

ESA Recovery Planning for Salmon and Steelhead in the Willamette and Lower Columbia River Basins



Status of Planning Effort and Strategy for Completing Plans

December 2005



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Acronyms

ESA	U.S. Endangered Species Act
ESU	Evolutionarily Significant Unit
LCFRB	Lower Columbia Fish Recovery Board
NMFS	National Marine Fisheries Service
NPCC	Northwest Power and Conservation Council
ODFW	Oregon Department of Fish and Wildlife
TRT	Technical Recovery Team
USFWS	United States Fish and Wildlife Service
VSP	Viable Salmonid Population
WDFW	Washington Department of Fish and Wildlife
WLC	Willamette and Lower Columbia River Basins

Glossary

This glossary is provided to help new readers differentiate between a number of terms related to types of plans, goals, and spatial scales relevant to recovery planning for salmon and steelhead in the Willamette and Lower Columbia River Basins.

De-listing criteria (recovery criteria): Criteria incorporated into U.S. Endangered Species Act (ESA) recovery plans that, when met, would result in a determination that a species was no longer threatened or endangered and could be proposed for removal from the Federal list of threatened and endangered species.

ESA recovery plan: A plan to recover a species listed as threatened or endangered under the U.S. Endangered Species Act. Plans must, at a minimum, contain (1) site-specific management actions necessary to achieve the plan's goal; (2) objective, measurable criteria which, when met, would result in a determination that the species should be removed from the list [de-listing criteria]; and (3) estimates of the time required and cost to carry out the measures needed to achieve the plan's goal.

Evolutionarily significant unit (ESU): A group of Pacific salmon or steelhead trout that is (1) substantially reproductively isolated from other nonspecific units and (2) represents an important component of the evolutionary legacy of the species.

Independent population: Any collection of one or more local breeding units within an ESU whose population dynamics or extinction risk over a 100-year time period is not substantially altered by exchanges of individuals with other populations.

Interim regional recovery plan: A recovery plan that is intended to lead to an ESA recovery plan but that is not yet complete. These plans might address only a portion of an ESU or lack other key components of an ESA recovery plan. NMFS endorses use of these plans until final ESU plans are complete.

Limiting factor: Physical, biological, or chemical features (e.g., inadequate spawning habitat, high water temperature, insufficient prey resources) experienced by the fish at the population, intermediate (e.g., stratum or major population grouping), or ESU levels that result in reductions in viable salmonid population (VSP)

parameters (abundance, productivity, spatial structure, and diversity).

Limiting life stage: The salmonid life stage where the greatest impairment to viability occurs.

Locally developed recovery plan: A plan developed by state, tribal, regional, or local planning entities to address recovery of a species. These plans are being developed by a number of entities throughout the region to address Endangered Species Act as well as state, tribal, and local mandates and recovery needs.

Management unit: A portion of an ESA-listed species (ESU) that might require different management due to different threats in certain geographic areas or management by different state, tribal, or local entities.

Population bottlenecks: The most significant limiting factors currently impeding a population from reaching its desired status. Bottlenecks result in the greatest relative reductions in abundance, productivity, spatial distribution, or diversity and are defined by considering viability impairment across limiting life stages and limiting factors.

Recovery domain: An administrative unit for recovery planning defined by NMFS based on ESU boundaries, ecosystem boundaries, and existing local planning processes. Recovery domains may contain one or more listed ESUs. NMFS intends to develop one recovery plan that addresses all listed ESUs within a domain.

Recovery goals: Goals that may be incorporated into a locally developed recovery plan. These goals are consistent with ESA de-listing but may also be designed to go beyond de-listing to achieve other legislative mandates, treaty obligations, or cultural and social values.

Recovery plan supplement: A NMFS supplement to a locally developed recovery plan that describes how the plan addresses ESA requirements for recovery plans. The supplement

also proposes ESA de-listing criteria for the ESUs addressed by the plan, since a determination of these criteria is a NMFS decision.

Recovery scenarios: Scenarios that describe a target status for each population within an ESU, generally consistent with TRT recommendations for how many and which populations need to be at a particular status for the ESU to have an acceptably low risk of extinction.

Recovery strategies: Broad sets of actions that address limiting factors and threats and are intended to lead to achieving recovery goals or de-listing criteria.

Stakeholder team: Teams to be convened in the recovery planning process in Oregon. These teams will serve as planning forums for developing local recovery plans that also address ESA recovery planning needs.

Strata/major population groups: An aggregate of independent populations within an ESU that share similar genetic, ecological, and spatial characteristics.

Technical Recovery Team (TRT): Teams convened by NMFS to develop technical products related to recovery planning. TRTs are composed of scientists from NMFS and other agencies, tribes, academic institutions, and

private consultants. TRTs are complemented by planning forums unique to specific states, tribes, or regions, which use TRT and other technical products to identify recovery actions.

Threats: Human activities or natural events (e.g., road building, floodplain development, fish harvest, hatchery influences, volcanoes) that cause or contribute to limiting factors. Threats may be caused by the continuing results of past events and actions as well as by present and anticipated future events and actions.

Viability criteria: Criteria based on the VSP parameters of abundance, productivity, spatial structure and diversity that describe a viable salmonid population (an independent population with a negligible risk of extinction over a 100-year time frame) and that describe a general framework for how many and which populations within an ESU should be at a particular status for the ESU to have an acceptably low risk of extinction.

Viable salmonid population (VSP): an independent population of Pacific salmon or steelhead trout that has a negligible risk (generally ≤ 5 percent) of extinction over a 100-year time frame. Viability at the independent population scale is evaluated based on the parameters of abundance, productivity, spatial structure, and diversity.

Introduction

This document describes the status of efforts to develop a recovery plan for salmon and steelhead listed under the U.S. Endangered Species Act (ESA) in the Willamette and Lower Columbia river basins and lays out the strategy for completing recovery plans in 2006 and early 2007. Historically, the Willamette and Lower Columbia river basins supported abundant populations of salmon and steelhead trout. For many hundreds of years these fish were a thriving part of the ecology, culture, and commerce of these basins, of the entire Columbia River basin, and of the Pacific Northwest. In the past several hundred years, increasing human population in the region and associated development and resource use have caused significant ecosystem alterations. These alterations, occurring in the context of natural disturbances and climate cycles, have driven some of these salmon and steelhead populations to extinction and many others to a point where their persistence is in doubt.

Since 1998, Chinook, chum, and coho salmon and steelhead trout in the Willamette and Lower Columbia river basins have been listed as threatened under the ESA. The following six evolutionarily significant units (ESUs)¹ are now listed in the Willamette and Lower Columbia rivers (see map 1):

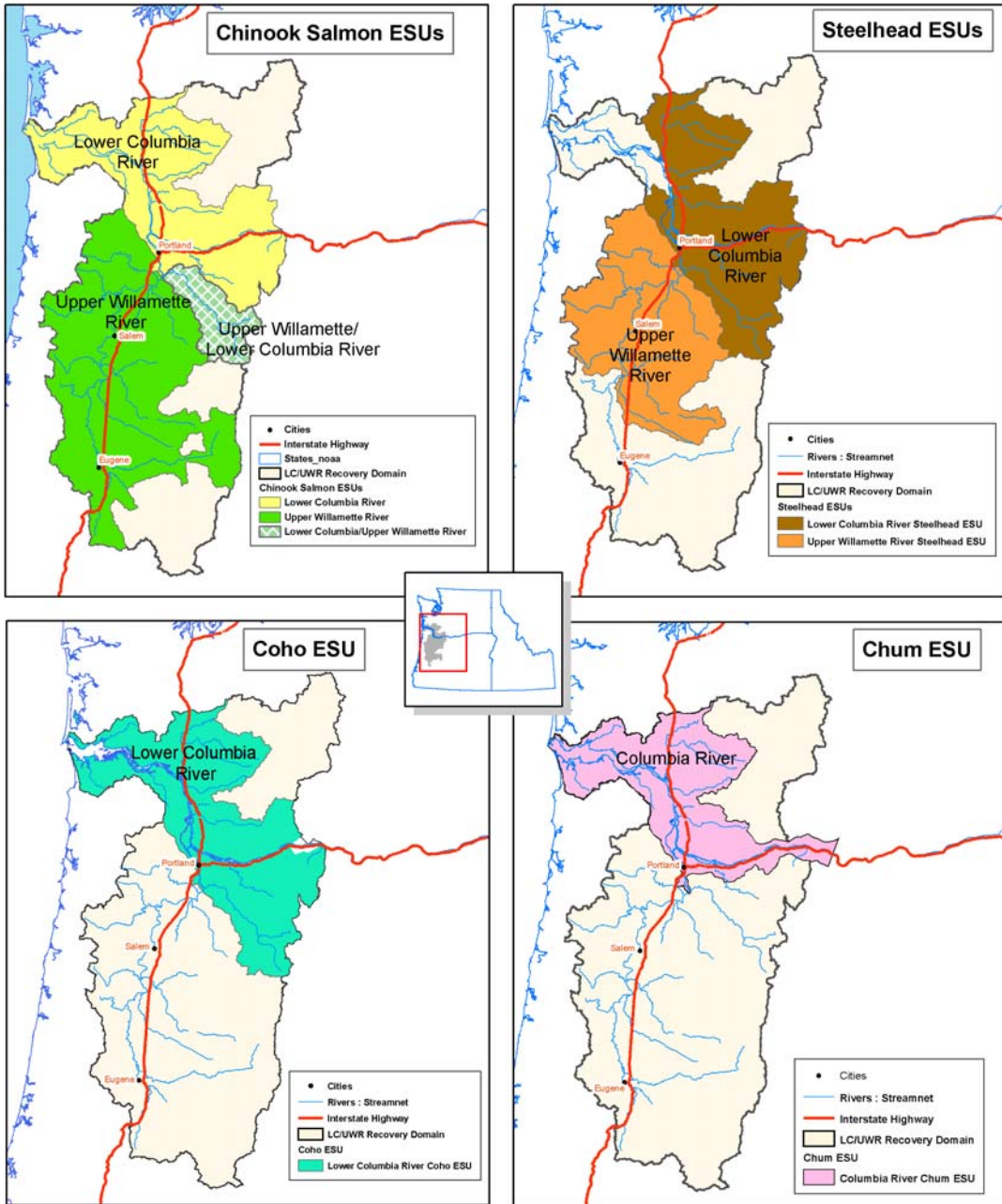
- Lower Columbia River steelhead (**threatened, 1998**—see 63 FR 13347)
- Lower Columbia River Chinook salmon (**threatened, 1999**—see 64 FR 14308)
- Columbia River chum salmon (**threatened, 1999**—see 64 FR 14507)
- Upper Willamette River Chinook salmon (**threatened, 1999**—see 64 FR 14308)
- Upper Willamette River steelhead (**threatened, 1999**—see 64 FR 14517)
- Lower Columbia River coho salmon (**threatened, 2005**—see 70 FR 37160)

The reasons for these ESA listings included the following:

- habitat alteration,
- over exploitation in fisheries,
- hydropower effects,
- hatchery effects, and
- inadequate regulatory and restoration programs.

¹ An ESU is a group of Pacific salmon or steelhead that is (1) substantially reproductively isolated from other groups and (2) represents an important component of the evolutionary legacy of the species (Waples 1991). The ESA allows listing decisions to be made at the scale of a species, sub-species, or distinct population segment (see definition of species at ESA section 3[15]). For Pacific salmon and steelhead, NMFS has defined distinct population segments as ESUs (56 FR 58612).

Map1 Listed Upper Willamette / Lower Columbia River ESUs



ESA Recovery Planning

The ESA requires that a recovery plan be developed and implemented for species listed as endangered or threatened under the statute. These plans must, at a minimum, contain (1) a description of site-specific management actions necessary to achieve the plan's goal for the conservation and survival of the species; (2) objective, measurable criteria which, when met, would result in a determination that the species should be removed from the list; and (3) estimates of the time required and cost to carry out the measures needed to achieve the plan's goal and to achieve intermediate steps toward that goal (section 4(f) of the ESA). De-listing, or recovery, criteria must include not only biological criteria but also criteria that address the threats to a species (i.e., the listing factors in ESA section 4[a][1]).² Although the plans are guidance documents, not regulatory, the authors of the ESA clearly saw recovery plans as a central organizing tool for the recovery of listed species.

NOAA's National Marine Fisheries Service (NMFS) is the agency responsible for recovery planning for salmon and steelhead.³ NMFS believes that local support of recovery plans is essential to their success, and is therefore committed to involving local citizens in development of the plans. In fact, in the Willamette and Lower Columbia river basins (as in other parts of the Pacific Northwest), state and local entities are leading the effort, with NMFS involvement, to develop recovery plans that meet ESA requirements, are technically sound, and are based on local efforts. Recovery plans that incorporate these elements will serve as realistic road maps to recovery.⁴

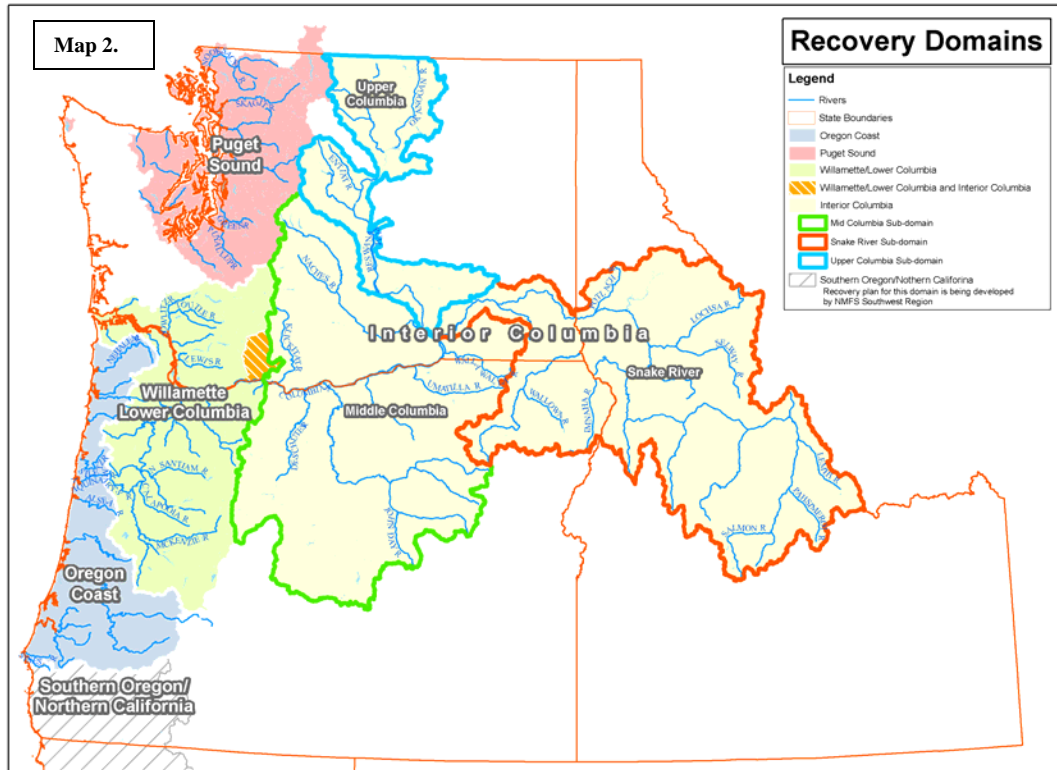
Recovery Domains

The Willamette and Lower Columbia river basins constitute one of four "recovery domains" that NMFS has delineated throughout Washington, Oregon, and Idaho to organize recovery planning for the 17 ESUs currently listed throughout the region (see map 2).

² See NMFS 2004 and *Fund for Animals v. Babbitt* 903 F. Supp. 96 (D.D.C. 1995, Appendix B).

³ NMFS has ESA jurisdiction for fish in the oceans, fish that migrate to the oceans, and marine mammals and sea turtles

⁴ Appendix 1 contains the NMFS Northwest Region's Recovery Plan Template. The template is meant to provide a guideline for the elements that must be included in ESA recovery plans; it is not a rigid format for ESA recovery plans.



Technical Recovery Teams

For each domain, NMFS has appointed an independent Technical Recovery Team (TRT) that has geographic and species expertise for the domain and can provide a solid scientific foundation for recovery plans. The charge of each TRT is to develop recommendations on biological viability criteria for ESUs and populations, to provide scientific support to local and regional recovery planning efforts, and to provide scientific evaluations of recovery plans. The TRTs include biologists from NMFS, other federal agencies, state, tribal, and local agencies, academic institutions, and private consulting groups.

All the TRTs use the same biological principles for developing their ESU and population viability criteria, principles described in a NOAA Technical Memorandum, *Viable Salmonid Populations and the Recovery of Evolutionarily Significant Units* (McElhany et al., 2000).⁵ A viable salmonid population (VSP) is defined as one that has a negligible extinction risk over a 100-year time frame. Viable salmonid populations are described in terms of four parameters: abundance, population productivity or growth rate, population spatial structure, and life history and genetic diversity. Viable ESUs are defined by some combination of multiple populations (at least some of which meet or exceed “viable”

⁵ Appendix 2 contains additional notes on this and other major documents related to recovery planning in this domain.

thresholds) that have appropriate geographic distribution, protection from catastrophic events, and diversity of life histories and other genetic expression.

Each TRT's recommendations are based on the VSP framework, as well as on considerations regarding data availability, the unique biological characteristics of the ESUs and habitats in the domain, and the members' collective experience and expertise. NMFS has encouraged the TRTs to develop regionally specific approaches for evaluating viability and identifying factors limiting recovery, but each TRT is working from a common scientific foundation to ensure that the recovery plans are scientifically sound and based on consistent biological principles.

TRT recommendations are used by NMFS and local planning groups to develop goals for recovery plans. As the agency with ESA jurisdiction for salmon and steelhead trout, NMFS makes final determinations of ESA de-listing criteria.

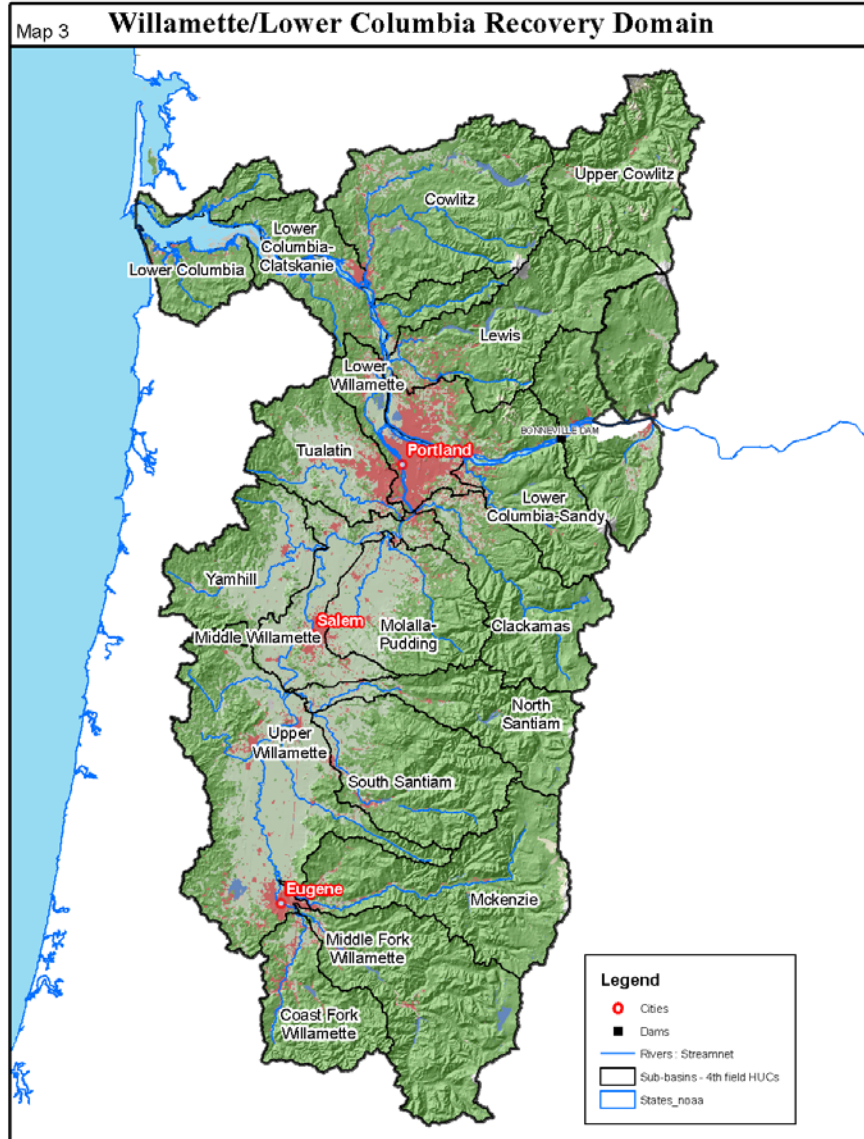
Collaboration with Local Stakeholders and Sovereigns

In each domain, NMFS collaborates with state, tribal, local, and other federal stakeholders to develop a planning forum appropriate to the domain, building to the extent possible on ongoing, locally led efforts. The role of these planning forums is to use the TRT and other technical products to agree on recovery goals and limiting factors and then to develop locally appropriate and locally supported recovery actions needed to achieve recovery goals. While these forums are working from a consistent set of assumptions regarding needed recovery plan elements, the process by which they develop those elements, and the form they take, may differ among domains. In the Columbia River Basin, subbasin plans developed under the Northwest Power and Conservation Council (NPCC) Fish and Wildlife Program (<http://www.nwcouncil.org/fw/Default.htm>) will also provide building blocks for recovery plans.

Once a local plan is completed and transmitted to NMFS, the agency reviews the plan and develops a supplement describing how the plan addresses ESA requirements for recovery plans. The supplement also proposes ESA de-listing criteria for the ESUs addressed by the plan, since a determination of these criteria is a NMFS decision. NMFS then makes the supplement and plan available for public review and comment before finalizing an ESA recovery plan.

ESA Recovery Planning in the Willamette-Lower Columbia Domain

The Willamette and Lower Columbia planning area is complex and diverse (see map 3). It includes the Willamette River basin and all Columbia River tributaries downstream from (and including) the Hood River in Oregon and downstream from (and including) the



White Salmon River in Washington. It encompasses parts of 2 states, 28 cities, 14 port districts, and substantial areas of agricultural and forest use, including both public and private ownership. The domain includes major urban centers such as the cities of Portland, Oregon, and Vancouver, Washington; portions of the Gifford Pinchot, Mt. Hood, and Willamette National Forests; and major hydropower or flood control facilities on a number of tributaries, including the Cowlitz and Lewis rivers in Washington and several major tributaries of the Willamette River in Oregon (the Clackamas, North Santiam, South Santiam, McKenzie, and Middle Fork Willamette rivers). While most populations in ESUs within this domain spawn in tributaries below the dams on the mainstem Columbia River, a few populations spawn (or spawned historically) in the tributaries immediately above Bonneville Dam.

The domain straddles parts of two states, and the structure and status of recovery planning differs in Washington and Oregon. Below is an update on the status of TRT

work and recovery planning efforts for this domain in both Washington and Oregon, along with a description of and timeline for the steps remaining to complete recovery plans for the domain.

Willamette-Lower Columbia Technical Recovery Team

The Willamette-Lower Columbia Technical Recovery Team (WLC TRT) was formed in May 2000. The WLC TRT includes members from the NMFS Northwest Fisheries Science Center, Washington Department of Fish and Wildlife (WDFW), U.S. Fish and Wildlife Service (USFWS), U.S. Army Corps of Engineers, University of Portland, and a private consultant. (For additional information on the TRT, including a list of members, see http://www.nwfsc.noaa.gov/trt/trt_wlc.htm).

Identification of Historical Independent Populations

The first step for each TRT has been to identify the historical demographically independent populations within each ESU.⁶ Delineating independent populations within each listed ESU is an important step in the development of a recovery plan. Understanding the size and spatial extent of populations is critical for assessing the status of an ESU. Independent populations are also a useful scale for assessing limiting factors and developing management actions.

The WLC TRT issued *Historical Population Structure of Willamette and Lower Columbia River Basin Pacific Salmonids* (Myers et al., 2003), which can be found at http://www.nwfsc.noaa.gov/trt/trt_wlc.htm. This document identifies populations within the Lower Columbia River Chinook salmon, steelhead, and chum salmon ESUs and the Upper Willamette River Chinook salmon and steelhead ESUs. The TRT is currently making minor revisions to this report and updating it to include identification of populations for the Lower Columbia River coho salmon ESU (Myers et al., in press). The revised version will be published as a NOAA Technical Memorandum in early 2006. (Appendix 3 contains maps showing the populations within each listed Willamette-Lower Columbia ESU, along with additional information on ESU status.)

Recommendations for ESU and Population Viability Criteria

TRTs were also asked to recommend viability criteria for ESUs and for independent populations. To describe viability criteria for ESUs, the TRTs were asked to describe how many and which populations would need to be at a particular status for an ESU as a whole to have an acceptably low extinction risk.

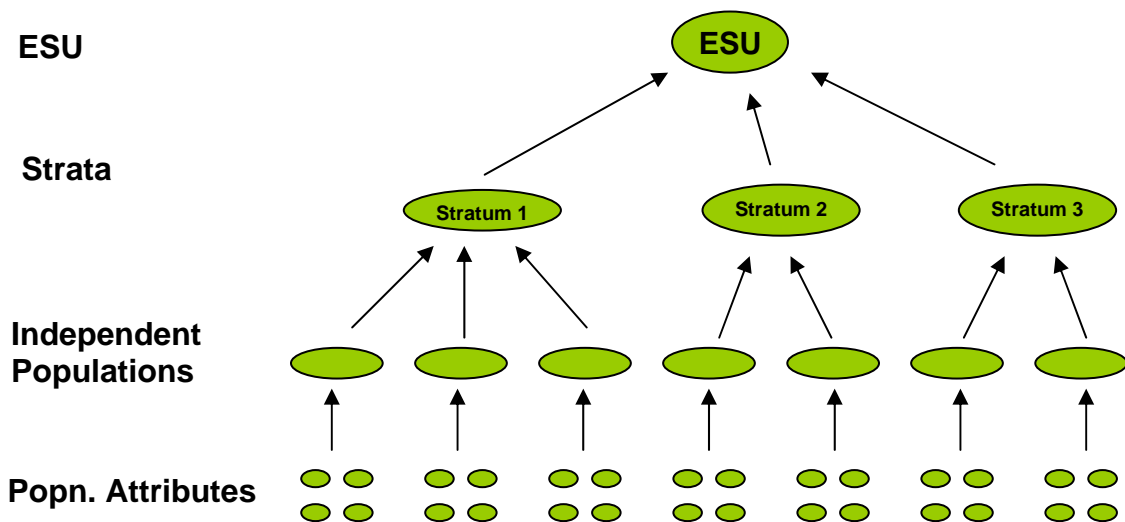
While a precautionary answer to this question would require all historical populations to meet or exceed viable population criteria, it is possible that a subset of the historical populations can provide an adequate likelihood of ESU persistence. For example, if a

⁶ Each ESU consists of multiple independent populations. An independent population is a local breeding group of fish that has been demographically independent from other such groups over a 100-year time period. Independent populations are almost always smaller than a whole ESU and are likely to inhabit geographic ranges on the scale of river basins or major subbasins.

hypothetical ESU historically contained 15 populations, it might be possible to achieve an acceptable overall probability of ESA persistence by recovering some number of populations to viable status or higher and the remaining populations to some intermediate risk level.

In answering this question, the WLC TRT (and all other TRTs) aggregated populations within ESUs into major population groups, or “strata,” as the WLC TRT calls the groupings. The WLC TRT defined strata based on two factors: run-timing (when salmon return to the native freshwater systems, e.g., spring, fall, late fall) and ecological zones (Coast, Cascade, and Gorge). Thus, strata are defined by each combination of run timing and ecological zone (e.g., Lower Columbia Cascade fall chinook and Lower Columbia Cascade spring Chinook are separate strata). Figure 1 illustrates this hierarchy of population structure. Appendix 3 identifies the strata within each listed Willamette-Lower Columbia ESU.

Figure 1. Hierarchy in Salmonid Population Structure



In describing viability at the independent population scale, TRT’s identified parameters for population abundance, productivity, spatial structure, and life history and genetic diversity (McElhany et al., 2000) that would indicate a population was viable. As described above, under “Technical Recovery Teams,” a viable population is defined as one that has a negligible risk of extinction over a 100-year time frame. Viability criteria for populations are expressed in terms of.

In March 2003, the WLC TRT completed its *Interim Report on Viability Criteria for Willamette and Lower Columbia Basin Pacific Salmonids* (McElhany et al., 2003). This report contains the TRT’s initial recommendations on viability criteria for each population within the listed Lower Columbia and Upper Willamette ESUs as well as recommendations addressing the question of how many and which populations should be recovered to what levels for an ESU to have an acceptably low extinction risk.

The TRT's recommendations are summarized below. The full report is available at: http://www.nwfsc.noaa.gov/trt/trt_wlc.htm

Willamette-Lower Columbia TRT Recommendations for ESU and Strata Viability

ESU-Level Viability Criteria and Strategies for Achieving Recovery

1. Every stratum (life history and ecological zone combination) that historically existed should have a high probability of persistence.
2. As a strategy for achieving recovery, until all ESU viability criteria have been achieved, no population should be allowed to deteriorate in its probability of persistence.
3. As a strategy for achieving recovery, high levels of recovery should be attempted in more populations than identified in the strata viability criteria because not all attempts will be successful.

Strata-Level Viability Criteria

1. Individual populations within a stratum should have persistence probabilities consistent with a high probability of strata persistence.
2. Within a stratum, the populations restored/maintained at viable status or above should be selected to:
 - a. Allow for normative meta-population processes, including the viability of "core" populations, which are defined as the historically most productive populations.
 - b. Allow for normative evolutionary processes, including the retention of the genetic diversity represented in relatively unmodified historic gene pools.
 - c. Minimize susceptibility to catastrophic events.

Willamette-Lower Columbia TRT Recommendations for Population Viability

Adult Population Productivity and Abundance

1. In general, viable populations should demonstrate a combination of population growth rate, productivity, and abundance that produces an acceptable probability of population persistence. Various approaches for evaluating population productivity and abundance combinations may be acceptable, but must meet reasonable standards of statistical rigor.
2. A population with non-negative growth rate and an average abundance approximately equivalent to estimated historic average abundance should be considered to be in the highest persistence category. The estimate of historic abundance should be credible, the estimate of current abundance should be averaged over several generations, and the growth rate should be estimated with adequate statistical confidence. This criterion takes precedence over criterion 1.

Juvenile Migrant Production

1. The abundance of naturally produced juvenile migrants should be stable or increasing as measured by observing a median annual growth rate or trend with an acceptable level of confidence.

Within-Population Spatial Structure

1. The spatial structure of a population must support the population at the desired productivity, abundance, and diversity levels through short-term environmental perturbations, longer-term environmental oscillations, and natural patterns of disturbance regimes. The metrics and benchmarks for evaluating the adequacy of a population's spatial structure should specifically address:
 - a. Quantity: Spatial structure should be large enough to support growth and abundance, and diversity criteria.
 - b. Quality: Underlying habitat spatial structure should be within specified habitat quality limits for life-history activities (spawning, rearing, migration, or a combination) taking place within the patches.
 - c. Connectivity: spatial structure should have permanent or appropriate seasonal connectivity to allow adequate migration between spawning, rearing, and migration patches.

- d. Dynamics: The spatial structure should not deteriorate in its ability to support the population. The processes creating spatial structure are dynamic, so structure will be created and destroyed, but the rate of flux should not exceed the rate of creation over time.
- e. Catastrophic Risk: the spatial structure should be geographically distributed in such a way as to minimize the probability of a significant portion of the structure being lost because of a single catastrophic event, either anthropogenic or natural.

Within-Population Diversity

1. Sufficient life-history diversity must exist to sustain a population through short-term environmental perturbations and to provide for long-term evolutionary processes. The metrics and benchmarks for evaluating the diversity of a population should be evaluated over multiple generations and should include:
 - a. Substantial proportion of the diversity of a life-history trait(s) that existed historically,
 - b. Gene flow and genetic diversity should be similar to historic (natural) levels and origins,
 - c. Successful utilization of habitats throughout the habitat, and
 - d. Resilience and adaptation to environmental fluctuations.

General Habitat

1. The spatial distribution and productive capacity of freshwater, estuarine, and marine habitats should be sufficient to maintain viable populations identified for recovery.
2. The diversity of habitats for recovered populations should resemble historic conditions given expected natural disturbance regimes (wildfire, flood, volcanic eruptions, etc.). Historic conditions represent a reasonable template for a viable population; the closer the habitat resembles the historic diversity, the greater the confidence in its ability to support viable populations.
3. At a large scale, habitats should be protected and restored, with a trend toward an appropriate range of attributes for salmonid viability. Freshwater, estuarine, and marine habitat attributes should be maintained in a non-deteriorating state.

The TRT is currently working on a revision to its *Interim Report on Viability Criteria* (McElhany et al., 2003) that will present refinements to the TRT's approach since March 2003 and incorporate additional technical work by other TRTs and by ODFW on adult abundance and productivity goals and current population and ESU status. A draft of the revision is expected to be completed in January 2006.

As part of its *Interim Report on Viability*, the WLC TRT also developed a scoring system to evaluate individual population attributes (abundance, productivity, etc.), overall population status, and ESU status (McElhany et al., 2003). The TRT applied this system to evaluate current status of populations in all listed Upper Willamette and Lower Columbia ESUs. The results are available in *Status Evaluations of Salmon and Steelhead Populations in the Willamette and Lower Columbia River Basins* (McElhany et al., 2004). This document is also available at http://www.nwfsc.noaa.gov/trt/trt_wlc.htm.

The goals in the recovery planning work completed in Washington to date (see below) are based on the *Interim Report on Viability* (McElhany et al., 2003), as well as on additional technical work by the WDFW and the Lower Columbia Fish Recovery Board (LCFRB). For a description and assessment of how the LCFRB applied the TRT's recommendations, see the NMFS supplement to the LCFRB plan, pages 5-6, 8-9, and 14-21 (pages 14-21 include identification of priority populations for recovery and numerical abundance targets for all Washington populations), available at <http://www.nwr.noaa.gov/Salmon-Recovery-Planning/ESA-Recovery-Plans/Draft-Interim-Recovery.cfm>.

The goals in the recovery plan for Oregon (see below) will be based on the January 2006 revision to the TRT's March 2003 document, as well as on additional technical work by the ODFW. The LCFRB and NMFS will also evaluate whether the Washington plan should be updated to reflect the new TRT work.

ESA Recovery Planning in the Washington Management Unit of the Domain

On April 20, 2005, NMFS made available for public review and comment a draft interim regional recovery plan for the "Washington Lower Columbia Management Units"⁷ of the Lower Columbia River Chinook, Lower Columbia River steelhead, and Columbia River chum ESUs (70 FR 20531).

Lower Columbia Fish Recovery Board

The plan was developed by the Lower Columbia Fish Recovery Board (LCFRB), which was established by Washington statute in 1998 to oversee and coordinate salmon and steelhead recovery efforts in the lower Columbia region of Washington. The LCFRB comprises representatives from the state legislature, city and county governments, the Cowlitz Tribe, the environmental community, hydroelectric utilities, and concerned citizens. Through an extensive public process starting in January 2002, the LCFRB developed its plan for the protection and restoration of native fish, aquatic habitats, and sensitive wildlife species in Washington lower Columbia River subbasins.

The Plan was developed to meet the requirements of four interrelated planning initiatives: (1) ESA recovery planning for salmon and steelhead; (2) Northwest Power and Conservation Council fish and wildlife subbasin planning for eight full and three partial subbasins; (3) watershed planning pursuant to the Washington Watershed Management Act; and (4) habitat protection and restoration pursuant to the Washington Salmon Recovery Act. The plan focuses primarily on salmon and steelhead. It contains actions that address all of the identified limiting factors and threats to the Lower Columbia salmon and steelhead ESUs and is based on an adaptive management approach for recovery actions (LCFRB 2004). Adaptive management is a crucial element of recovery plans that will allow plans to be modified as information from research, monitoring, and other evaluations (e.g., cost-effectiveness and action effectiveness) becomes available.

NMFS Response to LCFRB Plan

The LCFRB adopted the Plan on December 10, 2004. The state then approved the plan and submitted it to NMFS and the USFWS on December 15, 2004, as an interim recovery plan for consideration and inclusion in the formal ESA recovery plans of these agencies. On April 20, 2005, NMFS made the plan available for public review as an interim regional recovery plan, along with a supplement developed by NMFS. The supplement

⁷ A management unit is a portion of a listed species (ESU) that might require different management due to different threats in certain geographic areas or management by different state, tribal, or local entities. The Washington Lower Columbia Management Unit is the portion of these ESUs that occurs within Washington State and within the planning area of the Lower Columbia Fish Recovery Board.

describes the plan's relationship to ESA statutory requirements and lays out proposed delisting criteria for the three ESUs. Copies of this plan and the NMFS supplement are available on the internet at

http://www.nwr.noaa.gov/1srd/Recovery/domains/willow/WMU_Plan/index.html

By early 2006, NMFS intends to post on the internet a response to comments received on the plan and to formally endorse it as an interim regional recovery plan for the Washington Lower Columbia management units of the Lower Columbia River Chinook, Lower Columbia River Steelhead, and Columbia River Chum ESUs. By endorsing a plan as an interim regional recovery plan, NMFS is committing to implement the actions in the plan for which we have authority, to work cooperatively on implementation of other actions, and to encourage other federal agencies to implement plan actions for which they have responsibility and authority. We will also encourage the relevant state government to seek similar implementation commitments from state agencies and local governments (for additional information on how NMFS intends to use interim regional recovery plans, see the NMFS supplement referenced above).

The LCFRB planning area did not include portions of the Lower Columbia ESUs on the Oregon side of the Columbia River or in the White Salmon River in Washington. In 2006, NMFS expects to publish a notice of availability for a draft management unit plan for the White Salmon River. The strategy for completing a draft recovery plan for the Oregon portion of the domain is described below. Following public review of these plans, NMFS will finalize an ESA recovery plan covering the entire range of the ESUs.

The LCFRB plan did address Lower Columbia River coho salmon, but because that ESU was not listed until June 2005, NMFS did not propose using the plan as an interim regional recovery plan for Lower Columbia coho in its April 2005 *Federal Register* notice. Throughout 2006, the LCFRB will be updating the coho component of the plan and integrating it with ongoing work by Oregon so that in December 2006 there will be a draft recovery plan for the full Lower Columbia River coho ESU.

ESA Recovery Planning in the Oregon Management Unit of the Domain

The recovery plan for the Oregon portion of the domain is in development. The Oregon Department of Fish and Wildlife (ODFW) and the Oregon Governor's Office are leading the effort, with NMFS involvement. A plan for the Oregon management unit of the Lower Columbia River ESUs is expected to be completed in December 2006; for the Upper Willamette ESUs, a completed plan is expected in mid 2007.⁸

Major steps in the process include (1) completing technical work on recovery goals and current population and ESU status, (2) refining limiting factors assessments for each population, (3) forming two stakeholder teams, one for the Lower Columbia ESUs and

⁸ Draft components of these plans will be made available as they are completed throughout 2006 and early 2007.

one for the Upper Willamette ESUs, and (4) identifying recovery actions. Stakeholder teams will be involved in final determination of recovery goals and limiting factors and in identifying recovery actions.

Subbasin plans developed under the NPCC Fish and Wildlife Program will provide building blocks for these recovery plans. For additional information on subbasin planning and for completed subbasin plans, see <http://www.nwcouncil.org/fw/subbasinplanning/Default.htm>. The plans of interest in this portion of the domain are the Hood River Subbasin Plan, the Columbia Gorge Subbasin Plan, the Willamette River Subbasin Plan, and the Lower Columbia and Columbia Estuary Bi-State Plan.

Recovery Goals

As described above, under “Recommendations for Population and ESU Viability Criteria,” recovery goals are still in development for the Oregon portion of the recovery domain. ODFW and the TRT are refining the approach to establishing population abundance and productivity goals and to evaluating current status. A draft product is expected in January 2006.

Limiting Factors and Threats Assessment

Identifying limiting factors and threats is an important early step in developing recovery plans. These assessments provide the basis for identifying management actions that directly affect the factors most limiting recovery of an ESU. The primary goal for a limiting factors assessment is to identify the key physical, chemical, or biological features impeding ESUs and their independent populations from reaching their target status. The primary goal for a threats assessment is to identify actions or events that have, are currently, or may in the future, cause or contribute to the limiting factors. Actions in recovery plans are then prioritized to address the limiting factors and threats that have the greatest impacts on ESU viability and population status.

Expert panel

Much work on limiting factors and threats has already been completed in Oregon. In addition to plans completed for the NPCC’s subbasin planning process, other assessments have been completed under the Oregon Plan for Salmon and Watersheds, through the Oregon Watershed Enhancement Board, and through federal and local planning processes. This existing work will be refined for recovery planning, initially through an expert panel process and then, where possible, by additional, more quantitative analysis.

Expert panels will

- identify and rank the effects of limiting factors on viability of individual populations within each listed ESU,
- identify and rank bottlenecks to viability of each population (viability gaps),
- rank the relative effect of limiting factors on ESU viability, and

- develop a list of potential threats associated with key limiting factors and population bottlenecks.⁹

The effort to identify bottlenecks to population viability is a critical element of Oregon's effort to create future conditions that will recover listed ESUs and maintain their viability. Whereas many conservation and restoration efforts have attempted to address all factors for decline, Oregon's targeted approach is intended to provide more effective guidance for prioritizing short- and long-term conservation and restoration actions.

ODFW expects to convene an expert panel to address the Lower Columbia River coho ESU in January 2006. Panels for additional ESUs would be convened throughout early 2006. Quantitative work (such as life-cycle modeling) to refine and cross-check findings of the expert panels will be carried out as feasible in 2006 and beyond.

For additional information on ODFW's work related to limiting factors and threats, contact Bruce McIntosh at Bruce.McIntosh@oregonstate.edu.

Stakeholder Teams

As part of the recovery planning process for the Oregon management unit, Oregon will convene two stakeholder teams, one for the Oregon portion of the Lower Columbia ESUs and one for the Upper Willamette ESUs. Since the work of these two teams is related, they will at times meet jointly but will work separately when issues and tasks are more focused on their particular geographic areas. The teams will include representatives of a broad range of stakeholders such as soil and water conservation districts, watershed councils, local governments, tribes, agriculture, forestry, fishing, conservation, commerce, ports, utilities, and federal agencies. The role of the stakeholder teams will be to

- track and provide input to Oregon and NMFS on the recovery plan during its development,
- provide feedback on issues, ideas, or strategies that could improve effectiveness of implementation of the recovery plan,
- work with Oregon and NMFS to identify recovery scenarios, recovery strategies, and action options for the listed ESUs, and
- inform their constituents and the public on the development of the recovery plan.

The state expects to convene the stakeholder teams in early 2006. For additional information on the stakeholder teams, contact Bruce McIntosh at Bruce.McIntosh@oregonstate.edu or Louise Solliday at Louise.Solliday@state.or.us.

Identifying Recovery Actions

As mentioned above, it is crucial that actions in recovery plans are identified and prioritized to address the limiting factors and threats believed to have the greatest impacts on ESU viability and population status. It is also crucial to involve stakeholders in identification of recovery actions so that actions will be implemented. Arriving at a final

⁹ See the glossary for definitions of *limiting factors*, *threats*, and *population bottlenecks*.

set of recovery actions for the Willamette-Lower Columbia Recovery Plans will be an iterative process. One step will be to review actions already identified in subbasin plans; previous conservation plans such as the Willamette Restoration Strategy, developed by the Willamette Restoration Initiative; other locally developed plans (including the City of Portland’s Watershed Management Plan); the Federal Caucus’s Columbia Basinwide Salmon Recovery Strategy (http://www.salmonrecovery.gov/reports_and_papers/all_h_strategy/) and other federal agency plans and programs and assess the extent to which they adequately address priority limiting factors and threats.¹⁰

Actions identified in existing plans will need to be evaluated and refined in relationship to recovery goals, population priorities, and limiting factors and threats to ensure they are targeting the limiting factors and threats with the greatest impacts on ESU viability. In addition to this evaluation, the stakeholder teams will agree to a set of recovery actions likely to be implemented and effective. Together, these processes will result in identifying and prioritizing actions likely to result in recovery of listed ESUs.

Timeline

The table below shows key milestones and products in the recovery planning process for Oregon Lower Columbia and Upper Willamette ESUs.

Task	Expected Product	When (Lower Columbia ESUs)	When (Upper Willamette ESUs)
Complete technical work on goals, population structure of ESUs, and current population/ESU status	Draft revision to TRT March 2003 Viability Report, incorporating ODFW work on goals and current status	Early 2006	Early 2006
Convene expert panels for qualitative limiting factors/threats assessment	Report documenting expert panel process and conclusions	LCR Coho: Jan. 2006 LCR Chinook, Steelhead, Chum: Feb. 2006	April 2006
Convene stakeholder panels	N/A	Jan-Feb 2006	Jan-Feb 2006
Finalize goals, current status, and qualitative limiting factors	Agreement among technical experts and stakeholders on recovery goals	Spring 2006	Summer 2006
Management Actions 1. Assess existing actions 2. Identify additional actions 3. Work with stakeholders to reach agreement on actions	Final recovery plan will contain a set of actions that target priority limiting factors and are likely to lead to recovery	1. March-June 2006 2. March-June 2006 3. November 2006	1. May-October 2006 2. May-October 2006 3. April 2007
Cost Estimates	Cost estimates for plan actions	December 2006	June 2007
Research, Monitoring, and Adaptive Management	Research, monitoring, and adaptive management	November 2006	June 2007

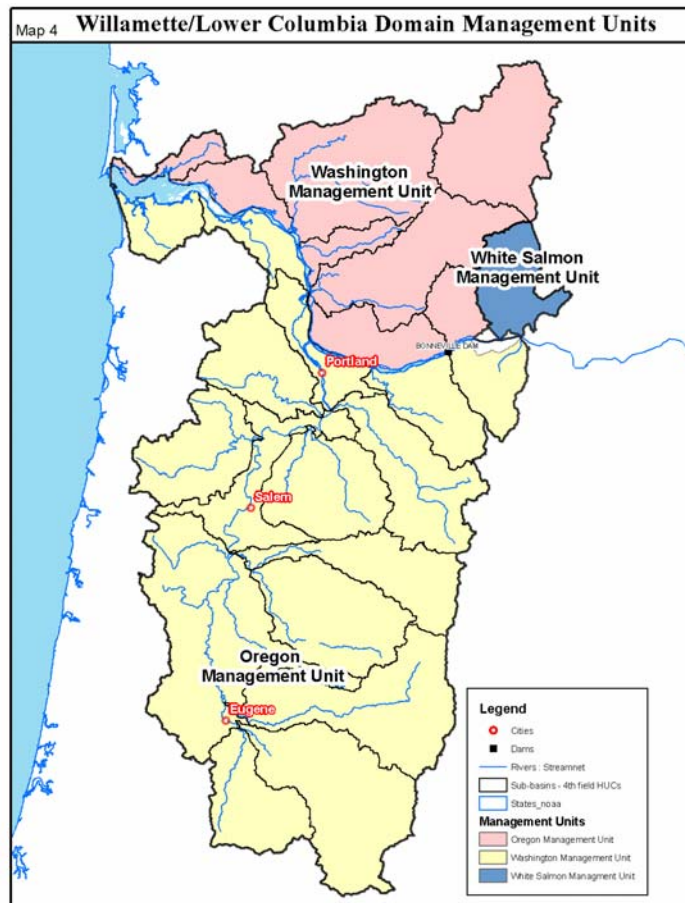
¹⁰ Some of these existing plans and programs may already be making significant contributions to recovery. For example, the Aquatic Conservation Strategy of the Northwest Forest Plan was developed to address conservation needs for salmonids on federal forest lands.

	framework for the recovery plan		
Complete Plan	Final Draft Plan	December 2006	July 2007

Combining the Oregon and Washington Management Unit Plans

For the Willamette-Lower Columbia recovery domain, the following three management unit¹¹ plans will eventually be developed (see map 4):

- Washington Lower Columbia (the portion of the Lower Columbia ESUs that occurs within Washington and within the planning area of the Lower Columbia Fish Recovery Board).
- White Salmon (the White Salmon River Basin in Washington),
- Oregon Lower Columbia-Upper Willamette (the portion of the Lower Columbia ESUs that occurs within Oregon and the Upper Willamette ESUs)



¹¹ As described earlier, a management unit is a portion of a listed species (ESU) that might require different management due to different threats in certain geographic areas or management by different state, tribal, or local entities.

Then, because the ESA requires recovery plans to address the entire listed entity, these management unit plans will be synthesized into a domain level plan that addresses the full ESUs.

This process of synthesis, or “roll up,” will address interdependencies and issues of regional scope, and ensure that the entire salmon life cycle and all threats are addressed. For example, there are interdependencies between the states related to some local hatchery and harvest issues, so certain recovery actions will need to be agreed upon by both states. In addition, some recovery actions related to harvest, hatcheries, the Federal Columbia River Power System, and the estuary are regional in scope and will require a regionally consistent set of assumptions and actions.¹² This roll up will also ensure that ESU-level recovery criteria are addressed and that research, monitoring, evaluation, and adaptive management strategies are regionally coordinated.

NMFS will work throughout 2006 with the states and local entities involved in management unit plan development, and with representatives from other sectors (e.g., ocean harvest, tribal harvest, Columbia mainstem hydropower) as appropriate to roll up the management unit plans and ensure that the full recovery needs of the listed ESUs are being addressed. The process will be one of ongoing consultation and coordination between NMFS and Washington and Oregon recovery planners. In the Willamette-Lower Columbia domain, the Willamette-Lower Columbia ESA Executive Committee (Ex Com) will provide a coordinating policy forum for at least some issues related to this roll up process. The Ex Com was formed in 2001 to serve a coordinating role for recovery planning in this domain (see appendix 4 for a list of Ex Com members).

The final domain-scale ESA recovery plan will maintain and incorporate the management unit plans, thereby endorsing the recommendations and decisions (for example, decisions on site-specific habitat actions) that are most appropriately left to local recovery planners and implementers.

Research, Monitoring, and Adaptive Management

A rigorous research, monitoring, and adaptive management framework is essential in ESA recovery plans. Research and monitoring helps to ensure that appropriate data are collected and evaluated to assess biological status of ESUs, status of threats to ESUs, effectiveness of recovery actions, and overall progress toward recovery. Adaptive management ensures that recovery actions are adjusted based on results of research and monitoring, so that plans will be more effective and efficient both biologically and economically. NMFS will work with local recovery planning groups to support development and implementation of the adaptive management and monitoring components of recovery plans.

NMFS is developing an adaptive management framework that will describe the agency’s needs for monitoring information and adaptive management in ESA recovery plans. The

¹² To provide a basis for regional discussion of these issues, NMFS is developing a series of recovery planning “modules” that will be posted on the regional website (www.nwr.noaa.gov) as they become available.

framework is based on a decision structure that identifies the questions that need to be answered to evaluate ESU status (from the perspective of both biological criteria and ESA listing factor criteria) and the monitoring information needed to answer those questions. The decision structure builds upon (a) the ESU and population viability principles described in McElhany et al., 2000 and associated indicators proposed by the TRTs, and (b) the biological factors and threats limiting population and ESU viability as identified in recovery plans and as organized by the five statutory listing factors in section 4(a)(1) of the ESA. NMFS will provide a web-accessible link to this document and staff support to help regional, state, tribal, and local entities develop appropriate research, monitoring, evaluation, and adaptive management plans for ESA recovery.

Contacts for Additional Information

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References

- Lower Columbia Fish Recovery Board. 2004. Lower Columbia Salmon Recovery and Fish and Wildlife Subbasin Plan.
- McElhany, P., M.H. Ruckelshaus, M.J. Ford, T.C. Wainwright, and E.P. Bjorkstedt. 2000. Viable Salmonid Populations and the Recovery of Evolutionarily Significant Units. U.S. Department of Commerce, NOAA Technical Memorandum. NMFS-NWFSC-42.
- McElhany, P., T. Backman, C. Busack, S. Heppell, S. Kolmes, A. Maule, J. Myers, D. Rawding, D. Shively, A. Steel, C. Steward, T. Whitesel. 2003. Interim Report on Viability Criteria for Willamette and Lower Columbia Basin Pacific Salmonids. WLC-TRT Report. NOAA Fisheries Northwest Fisheries Science Center. Seattle, WA.
- McElhany, P., T. Backman, C. Busack, S. Kolmes, J. Myers, D. Rawding, A. Steel, C. Steward, T. Whitesel, C. Willis. 2004. Status Evaluation of Salmon and Steelhead Populations in the Willamette and Lower Columbia River Basins. WLC-TRT Report. NOAA Fisheries Northwest Fisheries Science Center. Seattle, WA.
- Myers, J., C. Busack, D. Rawding, and A. Marshall. 2003. Historical Population Structure of Willamette and Lower Columbia River Basin Pacific Salmonids. WLC-TRT Report. NOAA Fisheries Northwest Fisheries Science Center. Seattle, WA.
- Myers, J., C. Busack, D. Rawding, D. Teel, A. Marshall, D. Van Doornik, M. Maher. In Press. Historical Population Structure of Willamette and Lower Columbia River Basin Pacific Salmonids. U.S. Department of Commerce, NOAA Technical Memorandum. NMFS-NWFSC-??.
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Appendices

1. NMFS Recovery Plan Template

This template is intended to be used as a guideline, not a dictum. It indicates elements that need to be included in an ESA recovery plan; plans may be reorganized in a manner most appropriate to particular areas, populations, or analyses.

Volume I should be a readable summary of the more detailed information and analyses presented by watershed or subbasin in *Volume II*. *Volume I* should include summary tables and relatively brief explanatory narrative wherever possible.

VOLUME I

1 Introduction

- Problem Statement
- Purpose of Plan
 - ESA
 - Tribal treaty/trust obligations
- Context of Plan Development
 - NMFS – Domains – TRTs – public involvement
 - Who developed this plan (agencies, stakeholder groups)

2 Recovery Goals/Measurable Criteria

- Goals – Delisting or downlisting, and other goals
- Biological criteria – VSP parameters
- Threats criteria – in terms of the 5 listing factors

3 Background on ESU(s)

- Description and Taxonomy
- Life History
- Habitat Requirements/Critical Habitat

4 Status of Species

- ESU
- Major Population Groups
- Independent Populations

5 Limiting Factors and Threats

6 Conservation Actions (ongoing, previous, already underway)

7 Recovery Strategy

- Overview of, and rationale for, recovery program
- Summary table – limiting factors, actions, effects

8 Site-Specific Management Actions

9 Summary of Implementation Roles and Schedule, Cost and Time Estimates

10 Summary of Research, Monitoring and Evaluation for Adaptive Management

VOLUME II

1 Watershed A (B, C, etc)

a. Description

b. Populations (A, B, C)

- Status
- Limiting factors/threats
- Recovery goal

c. Site-specific actions for this watershed

d. RM&E

e. Implementation schedule, including costs, time, who does what

2. Major Willamette-Lower Columbia Recovery Planning Documents to Date

Columbia Gorge Subbasin Plan. Oregon Department of Fish and Wildlife. 2004.

This subbasin plan was developed for the NPCC's Fish and Wildlife program and has been formally adopted by the Council. The document is available at <http://www.nwcouncil.org/fw/subbasinplanning/Default.htm>. This plan will be a building block for the ESA recovery plan for the Willamette-Lower Columbia domain.

Historical population structure of Willamette and Lower Columbia River Basin Pacific Salmonids. J. Myers, J., C. Busack, D. Rawding, and A. Marshall. 2003. WLC-TRT Report. NOAA's Northwest Fisheries Science Center. Seattle, WA.

This document, produced by the WLC TRT, identifies the historical population structure of the Lower Columbia Chinook, chum, and steelhead ESUs and the Upper Willamette River Chinook and steelhead ESUs. It is available on the internet at http://www.nwfsc.noaa.gov/trt/trt_wlc.htm. The document is currently undergoing minor revisions and the addition of historical population structure for the Lower Columbia River coho ESU. Publication of the revised document as a NOAA Technical Memorandum is expected in early 2006.

Hood River Subbasin Plan, Including Lower Oregon Columbia Gorge Tributaries. Hood River Soil and Water Conservation District. 2004.

This subbasin plan was developed for the NPCC's Fish and Wildlife program and has been formally adopted by the Council. The document is available at <http://www.nwcouncil.org/fw/subbasinplanning/Default.htm>. This plan will be a building block for the ESA recovery plan for the Willamette-Lower Columbia domain.

Interim Report on Viability Criteria for Willamette and Lower Columbia Basin Pacific Salmonids. P. McElhany, T. Backman, C. Busack, S. Heppell, S. Kolmes, A. Maule, J. Myers, D. Rawding, D. Shively, A. Steel, C. Steward, T. Whitesel. 2003. WLC-TRT Report. NOAA's Northwest Fisheries Science Center, Seattle, WA.

This document contains the WLC TRT's initial recommendations for criteria describing a viable population, expressed in terms of abundance and productivity, juvenile outmigrant growth rate, spatial structure, habitat, and diversity. It also contains the TRT's recommendations for ESU viability (i.e., a framework for determining which populations should be at what status for an ESU to have an acceptably low extinction risk) and a scoring system for evaluating population status. It is available on the internet at http://www.nwfsc.noaa.gov/trt/trt_wlc.htm. A draft revision to this document is expected to be available in January 2006. The revision will present refinements to the TRT's approach and incorporate new analyses related to current status and adult abundance and productivity criteria by the ODFW.

Lower Columbia Salmon Recovery and Fish and Wildlife Subbasin Plan.

Lower Columbia Fish Recovery Board, 2004.

This plan was developed by the Lower Columbia Fish Recovery Board (LCFRB) to address four planning initiatives: (1) ESA recovery planning for salmon and steelhead; (2) Northwest Power and Conservation Council fish and wildlife subbasin planning for eight full and three partial subbasins; (3) watershed planning pursuant to the Washington Watershed Management Act; and (4) habitat protection and restoration pursuant to the Washington Salmon Recovery Act. The LCFRB and the state of Washington submitted the plan to NMFS for consideration and inclusion in formal ESA recovery plans. On April 20, 2005, NMFS made the plan available for public review as an interim regional recovery plan, along with a Supplement developed by NMFS. NMFS intends to formally endorse the plan as an Interim Regional Recovery Plan in early 2006. Copies of this plan and the NMFS Supplement are available on the internet at http://www.nwr.noaa.gov/lsrd/Recovery/domains/willow/WMU_Plan/index.html

Mainstem Lower Columbia and Lower Columbia River Estuary Subbasin Plan. Lower Columbia River Estuary Partnership and Lower Columbia Fish Recovery Board. 2004.

This plan was prepared in May 2004 by the Lower Columbia River Estuary Partnership (LCREP) and the Lower Columbia Fish Recovery Board (LCFRB) for the NPCC's subbasin planning program. The plan's scope is the mainstem Columbia River and estuary from the Columbia River plume to Bonneville Dam at river mile 146. The plan also covers the western Oregon tributaries of Youngs Bay, Nicolai-Wikiup, Clakskanie, and Scappoose Bay. This plan will be a building block for the ESA recovery plan for the Willamette-Lower Columbia domain. The plan is available on the internet at http://www.nwcouncil.org/fw/subbasinplanning/lowerColumbia/plan/2004_05/BiState/Default.asp.

Endangered Species Management Plan for Lower Columbia Coho Salmon. Oregon Department of Fish and Wildlife. 2001.

The Oregon Fish and Wildlife Commission (OFWC) listed lower Columbia River wild coho salmon as an endangered species in July 1999 under Oregon's threatened and endangered species law. This law requires state agencies with a conservation role to prepare an endangered species management plan and have this plan approved by the OFWC. This plan fulfilled this requirement for ODFW and will be used as a building block for the ESA recovery plan for the Lower Columbia River coho ESU.

Status Evaluation of Salmon and Steelhead Populations in the Willamette and Lower Columbia River Basins. P. McElhany, T. Backman, C. Busack, S. Kolmes, J. Myers, D. Rawding, A. Steel, C. Steward, T. Whitesel, C. Willis. 2004. WLC-TRT Report. NOAA's Northwest Fisheries Science Center. Seattle, WA.

This document presents the results of a scoring system developed by the WLC TRT to evaluate population, stratum, and ESU status based on the population parameters of adult abundance and productivity, juvenile outmigrants, spatial structure, and diversity. The document is available on the internet at http://www.nwfsc.noaa.gov/trt/trt_wlc.htm.

Viable Salmonid Populations and the Recovery of Evolutionarily Significant Units. P. McElhany, M.H. Ruckelshaus, M.J. Ford, T.C. Wainwright, and E.P. Bjorkstedt. 2000. U.S. Department of Commerce, NOAA Technical Memorandum. NMFS-NWFSC-42.

This NOAA Technical Memorandum describes the biological principles for developing ESA and population viability criteria. It has formed the scientific foundation for all TRT recommendations and for ESA recovery planning for West Coast salmon and steelhead. The document can be found on the internet at <http://www.nwfsc.noaa.gov/publications/displayallinfo.cfm?docmetadataid=5561>

Willamette Basin Subbasin Plan. Willamette Restoration Initiative. 2004.

This subbasin plan was developed for the NPCC's Fish and Wildlife program by the Willamette Restoration Initiative and has been formally adopted by the NPCC. The document is available at <http://www.nwcouncil.org/fw/subbasinplanning/Default.htm>. This plan will be a building block for the ESA recovery plan for the Willamette-Lower Columbia domain.

3. Information on Listed ESUs

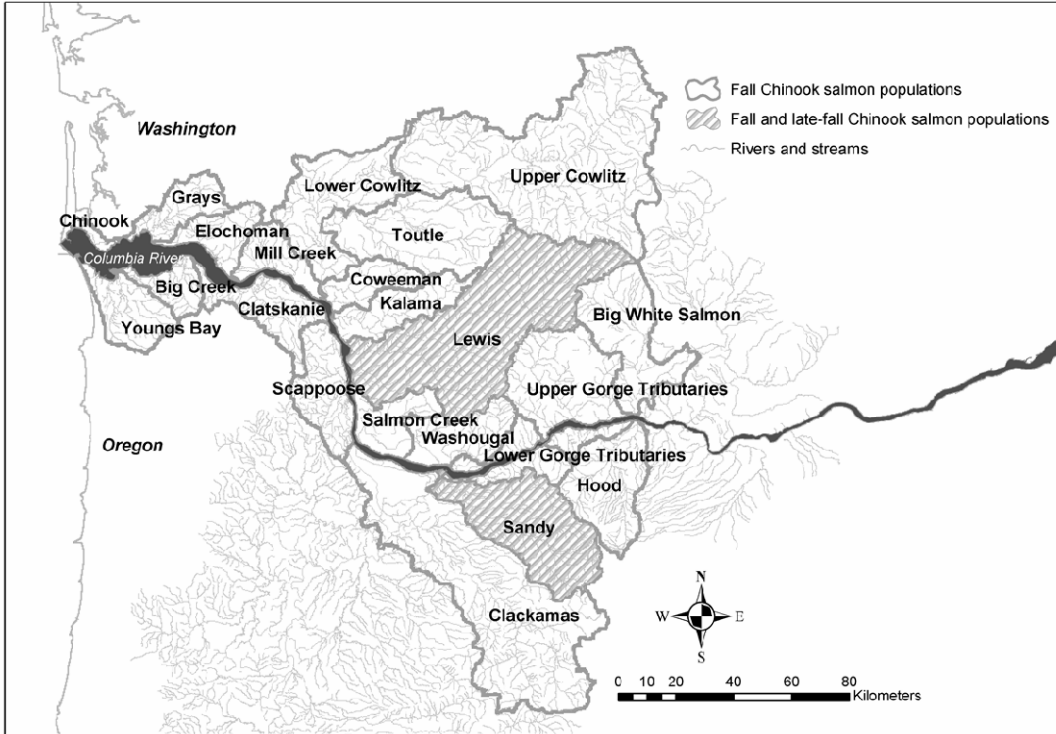
Lower Columbia River Chinook Salmon (*Oncorhynchus tshawytscha*)

Listing Status: Threatened (64 FR 14308, reaffirmed 70 FR 37160)

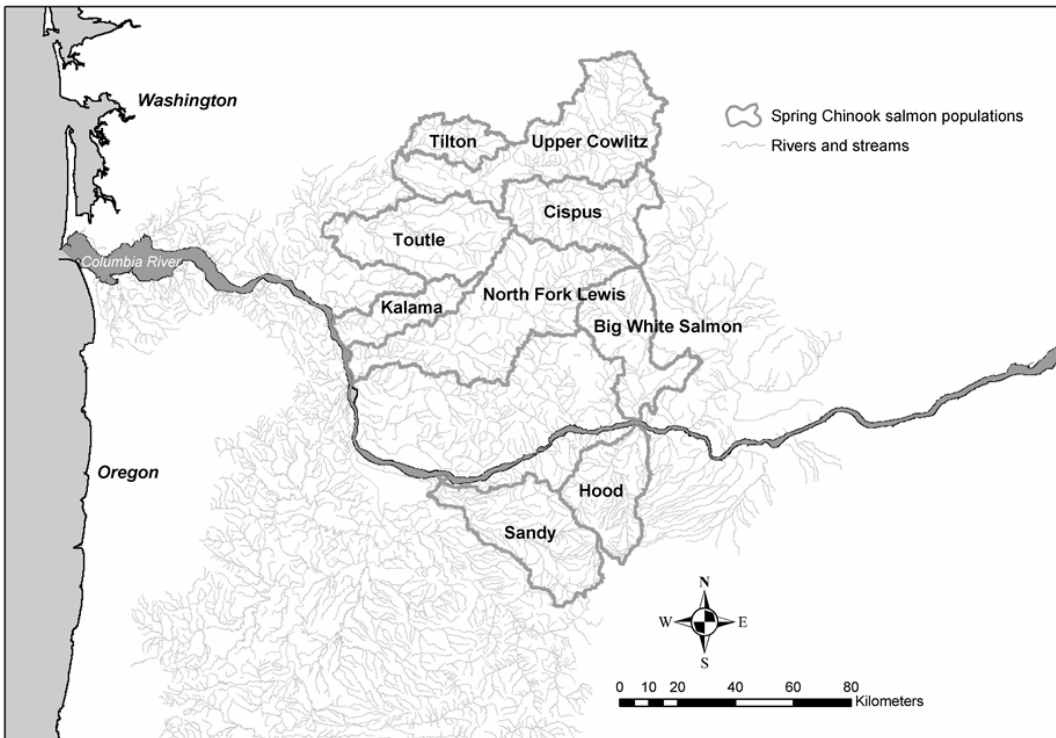
Range: The Lower Columbia River Chinook salmon ESU includes all naturally spawned populations of Chinook salmon from the Columbia River and its tributaries from its mouth at the Pacific Ocean upstream to a transitional point east of Hood River in Oregon and the White Salmon River in Washington. The historical site of Celilo Falls on the Columbia River is considered the transitional point for this ESU, since it may have been a migrational barrier to Chinook salmon at certain times of the year. The ESU includes spring Chinook in the Willamette River up to Willamette Falls, Oregon, exclusive of spring-run Chinook salmon in the Clackamas River. Seventeen artificial propagation programs are part of this ESU (see list at 70 FR 37174).

Population Identification: The WLC TRT identified 32 historical populations in the Lower Columbia River Chinook ESU (see maps A-1 and A-2, below) (Myers et al., in press). Myers et al., 2003 identified only 31 historical populations in this ESU, but based on input from WDFW, the TRT subsequently split the Lewis River fall run population into separate Lewis River fall run and Salmon Creek fall run populations.¹⁴

¹⁴ The Lower Columbia Fish Recovery Board's plan for the Washington management unit of this ESU was based on Myers et al. 2003. When the population identification document currently in press is finalized, NMFS will work with the LCFRB to address any implications of the changes to identification of historical populations.



Map A-1. Historical demographically independent fall-run Chinook salmon populations in the Lower Columbia River ESU.



Map A-2. Historical demographically independent spring-run Chinook salmon populations in the Lower Columbia River ESU.

The TRT aggregated these 32 historical populations into the following six strata:

Stratum	Population
Coastal Fall Run	Grays
	Elochoman
	Mill
	Youngs Bay
	Big Creek
	Clatskanie
	Scappoose
Cascade Fall Run	Lower Cowlitz
	Upper Cowlitz
	Toutle
	Coweeman
	Kalama
	Lewis
	Salmon Creek
	Washougal
	Clackamas
	Sandy
Cascade Late Fall Run	North Fork Lewis
	Sandy
Cascade Spring Run	Upper Cowlitz
	Cispus
	Tilton
	Toutle
	Kalama
	North Fork Lewis
	Sandy
Gorge Fall Run	Lower Gorge
	Upper Gorge
	White Salmon
	Hood
Gorge Spring Run	White Salmon
	Hood

NMFS's 2005 Report to Congress for the Pacific Coastal Salmon Recovery Fund (see <http://www.nwr.noaa.gov/Salmon-Recovery-Planning/PCSRF/Index.cfm>) identified the following major factors limiting recovery of this ESU:

- Reduced access to spawning/rearing habitat in tributaries
- Hatchery impacts
- Loss of habitat diversity and channel stability in tributaries
- Excessive sediment in spawning gravel

- Elevated water temperatures in tributaries
- Harvest impacts on fall Chinook

Identification of these limiting factors was based on existing information in subbasin plans and other documents. Based on this existing information, NMFS staff assessed limiting factors at the population scale and aggregated them to the ESU scale; major limiting factors for particular populations may differ from the ESU-scale shown above.

For additional information on limiting factors for Washington populations within this ESU, see the Lower Columbia Fish Recovery Board Salmon Recovery and Fish and Wildlife Subbasin Plan at <http://www.nwr.noaa.gov/Salmon-Recovery-Planning/ESA-Recovery-Plans/Draft-Interim-Recovery.cfm>.

Additional information on limiting factors for Oregon populations in this ESU will be developed as part of the recovery planning process in 2006.

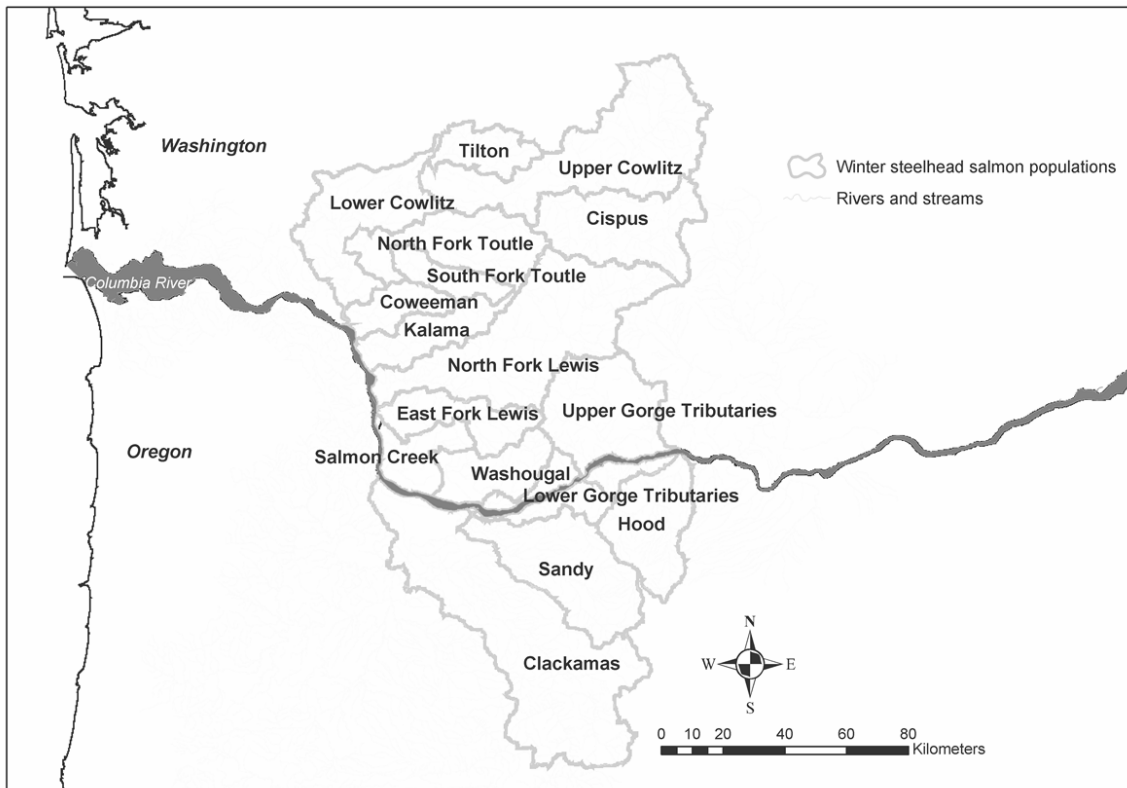
Additional information on this ESU is available at <http://www.nwr.noaa.gov/ESA-Salmon-Listings/Salmon-Populations/Chinook/CKLCR.cfm>.

Lower Columbia River Steelhead (*Oncorhynchus mykiss*)

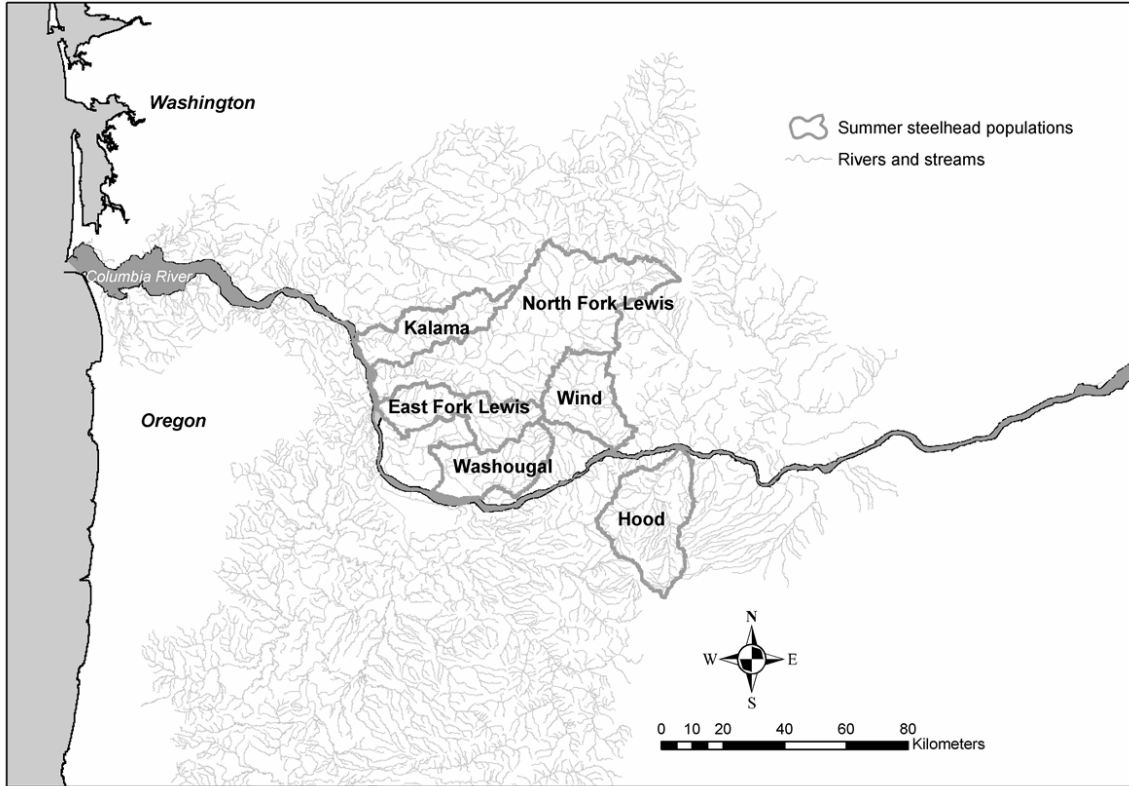
Listing Status: Threatened (63 FR 13347)

Range: The Lower Columbia River steelhead ESU includes all naturally spawned populations of steelhead in streams and tributaries to the Columbia River between the Cowlitz and Wind rivers in Washington (inclusive) and between the Willamette and Hood rivers in Oregon (inclusive). Steelhead above Willamette Falls are excluded. On June 14, 2004, NMFS proposed to reaffirm this listing as threatened (69 FR 33102). A final determination on this decision is due on December 14, 2005.

Population Identification: The WLC TRT identified 23 historical populations in this ESU (see maps A-3 and A-4, below) (Myers et al., in press).



Map A-3. Historical demographically independent winter-run steelhead populations in the Lower Columbia River ESU.



Map A-4. Historical demographically independent summer-run steelhead populations in the Lower Columbia River ESU.

The TRT aggregated these 23 historical populations into the following four strata:

Stratum	Population
Cascade Winter Run	Cispus
	Tilton
	Upper Cowlitz
	Lower Cowlitz
	North Fork Toutle
	South Fork Toutle
	Coweeman
	Kalama
	North Fork Lewis
	East Fork Lewis
	Clackamas
	Salmon Creek
	Sandy
	Washougal
Cascade Summer Run	Kalama
	North Fork Lewis
	East Fork Lewis
	Washougal

Gorge Winter Run	Lower Gorge
	Upper Gorge
	Hood
Gorge Summer Run	Wind
	Hood

NMFS’s 2005 Report to Congress for the Pacific Coastal Salmon Recovery Fund (see <http://www.nwr.noaa.gov/Salmon-Recovery-Planning/PCSRF/Index.cfm>) identified the following major factors limiting recovery of this ESU:

- Degraded floodplain and stream channel structure and function
- Reduced access to spawning/rearing habitat
- Altered streamflow in tributaries
- Excessive sediment and elevated water temperature in tributaries
- Hatchery impacts

Identification of these limiting factors was based on existing information in subbasin plans and other documents. Based on this existing information, NMFS staff assessed limiting factors at the population scale and aggregated them to the ESU scale; major limiting factors for particular populations may differ from the ESU-scale shown above.

For additional information on limiting factors for Washington populations within this ESU, see the Lower Columbia Fish Recovery Board Salmon Recovery and Fish and Wildlife Subbasin Plan at <http://www.nwr.noaa.gov/Salmon-Recovery-Planning/ESA-Recovery-Plans/Draft-Interim-Recovery.cfm>.

Additional information on limiting factors for Oregon populations in this ESU will be developed as part of the recovery planning process in 2006.

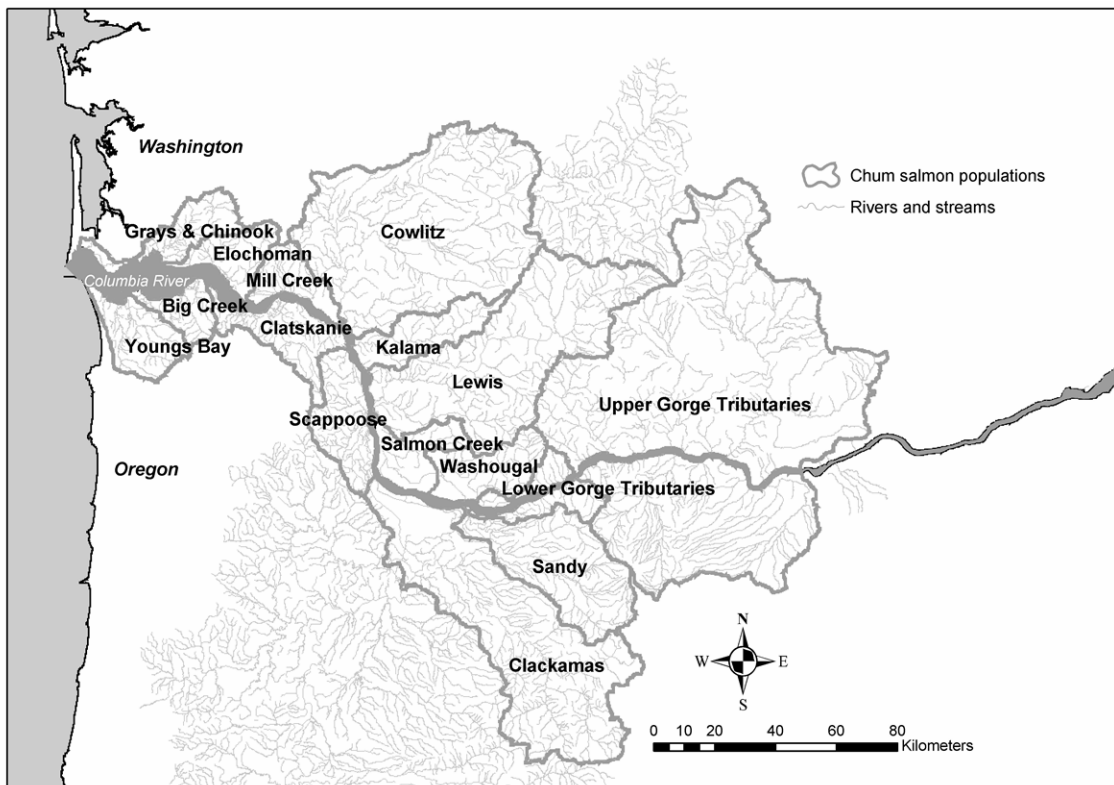
Additional information on this ESU is available at <http://www.nwr.noaa.gov/ESA-Salmon-Listings/Salmon-Populations/Steelhead/STLCR.cfm>.

Columbia River Chum (*Oncorhynchus keta*)

Listing Status: Threatened (64 FR 14508, reaffirmed 70 FR 37160)

Range: The Columbia River chum salmon ESU includes all naturally spawned populations in the Columbia River and its tributaries in Washington and Oregon. Three artificially propagated stocks are considered part of the ESU: those in the Chinook River (Sea Resources Hatchery), Grays River, and Washougal River/Duncan Creek chum hatchery programs.

Population Identification: The WLC TRT identified 16 historical populations in this ESU (see map A-5, below) (Myers et al., in press).



Map A-5. Historical demographically independent populations in the Columbia River Chum ESU.

The TRT aggregated these 16 historical populations into the following three strata:

Stratum	Population
Coastal	Grays and Chinook
	Elochoman
	Mill
	Youngs Bay
	Big Creek

	Clatskanie
	Scappoose
Cascade	Cowlitz
	Kalama
	Lewis
	Salmon
	Washougal
	Clackamas
	Sandy
Gorge	Lower Gorge
	Upper Gorge

NMFS’s 2005 Report to Congress for the Pacific Coastal Salmon Recovery Fund (see <http://www.nwr.noaa.gov/Salmon-Recovery-Planning/PCSRF/Index.cfm>) identified the following major factors limiting recovery of this ESU:

- Altered channel form and stability in tributaries
- Excessive sediment in tributary spawning gravels
- Altered stream flow in tributaries and mainstem Columbia
- Loss of some tributary habitat types
- Harassment of spawners in tributary and mainstem

Identification of these limiting factors was based on existing information in subbasin plans and other documents. Based on this existing information, NMFS staff assessed limiting factors at the population scale and aggregated them to the ESU scale; major limiting factors for particular populations may differ from the ESU-scale shown above.

For additional information on limiting factors for Washington populations within this ESU, see the Lower Columbia Fish Recovery Board Salmon Recovery and Fish and Wildlife Subbasin Plan at <http://www.nwr.noaa.gov/Salmon-Recovery-Planning/ESA-Recovery-Plans/Draft-Interim-Recovery.cfm>.

Additional information on limiting factors for Oregon populations in this ESU will be developed as part of the recovery planning process in 2006.

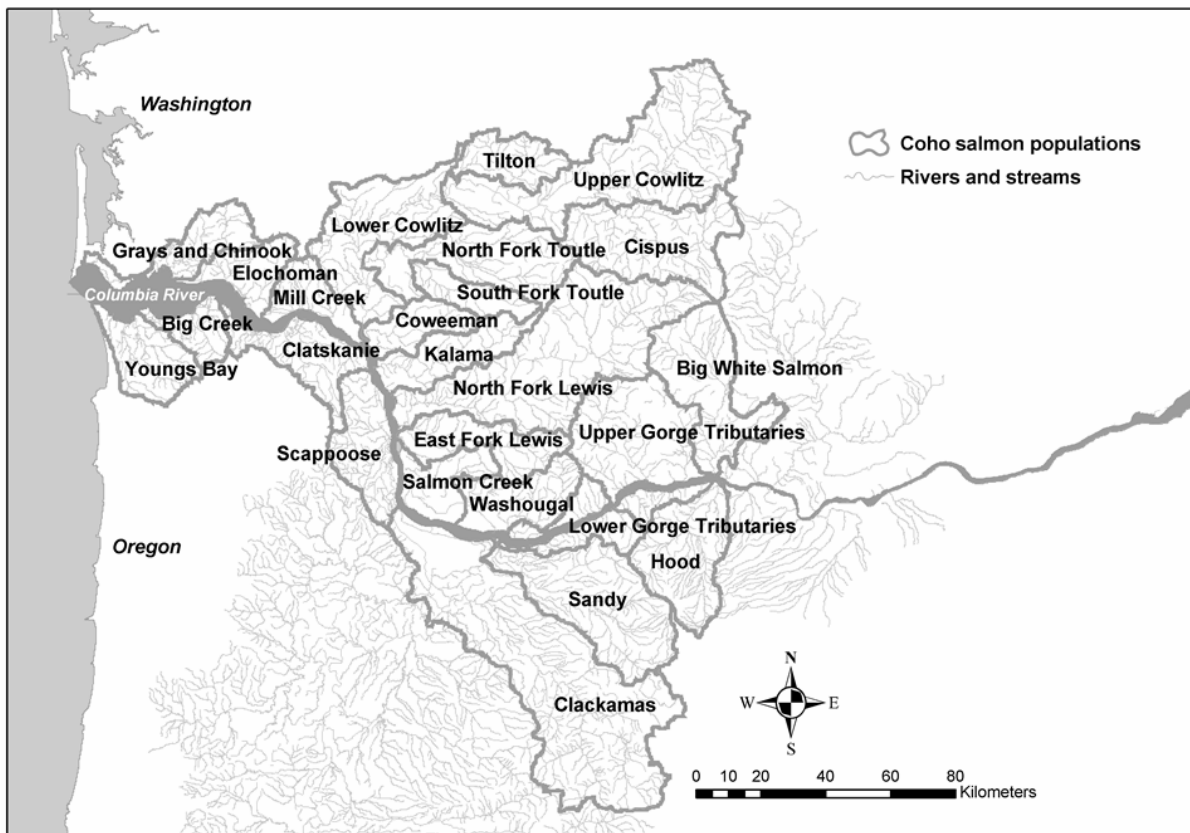
Additional information on this ESU is available at <http://www.nwr.noaa.gov/ESA-Salmon-Listings/Salmon-Populations/Chum/Index.cfm>.

Lower Columbia River Coho (*Oncorhynchus kisutch*)

Listing Status: Threatened (70 FR 37160)

Range: The Lower Columbia River coho salmon ESU includes all naturally spawned populations of coho salmon in the Columbia River and its tributaries in Washington and Oregon, from the mouth of the Columbia up to and including the Big White Salmon and Hood Rivers, and includes the Willamette River to Willamette Falls, Oregon, as well as twenty-five artificial propagation programs (see list at 70 FR 37178)

Population Identification: The WLC TRT tentatively identified 25 historical populations in this ESU (see map A-6, below) (Myers et al., in press). These population designations are currently undergoing revision. The TRT will combine the Washington Upper Gorge and Big White Salmon populations into a single Big White Salmon population and the Oregon Upper Gorge and Hood populations into a single Hood population. This change will reduce the total number of populations in the ESU to 24.¹⁵



Map A-6. Historical demographically independent populations in the Columbia River Coho ESU.

¹⁵ The Lower Columbia Fish Recovery Board’s plan for the Washington management unit of this ESU was based on the TRT’s tentative identification of the Upper Gorge and White Salmon populations as distinct. When the population identification document currently in press is finalized, NMFS will work with the LCFRB to address any implications of the changes to identification of historical populations.

These 24 populations would fall into the following three strata:

Stratum	Population
Coastal	Grays and Chinook
	Elochoman
	Mill Creek
	Youngs Bay
	Big Creek
	Clatskanie
	Scappoose
Cascade	Lower Cowlitz
	Tilton
	Upper Cowlitz
	Cispus
	North Fork Toutle
	South Fork Toutle
	Coweeman
	Kalama
	North Fork Lewis
	East Fork Lewis
	Salmon Creek
	Washougal
	Clackamas
Sandy	
Gorge	Lower Gorge
	White Salmon
	Hood

NMFS's 2005 Report to Congress for the Pacific Coastal Salmon Recovery Fund (see <http://www.nwr.noaa.gov/Salmon-Recovery-Planning/PCSRF/Index.cfm>) did not address this ESU because it was not listed at the time. NMFS's listing decision for the Lower Columbia River coho salmon ESU (70 FR 37160) identified habitat loss, loss of spawning populations, low abundance of extant populations, diminished diversity, and fragmentation and isolation of remaining naturally produced fish as risks to the ESU (70 FR 37188).

For additional information on limiting factors for Washington populations within this ESU, see the Lower Columbia Fish Recovery Board Salmon Recovery and Fish and Wildlife Subbasin Plan at <http://www.nwr.noaa.gov/Salmon-Recovery-Planning/ESA-Recovery-Plans/Draft-Interim-Recovery.cfm>.

Additional information on limiting factors for Oregon populations in this ESU will be developed as part of the recovery planning process in 2006.

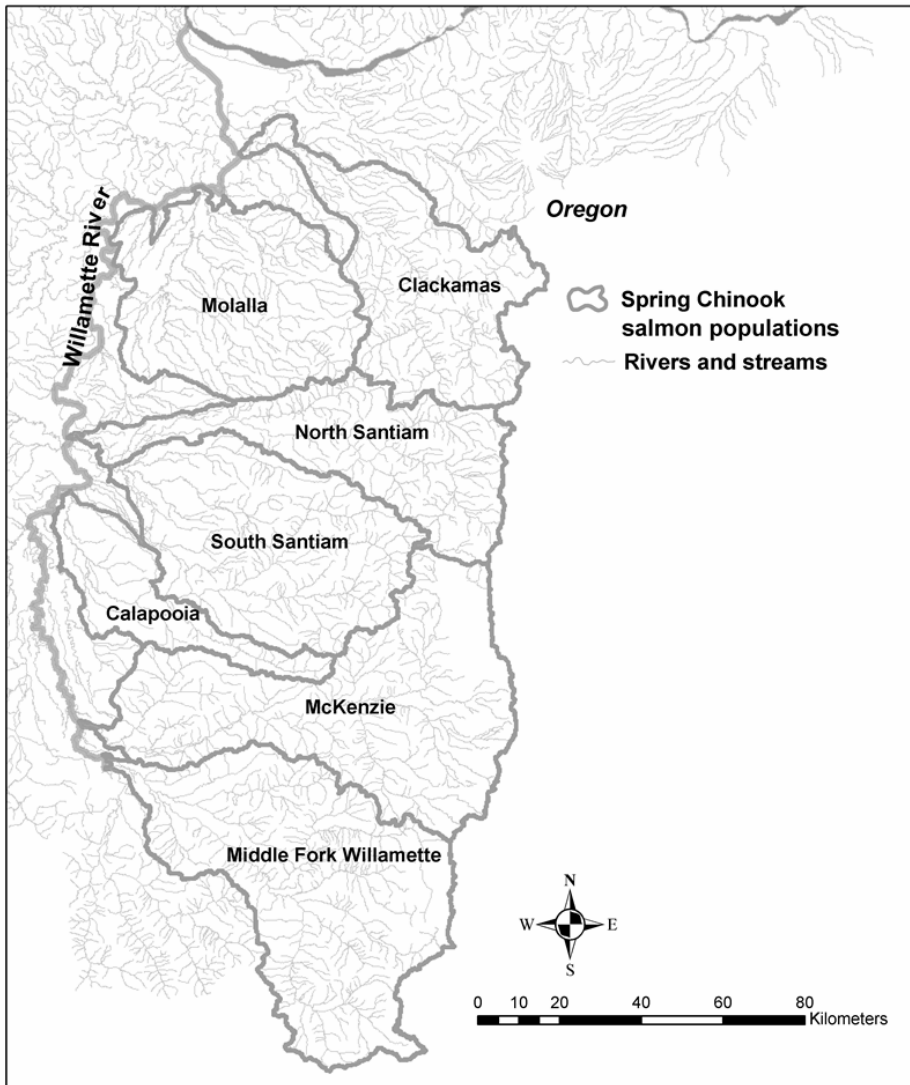
Additional information on this ESU is available at <http://www.nwr.noaa.gov/ESA-Salmon-Listings/Salmon-Populations/Coho/COLCR.cfm>.

Upper Willamette River Chinook (*Oncorhynchus tshawytscha*)

Listing Status: Threatened (64 FR 14308, reaffirmed 70 FR 37160)

Range: The Upper Willamette spring Chinook ESU includes all naturally spawned populations of spring-run Chinook salmon in the Clackamas River and in the Willamette River and its tributaries above Willamette Falls, Oregon. The following seven artificial propagation programs are part of this ESU: Willamette, McKenzie, Clackamas, Marion Forks/North Santiam, and the South Santiam hatcheries in the Molalla, Calapooia, and South Santiam rivers (see list at 70 FR 37177).

Population Identification: The WLC TRT identified 7 historical populations in this ESU (see map A-7, below) (Myers et al., in press).



Map A-7. Historical demographically independent populations in the Upper Willamette River Chinook ESU.

This ESU contains only one stratum. All 7 populations are part of the Cascade spring run stratum.

NMFS's 2005 Report to Congress for the Pacific Coastal Salmon Recovery Fund (see <http://www.nwr.noaa.gov/Salmon-Recovery-Planning/PCSRF/Index.cfm>) identified the following major factors limiting recovery of this ESU:

- Reduced access to spawning/rearing habitat in tributaries
- Altered water quality and temperature in tributaries
- Lost/degraded floodplain connectivity and lowland stream habitat
- Altered streamflow in tributaries
- Hatchery impacts

Identification of these limiting factors was based on existing information in subbasin plans and other documents. Based on this existing information, NMFS staff assessed limiting factors at the population scale and aggregated them to the ESU scale; major limiting factors for particular populations may differ from the ESU-scale shown above.

Additional information on limiting factors for the populations in this ESU will be developed as part of the recovery planning process in Oregon in 2006.

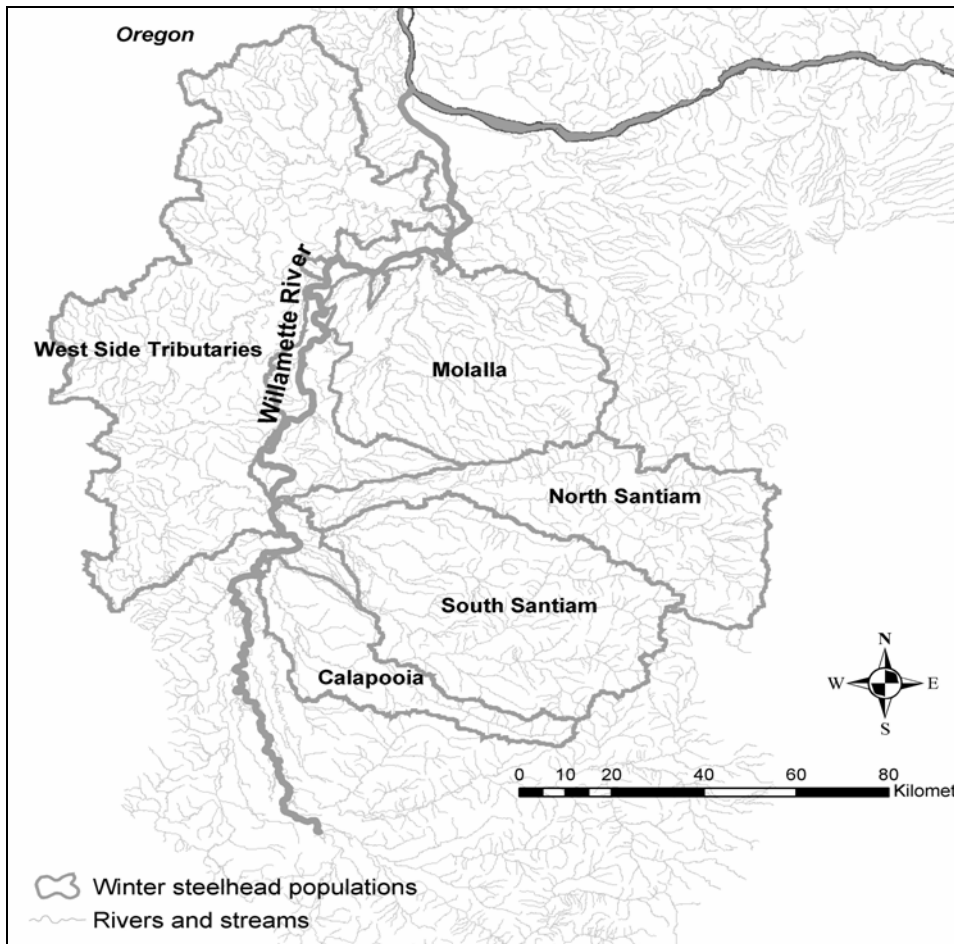
Additional information on this ESU is available at <http://www.nwr.noaa.gov/ESA-Salmon-Listings/Salmon-Populations/Chinook/CKUWR.cfm>.

Upper Willamette River Steelhead (*Oncorhynchus mykiss*)

Listing Status: Threatened (64 FR 14517)

Range: The Upper Willamette River steelhead ESU includes all naturally spawned populations of winter-run steelhead in the Willamette River, Oregon, and its tributaries upstream from Willamette Falls to the Calapooia River (inclusive). On June 14, 2004, NMFS proposed to reaffirm this listing as threatened (69 FR 33102). A final determination on this decision is due on December 14, 2005.

Population Identification: The WLC TRT identified 4 historical populations and one “population sink” area (the Westside tributaries) in this ESU (see map A-8, below). The TRT determined that the westside tributaries were unlikely, individually or collectively, to have constituted a demographically independent population. The TRT included the westside tributaries in the population map as a population sink. This designation recognizes that winter steelhead may intermittently utilize some of these tributaries for spawning or rearing and underscores the influence of these tributaries on water conditions in the mainstem Willamette River (Myers et al., in press).



Map A-8. Historical demographically independent populations in the Upper Willamette River Steelhead ESU.

This ESU contains only one stratum. All 4 populations are part of the Cascade winter run stratum.

NMFS's 2005 Report to Congress for the Pacific Coastal Salmon Recovery Fund (see <http://www.nwr.noaa.gov/Salmon-Recovery-Planning/PCSRF/Index.cfm>) identified the following major factors limiting recovery of this ESU:

- Reduced access to spawning/rearing habitat in tributaries
- Altered water quality and temperature in tributaries
- Lost/degraded floodplain connectivity and lowland stream habitat
- Altered streamflow in tributaries

Identification of these limiting factors was based on existing information in subbasin plans and other documents. Based on this existing information, NMFS staff assessed limiting factors at the population scale and aggregated them to the ESU scale; major limiting factors for particular populations may differ from the ESU-scale shown above.

Additional information on limiting factors for the populations in this ESU will be developed as part of the recovery planning process in Oregon in 2006.

Additional information on this ESU is available at <http://www.nwr.noaa.gov/ESA-Salmon-Listings/Salmon-Populations/Steelhead/Index.cfm>.

References

Myers, J., C. Busack, D. Rawding, and A. Marshall. 2003. Historical population structure of Willamette and Lower Columbia River Basin Pacific Salmonids. WLC-TRT Report. NOAA Fisheries Northwest Fisheries Science Center. Seattle, WA.

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