovery Plan defined the overall set of strategies and actions that would lead to recovery within an expected time horizon of 50 years, the Plan did not establish the pace at which expected actions would occur in any incremental sense. This is understandable given that establishing the pace of recovery actions is something that is subject to the influence of many external factors and needs to be considered during the implementation phase.

Now that the Recovery Plan is being implemented, the Recovery Council, Partnership, and Watersheds should set the pace of the recovery strategies and actions. This should be done in light of the suite of factors that affect the work, such as: the urgency of a population’s needs, the complexity and scope of the actions, the amount of funding available, whether public and political support exists for certain actions, and the like.

Establishing Targets

One way to articulate the pace of recovery efforts is to establish *targets*, which describe the desired level of implementation actions that have been taken and the substantive results gained for salmon in terms of the two framework Benchmarks (VSP characteristics and Limiting Factors), within a certain time frame. This Plan recommends that targets be adopted to establish the pace of recovery efforts in light of the proposed framework benchmarks.

Given that NOAA is legally required to perform a status review of the work under the Recovery Plan every five years after adoption of the Recovery Plan, this MAMA further recommends that targets be established using 5-year time increments. This will assist those responsible for implementing the Recovery Plan in articulating our progress in a timeframe consistent with the federal review under the ESA.

Identifying Priority Benchmark Factors for Setting Targets

It is recognized that establishing targets may take some time, because the task involves making value judgments about what are the highest priorities for implementation across a wide-range of strategies and actions. **It is recommended that the Recovery Council, Watersheds and Partnership articulate the highest priorities within the two MAMA Framework benchmarks (Salmon VSP Benchmark and Limiting Factors Benchmark), and establish targets for achieving results against those benchmarks by the end of the first quarter of 2008.**

Although ultimately it will be up to the policy decision-makers to determine which factors within the two benchmarks present the highest priority for measuring the pace of implementation, **this plan recommends that at a minimum, habitat, harvest and hatcheries factors be designated as high priorities and recommend that targets be established for each of them within the Limiting Factors Benchmark.**

To that end, below are proposed targets for hatcheries and harvest, as factors listed within the Limiting Factors Benchmark. They are put forward in this review draft of the MAMA Plan for consideration and discussion by the Recovery Council, Watersheds and Partnership. It is recommended that targets also be developed for Habitat as a factor within the Limiting Factors Benchmark, as well as factors associated with the VSP Characteristic Benchmark.

Targets for Hatchery Adaptive Management – What Will We Have Done in Five Years?

- We will have contingency plans with triggers for initiating hatchery programs for all indigenous populations at immediate risk of extinction.
- We will have goals for all salmon hatchery programs with clearly defined numerical objectives for each stage of artificial production (brood stock selection, collection, spawning, incubation, rearing, and release).
- We will have reviewed and changed all hatchery programs to be consistent with watershed goals and ESU-wide recovery strategies and developed a schedule of regular 5-7 year reviews of all hatchery programs.
- We will have fish culture guidelines that guide the day-to-day operations of all Chinook salmon hatchery programs and that describe the contingency actions for rare circumstances

that can derail hatchery programs from achieving objectives (such as too few brood stock, epizootics, or facility failures).

- We will have a continuing education program for hatchery managers and technicians that includes instruction in the hatchery guidelines and associated tasks.
- We will have an implementation and effectiveness monitoring plan for each hatchery program and a supporting data system for tracking progress.
- We will have a legally approved co-management decision making process for making and reporting intra-annual, annual, or long-term changes in hatchery programs.

TARGETS for Harvest Adaptive Management – What Will We Have Done in Five Years?

- We will have protected all 22 populations of Chinook salmon in the ESU by implementing fishing exploitation rate (ER) ceilings based on abundance and natural productivity thresholds.
- We will have negotiated new protections for salmon with Canada.
- We will have continued to improved our system for estimating impacts of fisheries, assessing annual escapements and proportions both hatchery and wild salmon to the rivers, and predicting population abundances.
- We will have continued to enforce fishery rules and regulations and to evaluate the effectiveness of the regulations.
- We will have continued to make harvest management decisions through a government-to-government process among Tribal, state, and federal managers.
- We will have continued to promote fishing opportunities for other Pacific salmon species for their cultural and economic value.

Reporting and Adaptive Management Decision-making System

Reporting on the progress and status of benchmarks, strategies, and actions is the main accountability tool that enables the Recovery Council, Watersheds, NOAA, those who fund recovery efforts and the public to assess the ESU's progress toward recovery. It ensures that adaptive management decisions are made on a regular basis at both the watershed and regional scales. It provides opportunities for individual watersheds to seek support from the region on tough issues, and ensures that the region is providing the technical and policy support needed to increase the effectiveness of each watershed.

The reporting system that is described here is based upon the roles and responsibilities to which the region has committed for purposes of implementing the Recovery Plan, as well as the benchmarks established in this MAMA Plan. Reports will be based on a combination of

information and data collected as part of the Monitoring Plans (implementation, status and trends and effectiveness monitoring) as well as analysis about what those monitoring results mean when measured against the benchmarks established for each major component of the Recovery Plan.

Monitoring and reporting will be performed by Watershed groups, Recovery Council and the Puget Sound Partnership. Reports prepared at the local and regional levels will reflect the varying roles and responsibilities of the Watersheds and Recovery Council in governance of the Recovery Plan. (See, Chapter One, above). In order to ensure that recovery of the entire ESU stays on track, both the local and regional monitoring efforts must be coordinated. To that end, this MAMA Plan provides the framework through which these efforts will be performed.

Monitoring, Reporting and Adaptive Decision-making by Watersheds

It is expected that each watershed planning group will assist in performing regional monitoring under this MAMA Plan, and provide monitoring data and information collected, analysis of the data/information, and reports to the Recovery Council for the purpose of answering management questions related to regional benchmarks. Watersheds will assess regional results against benchmarks and propose regional and/or individual responses as necessary and appropriate. Watersheds will also share lessons learned with each other in order to increase the efficiency and effectiveness of recovery efforts all across the ESU.

It is also expected that each watershed may also collect monitoring data and information for the purpose of informing local decision-makers about progress against local adaptive management benchmarks. This information should also be made available to the region and other watersheds through data-sharing and the sharing of local reports and analysis. Watersheds will assess local results and adjust local plan strategies as needed.

Monitoring, Reporting and Adaptive Decision-making by the Recovery Council

It is expected that the Recovery Council will be responsible for providing funding and support to public and/or private entities, including watersheds, to collect monitoring data and information for the purpose of informing the Council about progress against the regional benchmarks set forth in this MAMA Plan. The Recovery Council will ensure that the data and information collected is analyzed and that reports are received according to the schedule established in this Section, as amended over time. The information gained from this adaptive management process shall be made available to the watersheds, NOAA and other federal, state, local, tribal governments or NGOs that fund recovery efforts, as well as to the public. The Recovery Council shall consider the progress made against regional benchmarks, the effectiveness of the strategies implemented in the Recovery Plan, and whether the hypotheses relied upon were correct. The Recovery Council may amend, abandon or adopt new strategies and actions over time as deemed necessary or appropriate based on the information learned from this adaptive management process.

The reporting of the results of monitoring will occur at various times throughout the life of the Recovery Plan according to the regional benchmarks set forth in Chapter Three, below). It is anticipated that this reporting cycle will be reviewed every five years concurrently with the mandatory NOAA five-year review of the Recovery Plan under the ESA, to ensure that monitoring results are being reported in appropriate time intervals.

UPDATING THE MAMA PLAN OVER TIME

It is anticipated that the implementation and effectiveness of this MAMA Plan will be monitored, analyzed and reported on during the life of the Recovery Plan so that the Watersheds, Recovery Council, Puget Sound Partnership and NOAA can ensure that it provides the necessary governance structures and information required for adaptive management of the Recovery Plan over time.

As such, it is expected that the Recovery Council, Puget Sound Partnership and NOAA will track the implementation, funding and support for regional monitoring as defined in this MAMA Plan, as well as the effectiveness of adaptive management decision-making process that will guide the efforts throughout the ESU. It is also expected that each watershed will track the implementation, funding and support for regional and local monitoring at the local level, as well as the effectiveness of adaptive management decision-making at both the regional and local levels.

Getting Started: A Phased Approach

The different levels of monitoring described above take various amounts of time to demonstrate results, so it will be necessary to sequence adaptive management and monitoring implementation in such a way that caters to these different timelines while continuing to report on short-term progress. This Plan proposes a 50-Year Adaptive Management Framework, with a phased approach to implementation beginning with five-year increments in Years 1 through 10, to coincide with NOAA's National Marine Fisheries Service (NMFS) statutory review time periods.

- **Years 1-2: Roll Out: Final Design, Training and Implementation of Monitoring Plan**
 - Refine, finalize, and adopt the Puget Sound Regional Adaptive Management and Monitoring Plan and request formal adoption of the Plan by the NOAA.
 - Perform a watershed assessment survey to identify the status of monitoring and adaptive management systems at the local scale.
 - Hold a Watershed workshop to begin development of monitoring and adaptive management processes at the local level where not already in existence.
 - Begin design of watershed-level monitoring plans (where not yet in existence) to track implementation progress on strategies in watershed chapters. Begin design of monitoring.
 - Begin/continue data input into the Habitat Work Schedule database to track implementation of projects at the watershed scale.
 - Summarize relevant monitoring data that has been (or is currently being) collected in the Puget Sound region as a baseline for future monitoring and trend analyses.
 - Refine monitoring plans by developing due dates for data reporting at all levels of monitoring, monitoring collection protocols, and assignments for completing monitoring tasks.
 - Establish regional training program using the Governor's Monitoring Forum Quality Assurance Plan protocols. Begin training field teams for data collection.
 - Begin or continue all three levels of monitoring as specified by the Plan.

- Begin Reporting Results of Implementation Monitoring and make available to the public.
 - Begin Fish VSP and Habitat Status and Trends Monitoring.
 - Define existing surrogate information that can be used to answer management questions and identify data gaps that exist.
 - Science teams design effectiveness monitoring research experiments on high priority management questions.
 - Report existing habitat and VSP data to establish a baseline and make available to the public.
 - Recovery Council establishes milestone dates for reporting progress on implementation each Spring on watershed and regional strategies, and for making adaptive management decisions each Fall.
- **Years 3-5: Roll Out: First Set of Research Experiments for Effectiveness Monitoring; Continue: Implementation Monitoring and Status & Trends Monitoring**
 - Begin effectiveness monitoring research experiments.
 - Begin evaluating effectiveness monitoring data.
 - Continue reporting results of implementation monitoring each Spring and making adaptive management decisions about the Plan and progress each Fall.
- **Year 5: First NOAA Reporting Period**
 - Begin evaluating status and trends monitoring data on habitat conditions and fish conditions according to the VSP criteria and in light of management questions.
 - Report on results from all types of monitoring.
 - Prepare first 5-Year Report to NOAA on the status of salmon recovery under the Plan.
- **Years 6-10: Full Implementation of the Monitoring Plan and Adaptive Management Cycle**
 - Continue implementation, status and trends and effectiveness monitoring data collection, analysis and reporting at established intervals.
 - Science teams designs new effectiveness monitoring research experiments on the next set of high priority management questions.
 - Continue making adaptive management decisions about Plan strategies and progress under the Plan.
- **Year 10: Second NOAA Reporting Period**
 - Prepare first full analysis of status and trends monitoring data on habitat conditions and fish conditions according to the VSP criteria and in light of management questions.
 - Report on results from all types of monitoring.
 - Prepare second 5-Year Report to NOAA on the status of salmon recovery under the Plan.
 - Continue making adaptive management decisions about Plan strategies and progress under the Plan.

- Consider amending and updating the Plan with new short-term goals for 2020.
- **Years 10-15 and Beyond: Full Implementation of the Monitoring Plan and Adaptive Management Cycle**
 - *(See established cycles, as set forth above).*
- **Annual products**
 - **New science workshops**
 - Present new and/or updated scientific tools (analytical models, data collection protocols, etc.);
 - Present new research findings that pertain to current uncertainties around recovery strategies and actions;
 - Discuss regional monitoring results and whether a change in strategy or strategies is warranted; and
 - Present and discuss information and research deemed valuable by watersheds within Puget Sound.

BENCHMARKS FOR MEASURING PROGRESS TOWARD RECOVERY

This section presents the assessment framework in a series, beginning at the population scale and moving to the MPG and ESU scales, for the six benchmark questions:

Benchmark 1 - Is the status of each population and the entire ESU improving in terms of the recommended VSP characteristics?

Benchmark 2 - Are the primary factors limiting the status of the population and ESU increasing or decreasing?

Benchmark 3 – Do the watersheds/region have the strategies and resources necessary to conduct outreach and education for elected leaders, landowners and citizens about salmon recovery work such that it sustains and increases the support and funding for the work?

Benchmark 4 – Do the watersheds/region have the resources (capacity) necessary to fully implement priority strategies in the Recovery Plan?

Benchmark 5 - Have all of the strategies and actions for populations been fully integrated across habitat, harvest and hatcheries such that they do not conflict and are sequenced to maximize the benefits for salmon recovery?

Benchmark 6 – Do the watersheds/region have adequate funding resources to fully implement priority strategies in the Recovery Plan?

Each benchmark section includes the associated factors (where known) for each benchmark, the management questions linked to each benchmark factor, and the monitoring and reporting cycles that will provide answers to the management questions. After the population scale benchmarks have been addressed, the framework poses the same set of benchmark questions at the major population group (MPG) scale (representing the five biogeographical regions

identified by the TRT), and then finally the ESU scale. As noted above, the questions become more general as the benchmarks move from the population scale to the broader regional scale. Together, this section sets for the essential framework for assessing progress toward the goals in the Recovery Plan.

Benchmark 1A – Is the Status of each Salmon Populations improving in terms of the recommended VSP characteristics?¹⁰

Scale: **Individual Population**

Benchmark 1A – VSP CHARACTERISTICS

Overall Policy Question: *Does the status and change in status of the population’s viability characteristics, in the aggregate, demonstrate a level of risk, or probability of persistence, sufficient to consider that the population has achieved the viability targets established for its classification (i.e., the level of risk considered acceptable for this population)?*

Comment: This policy question considers the population status using VSP characteristics (abundance, productivity, spatial structure, diversity) within the population measured against population-specific viability planning ranges established in the Puget Sound TRT Guidance, to arrive at an overall conclusion on the population’s status.

Factors Linked to this Benchmark: *Abundance, Diversity, Spatial Structure, Productivity*

Note to Reader: *For this Benchmark, the factors associated with it can be displayed together in a single page. For the Limiting Factors Benchmark, the factors associated with it are displayed on separate pages due to their complexity and length and for some, the need to also display sub-factors (e.g., habitat).*

Management Questions associated with each Factor:

- **Overall Management Question:** What is the status and change in status of the population’s viability characteristics relative to its target viability parameters and status?
- **Abundance and Productivity Management Question:** What is the abundance/productivity status of the population based on population change criteria or viability curves for natural-origin salmon considering historical/intrinsic capacity estimates, depensation thresholds, or natural return ratio?
- **Spatial Structure Management Question:** What is the status of the spatial structure of the population based on consideration of the existing number, size, productivity, and distribution of spawning and rearing locations relative to what is sufficient for the population to be viable?
- **Diversity Management Questions:**

¹⁰ This Benchmark seeks to assess whether the NOAA VSP criteria are being met. The management questions that must be answered in order to make such an assessment are based on the recommendations set forth in *Adaptive Management for ESA-Listed Salmon and Steelhead Recovery: Decision Framework and Monitoring Guidance* (NOAA’s National Marine Fisheries Service and Northwest Fisheries Science Center, 2007).

- What is the current state, and change in state, of the genetic diversity of the population based on consideration of natural patterns of gene flow, existing diversity, habitats, and environmental variation?
- What is the current fraction and change in fraction of hatchery vs. natural-origin spawners in the population?
- What is the origin of hatchery fish in the population?

Monitoring Data that will be used to answer management questions: Adult and Juvenile Fish Status and Trends Monitoring data. (See Chapter II(A), Volume II for more information).

Reporting Cycle: A review of the status of each population will be conducted by December 31, 2012, and repeated every five years.

Benchmark 1B – Is the Status of each each major population group improving in terms of the recommended VSP characteristics?

Scale: Major Population Group

Benchmark 1B – VSP CHARACTERISTICS

Overall Policy Question: *For each MPG, does the aggregate status and change in status over time of the populations and habitats within the MPG demonstrates a level of risk, natural sustainability, or probability of persistence sufficient to consider the MPG viable when measured against the established TRT criteria?*

Comment: This policy question requires the aggregation or synthesis of the viability of all populations in an MPG. Each population must be evaluated against the population-specific viability planning ranges recommended in the Puget Sound TRT Guidance to arrive at a conclusion on overall MPG viability.

Factors Linked to this Benchmark: *Abundance, Diversity, Spatial Structure, Productivity*

Management Questions associated with the Factors when viewed in the Aggregate at the MPG scale:

- Are there enough populations at high viability/low risk consistent with recommended TRT Guidance for ESU viability characteristics, and are the remaining populations and streams within the MPG at sufficient status or quality to meet the ESU viability characteristics?
- Do at least 2-4 populations within the MPG (with a minimum of two populations) meet viability standards?
- Do viable populations within the MPG include some populations classified (based on historical intrinsic potential) as “Very Large,” “Large,” or “Intermediate,” generally reflecting the proportions historically present within the MPG? In particular, are Very Large and Large populations at or above their composite historical fraction within the MPG?

- Are all major life history strategies (e.g. spring and summer run timing) that were present historically within the MPG represented in populations meeting viability requirements?
- Are the remaining populations being maintained with sufficient abundance, productivity, spatial structure, and diversity to provide for ecological functions and to preserve options for ESU recovery?

Monitoring Data that will be used to answer management questions: Aggregated Adult and Juvenile Fish VSP Status and Trends Monitoring data for each of the five MPGs. (See Chapter II (A), Volume II for more information).

Reporting Cycle: A review of the status of each MGP will be conducted by December 31, 2012, and repeated every five years.

Benchmark 1C – Is the Status of the Salmon Populations in all five MPGs improving in terms of the recommended VSP characteristics?

Scale: **ESU-Wide**

Benchmark 1C – VSP CHARACTERISTICS

Overall Policy Question: *Does the aggregate status and change in status of the MPGs in the ESU demonstrate a level of risk, natural sustainability, or probability of persistence sufficient to warrant a change in ESU listing status when measured against the established TRT criteria?*

Comment: This benchmark represents an overarching question about whether Puget Sound Chinook salmon have “recovered” in both a biological and legal sense. The benchmark requires an evaluation of the overall status of the ESU, based on an aggregation or synthesis of the status of all Major Population Groups (MPGs) within the ESU. To answer this question, each MPG will be evaluated against ESU criteria to arrive at an overall conclusion about ESU viability. (For its part, NOAA will ultimately base its de-listing decision on a determination of whether the ESU is no longer in danger of extinction or likely to become endangered in the foreseeable future).¹¹

Factors Linked to this Benchmark: *Abundance, Diversity, Spatial Structure, Productivity*

Management Questions associated with the Factors when viewed in the Aggregate at the ESU scale:

- What is the aggregate status and change in status of the MPGs in the ESU relative to viability criteria?
- Are all MPGs within the ESU at, or clearly trending toward, a low risk status as defined by the TRT’s VSP criteria?

¹¹See, 50 CFR Section 424.11.

Monitoring Data that will be used to answer the management questions: Aggregated Adult and Juvenile Fish Status and Trends Monitoring data for all MPGs in the ESU. (See Chapter II(A), Volume II for more information).

Reporting Cycle: A review of the status of the ESU as a whole shall be conducted by December 31, 2012, and repeated every five years thereafter.

Benchmark 2A - Are the primary factors limiting the status of the population increasing or decreasing?

Scale: **Individual Population**

Benchmark 2A – PRIMARY LIMITING FACTORS

Overall Policy Question: *Have the statutory listing factors been addressed such that the combined threats to the population have been diminished to such an extent that they no longer pose a threat to the continued existence of the population?*

Comment: This benchmark considers the combined effects of *all* listing factors on a single population. To answer this policy question, decision-makers will be required to perform a “cumulative effects analysis” after examining each factor and the supporting management questions associated with this benchmark.

Factors Associated with this Benchmark: *Habitat and Hydropower, Harvest, Hatcheries, Predation, Disease, Ocean Conditions and Climate Change.*

Note to the Reader: Following Benchmark 2A, a series of pages is presented for each associated Factor that must be considered for each population. Next is a discussion of Benchmark 2B, which considers the affect of the primary limiting factor in the aggregate, or at the ESU scale.

Management Questions associated with the Factors when viewed in the Aggregate at the population scale:

- Is the population achieving or clearly trending toward a low-risk status in response to actions that have been implemented to diminish those factors limiting achievement of the population’s viability as described in the VSP criteria?
- Is there an effect of the listing factor on any of the viability parameters of natural origin fish, and if so, what is the *magnitude* of that effect?
- If there are effects of the listing factor on viability parameters of natural-origin fish, what is the *significance* of those effects for the viability of the population?

Monitoring Data that will be used to answer the management questions : All sources of monitoring data. (Implementation Monitoring – See Chapter One, Volume II; Status and Trends Monitoring – See Chapter Two, Volume II; and Effectiveness Monitoring – See Chapter Three, Volume II).

Reporting Cycle: A review of the status of the combined threats present for all MPGs within the ESU based on the NOAA limiting factors will be conducted by December 31, 2012, and repeated every five years.

Benchmark 2A – PRIMARY LIMITING FACTORS

Factor 1 - Habitat Destruction, Modification or Curtailment

Scale: **Population**

Overall policy question: *Has the present or threatened destruction, modification or curtailment of a population’s habitat or historic range been diminished to such an extent that those threats no longer pose a threat to the continued existence of the population?*

Comment: This benchmark represents the overarching question that considers the sum of all of the “limiting factors”¹² relative to habitat for a single population. These *sub-factors* include floodplain connectivity and function, channel structure and complexity, riparian areas and LWD recruitment, stream substrate, stream flow, water quality, fish passage, nearshore, marine and estuarine areas.

Note: Not every habitat parameter listed here as a sub-factor for habitat is a limiting factor for each population. However, the Recovery Council will consider the combined effects of habitat limiting factors at the ESU, MPG and individual population scales in order to ensure that the Recovery Plan is being effectively and efficiently implemented.

Management Question associated with this Factor:

- What is the effect of present or threatened habitat degradation (all limiting factors affecting a single population) on the observed abundance, productivity, diversity¹³, and distribution of the natural origin fish of a single population?

Monitoring Data that will be used to answer the management question: Monitoring Data that will be used to answer the management questions: Implementation Monitoring of plan strategies associated with protecting and restoring habitat at the population scale; Habitat Status and Trends Monitoring for a minimum of 1-2 populations per MPG. The specific populations that will be sampled is yet to be determined. Perform effectiveness monitoring studies to answer uncertainties about the role and contribution of habitat to Chinook salmon viability.

Reporting Cycle: Reporting at the population scale should occur at least every five years. It is acknowledged that it will take several years to establish a habitat baseline (status) from which to compare new monitoring data. It will take approximately 10 years for habitat trends to appear that have statistical certainty, although some coarse scale changes in habitat conditions may be visible annually through aerial or satellite imagery.

¹² The term “limiting factors” is used to describe the present or threatened set of conditions within certain habitat parameters that inhibit the viability of salmon as defined by the VSP criteria.

¹³ Including run timing.

Benchmark 2A – PRIMARY LIMITING FACTORS

Factor 2A.1 - Habitat Destruction, Modification or Curtailment

Scale: **ESU-wide**

Overall Policy Questions:

- 1. Have the habitat-related threats been diminished to such an extent that they do not limit attainment of the desired status of the ESU as described in the VSP criteria?*
- 2. Has the quality and quantity of habitat recovered to an extent that it can support recovery of the ESU as described in the VSP criteria?*

Comment: These questions assesses the sum of *all* habitat primary limiting factors to determine whether progress has been made sufficient to make a statement that those factors no longer pose a threat to long-term salmon viability. It involves two different kinds of actions. First is *protection* or all the actions that diminish habitat-related threats. The second is *restoration* or rehabilitation that rebuilds the quantity, distribution, and quality of habitat to levels that support population targets and goals. Currently, we have no ESU-wide numeric targets or goals for either how much, where, and what kind of habitat must be protected or how much, where, and what kind of habitat must exist to support a recovered ESU or populations. Developing targets for both of these strategies that can be modified through adaptive management will be critical for all watersheds and populations.

In order to answer policy questions here, the Recovery Council and Watersheds will need to consider *habitat limiting factors* from the perspectives of both protection and restoration. Each habitat limiting factor has its own benchmarks so that policy decision-makers can assess the contribution of those individual factors to the overall habitat picture. Those benchmarks immediately follow.

Management Question associated with this Factor at the population scale:

- What is the effect of present or threatened habitat degradation (limiting factors) on the observed abundance, productivity, diversity¹⁴, and distribution of the natural origin fish for all populations in the ESU?
- What is the effect of restoration of from habitat degradation (limiting factors) on the observed abundance, productivity, diversity¹⁵, and distribution of the natural origin fish for all populations in the ESU?

Monitoring Data that will be used to answer the management questions: Collect information on implementation of plan strategies associated with protecting and restoring habitat at the regional scale. Collect habitat status and trends data for a minimum of 1-2 populations per MPG across the entire ESU. Perform effectiveness monitoring studies to answer uncertainties about the role and contribution of habitat to Chinook salmon viability.

¹⁴ Including run timing.

¹⁵ Including run timing.

Reporting Cycle: Reporting at the ESU scale should occur at least every five years. It is acknowledged that it will take several years to establish a habitat baseline (status) from which to compare new monitoring data. It will take approximately 10 years for habitat trends to appear that have statistical certainty, although some coarse scale changes in habitat conditions may be visible annually through aerial or satellite imagery.

Benchmark 2A – PRIMARY LIMITING FACTORS

Sub-Factor 2A.1.1 – Habitat: Degraded Floodplain Connectivity

Scale: **Population**

Overall Policy Questions: *Has floodplain connectivity improved to the point where it no longer limits the attainment of a population’s viability as set forth in the VSP criteria?*

Comment: This benchmark considers the loss, impairment or degradation of floodplain connectivity; access to previously available habitats (e.g., seasonal wetlands, off-channel habitat, side channels), and whether there is a connected and functional hyporheic zone.

Management Questions associated with this sub-factor:

Technical Questions

- What is the effect of existing or threatened degraded floodplain connectivity on the observed abundance, productivity, diversity and distribution of natural-origin fish in this population?
- If there are observed habitat-related effects, what is the significance of those effects for the viability of this population? Do these effects inhibit the population from achieving VSP?
- Does the status of other listing factors modify the absolute risk posed by the current and potential future status of this listing factor?

Policy Questions

- Have floodplain protection and restoration measures described in the regional chapters of the Recovery Plan been implemented?
- Have floodplain protection and restoration measures described a watershed chapter of the Recovery Plan been implemented?
- Do existing or potential new structures such as dikes, levees, roads or other structures threaten floodplain connectivity?
- What is the effect of existing regulations and incentive programs on floodplain connectivity?
- Are federal, state, local, and tribal governments and private NGOs, farmers or individuals that may have legal authority over structures that are placed within the floodplain engaged in protecting and restoring floodplain function and connectivity?

Monitoring Data that will be used to answer the management questions: Habitat Status and Trends Monitoring; Implementation Monitoring. (See Chapters One and Two(B) Volume II).

Indicator(s): Trends in land use conversion; Trends in stream depth-width ratios; Number of federal, state and county or city permits issued for construction in or alteration of frequently flooded areas, channel migration zones, floodways and floodplains.

Data Collection(s):

- (1) Landsat analysis of mainstem rivers and streams, including associated vegetation.
- (2) GIS analysis of roads, landslides, dikes and levees, and land conversions.
- (3) On the ground data collection to verify and calibrate remote data.
- (4) Watershed surveys on outreach/education and participation by key stakeholders.

Reporting Cycle: Varies, but annually within each MPG. See proposed cycle in Chapter Two(B), Volume II for details).

Benchmark 2A – PRIMARY LIMITING FACTORS**Sub-Factor 2A.1.2 – Habitat: Degraded Channel Structure**

Scale: Population

Overall Policy Questions: *Has channel structure improved to the point where it no longer limits the attainment of a population's viability as set forth in the VSP criteria?*

Comment: This benchmark considers the loss, impairment or degradation of channels; whether there suitable distribution of riffles and functional pools exist, and functional amounts and sizes of large woody debris or other channel structures are present.

Management Question associated with this sub-factor**Technical Questions**

- What is the effect of existing or threatened degraded channel structures on the observed abundance, productivity, diversity and distribution of natural-origin fish in this population?
- If there are observed habitat-related effects, what is the significance of those effects for the viability of this population? Do these effects inhibit the population from achieving VSP?
- Does the status of other listing factors modify the absolute risk posed by the current and potential future status of this listing factor?

Policy Questions

- Have channel structure protection and restoration measures described in the regional chapters of the Recovery Plan been implemented?
- Have channel structure protection and restoration measures described a watershed chapter of the Recovery Plan been implemented?
- Do existing or potential new structures such as dikes, levees, roads or other structures threaten channel structure?
- What is the effect of existing regulations and incentive programs on channel structure?
- Are federal, state, local, and tribal governments and private NGOs, farmers or individuals that may have legal authority over physical structures that are placed within rivers or streams engaged in protecting and restoring channel structure?

Monitoring Data that will be used to answer the management questions: Habitat Status and Trends Monitoring; Implementation Monitoring. (See Chapters One and Two(B) Volume II).

Indicator(s): Trends in land use conversion; Trends in stream depth-width ratios. Number of federal, state and county or city permits issued for construction in or alteration of stream channels and adjacent areas; Watershed surveys on outreach/education and participation by key stakeholders.

Data Collection:

- (1) Landsat analysis of mainstem rivers and streams, including associated vegetation.
- (2) GIS analysis of roads, landslides, dikes and levees, and land conversions.
- (3) On the ground data collection to verify and calibrate remote data.

Reporting Cycle: Varies, but annually within each MPG. See proposed cycle in Chapter Two(B), Volume II for details).

Benchmark 2A – PRIMARY LIMITING FACTORS

Sub-Factor 2A.1.3 –Habitat: Degraded Riparian Areas & LWD Recruitment Scale: Population

Overall Policy Questions: *Have riparian conditions and the recruitment of LWD improved to the point where it no longer limits the attainment of a population’s viability as set forth in the VSP criteria?*

Comment: This benchmark considers the loss, degradation or impairment of riparian conditions important for production of food organisms and organic material, shading, bank stabilizing by roots, nutrient and chemical mediation, control of surface erosion, and production of large-sized woody material.

Management Question that associated with this sub-factor:

Technical Questions

- What is the effect of existing or threatened degraded riparian conditions and LWD recruitment on the observed abundance, productivity, diversity and distribution of natural-origin fish in this population?
- If there are observed habitat-related effects, what is the significance of those effects for the viability of this population? Do these effects inhibit the population from achieving VSP?
- Does the status of other listing factors modify the absolute risk posed by the current and potential future status of this listing factor?

Policy Questions

- Have measures been implemented to protect and restore riparian areas and LWD recruitment as described in the regional chapters of the Recovery Plan?
- Have riparian protection and restoration measured described a watershed chapter of the Recovery Plan been implemented?
- Do existing or potential new structures such as dikes, levees, roads or other structures threaten riparian areas and LWD recruitment?
- What is the effect of existing regulations and incentive programs on riparian areas and LWD recruitment?
- Are federal, state, local, and tribal governments and private NGOs, businesses, farmers or individuals that may have legal authority over physical structures that are placed

within riparian areas engaged in protecting and restoring riparian areas and providing for the recruitment of LWD?

Monitoring Data that will be used to answer the management questions: Habitat Status and Trends Monitoring; Implementation Monitoring. (See Chapter One and Two, Volume II).

Indicator(s): (1) Trends in land use conversion/change; (2) Trends in land cover (forest/vegetation); (3) Classification of LWD; (4) Trends in transportation impacts (miles of road crossings); and (5) Trends in riparian vegetation and canopy cover; Watershed surveys on outreach/education and participation by key stakeholders.

Data Collection:

- Landsat analysis of mainstem rivers and streams, including associated vegetation.
- GIS/aerial photography of roads, landslides, dikes and levees, and land conversions, land cover.
- On the ground data collection to verify and calibrate remote data.
- On the ground data collection to classify LWD (tree counts, DBH, etc.), riparian vegetation, canopy cover, macroinvertebrates.
- Supporting documentation from local governments and/or CTED:
 - GMA Buildable Lands Reports; Six-Year Transportation Improvement Plans
 - Annual summary reports of building permits issued and land divisions approved;
 - Maps and other documents showing changes in GMA land use designations/zoning;
- Results from Watershed surveys on outreach/education and participation by key stakeholders.

Reporting System: Varies. Annual reporting using local government supporting data; Annual Habitat Status and Trends Monitoring for some populations within each MGP. (See Chapter Two(B), Volume II for cycle details).

Benchmark 2A – PRIMARY LIMITING FACTORS

Sub-Factor 2A.1.4 – Habitat: Stream Substrate

Scale: Population

Overall Policy Questions: *Has stream substrate improved to the point where it no longer limits the attainment of a population's viability as set forth in the VSP criteria?*

Comment: This benchmark considers the impact of altered sediment routing leading to an overabundance of fine-grained sediments, excess coarse-grained sediments, inadequate coarse-grained sediments, and contaminated sediment in streams.

Management Question associated with this sub-factor:

Technical Questions

- What is the effect of existing or threatened degraded stream substrate conditions on the observed abundance, productivity, diversity and distribution of natural-origin fish in this population?

- If there are observed habitat-related effects, what is the significance of those effects for the viability of this population? Do these effects inhibit the population from achieving VSP?
- Does the status of other listing factors modify the absolute risk posed by the current and potential future status of this listing factor?

Policy Questions

- Have measures been implemented to protect and restore riparian areas and geologically hazardous areas near rivers and streams as described in the regional chapters of the Recovery Plan?
- Have stream substrate protection and restoration measures described in a watershed chapter of the Recovery Plan been implemented?
- Do existing or potential new structures such as dikes, levees, roads, homes or other structures threaten stream substrates due to sedimentation?
- What is the effect of existing regulations and incentive programs on stream structure?
- Are federal, state, local, and tribal governments and private NGOs, businesses, farmers or individuals that may have legal authority over physical structures that are placed within riparian areas and geologically hazardous areas near streams or rivers engaged in protecting and restoring stream substrates?

Monitoring Data that will be used to answer the management questions: Habitat Status and Trends Monitoring; Implementation Monitoring. (See, Chapters One and Two, Volume II)

Indicator(s): (1) Status and trends in water turbidity; (2) Status and trends in soil erosion; (3) Number of permits issued in geologically hazardous areas and riparian areas by federal, state, tribal and local governments.

Data Collection: On the ground data collection to assess streambank stability/erosion and water turbidity (using turbidity meters or turbidity tubes) to measure percent fines at pool tail crests; Results from watershed surveys about key stakeholder participation.

Reporting System: Varies. Annual reporting using local government supporting data; Annual Habitat Status and Trends Monitoring for some populations within each MGP. (See Chapter Two(B), Volume II for cycle details).

Benchmark 2A – PRIMARY LIMITING FACTORS

Sub-Factor 2A.1.5 – Habitat: Water Quantity/Stream Flow

Scale: **Population**

Overall Policy Question: *Has stream flow improved to the point where it no longer limits the attainment of a population's viability as set forth in the VSP criteria?*

Comment: This benchmark considers the impact of inadequate flows, scouring flows, or changes to the hydrograph to the point that it inhibits development and survival of salmonids.

Management Question associated with this sub-factor:

Technical Questions

- What is the effect of existing or threatened degraded stream flow or hydrologic conditions on the observed abundance, productivity, diversity and distribution of natural-origin fish in this population?
- If there are observed habitat-related effects, what is the significance of those effects for the viability of this population? Do these effects inhibit the population from achieving VSP?
- Does the status of other listing factors modify the absolute risk posed by the current and potential future status of this listing factor?

Policy Questions

- Have measures been implemented to protect and restore instream flows as described in a watershed chapter of the Recovery Plan?
- Do existing or potential water withdrawals or interruptions to the hydrologic regime in a watershed threaten stream flows or the hydrologic regime necessary for natural-origin fish to achieve VSP criteria?
- What is the effect of existing regulations and incentive programs on instream flows and the hydrologic regime?
- Are federal, state, local, and tribal governments and private NGOs, businesses, farmers or individuals that may have legal authority over water withdrawals or changes in land use engaged in protecting and restoring stream flows?

Monitoring Data that will be used to answer the management questions: Habitat Status and Trends Monitoring; Implementation Monitoring. (See, Chapters One and Two, Volume II)

Indicator(s):

Hydrograph; water withdrawal/consumption rates; total impervious area (TIA).

Data Collection:

(1) Landsat analysis of changes in road crossings and TIA; (2) GIS analysis of roads, land conversions and changes in TIA; (3) On the ground data collection to verify and calibrate remote data; (4) On the ground data collection to gauge stream flows, hydrology and measure water temperature; and (5) Results from watershed surveys regarding engagement of stakeholders; (6) Groundwater withdrawals; Water rights allocation and use decisions.

Reporting System: Varies. Annual reporting using local government supporting data; Annual Habitat Status and Trends Monitoring for some populations within each MGP. (See Chapter Two(B), Volume II for cycle details).

Benchmark 2A – PRIMARY LIMITING FACTORS

Sub-Factor 2A.1.6– Habitat: Water Quality

Scale: **Population**

Overall Policy Questions: *Has water quality improved to the point where it no longer limits the attainment of a population’s viability as set forth in the VSP criteria?*

Comment: This benchmark considers the impact of degraded or impaired water quality due to abnormal temperatures or levels of suspended fine sediment, dissolved oxygen, nutrients, heavy metals, pesticides, herbicides and other contaminants (toxics).

Management Question associated with this Sub-Factor:

Technical Questions

- What is the effect of existing or threatened degraded water quality on the observed abundance, productivity, diversity and distribution of natural-origin fish in this population?
- If there are observed habitat-related effects, what is the significance of those effects for the viability of this population? Do these effects inhibit the population from achieving VSP?
- Does the status of other listing factors modify the absolute risk posed by the current and potential future status of this listing factor?

Policy Questions

- Have measures been implemented to protect and restore water quality as described in the regional chapters of the Recovery Plan?
- Have measures been implemented to protect and restore water quality as described in a watershed chapter of the Recovery Plan?
- Do existing or potential land use activities threaten interruptions to the hydrologic regime in a watershed or threaten water quality?
- What is the effect of existing regulations and incentive programs on water quality and the hydrologic regime?
- Are federal, state, local, and tribal governments and private NGOs, businesses, farmers or individuals that may have legal authority over water withdrawals or changes in land use engaged in protecting and restoring stream flows?

Monitoring Data that will be used to answer the management questions: Habitat Status and Trends Monitoring; Implementation Monitoring. (See, Chapters One and Two, Volume II)

Indicator(s): Trends in water quality standards, as judged against surface water quality standards adopted by the Washington State Department of Ecology in WAC 173-201A et seq.; Surveys by watersheds on the engagement of key stakeholders.

Data Collection: On the ground data collection to assess surface water quality parameters; Results from Surveys by watersheds about key stakeholder involvement.

Reporting System: Varies. Annual reporting using local government supporting data; Annual Habitat Status and Trends Monitoring for some populations within each MGP. (See Chapter Two(B), Volume II for cycle details).

Benchmark 2A – PRIMARY LIMITING FACTORS

Sub-Factor 2A.1.7 – Habitat: Fish Passage

Scale: **Population**

Overall Policy Questions: *Have blockages to fish passage been diminished or removed to the point where they no longer limit the attainment of a populations viability as set forth in the VSP criteria?*

Comment: This benchmark considers the total or partial human-caused blockage to previously accessible habitat that eliminates or decreases migration ability or alters the range of

conditions under which migration is possible. This may include seasonal or periodic total migration blockage. This category also includes entrainment in irrigation diversions.

Management Question associated with this Sub-Factor:

Technical Questions

- What is the effect of existing or threatened fish passage conditions on the observed abundance, productivity, diversity and distribution of natural-origin fish in this population?
- If there are observed habitat-related effects, what is the significance of those effects for the viability of this population? Do these effects inhibit the population from achieving VSP?
- Does the status of other listing factors modify the absolute risk posed by the current and potential future status of this listing factor?

Policy Questions

- Have measures been implemented to protect and restore fish passage as described in the regional chapters of the Recovery Plan?
- Have measures been implemented to protect and restore fish passage as described in a watershed chapter of the Recovery Plan?
- Do existing or potential land use activities threaten fish passage?
- What is the effect of existing regulations and incentive programs on fish passage?
- Are federal, state, local, and tribal governments and private NGOs, businesses, farmers or individuals that may have legal authority over activities that may impact fish passage or changes in land use engaged in protecting and restoring fish passage?

Monitoring Data that will be used to answer the management questions: Habitat Status and Trends Monitoring; Implementation Monitoring. (See, Chapters One and Two, Volume II)

Indicator: Miles of newly inhabited spawning grounds; Watershed surveys relating to the engagement of key stakeholders.

Data Collection:

- (1) On the ground data collection to verify fish presence at ground sites;
- (2) On the ground verification of barrier removal; Use of local, state, federal or tribal fish barrier inventories;
- (3) Survey results from watersheds regarding stakeholder involvement.

Reporting System: Varies. Annual Implementation Monitoring; Annual reporting using local government supporting data; Annual Habitat Status and Trends Monitoring for some populations within each MGP. (See Chapters One and Two(B), Volume II for cycle details).

Benchmark 2A – PRIMARY LIMITING FACTORS

Sub-Factor 2A.1.7 – Habitat: Nearshore and Marine Areas

Scale: Population

Overall Policy Question: *Has the loss or degradation of nearshore marine habitat been diminished to the point where it no longer limits the attainment of a populations viability as set forth in the VSP criteria?*

Comment: This benchmark considers loss and degradation of nearshore marine habitat such as the disruption or loss of drift cell processes that create and maintain nearshore habitat features such as spits, lagoons, bays and beaches, or oceanographic water transport processes (freshwater, tidal, wave and physio-chemical properties); toxic contaminants; altered juvenile salmon migratory paths; disrupted eelgrass and kelp beds.

Management Question that must be answered to support the decision:

- What is the effect of existing or threatened loss or degradation nearshore marine habitat on the observed abundance, productivity, diversity and distribution of natural-origin fish in this population?
- If there are observed habitat-related effects, what is the significance of those effects for the viability of this population? Do these effects inhibit the population from achieving VSP?
- Does the status of other listing factors modify the absolute risk posed by the current and potential future status of this listing factor?

Monitoring Data that will be used to answer the management questions: The design of an appropriate monitoring for the existence or potential for a loss of nearshore marine habitat has not yet been accomplished. Further work is needed to develop this part of the MAMA assessment framework. It is proposed that the Partnership support the creation of a nearshore monitoring sample design to be completed by the end of 2008 for inclusion in this Plan. Currently the Skagit Estuary Intensely Monitored Watershed (IMW) program is ongoing and will provide some information about the estuarine environment, as it relates to the nearshore.

Indicator(s): Unknown at this time. Need additional scientific research to determine.

Data Collection: Unknown at this time. Need additional scientific research to determine.

Reporting System: TBD

Benchmark 2A – PRIMARY LIMITING FACTORS

Sub-Factor 2A.1.8 – Habitat: Estuarine Areas

Scale: Population

Overall Policy Question: *Has the loss or degradation of estuarine habitat been diminished to the point where it no longer limits the attainment of a population's viability as set forth in the VSP criteria?*

Comment: This benchmark considers loss or degradation of estuarine habitat processes such as fluvial process inputs (including water, LWD, and sediment supply, transport and deposition) that help create and maintain estuarine habitat features such as distributary and dendritic channels, mudflats, and emergent marshes; physio-chemical processes that also help create and maintain estuarine habitat features such as salinity gradients and turbidity maxima; and water transport processes (freshwater, tidal and wave).

Management Question associated with this Sub-Factor:

Technical Questions

- What is the effect of existing or threatened loss or degradation estuarine habitat on the observed abundance, productivity, diversity and distribution of natural-origin fish in this population?
- If there are observed habitat-related effects, what is the significance of those effects for the viability of this population? Do these effects inhibit the population from achieving VSP?
- Does the status of other listing factors modify the absolute risk posed by the current and potential future status of this listing factor?

Policy Questions

- Have measures been implemented to protect and restore estuarine habitat as described in the regional chapters of the Recovery Plan?
- Have measures been implemented to protect and restore estuarine habitat as described in a watershed chapter of the Recovery Plan?
- Do existing or potential land use activities estuarine habitat?
- What is the effect of existing regulations and incentive programs on estuarine habitat?
- Are federal, state, local, and tribal governments and private NGOs, businesses, farmers or individuals that may have legal authority over activities that may impact estuarine habitat or changes in land use engaged in protecting and restoring estuaries?

Monitoring Data that will be used to answer the management questions: Habitat Status and Trends Monitoring; Implementation Monitoring. (See, Chapters One and Two, Volume II)

Indicator(s): Trends in riparian vegetation; Trends in land use; Miles of properly functioning estuarine habitat; Watershed surveys re: the engagement of key stakeholders.

Data Collection:

- (1) Landsat analysis of mainstem rivers and estuaries.
- (2) GIS/aerial photography of roads, landslides, dikes and levees, and land conversions, land cover.
- (3) On the ground data collection to verify and calibrate remote data.
- (4) On the ground data collection of riparian vegetation, macroinvertebrates.
- (5) Supporting documentation from local governments and/or CTED:
 - GMA Buildable Lands Reports;
 - Annual summary reports of building permits issued and land divisions approved;
 - Maps and other documents showing changes in GMA land use designations/zoning;
 - Six-Year Transportation Improvement Plans
- (6) Survey Results from watersheds re: key stakeholders

Reporting System: Varies. Annual Implementation Monitoring; Annual reporting using local government supporting data; Annual Habitat Status and Trends Monitoring for some populations within each MGP. (See Chapters One and Two(B), Volume II for cycle details).

Benchmark 2A – PRIMARY LISTING FACTORS

Factor 2A.2: Hydropower

Scale: Population

Overall Policy Questions: *Have hydropower-related threats have been ameliorated such that they do not limit attainment of the desired status of the populations relative to population-specific viability criteria identified in the recovery plan?*

Comment: This benchmark considers the effects of hydroelectric dams on VSP.

Management Question associated with this Factor:

- What is the effect hydroelectric dams on the observed abundance, productivity, diversity, and distribution of the natural-origin fish in this population?
- What is the effect hydropower-related fish passage impairment on this population's attainment of VSP?
- What is the effect of upstream and downstream habitat modification of each dam (including water quantity, quality, etc.) on this population's attainment of VSP?
- How do hydropower-related effects on viability parameters of natural-origin fish relate to viability criteria stated in the recovery plan?
- Does the status of the *other* listing factors modify the absolute risk posed by the current and potential future status of *this* listing factor?

Monitoring Data that will be used to answer the management questions: Habitat Status and Trends Monitoring; Implementation Monitoring. (See, Chapters One and Two, Volume II)

Indicator(s):

- Egg-smolt survival for mainstem spawners;
- Juvenile migration survival rates;
- Juvenile travel time (via barge or in-river)
- Upstream migrating adult survival rates;
- Downstream migrating adult survival rates.
- Miles of historic habitat now inaccessible upstream of dams
- Miles or Quantity of spawning habitat inundated by dams or operations
- Percentage of total dams not subject to protective measures (e.g. spill operations)

Data Collection: Fish In-Fish Out (See Volume II)

Reporting System: Varies. Annual Implementation Monitoring; Annual reporting using local government supporting data; Annual Habitat Status and Trends Monitoring for some populations within each MGP. (See Chapters One and Two(B), Volume II for cycle details).

Benchmark 2A – PRIMARY LISTING FACTORS

Factor 2A.3: Harvest

Scale: Population

Overall Policy Question: *Have harvest-related threats been diminished such that they do not, and will not, limit attainment of the desired status of all populations relative to population-specific viability criteria stated in the recovery plan?*

Management Questions associated with this Factor:

- What is the effect of harvest, expressed in terms of current total fishery exploitation rate, on the observed abundance, productivity and escapement, spatial distribution, and diversity of the natural-origin fish in this population?
- If there are harvest-related impacts on observed abundance, productivity, diversity or distribution of the natural-origin fish, what is the significance of these effects for the viability of the population?
- Does the status of the *other* listing factors modify the absolute risk posed by the current and potential future status of *this* listing factor?

Monitoring Data that will be used to answer the management questions: The existence or potential effect of harvest on natural-origin fish VSP will be monitored using

Indicator(s):

- Total fishery escapement and the abundance of spawners;
- Recruits per spawner

Data Collection: Fish In-Fish Out (see Volume II)

Reporting System: The reporting of data relative to harvest will be done according to the schedule set forth in Chapter Two(C), Volume II.

Benchmark 2A – PRIMARY LISTING FACTORS

Factor 2A.4: Disease and Predation

Scale: Population

Overall Policy Question: *Have disease and predation-related threats been diminished such that they do not, and will not, limit attainment of the desired status of populations relative to viability criteria?*

Comment: This benchmark assesses the affects of disease and predation by other species on Chinook Salmon viability.

Management Questions associated with this Factor:

- What is the effect of disease on the observed abundance, productivity, spatial distribution, or diversity (including timing) of the natural-origin fish in this population?
- What is the effect of predation on the observed abundance, productivity, spatial distribution, or diversity (including timing) of the natural-origin fish in this population? Evaluate as to all 3 predator groups:
 - Avian predators (e.g., cormorants and terns)
 - Marine mammals (e.g., pinnipeds, orcas)
 - Piscine predators (e.g., northern pikeminnow, bass)

- If there are disease or predation-related impacts on observed abundance, productivity, distribution, or diversity of the natural-origin fish, what is the significance of these effects for the population's ability to achieve viability objectives?
- Does/will the observed disease-related reduction in fitness limit the population's capability to achieve its viability criteria?
- Does/will the predation rate on the population inhibit the population from achieving its viability criteria? Evaluate as to all 3 predator groups:
 - Avian predators (e.g., cormorants and terns)
 - Marine mammals (e.g., pinnipeds, orcas)
 - Piscine predators (e.g., northern pikeminnow, bass)
- Does the status of the *other* listing factors modify the absolute risk posed by the current and potential future status of *this* listing factor?

Monitoring Data that will be used to answer the management questions: [NOAA NEEDS TO PROVIDE] The existence or potential effects of disease and predation on natural-origin fish VSP will be monitored using the indicators and techniques more fully described in Chapter Two (D), Volume II.

Indicator(s):

- Estimated reduction in fitness of exposed individuals;
- Estimated mortality in populations
- Change in predator and prey population size and structure

Data Collection: Fish In-Fish Out (see Volume II)

Reporting System: The reporting of data relative to disease and predation will be done according to the schedule set forth in Volume II. [NOAA NEEDS TO PROVIDE]

Benchmark 2A – PRIMARY LISTING FACTORS

Factor 2A.5 Inadequacy of existing regulatory mechanisms

Scale: Population

Overall Policy Question: *Have the inadequacies of existing regulatory mechanisms have been addressed such that regulatory mechanisms do not, and likely will not, limit attainment of the desired status of populations relative to viability criteria stated in the recovery plan?*

Comment: This benchmark examines a number of listing factors and asks whether regulatory mechanisms are being used to reduce the most significant risks under each factor.

Note: Many of the management questions raised in this section are directly related to the management questions presented within many of the sub-factors for Habitat. This section is presented as a stand-alone Factor because it is listed within the NOAA Listing Framework as a separate limiting factor.

Management Questions that must be answered in order to support the decision:

1. What is the effect of federal, state, tribal, or local regulatory mechanisms on the status of the limiting factors associated with listing factors 1, 2, 3 and 5?

Habitat

- What were the most significant habitat-related factors limiting the population from achieving recovery plan objectives?
- Has the region developed a method of evaluating the effectiveness of protective regulations which was started through the San Juan Initiative pilot project?
- Has the effectiveness evaluation been applied to all watersheds within the ESU?
- What is the status and change in status of the most significant limiting factors relative to habitat?
- Are the risks to desired population status from those limiting factors still present?
- What regulatory mechanisms are in place to maintain the reduced risk or further reduce the risk of those limiting factors to desired population status in the future and how effective are they?

Hydropower

- What were the most significant hydropower-related factors limiting the population from achieving recovery plan objectives?
- What is the status and change in status of those limiting factors?
- Are the risks to desired population status from those limiting factors still present?
- What regulatory mechanisms are in place to reduce the risk of those limiting factors to desired population status in the future and how effective are they?

Harvest

- What were the most significant harvest-related factors limiting the population from achieving recovery plan objectives?
- What is the status and change in status of those limiting factors?
- Are the risks to desired population status from those limiting factors still present?
- What regulatory mechanisms are in place to reduce the risk of those limiting factors to desired population status in the future and how effective are they?

Disease and Predation

- What were the most significant disease-related and predation-related factors limiting the population from achieving recovery plan objectives?
- What is the status and change in status of those limiting factors?
- Are the risks to desired population status from those limiting factors still present?
- What regulatory mechanisms are in place to reduce the risk of those limiting factors to desired population status in the future and how effective are they?

Hatcheries

- What were the most significant hatchery-related factors limiting the population from achieving recovery plan objectives?
- What is the status and change in status of those limiting factors?
- Are the risks to desired population status from those limiting factors still present?

- What regulatory mechanisms are in place to reduce the risk of those limiting factors to desired population status in the future and how effective are they?

2. Are the regulatory mechanisms adequate? That is, is the status (effectiveness, geographical scope and certainty of implementation) or change in status of regulatory mechanism(s) addressing the limiting factors such that those limiting factors will not pose a significant threat in the future to the maintenance of the population at viability levels identified in the recovery plan?

- Habitat
- Hydropower
- Harvest
- Disease and Predation
- Hatcheries

3. If not, is the Recovery Council, Watershed or others in the region taking steps to amend, repeal or add new regulations to address the most significant limiting factors?

4. Is the significance of the combined effect of all listing factors on the population's achievement of specific viability criteria or goals established in the recovery plan affected by the cumulative effect of the other listing factors?

Monitoring Data that will be used to answer the management questions: The effectiveness and significance of regulation as a tool to reduce the effects of listing factor threats to natural-origin fish VSP will be monitored using the indicators and techniques more fully described in Volume II.

Indicator(s): Results of effectiveness monitoring studies. [[?? Not sure how to handle this one]

- Habitat – effectiveness monitoring? Requires completion of SJI, etc.
- Hydropower
- Harvest
- Disease and Predation
- Hatcheries

Data Collection: TBD

Reporting System: [TBD—Need policy input from broader group: Annually? Every 5 years?]

Benchmark 2A – PRIMARY LISTING FACTORS

Factor 2A.6 Natural Factors - Ocean Conditions & Climate Change

Scale: **Population**

Overall Policy Question: *Have other natural factors been accounted for such that they do not limit attainment of the desired status of populations relative to viability criteria identified in the recovery plan?*

Comment: This benchmark measures other natural factors that effect salmon VSP, including but not limited to ecosystem interactions, ocean conditions, global climate change, and catastrophic events. Other manmade factors include, but are not limited to, various effects of hatchery operations and inter-specific and intra-specific forms of competition.

Management Questions associated with this sub-factor:

1. What is the current and potential future effect of other natural factors on the observed abundance, productivity, spatial distribution, and diversity of the natural-origin fish in this population?

- What is the current and potential future effect of ecosystem interactions on the population's viability attributes?
- What is the current and potential future effect of ocean conditions?
- What is the current and potential future effect of climate change?
- What is the current and potential future effect of any likely future catastrophic event?
- What is the current and potential future effect of changes in the distribution or intensity of competition? (For simplicity, this includes competitive interactions from invasive species regardless of the mechanisms by which they were introduced.)

2. If natural factors affect observed abundance, productivity, distribution, or diversity of the natural-origin fish, what is the significance of those effects for the viability of the population?

- Does/will the effect of ecosystem interactions inhibit the population from achieving viability criteria established in the recovery plan? (Does the actual risk [probability of occurrence, magnitude of effect] warrant consideration in the recovery plan?)
- Does/will the effect of climate change inhibit the population from achieving viability criteria established in the recovery plan?
- Does/will the effect of ocean conditions inhibit the population from achieving viability criteria established in the recovery plan?
- Does/will the effect of catastrophic events inhibit the population from achieving viability criteria established in the recovery plan?
- Does/will the effect of current competitive interactions inhibit the population from achieving viability criteria established in the recovery plan?

Monitoring Data that will be used to answer the management questions: [NOAA needs to provide this information for completion of the final draft].

Reporting System: [NOAA to provide]

Benchmark 2A – PRIMARY LISTING FACTORS

Factor 2A.7 Hatcheries

Scale: **Population**

Overall Policy Question: *Have hatchery-related threats have been ameliorated such that they do not, and will not, limit attainment of the desired status of populations relative to viability criteria stated in the Recovery Plan?*

Management questions associated with this factor:

1. What is the effect of hatchery operations on the observed abundance, productivity, distribution, or diversity of the natural-origin fish in this population?

- What is the effect of broodstock collection on the population's abundance and productivity?
- What is the effect of genetic introgression/residualism on the population's diversity?
- What is the effect of domestication on the population's diversity?
- What is the effect of hatchery-related disease on the abundance, productivity, distribution or diversity of the population?
- What is the effect of hatchery-related competition/density-dependent effects on the abundance, productivity and distribution of the population?
- What is the effect of hatchery-related changes to predation rates on the abundance, productivity, distribution, and diversity of the population?
- What is the effect of hatchery-related changes to ecosystem nutrient dynamics on the abundance, productivity and distribution of the population?
- What is the effect of hatchery spawning times on the diversity of the population?

2. If there are hatchery-related impacts on observed VSP criteria of natural-origin fish, what is the significance of these effects? Do they decrease the population's ability to achieve viability criteria stated in the recovery plan or increase the risk to the population?

- Broodstock collection effect
- Genetic introgression/residualism
- Domestication selection on hatchery fish
- Hatchery-related disease
- Hatchery-related competition/density-dependent effects
- Hatchery-related changes to predation rates
- Hatchery-related changes to ecosystem nutrient dynamics
- Hatchery practice-induced changes in morphology and life history of hatchery fish

3. Is the significance of the effect of hatcheries on the population's achievement of viability criteria stated in the recovery plan affected by the cumulative effect of the other listing factors?

Monitoring Data that will be used to answer the management questions:

[NEED DFW OR NOAA TO PROVIDE]

Reporting System: [Awaiting NOAA/Co-Manager Information]

Benchmark 2B - Are the primary factors limiting the status of the ESU increasing or decreasing?

Benchmark 2B – PRIMARY LISTING FACTORS

Scale: **ESU-wide**

Overall Policy Question: *Have the primary limiting factors been addressed such that threats to the ESU have been diminished to such an extent that they no longer pose a threat to the continued existence of the ESU?*

Comment: The benchmarks in this section set forth the decisions and information needed to assess the status of the primary limiting factors, including any factors identified subsequent to listing. Populations may be exposed to different risks within a single MPG. The level of risk acceptable across populations within an MPG may vary. In contrast to the viability assessment, the NOAA *Listing Status Decision Framework* does not rely on explicit criteria when considering the MPG scale, but steps down directly from the ESU to the individual population, when possible. This Plan follows that same approach and examines each limiting factor at the population and ESU scales.

Management Questions to be answered that support the decision:

- Is the ESU achieving or clearly trending toward a low-risk status in response to actions that have been implemented to diminish those factors limiting achievement of ESU viability criteria?
- Is there an effect of the listing factor on any of the viability parameters of natural origin fish, and if so, what is the *magnitude* of that effect?
- If there are effects of the listing factor on viability parameters of natural-origin fish, what is the *significance* of those effects for the viability of the population?

Monitoring Data that will be used to answer the management questions:

All monitoring types (implementation, status and trends, effectiveness monitoring). See Volume II for more details.

Reporting Cycle: A review of the status of the combined threats present for all MPGs within the ESU based on the NOAA limiting factors will be conducted by December 31, 2012, and repeated every five years.

Benchmark 3 – Outreach and Education

Scale: **ESU**

Overall Policy Question: *Do the watershed planning groups have the strategies and resources necessary to conduct outreach and education to elected leaders and citizens about salmon recovery work such that it sustains and increases the support for and funding Recovery Plan implementation?*

Comment: This benchmark assesses whether key actions are being taken and whether adequate resources have been provided to each watershed to ensure that support for salmon recovery is sustaining and growing over time.

Management Questions associated with this benchmark:

- Has each watershed identified key leaders and elected officials within the community who have the ability to influence (positively or negatively) support to salmon recovery?
- Has each watershed created an outreach and education plan to those key leaders and elected officials?
- Has each watershed identified the funding and other support necessary to carry out the work?
- Has the Recovery Council identified the regional need necessary to carry out this work and created strategies to provide watersheds with the support necessary to carry out this work?
- Has the Recovery Council and/or Puget Sound Partnership implemented regional strategies to provide watersheds with the support necessary to carry out this work?

Monitoring Data that will be used to answer the management questions: Implementation monitoring and effectiveness monitoring (See Chapters One and Three, Volume II for more details).

Indicator(s):

- Copies of outreach and education program strategies from each watersheds, including a statement of financial need or other support required.
- Copy of Recovery Council’s regional outreach and education program funding and support strategy.
- Results of watershed surveys showing increasing support from key leaders and the public for salmon recovery work.
- Increased funding received for salmon recovery implementation work from local, state, tribal, federal governments or other NGO sources.
- Increased staff or other in-kind support for salmon recovery implementation work from local, state, federal governments or other NGO sources.

Reporting System: Annual reporting to the Recovery Council and Watersheds Leads.

Benchmark #4 – Capacity of Watersheds and the Region

Scale: **ESU**

Overall Policy Question: *Do the watershed planning groups have the resources necessary to fully implement priorities strategies in the Recovery Plan?*

Comment: This benchmark assesses whether key actions are being taken and whether adequate resources have been provided to each watershed to ensure that each planning group has the resources (staffing, expertise, funding, support) necessary to carry out the work of salmon recovery in an efficient and effective manner?

Management Questions associated with this Benchmark:

- Has each watershed identified the staffing, expertise, funding and support necessary to carry out the work?
- Has each watershed identified strategies and actions that it can take to achieve the resources needed to carry out the work?
- Has the Recovery Council identified the regional capacity needed to ensure that salmon recovery work is implemented as efficiently and effectively as possible?
- Has the Recovery Council and/or Puget Sound Partnership created and implemented regional strategies to assist watersheds in achieving the resources needed to carry out the work?

Monitoring Data that will be used to answer the management questions: Implementation monitoring and effectiveness monitoring (See Chapters One and Three, Volume II for more details).

Indicator(s):

- Statement of the resources needed from each watershed to fully implement salmon recovery strategies and actions by 2012 by June 30, 2008.
- Statement of the resources needed by the region to fully implement salmon recovery strategies and actions by 2012 by July 31, 2008.
- Regional strategic plan to achieve resources needed for salmon recovery by August 31, 2008.
- **XX percent** increase in watershed resources and capacity by **[end of 2008 session?]** to achieve 2012 targets.

Reporting System: Annual reporting to the Recovery Council and Watersheds Leads.

Benchmark #5 – Integration of Harvest, Hatcheries & Habitat Strategies

Scale: **Population**

Overall Policy Question: *Have all of the strategies and actions for populations been fully integrated across habitat, harvest and hatcheries such that they do not conflict and are sequenced to maximize the benefits for salmon recovery?*

Comment: “H-Integration” refers to the coordinated combination of actions among all management sections—harvest, hatchery, and habitat (inclusive of hydropower)—that together work to achieve the goal of recovering self-sustaining, harvestable salmon runs. The process of H-integration is the process of achieving a balance between the most ecologically efficient ways of recovering salmon populations and fairness to different groups that rely on salmon or their habitats so that the balance achieves the recovery goals. This is important because strategies that emphasize only fairness achieve political solutions at the expense of salmon. Likewise, strategies that emphasize only ecological efficiency often fail to succeed because they have no political support. In practical terms, H-integration refers to developing coordinated actions that consider the timing, location, sequence, and magnitude of recovery actions that work together rather than in opposition.

Management Questions that must be answered in order to support the decision:

- Does the watershed/ESU have a comprehensive group of decision makers and stakeholders who have the authority and power to implement changes in management to benefit salmon and who are working together?
- Do participants have common goals that reflect salmon recovery needs and community values? Are community values changing and how will that affect salmon recovery?
- Do we have an agreed-to a process to examine, evaluate, and choose between suites of complementary actions that will achieve outcomes that acknowledges participants needs, incorporate their rights, and uses their ability to implement change.
- Do participants have and use a set of analytical tools to gain a common understanding of how H-sectors actions interact to affect salmon? Do the tools allow participants to examine suites of actions sequentially, in different locations, and at different levels of magnitude?
- Do participants adjust their actions plans based on new information?

Monitoring Data that will be used to answer management questions: Implementation Monitoring, Status and Trends Monitoring, Effectiveness Monitoring (See Chapters One, Two and Three in Volume II for more details).

Reporting System: Annual reporting to the Recovery Council.

Benchmark #6 – Funding Necessary to Implement the Recovery Plan **Scale: ESU**

Overall Policy Question: *Is sufficient funding available to meet recovery plan commitments and stay on track towards recovery?*

Comment: This benchmark assesses two important factors regarding funding of the recovery plan: (1) whether entities that committed to responsibilities in the plan have the funding needed to execute their commitments, and (2) whether the committed funding is sufficient to meet recovery goals and milestones.

Management Questions that must be answered in order to support the decision:

- Has each of the key local government participants (particularly the major cities and urban counties) supported the budgeting of locally generated matching funds needed to meet funding targets?
- Has each watershed supported the consideration of and commitment to salmon funding needs in local, state and federal budget processes?
- Have the Recovery Council and relevant state agencies supported the consideration of and commitment to salmon funding needs in state and federal budget processes?
- Have the Washington Legislature and the US Congress appropriated the funding necessary to support recovery plan goals and milestones?

Monitoring Data:

Indicator(s):

- Statement of the funding needed from each participating jurisdiction to support watershed goals and milestones, to be produced by each Puget Sound watershed by May 31, 2008 and each May 31 in following years.
- Funding plan for the next fiscal year, including state and federal funding requirements, to be produced by each Puget Sound watershed by June 30, 2008 and each June 30 in following years.
- Recovery Council approval of a coordinated Puget Sound state and federal funding request and sufficient funding to support the request by July 31, 2008 and each July 31 in following years.
- Annual local, state, and federal appropriations approved by April 30, 2009 and every April 30 in following years.
- Doubling of total funding for recovery plan implementation by 2012.

Monitoring Data that will be used to answer the management questions: Implementation monitoring. See Chapter One, Volume II for more information).

Reporting System: Annual reporting to the Recovery Council and Watersheds Leads.

CHAPTER THREE

GLOSSARY OF TERMS

Action

A specific program, project, or change in behavior intended to achieve one or more outcomes. As used in this MAMA Plan, actions are the means through which recovery strategies are carried out.

Abundance - Abundance is the number of individuals comprising a population or a component of the population, at a given life stage. Abundance may be expressed as brood year escapement (spawners of all ages that survive from one brood year) or return year escapement (the individuals maturing and returning to spawn in a single year). Abundance goals are expressed as numeric life stage targets reflective of the capacity of the associated ecosystem.

Adult Equivalent (AEQ) - The adjustment of fishing mortality to account for the potential contribution of fish of a given age to the spawning escapement, in the absence of fishing. Because not all unharvested fish will survive to contribute to spawning escapement, a two-year old chinook has a lower probability of surviving to spawn, in the absence of fishing, than does a five-year-old.

Benchmark

An intermediate target to measure progress, after a given period of action implementation, using a certain indicator. A reference point or standard against which to compare performance or achievements. A benchmark must reflect an understanding of what is possible to achieve from a certain type of action over a certain timeframe.

Biogeographical region -

Catch Ceiling - A fishery catch limitation expressed in numbers of fish. A ceiling fishery is managed so as not to exceed the ceiling. A ceiling is not an entitlement. (See also, catch quota).

Catch Quota - A fishery catch allocation expressed in numbers of fish. A quota fishery is managed to catch the quota; actual catch may be slightly above or below the quota. (See also, catch ceiling).

Cohort Analysis - Reconstruction of the abundance of a population or management unit prior to the occurrence of any fishing mortality. The calculation sums spawning escapement, fisheries related mortality, and adult natural mortality.

Cohort Size (initial) - The total number of fish of a given age and stock at the beginning of a particular year of life.

Coded-Wire Tag (CWT) - Microtags containing binary codes that are implanted in juvenile salmon prior to their release from hatcheries, which provide specific information about the age and origin of the fish upon sampling catch and escapement.

Critical uncertainties

Uncertain relationships, conditions or information related to the biological or ecological needs of Puget Sound Chinook salmon that must be known in order to ensure appropriate management decisions are being made to recover the species.

Depensation effect: The tendency for the population growth rate to decrease as the population abundance decreases below a certain, taxon-specific threshold. Depensatory effects heighten extinction risk.

Depensation Threshold: A rate below which the demographic and genetic behavior of any given population becomes highly uncertain. A species is endangered if it declines to a taxon-specific depensation threshold.

Diversity - Diversity is the measure of the heterogeneity of the population or the ESU, in terms of the life history, size, timing, and age structure. It is positively correlated with the complexity and connectivity of the habitat.

Drop-off Mortality - The fraction of salmon encountered by a particular gear type that "dropoff" before they are landed, and die from their injuries prior to harvest or spawning.

Effectiveness monitoring

Evaluating whether actions produced the hypothesized physical change (this document does not consider biological change part of effectiveness monitoring, see *validation monitoring*).

Escapement – Adult salmon that survive fisheries and natural mortality, and return to spawn.

Evaluation or Test Fishery - A fishery scheduled specifically to obtain technical or management information, e.g. run timing, abundance, and age composition.

Exploitation Rate (ER) - Total mortality in a fishery or aggregate of fisheries expressed as the proportion of the sum of total mortality plus escapement.

Extreme Terminal Fishery – A fishery in freshwater that is assumed to harvest fish from the local management unit.

Fishery – Harvest by a specific gear type in a specific geographical area during a specific period of time.

FRAM - The Fishery Regulation Assessment Model is a simulation model developed to estimate the impacts of Pacific Coast fisheries on chinook and coho stocks.

Gamma Distribution - The gamma distribution is member of the exponential family of distributions. Values of the gamma distribution are positive, ranging from zero to infinity, a property which makes it attractive for modeling variances. Shape and scale parameters describe the distribution.

Gene flow -

Goals - High-level statements about overall aims or purposes.

Harvest Rate (HR) - Total fishing mortality of a given stock expressed as a proportion of the total fish abundance available in a given fishing area at the start of a time period.

H or H-sector -

H-integration

The coordinated combination of actions among all the H-sectors — harvest, hatchery and habitat (inclusive of hydro) — that together work to achieve the goal of recovering self-sustaining, harvestable salmon runs.

Implementation monitoring

Evaluating whether agreed to actions were performed as promised.

Independent population -

Indicator - An aggregation and synthesis of related metrics

Intrinsic capacity - An estimate of the historical abundance/productivity of a specific population.

Intrinsic potential -

Landed Catch – Harvested fish that are taken aboard vessels or shore and retained by fishers. [see also **Nonlanded Mortality**]

Limiting factors

Low abundance threshold - A spawning escapement level, set intentionally above the point of biological instability, which triggers extraordinary fisheries conservation measures to minimize fishery related impacts and increase spawning escapement.

Major population group

Management Period – Based on information about migration timing, the management period is the time interval during which a given species or management unit may be targeted by fishing in a specified area. [see also **Management Unit**]

Management Unit - A stock or group of stocks that are aggregated for the purpose of achieving a management objective.

Maximum Sustainable Harvest (MSH) - The maximum number of fish of a management unit that can be harvested on a sustained basis, that will result in a spawning escapement level that optimizes productivity.

Metric - The condition or activity of interest that is actually measured or counted (see Verification and Accountability System section for link to definition source).

MSH Exploitation Rate (MSH) - The proportion of the stock abundance that could be harvested if long-term yield was to be maximized. The MSH exploitation rate is typically computed assuming stable stock productivity, although annual variability may occur.

Natural-origin

Natural Return Ratio (NRR) - The number of naturally produced fish that are born during a given brood year and subsequently return to spawn, divided by the total number of fish on the natural spawning grounds (including naturally spawning hatchery fish) in that brood year.

Non-landed Mortality – Fish not retained that are otherwise killed as a result of encountering fishing gear. It includes a proportion of sub-legal fish that are captured and released, hook-and line drop-off, and net drop-out mortality. [see **Landed Catch**]

Non-treaty Fisheries - All fisheries that are not treaty Indian fisheries. [see **Treaty Fisheries**]

North of Cape Falcon Forum– A pre-season, management planning process for fisheries in Washington and Oregon, consisting of two public meeting, which occur between the March and April Pacific Fishery Management Council meetings. These meetings provide for an opportunity for discussion, analysis and negotiation among management entities with authority over southern US fisheries

Objectives - Specific statements that describe elements of a goal in measurable terms and break the goals down into more specific pieces.

Parties - The State of Washington and 17 Puget Sound tribes comprise the parties to this plan.
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Performance measures-

Point of instability - that level of abundance (i.e., spawning escapement) that incurs substantial risk to genetic integrity, or exposes the population to depensatory mortality factors.

Pre-terminal Fishery- A fishery that harvests significant numbers of fish from more than one region of origin.

Productivity - Productivity is the ratio of the abundance of juvenile or adult progeny to the abundance of their parent spawners

Recruitment – Production, quantified at some life stage (e.g. smolts or sub-adults) from a single parent brood year.

Run Size - The number of adult fish in an allocation unit, management unit, stock or any aggregation thereof that is subject to harvest in a given management year.

Shaker Mortality - Nonlanded fishing mortality that results from releasing sub-legal fish, or non-target species. [see **Nonlanded Mortality**]

Southern US Non-Ceiling Index – The index compares the expected AEQ mortalities (assuming base period exploitation rates and current abundance) with the observed AEQ mortalities, by calendar year, over all non-ceiling fisheries in southern US. This index originates from the pass through provision of the Pacific Salmon Treaty.

Spatial structure -

Status monitoring - Characterizing the immediate condition of a specified metric. As used in this document status monitoring refers to the immediate condition of salmonid viability (in terms of abundance, distribution, spatial structure and ____), and/or a listing factor such as habitat, hydropower, hatcheries, ocean or climate conditions, or disease and predation.

Stock - a group of fish of the same species that spawns in a particular lake or stream (or portion thereof) at a particular season and which, to a substantial degree, does not interbreed with fish from any other group spawning in a different place or in the same place at a different season.

Strategy - Describes how we will achieve our salmon recovery goals and outcomes; includes the methods or approaches that set the path from current conditions to the desired future state, and guide the creation of actions.

Terminal Fishery - A fishery, usually operating in an area adjacent to or in the mouth of a river, which harvests primarily fish from the local region of origin, but may include more than one management unit. Non-local stocks may be present, particularly in marine terminal areas.

Treaty Fisheries - Fisheries authorized by tribes possessing rights to do so under the Stevens treaties (see also **Non-treaty Fisheries**).

Trend monitoring - Characterizing changes in conditions of a specified metric over time. In this document trend monitoring refers to the immediate condition of salmonid viability (in terms of abundance, distribution, spatial structure and diversity), and/or a listing factor such as habitat, hydropower, hatcheries, ocean or climate conditions, or disease and predation.

Tribes - Puget Sound treaty tribes that are parties to this Plan include the: Lummi, Nooksack, Swinomish, Upper Skagit, Sauk-Suiattle, Tulalip, Stillaguamish, Muckleshoot, Suquamish, Puyallup, Nisqually, Squaxin Island, Skokomish, Port Gamble S'Klallam, Jamestown S'Klallam, Lower Elwha Klallam, and Makah.

Trigger: A predetermined value of an indicator that helps to think about whether and when action is needed. Trigger points cause thought and/or action. Trigger points show what level of an indicator is acceptable, and what is not. Trigger points specified at the outset of evaluation provide a framework for future discussions and help avoid conflicts about when action is needed. Benchmarks and trigger values for indicators signal the need to re-evaluate strategies to ensure sufficient progress is made. Benchmarks and triggers reflect an expectation for the rate of progress over a specified timeframe.

Viable – In this plan, this term is applied to salmon populations that have a high probability of persistence (i.e. a low probability of extinction) due to threats from demographic variation, local environmental variation, or threats to genetic diversity. This meaning differs from that used in some conservation literature, in which viability is associated with healthy, recovered population status (see McElhany et al. 2000).