Oregon Coastal Coho Assessment

Part 1: Synthesis of the Coastal Coho ESU Assessment – Including:

1. **Viability Analysis**
2. **Population Bottlenecks**
3. **Evaluation of Conservation Efforts**
4. **Monitoring**
5. **Current Threats to ESU Viability**
6. **Adaptive Management Commitments**

State of Oregon[1]

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EXECUTIVE SUMMARY

Background

Populations of coho salmon (*Oncorhynchus kisutch*) that occur in coastal watersheds between Cape Blanco and the mouth of the Columbia River are being evaluated by NOAA Fisheries for listing under the federal Endangered Species Act (ESA). These populations, which have been designated a single Evolutionary Significant Unit (ESU) (Weitkamp et al. 1995), have been the focus of a considerable conservation effort by the State of Oregon, local and private entities, and federal management partners. Much of this conservation effort has been developed and implemented under a planning framework called the Oregon Plan for Salmon and Watersheds (Oregon Plan). The Oregon Plan brings together various governmental and non-governmental entities to implement conservation strategies for fish populations throughout Oregon, including those belonging to the Oregon coastal coho ESU. In this context, the Oregon Plan refers to the broad suite of conservation efforts implemented to improve the status of coho and their watersheds (e.g., harvest, hatcheries, habitat, etc).

The Coastal Coho Project and the Coho Assessment

The State of Oregon, in partnership with the National Marine Fisheries Service (NOAA Fisheries), initiated a collaborative project to address the conservation of coastal coho on the Oregon coast. The primary objectives of the Coastal Coho Project are to:

- Assess Oregon Plan efforts to conserve and rebuild coastal coho populations.
- Use the assessment to inform NOAA Fisheries' status review listing determination.
- Use the assessment as a foundation for developing a conservation or recovery plan for coho.
- In the event that NOAA Fisheries determines to list this ESU as threatened, use the assessment as a basis to seek legal assurances for those carrying out activities that are consistent with the Oregon Plan.

This report addresses objective (2) of the Coastal coho Project by providing a synthesis (Part 1) of the biological analysis of coho status relative to viability criteria (Part 2) and an assessment of conservation efforts to address the factors for decline and threats associated with the coastal coho ESU (Parts 3 and 4). The four parts of this report address ESA listing considerations, including the federal Policy for Evaluation of Conservation Efforts When Making Listing Decisions (PECE) (68CFR15100).

The Coho Assessment Process

The framework for this assessment included developing measurable criteria to define population and ESU viability, utilizing the best available information to evaluate fish status relative to these criteria, identifying key factors likely responsible for the evaluation result, assessing the implementation certainty and effectiveness of conservation efforts to address factors for decline and potential threats to viability, and concluding with Oregon's overall evaluation of what threats to this ESU remain and what the significance of those threats is in terms of risk to viability.

To accomplish this, various types of data were examined, including: fish abundance and distribution, marine survival, fishery harvest, hatchery programs, stream complexity, riparian condition, water quality, streamflow, fish passage (access to spawning and rearing streams), predation, fish disease, and exotic fish species. These data represent available information collected both before and after the formal implementation of the Oregon Plan in 1997.

The State of Oregon has conducted this comprehensive assessment of the status of the fish, the status of habitat that supports the species' life cycle, and the ongoing conservation efforts for this ESU in order to inform the continued management programs and activities. The results of this Assessment are intended also to inform the federal government's listing decision. Oregon's assessment includes:

1. Evaluating the biological viability (sustainability) of the ESU.
2. Identifying key risk factors that contributed to the past decline of coho or potentially threatening coho viability in the foreseeable future.
3. Determining the current levels of risk to ESU viability presented by these key risk factors.
4. Evaluating the status and trends of management programs, restoration work, habitat, and other conditions in place to address these risk factors and maintain or enhance the continued viability of the ESU.

The Coho Assessment will Inform Recovery Planning

The Coastal Coho ESU Assessment is the starting point for more effective future restoration investment, monitoring, and adaptive management action. Regardless of the current ESA listing decision, Oregon, in partnership with NOAA Fisheries and interested stakeholders, will continue the ongoing process of completing a full conservation/recovery plan. This plan builds upon the Assessment to establish goals beyond the threshold of viability, focuses management actions on the primary limiting threats to reaching those goals, and establishes a comprehensive monitoring and evaluation program for adaptive management. The draft conservation/recovery plan is scheduled to be completed by the end of 2005.

Contents of the Part 1 Synthesis Document

This Part 1 Synthesis document provides a complete overview of the Assessment. A reader will be able to review the entire Assessment story here, including the following elements.

1. Viability analysis
2. Population bottlenecks
3. Evaluation of conservation efforts
4. Monitoring
5. Evaluating current threats to ESU viability
6. Oregon's conclusions regarding future ESU viability
7. Lessons learned and adaptive management commitments

Assessment Results Will Also be Displayed Graphically in Storyboards

A series of Storyboards have also been developed that display key elements of data and interpretation developed during the Assessment. Storyboards are developed at three spatial/biological scales: the ESU, the Monitoring Area, and the population. These storyboards are an additional effort to communicate the key elements of a complex story in shorthand. The storyboards may be viewed and printed from the following internet address. The internet address will be active on May 6, 2005. Some of the data displayed in the storyboards will be revised during the month of May, and final versions will be complete by the end of May 2005. http://mtjune.uoregon.edu/website/OWEB/Assessment

Key Conclusions Regarding ESU Viability

1. The Coastal coho ESU is viable, that is, coho populations generally demonstrate sufficient abundance, productivity, distribution and diversity to be sustained under the current and foreseeable range of environmental conditions. In fact, the ESU retains sufficient productivity and is supported by sufficient habitat to be sustainable through a future period of adverse ocean, drought and flood conditions similar to or somewhat more adverse than the most recent period of poor survival conditions (late 1980s and 1990s).
2. During and after the recent period of poor marine survival, coho populations generally demonstrated adequate resiliency to resist continued downward population trends, and demonstrated the ability to rebound dramatically as marine survival conditions improved.
3. The mechanisms for this response are most likely a combination of inherently strong density-dependent recruitment coupled with sufficient high quality habitats to sustain productivity during periods of adverse environmental conditions. This reasoning does not imply that habitat conditions are optimum for the species nor that habitat is currently sufficient to achieve broader Oregon Plan recovery goals for the ESU.
4. Although the ESU passed viability criteria, 7 of 21 independent coho populations failed at least one of the viability criteria. These populations are distributed across 4 of 5 population strata that comprise the ESU.
5. Hatchery programs were associated with 5 of the 7 populations that did not pass viability criteria, and may have contributed to poor population performance. Significant improvements have already been made in hatchery programs for 3 of these 5 populations; positive gains in the viability of these populations are expected to become evident over the next decade.
6. The possibility that a number of adverse environmental conditions could converge and create a catastrophic threat to ESU viability is real. The convergence of the worst marine survival conditions in the last five decades, drought and extreme floods all occurred in the 1990s. Although the impacts were dramatic the ESU remained viable through this period and rebounded quickly once conditions moderated. Oregon concludes that the life cycle of the species, its population dynamics and structure, and its broad geographic distribution all provide protection and reduce the likelihood that catastrophic events or convergence of multiple adverse environmental conditions would result in this ESU not being viable in the foreseeable future.

7. The assessment that Oregon coastal coho are viable and likely to persist into the foreseeable future is predicated on the assumption that freshwater habitat and marine survival conditions in the future will generally correspond with environmental conditions and variability evident in the past several decades. If survival associated with marine or freshwater conditions trend moderately downward into the future, then the assessment should be revisited and adjusted accordingly.
8. Diligence in ongoing conservation efforts, coupled with an ongoing commitment to monitoring and evaluation for adaptive management, will ensure that viability is maintained. Improving viability to better meet recovery goals and Oregon Plan objectives will likely require additional conservation efforts focused on key limiting factors. Oregon and NOAA Fisheries, in collaboration with stakeholders, are currently developing this expanded conservation plan. A draft is scheduled for completion by the end of 2005.

Key Conclusions Regarding Population Bottlenecks

1. Oregon has identified primary and secondary risk factor bottlenecks for each of the 21 independent populations that comprise the ESU.
2. This work will help prioritize future management and restoration work to further strengthen ESU viability and achieve the intent of the Oregon Plan.
3. Stream complexity and water quality were the two most commonly identified population bottlenecks, regardless of whether populations were or were not classified as viable.
4. Stream complexity was the primary bottleneck for 13 of 21 populations and was a secondary bottleneck for 8 of 21 populations.
5. Water quality was not a primary bottleneck for any populations; however, it is a secondary bottleneck for 15 of 21 populations.
6. Other risk factors that were identified as primary population bottlenecks include: hatchery impacts (2 populations), exotic fish species (3 populations), water quantity (2 populations), and spawning gravel (1 population).
7. Oregon concludes that it will often be more reasonable to simultaneously pursue remediation of both primary and secondary population bottlenecks, using local data to prioritize restoration funding at local spatial scales, rather than to adopt a narrow view of only attempting to remediate the primary risk factor bottleneck.

Key Conclusions Regarding Oregon's Conservation Effort

1. Historical land, water and fish management activities that were the major contributing factors for the legacy of coho declines have been stopped.
2. State and federal laws established during the 1950s through 2004 (Splash damming eliminated, gill-netting eliminated in coastal rivers, federal Clean Water Act, federal Endangered Species Act, Oregon Forest Practices Law, Oregon Fill and Removal Law, PFMC Harvest Matrix Amendment 13, Native Fish Conservation Policy, Salmon and Parks Initiative, etc) establish a far more protective management environment than existed previously.
3. Implementation of the Oregon Plan beginning in 1997 demonstrated a substantial effort by the state to expand and strengthen an already considerable programmatic

conservation and restoration effort – designed to improve the status and prevent any future deterioration of this ESU's viability.

4. Fishery harvest rates over the last decade have been maintained by management action at extremely (unprecedented) low levels compared to the prior four decades.
5. Hatchery programs and impacts are at the lowest levels during the past four decades.
6. Conservative regulation of fishery and hatchery impacts is required by state and federal policies that will continue to protect and strengthen future ESU viability.
7. Reduced adverse impacts from hatchery programs across the ESU in the last two decades may not have been fully reflected in populations that were most adversely affected by historical practices. Such positive expression of current management practices may occur in the next decade or so.
8. New regulatory and programmatic action by DEQ, ODA, and ODF has been implemented; this action should further improve water quality and habitat supporting the ESU.
9. A new analysis of water use in the ESU indicates that permitted water use is not and will not become a primary limiting factor of ESU viability.
10. Restoration work (including fish passage) in the ESU during 1997-2003 exceeded any previous level of effort.
11. Recent analyses of wetlands associated with coastal estuaries indicate that these habitats are being protected by current regulations.
12. Primary habitat-related threats to coho viability are being addressed through ongoing conservation efforts.

Key Findings Regarding Future Conditions in the ESU

1. Watershed councils have been established throughout the ESU; these will complement future conservation and restoration efforts by Soil and Water Conservation Districts, private landowners, and state and federal agencies.
2. State funding to support Oregon Plan work (e.g., restoration, Watershed Council support, Soil and Water conservation District support, monitoring, assessments, etc.) is provided by Oregon Law until at least mid-2014.
3. Substantial new investments in monitoring of coho, habitat, and water quality provided a rich source of data to support Oregon's ESU assessment and adaptive management of conservation efforts.
4. The ocean environment for coho survival improved since mid-to-late 1990s, although current conditions and future trend is uncertain.
5. Abundance and density of coho spawners throughout the ESU increased since 1998 to the highest average level observed in five decades, reflecting a rapid and ESU-wide response of the populations that comprise the ESU. Higher spawner numbers distributed widely across the ESU should have positive impact on the ESU as a consequence of increased input of marine derived nutrients.
6. Analyses by the Coastal Landscape Analysis and Modeling Study (CLAMS) suggest that the future availability of larger riparian trees in forestlands will increase on fish-bearing streams regardless of land ownership. In contrast, the future potential for wood recruitment is likely to vary across forestland ownerships, with the higher potentials on public lands and lower potentials on

private lands. Oregon concludes that these projections suggest that future habitat conditions for coho across the ESU will be at least similar to and perhaps improved over current conditions.

7. CLAMS analyses did not consider what is likely to happen to riparian vegetation on agricultural or urban portions of the landscape. The State concludes that modest improvement in riparian vegetation is likely to accrue on agricultural lands under current rules but acknowledges that considerable uncertainty exists regarding specificity of improvement.
8. Monitoring of habitat and water quality since 1997 provides a baseline to detect future trends (positive or negative) that could affect ESU viability. The sensitivity (ability to detect change) of monitoring will increase substantially in the next 3-8 years as more data become available.

Key Conclusions Regarding Current Threats to ESU Viability

1. Based on Oregon's finding that the Coastal coho ESU is viable – plus evaluation of habitat data, conservation efforts, and monitoring programs – current levels of threat to continued ESU viability were determined.
2. Oregon concluded that two risk factors (ocean conditions and stream complexity) currently present moderate levels of risk to future ESU viability.
3. This finding is in sharp contrast to 1997 when many risk factors (fishery harvest, hatchery programs, stream complexity, fish passage, water quality, water quantity) were thought to present high levels of threat to ESU viability.

Key Conclusions Regarding Adaptive Management

1. Recently available tools (e.g., *High Intrinsic Potential* modeling, fish passage structure mapping at 1:24,000K scale, ESU population structure description) represent tangible opportunities to improve the efficacy of future conservation and restoration investments.
2. Oregon will develop a draft conservation plan for the Oregon Coast coho ESU by December 2005 with participation by NOAA and a stakeholder team. This plan will build on existing adaptive management frameworks (e.g., Oregon Plan, Native Fish Conservation Policy, Hatchery Management Policy, Pacific Fishery Management Council) to identify specific triggers for additional responsive actions to address unanticipated declines in fish numbers or unanticipated threats to viability. Until this comprehensive plan is completed, existing adaptive management triggers remain in place (e.g., Native Fish Conservation Policy interim criteria).
3. Oregon has committed to complete a review of monitoring programs in relation to findings of this Assessment and propose any needed refinement or alteration of monitoring designs by the 2006 field season.
4. Oregon has committed to maintain and upgrade a data library website to provide access to data used in the Assessment
5. Oregon has committed to focus habitat inventories and culvert condition evaluations first on identifying the presence of high quality overwintering habitat above existing fish passage barriers and on clarifying the passage status of structures that would provide access to high intrinsic potential streams.

6. Oregon has committed to building on existing information to ensure that high quality habitats are well defined and mapped.

Key Findings Regarding Future ESU Viability

1. A diverse set of conditions supports the conclusion that this ESU will maintain its viability into the foreseeable future. This set of conditions includes laws, management programs, monitoring, environmental conditions, and societal networks. In concert, these conditions serve to sustain and improve future viability of the ESU by: (1) reversing many of the environmental alterations and fishery impacts caused by historical management practices, (2) conserving existing conditions that support viability of the ESU, (3) creating future environmental conditions, based on an understanding of primary threats to individual populations, that will further improve the viability of the ESU in fulfillment of Oregon Plan objectives; and (4) maintaining a comprehensive monitoring program to allow adaptive management of conservation efforts as new information is gained.
2. It is unlikely that conditions currently supporting viability of the ESU will change so rapidly or dramatically as to preclude future, timely detection and protective action under Oregon management programs or the federal ESA.
3. Ongoing vigilance regarding conservation and restoration programs is necessary to sustain and improve viability of the ESU, most notably the responsiveness of these programs to variation in marine survival.
4. Recognizing that considerable uncertainty does indeed exist in relation to data, modeling, and interpretation of future trends, Oregon concludes that a modest level of optimism is warranted regarding the overall status and management of this ESU. Oregon also concludes that future evaluation of data will be conducted and that this future analysis will provide sufficient accountability to detect any errors that may have been made in interpreting the present status of the ESU.

SUMMARY – VIABILITY ANALYSIS[2]

Prior ESA listing decisions and the current NOAA Fisheries status review for coastal coho did not include an up-to-date and comprehensive analysis of coho viability relative to a suite of fish performance attributes examined at the population and ESU level (50 CFR Part 27). Recent description of the ESU population structure by the NOAA Coastal Coho Technical Recovery Team (TRT) (Lawson et al. 2004), ongoing development of viability criteria by the TRT, plus the availability of extensive data on coho abundance and distribution collected during 1997 – 2004, are new elements that allowed Oregon to complete a more comprehensive and updated analysis of coastal coho viability.

The framework used in the viability analysis included: identifying the ESU population structure; selecting fish performance attributes essential for viability; developing population viability criteria for each attribute and the roll-up to assess ESU viability; and then analyzing the status of coastal coho relative to population and ESU viability criteria.

ESU Population Structure

The NOAA Technical Recovery Team has proposed a population structure (Lawson et al. 2004) for the Coastal coho ESU, slightly modified in recent months, that identifies 57 *populations* comprising five population *strata* within the ESU. Of these 57 populations, only 21 are thought to occur in basins with sufficient historical habitat to have persisted through several hundred years of normal variations in marine and freshwater conditions (Figure 1). These have been classified as “potentially independent” and “functionally independent” populations[3] and are grouped into five strata (Table 1). The vast majority (~ 95%) of the coho historically produced in this ESU probably originated from these independent populations. The remaining 36 populations, which Lawson et al. (2004) classifies as “dependent populations,” are generally thought to be dependent on the periodic reproductive contribution of strays from adjacent larger populations in order to naturally persist for periods longer than 100 years. Populations are the basic elements of the ESU and population strata are used to represent clusters of populations that share ecological or geographic similarities. The 21 independent populations were the focus of the viability assessment because the fate of the ESU is largely driven by their condition.

[2] See Part 2 of report for detailed description and discussion of the coho viability analysis.

[3] Potentially independent populations were historically self-sustaining but also likely were demographically influenced by neighboring independent populations. Functionally independent populations were historically self-sustaining and likely had relatively little demographic influence from neighboring populations (Lawson et al. 2004).

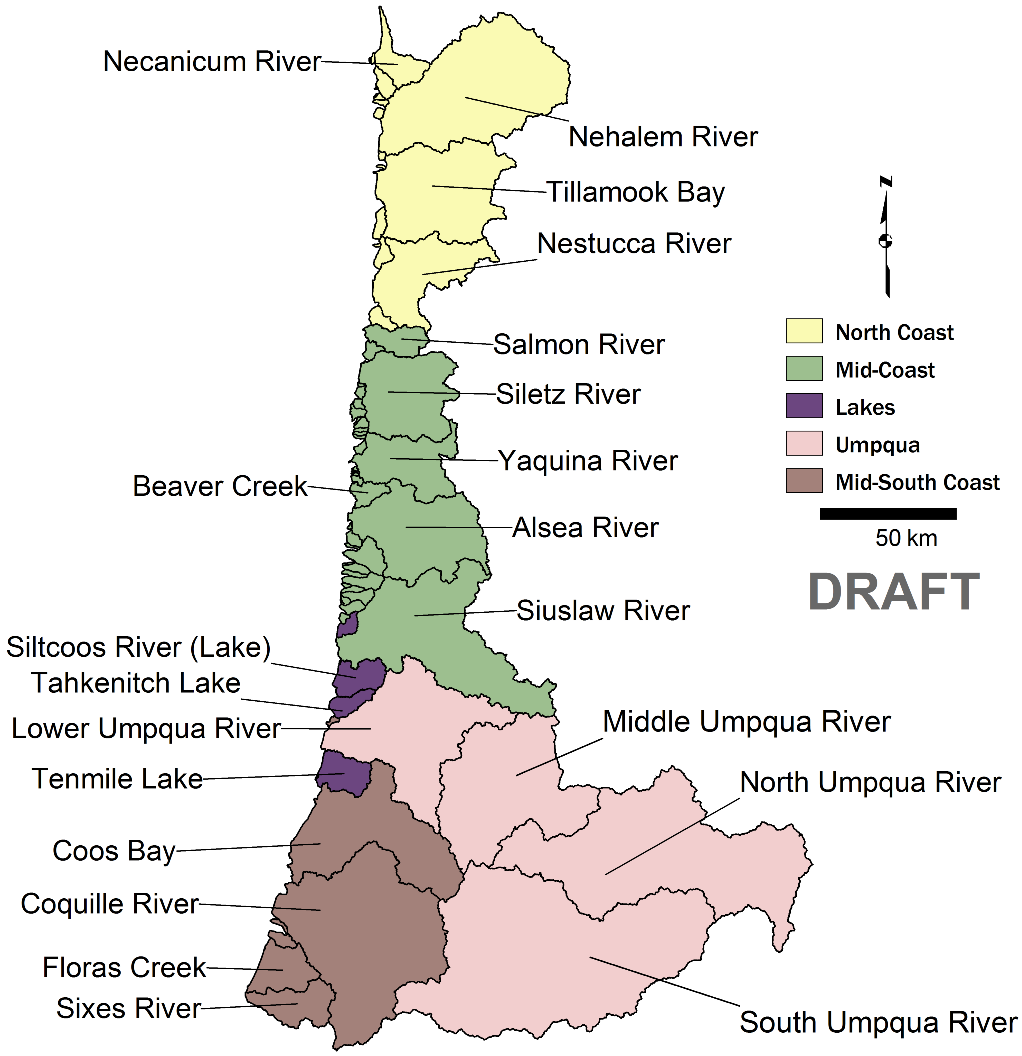

Figure 1. Independent populations and geographic strata of the coastal coho ESU.

Table 1. Geographic strata and independent populations for the Coastal coho ESU.

Geographic Stratum	Population	Population Type
Northern	Necanicum	Potentially Independent
	Nehalem	Functionally Independent
	Tillamook	Functionally Independent
	Nestucca	Functionally Independent
North-Central	Salmon	Potentially Independent
	Siletz	Functionally Independent
	Yaquina	Functionally Independent
	Beaver	Potentially Independent
	Alsea	Functionally Independent
	Siuslaw	Functionally Independent
Umpqua	Lower Umpqua	Functionally Independent
	Mid Umpqua	Potentially Independent
	North Umpqua	Potentially Independent
	South Umpqua	Functionally Independent
Lakes	Siltcoos	Potentially Independent
	Tahkenitch	Potentially Independent
	Tenmile	Potentially Independent
South-Central	Coos	Potentially Independent
	Coquille	Functionally Independent
	Floras	Potentially Independent
	Sixes	Potentially Independent

Fish Performance Attributes

Multiple, mostly independent criteria were used to evaluate whether populations within the ESU are viable based on abundance, productivity, persistence, distribution and diversity attributes of coho performance.

Abundance was evaluated by determining if populations averaged above five spawners per mile associated with the seven worst years of poor marine survival conditions in the 1990s. Productivity was evaluated by determining if populations averaged at or above replacement when spawner densities were relatively low during the record downturn of the 1990s. Persistence was evaluated by a modeling exercise that forecast spawner abundance levels over a period of 100 years incorporating 3 randomly fluctuating variables: habitat capacity, intrinsic productivity and marine survival conditions. The probability of persistence was one minus the proportion of the model simulations that adult abundance was forecast to be less than an effective extinction level. Distribution was evaluated by examining whether reasonable numbers of coho where observed in a majority of stream reaches most years. Diversity was evaluated by estimating the potential loss of genetic variation over the next 100 years.

Abundance, productivity and distribution criteria were evaluated based on a retrospective evaluation of population performance including the most recent period of adverse ocean conditions. Persistence and diversity criteria were based on a prospective forecast of future population abundance based on coho recruitment data from the 1950s through 2003. All attributes were evaluated at the population level, and then rolled up for strata and ESU evaluation.

Population Viability Criteria

The following criteria were assigned to each attribute to represent viable populations. If a population failed one or more of the criteria, it was not considered viable. Part 2 of this report provides a more thorough description of criteria.

Abundance: (1) During a recent period of very poor ocean survival conditions (1993-1999), the average spawning abundance met or exceeded levels equivalent to five fish per mile.

Productivity: (2) During a recent period of very poor ocean survival conditions, the recruits per spawner (R/S) averaged at or above replacement when spawner density was less than 10 fish per mile.

Persistence: (3) The probability of averaging only one fish per mile for any three-year period over the next 100 years is no more than 5%.

Distribution: (4) Based on pooled spawner data for the recent 12-year period of poor marine survival (1989-2000), at least half of the sampling sites within a population's spawning area have at least four fish per mile for at least half of the 6^{th} field Hydrologic Unit subbasins.

Diversity: (5) The harmonic mean of annual forecasted spawner abundance exceeds 600 spawners to avoid loss of 5% genetic variation over the next 100 years.

ESU Viability Criteria

Population viability results were rolled up to evaluate the status of the ESU. The ESU was considered viable if all of the following conditions were met: (1) at least half of the independent ESU populations passed all population viability criteria; (2) at least two populations per strata passed all population viability criteria; and (3) all strata passed (i.e., met conditions 2 and 3).

Assessment of Coho Status Relative to Criteria

Based on our assessment of the status of coastal coho relative to viability criteria, the ESU is viable (Table 2). All strata passed their criteria; 14 populations passed all the population criteria, and seven populations failed at least one criterion.

Table 2. Conclusions from the viability analysis for Oregon coastal coho at the population, strata and ESU level. Distinction between pass and pass+ designations was not quantified and is only provided to identify those populations that passed one or all criteria by relatively narrow margins.

ESU criteria conclusion	Geographic stratum	Stratum criteria conclusion	Population	Population criteria conclusion
Pass	Northern	***Pass***	Necanicum	Pass
			Nehalem	**Fail**
			Tillamook	**Fail**
			Nestucca	Pass
	North-Central	***Pass***	Salmon	**Fail**
			Siletz	**Fail**
			Yaquina	Pass +
			Beaver	Pass +
			Alsea	**Fail**
			Siuslaw	Pass +
	Umpqua	***Pass***	Lower Umpqua	Pass +
			Mid Umpqua	Pass +
			North Umpqua	**Fail**
			South Umpqua	Pass +
	Lakes	***Pass +***	Siltcoos	Pass +
			Tahkenitch	Pass +
			Tenmile	Pass +
	South-Central	***Pass***	Coos	Pass +
			Coquille	Pass
			Floras	Pass
			Sixes	**Fail**

In general, the results from application of these criteria to populations comprising the ESU produced consistent results. For example, populations in the northerly portion of the ESU were less resilient than populations in the south, and the Lakes stratum contained the most robust populations in the entire ESU.

Our analysis indicates the ESU is viable assuming that environmental and habitat conditions in the future are no more than moderately worse than those that have been experienced during the last five decades (Table 3 and see Part 2 of this report). Moderate to severe declines in the condition of the marine and freshwater habitats would put populations at greater risk. However, several populations most vulnerable to this additional stress are also expected to benefit from recent reduction in the number of hatchery coho released (see Part 2 of this report).

Table 3. Sensitivity of failing the persistence criterion (p>0.05; shaded cells) based on positive and negative changes to the current life cycle survival of independent coastal coho populations. Changes in life cycle survival are relative to the base period 1958 – 2000; identified as 1.00 in Table Heading.

Population	Life Cycle Survival Relative to 1958 – 2000 Average											
	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.50	2.00
Necanicum	1.00	1.00	1.00	0.98	0.80	0.40	0.14	0.03	0.00	0.00	0.00	0.00
Nehalem	1.00	1.00	1.00	1.00	0.99	0.89	0.65	0.42	0.19	0.10	0.00	0.00
Tillamook	1.00	1.00	1.00	1.00	0.99	0.89	0.72	0.47	0.25	0.15	0.00	0.00
Nestucca	1.00	1.00	0.98	0.76	0.37	0.15	0.04	0.00	0.00	0.00	0.00	0.00
Salmon	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Siletz	1.00	1.00	1.00	1.00	1.00	0.98	0.86	0.63	0.43	0.23	0.00	0.00
Yaquina	1.00	1.00	0.98	0.79	0.47	0.25	0.10	0.04	0.02	0.01	0.00	0.00
Beaver	1.00	1.00	0.73	0.09	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Alsea	1.00	1.00	1.00	1.00	0.98	0.82	0.58	0.28	0.11	0.03	0.00	0.00
Siuslaw	1.00	1.00	0.93	0.53	0.19	0.05	0.02	0.00	0.00	0.00	0.00	0.00
LoUmpqua	1.00	1.00	0.66	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MidUmpqua	1.00	0.97	0.16	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NUmpqua	1.00	1.00	1.00	1.00	0.99	0.92	0.73	0.48	0.26	0.11	0.00	0.00
SUmpqua	1.00	1.00	0.85	0.23	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Siltcoos	1.00	0.27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tahkenitch	1.00	0.73	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tenmile	1.00	1.00	0.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Coos	1.00	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Coquille	1.00	1.00	0.92	0.27	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Floras	1.00	1.00	1.00	0.64	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sixes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.24	0.01

Persistence modeling predicted that several additional populations would be at risk in the northern and middle portions of the ESU if overall survival declined moderately (e.g., 15-50%) from what was experienced over the last five decades, which included the dramatic downturn of the 1990s. Changes of this magnitude are unlikely to occur so quickly as to preclude detection and adaptive response from state and federal managers.

Observed productivity indicates the ESU would remain viable if the adverse conditions of the 1990s are repeated. Risk of catastrophic events further compounding the effects of a return to poor ocean conditions is low. This is because the assessment of viability is based on data reflecting the adverse conditions of the 1990s, which already included poor ocean conditions, several years of drought, and extreme winter flood events (50-year event).

Potential sources of error in this evaluation relate to five general topics: 1) basic data measurement error, 2) the span of years with data was shorter than optimal for a highly reliable evaluation, 3) uncertainty with respect to the impact and trends in future habitat conditions, marine survival, and hatchery programs, and 4) validity of assumptions that formed the basis for criteria test metrics. Part 2 of this report discusses these potential sources of error in more detail.

There are numerous strengths of the viability analysis. It is based on an exceptionally comprehensive and long-term fish abundance and distribution data series. This comprehensive monitoring coincided with a previously unrecorded period of adverse environmental conditions that tested coho viability. The wealth of data that recorded the performance of coastal coho populations during this test period, and their subsequent rebound when environmental conditions moderated, allowed an empirical approach to assessing viability rather than just hypothetical. Finally, for the persistence criterion metric, a sensitivity analyses was performed to assess the implication of errors in measurement of population abundance, the implication of these errors on the model used to forecast coho recruitment, and the effect of different assumptions concerning future freshwater and marine conditions.

In addition, several areas of the analysis are risk averse resulting in a precautionary approach to assessing viability. Some examples include:

- if four out of five population viability criteria are met, the population is still considered not viable; if four out of five strata pass, the ESU is still considered not viable;
- persistence modeling dampened productivity at low fish densities even though the opposite was observed empirically;
- persistence modeling defined an extinction event as abundance equivalent to a density of one fish mile or 50 spawners, which ever was larger. A less precautionary approach to modeling persistence would have defined an extinction event as zero fish; and
- the expected positive impact of recent reductions in the number of hatchery smolts on the overall productivity of naturally reproducing populations was not included when testing to see if the population passed the persistence criterion.

In summary, the ESU is judged to be viable, that is, it retains sufficient productivity and is supported by sufficient quantity and quality of habitat to be sustainable through a future period of adverse conditions similar to or slightly more adverse than the most recent period of poor ocean survival (late 1980s and 1990s).

SYNTHESIS – BOTTLENECKS FOR POPULATIONS THAT COMPRISE THE ESU

The intent of this section is to report Oregon's determination of population bottlenecks for the 21 coho populations that comprise the ESU. This analysis is an important new element of Oregon's effort to create future conditions that will strengthen ESU viability. Whereas conservation and restoration efforts during 1997 -2004 were conducted in an attempt to address all factors for decline, the results of a risk factor (Table 4) analysis has the potential of providing more effective focus to conservation and restoration work.

Table 4. Definition of terms related to risk factors.

Risk Factor: management or environmental condition that has the potential of affecting ESU viability. Risk factors may be discussed in past, present, and future tense.
Factor for Decline: Risk factors that significantly contributed to a previous decline in the viability of the ESU. Factors for decline are typically discussed in past tense.
Threat to Viability: Threats to viability are only discussed in present or future tense. Threats to ESU viability were ranked as high, moderate, or low.

Population Bottleneck Defined

Oregon's intent was to identify the *primary* risk factor that limits production for each population in the ESU, regardless of whether or not the population passed viability criteria. This risk factor is referred to as a population *bottleneck:* the risk factor that most limits the population. In theory, then, efforts to improve viability or production of the population would address the population bottleneck first. The State recognizes that the risk factor *ocean conditions* exerts crucial influence on life-cycle survival. However, this risk factor was excluded from the bottleneck deliberation, because it is not possible to directly influence this environmental condition through management action.

Oregon believes that it is most useful to identify bottlenecks at the scale where restoration or management action could affect a positive response to improve ESU viability. In most instances, this means the population. However, some management actions are implemented so broadly that they affect the ESU. The following two examples illustrate these contrasting situations.

1. Management action to reduce impacts of fishery mortality in the ocean would affect many populations across the ESU.
2. A restoration project designed to improve fish passage at a culvert would affect productivity of an individual population.

Regardless of whether a specific population currently *does or does not* meet biological criteria, restoration work designed to address a population bottleneck should serve to strengthen the population and, thus, strengthen the existing viability of the ESU.

Stream Complexity Defined

Considerable research has suggested that the availability of overwinter rearing habitat is a critical life-cycle bottleneck for the Oregon Coast coho ESU; however, no previous effort identified population-scale bottlenecks. Oregon's use of the term *stream complexity* refers to any multivariate set of habitat conditions that create shelter for rearing juvenile coho salmon, especially habitat conditions that create shelter during the overwinter rearing period. The State is particularly concerned with habitat of such quality that it provides overwinter survival at rates high enough to produce a positive recruits-per-spawner relationship during periods of extremely adverse ocean conditions. Habitat conditions that create sufficient shelter for overwintering juveniles may be characterized by the presence of one or more features including the following: large wood, a lot of wood, pools, connected off-channel alcoves, beaver ponds, pasture trenches, lakes, reservoirs, connected wetlands, and other conditions.

The State has decided to use the term *stream complexity* to refer to any of the various combinations of conditions that result in overwinter shelter conditions sufficient to support sustainable populations through especially adverse periods of ocean survival. This decision is based on observations that habitats with higher levels of complexity (more wood, more large wood, more braided channels, etc) are more likely to provide sufficient levels of overwinter survival, although coho may be experiencing sufficient overwinter survival in some relatively less complex habitats like pools, pasture trenches, etc. Oregon notes that stream habitats with higher levels of complexity also tend to provide benefits to all coho life stages.

Expert Panel Composition

Primary and secondary risk factor bottlenecks were identified for all independent coho populations in the Coastal ESU through a multi-stage process of discussions with State of Oregon fish biologists. Seventeen individuals participated in this expert panel deliberation and included District Fish Biologists, Watershed District Managers, researchers, and a variety of project and staff personnel with significant career expertise applicable to the issue. Oregon's process employed several basic aspects of consensus decision-making processes that are often referred to as a Delphi Process.

General Process of Delphi-Like Deliberation

Identification of life cycle bottlenecks evolved over a period of more than a year and included 5 work sessions of as few as 2 to over 10 individuals in any single work session. Initial risk factor rankings were developed by headquarters and research staff. District Fish Biologists were brought into the process to provide review and additional perspective based on extensive field experience in each of the basins in the ESU. The experts participating at each stage of the deliberation process listened to each other and presented the group with alternate rationale for identifying a primary bottleneck for each population. In most populations, a secondary bottleneck was also identified. In a handful of populations, however, either no secondary bottle neck was identified, or two secondary bottlenecks were identified. Fish experts who participated in the process had from 15 to over 25 years professional experience in the Pacific Northwest as fish biologists, fish researchers, and fish managers. Experts met, discussed likely population bottlenecks through an iterative, interactive discussion process and reached consensus decisions. Discussions included the expert's broad view of published research, data on fish and habitat, and personal field observations and experience in specific watersheds. In addition, new analyses developed for the Coastal Coho Project were considered in the group's deliberations.

Stages in the Deliberation

1. An initial work session was held in late 2003 where headquarters and research fish biologists met and identified primary risk factor bottlenecks for each of the 19 independent coho populations. Results from this meeting were tabulated and distributed among the group for consideration and feedback
2. Some of the group's initial decisions were modified after additional discussion and review of the entire context of decisions at the first meeting.
3. At the conclusion of each work session, the group agreed on determinations for each of the 19 independent populations.
4. A smaller group of 3 experts (Nicholas, Rodgers, and McIntosh) discussed the bottleneck determinations agreed to by the first two working groups and made some changes based on data analyses that were not initially available. Final determinations were made in a work session that included, for the first time, Watershed District Managers and District Fish Biologists with extensive local field experience in the ESU. Previous bottleneck determinations were discussed to determine whether local field experience suggested revisions, and the group deferred to local expertise by modifying bottleneck determinations for several populations.

Outcome is Consensus opinion

Oregon recognizes that the outcome of this process is a consensus opinion of experts rather than an objective fact. Oregon recognizes that the population bottlenecks identified through this consensus process are, in effect, working hypotheses, and that different risk factors could be bottlenecks at spatial scales smaller than the population. Future monitoring, research and analysis should be devoted to ground-truth these bottleneck determinations.

The State also recognizes that Delphi-like processes have strengths and weaknesses. The benefit of developing a consensus opinion regarding coho population bottlenecks is that it will provide general guidance to a broad range of activities including management, restoration, research, and monitoring efforts. Actions on-the-ground should be based on site-specific information and needs. An alternative restoration approach would be to reduce mortality at all life-cycle stages through management actions (fishery and hatchery management) and restoration of all aspects of watershed function. Common sense suggests that the *fix-everything-randomly-in-equal-measure* will not produce the most prompt improvements in the ESU viability – unless all risk factors equally and independently impair viability of all populations.

Cross-Checking the Findings of the Expert Panel

Subsequent to determining population scale bottlenecks using the Delphi-like process outlined above, Oregon conducted an analysis to estimate the smolt production capacities of summer and winter habitat in each coho population unit (Part 4 (C) ODFW (3) Habitat Report). Summer habitat smolt potential was calculated for all available habitat and then reduced proportionally to reflect potential summer water temperature limitations identified at the Monitoring Area scale by ODEQ (Part 4(B) DEQ Water Quality Report).

Winter habitat smolt potential was calculated for all available habitat and for high quality habitat only. Calculation of the smolt potential from high quality habitat was conducted because modeling conducted by Nickelson and Lawson (1998) demonstrates that during periods of prolonged poor ocean survival (i.e., $\leq$ 3 %), coho populations will tend to persist only in areas with high quality winter habitat.

During periods of good ocean survival rates (i.e., >3%), the temperature-limited summer smolt capacity for the ESU as a whole is approximately 1.7 times higher than total winter smolt capacity (Table 5). When only the smolt production capacity of high quality winter habitat is considered (i.e. those areas where populations will persist during poor ocean conditions) the temperature-limited summer smolt capacity is over 6 times higher than winter capacity.

Table 5. Estimated seasonal smolt capacity of independent and potentially independent population units in the ESU.

Population Unit	Temperature Limited Summer Smolt Potential	Winter Smolt Potential (all habitat)	Winter Smolt Potential (HQ habitat)	Total Winter/Summer	High Quality Winter/Summer
Necanicum	145,191	65,498	12,844	2.2	11.3
Nehalem	2,272,785	1,043,877	244,570	2.2	9.3
Nestucca	508,587	231,173	22,070	2.2	23.0
Tillamook	1,168,435	525,830	45,741	2.2	25.5
Alsea	859,331	535,474	108,784	1.6	7.9
Beaver	79,380	54,654	40,604	1.5	2.0
Salmon	96,496	68,580	9,068	1.4	10.6
Siletz	409,958	285,257	89,182	1.4	4.6
Siuslaw	1,560,483	1,013,033	327,643	1.5	4.8
Yaquina	732,571	477,688	225,182	1.5	3.3
Coos	1,138,597	815,422	467,636	1.4	2.4
Coquille	1,166,392	617,918	129,569	1.9	9.0
Floras	166,772	82,346	0	2.0	-[1]
Siltcoos	NA[2]	NA[2]	NA[2]	NA[2]	NA[2]
Sixes	190,258	99,277	0	1.9	-[1]
Tahkenitch	NA[2]	NA[2]	NA[2]	NA[2]	NA[2]
Tenmile	NA[2]	NA[2]	NA[2]	NA[2]	NA[2]
Lower Umpqua	546,504	722,006	137,878	0.8	4.0
Midddle Umpqua	291,515	399,169	105,591	0.7	2.8
North Umpqua	81,578	113,824	16,131	0.7	5.1
South Umpqua	243,539	410,717	50,051	0.6	4.9
ESU	13,138,682	7,710,675	2,032,543	1.7	6.5

[1]No high quality habitat available

[2]Estimates for lake population units are not available.

This, preliminary analysis, suggests that winter habitat (i.e. stream complexity) is a higher priority for restoring coho populations across the ESU than water quality. The analysis also suggests that during periods of good ocean conditions, the Umpqua populations are limited by summer rearing capacity. This finding is consistent a determination that water quantity and water quality were primary or secondary risk factors in the Umpqua. Further analysis demonstrated that for summer rearing to become the life cycle bottleneck at any time in all populations except the Umpqua, the proportion of stream miles that exceed the temperature standard would have to reach 68% on average (range among populations 60 to 72%). This translates into a 26% increase in the miles of streams that would have to exceed the temperature standard relative to current conditions.

Conclusions of Oregon's Delphi-Like Process

Population bottlenecks identified via Oregon's Delphi-like process are displayed in Table 6. A scarcity of stream complexity (crucial to over-winter survival of juvenile coho) was the most common primary risk factor bottleneck and water quality was the most common secondary bottleneck in these populations. Identification of these population bottlenecks provides a useful context for work to both conserve present conditions and to create improved future conditions for the ESU that should strengthen viability beyond its present condition.

Bottleneck Determinations will inform Conservation Planning

Oregon's ongoing effort to develop a conservation/recovery plan, consistent with the requirements of the Native Fish Conservation Policy, the Oregon Plan, and federal conservation/recovery guidelines, will provide a coordinated approach for maintaining and enhancing the status of the coastal coho ESU. Oregon's conservation planning effort currently involves a Stakeholder Team, NOAA Fisheries staff, and other fish, water and land managers. The conservation planning team will help develop and review various management scenarios for the ESU and will describe quantifiable attributes that will define a socially agreed-on condition for the ESU that is compatible with the broad Oregon Plan Mission. Any recommended changes to existing conservation efforts will include a thorough public review process. The current schedule for completing a draft conservation/recovery plan is December 2005.

Table 6. Primary and secondary life cycle bottlenecks for independent populations in the Oregon Coastal coho ESU. (*Source*: ODFW unpublished data)

Population	Primary Bottleneck	Secondary Bottleneck	Viability Status
Necanicum	Stream Complexity	--	Pass
Nehalem	Stream Complexity	Water Quality	**Fail**
Tillamook	Stream Complexity	Water Quality	**Fail**
Nestucca	Stream Complexity	--	Pass
Salmon	Hatchery Impacts	Stream Complexity	**Fail**
Siletz	Stream Complexity	--	**Fail**
Yaquina	Stream Complexity	Water Quality	Pass+
Beaver	Spawning Gravel	Stream Complexity	Pass+
Alsea	Stream Complexity	Water Quality	**Fail**
Siuslaw	Stream Complexity	Water Quality	Pass+
Lower Umpqua	Stream Complexity	Water Quality	Pass+
Middle Umpqua	Water Quantity	Stream Complexity Water Quality	Pass+
North Umpqua	Hatchery Impacts	Stream Complexity	**Fail**
South Umpqua	Water Quantity	Stream Complexity Water Quality	Pass+
Siltcoos	Exotic Fish Species	Stream Complexity Water Quality	Pass+
Tahkenitch	Exotic Fish Species	Stream Complexity Water Quality	Pass+
Tenmile	Exotic Fish Species	Stream Complexity Water Quality	Pass+
Coos	Stream Complexity	Water Quality	Pass+
Coquille	Stream Complexity	Water Quality	Pass
Floras	Stream Complexity	Water Quality	Pass
Sixes	Stream Complexity	Water Quality	**Fail**

Applying Bottleneck Determinations to Restoration Prioritization

Theoretically, future restoration work will be most effective if work is directed first at the primary bottleneck in each population. This course of action would be suitable if it was certain that the coho population bottleneck was accurately identified, and if the only objective of restoration was improvement in the coho population (i.e., as opposed to considering related Oregon Plan objectives of improving water quality or restoring watershed function).

As previously noted, however, Oregon recognizes that the Bottleneck determinations represent consensus expert opinions and should be viewed as working hypotheses rather than cast-in-stone certainties. The reality is that there may indeed be many local circumstances where the distinction between primary and secondary bottlenecks is slight. Also, actions that might be taken to improve water quality should contribute to stream complexity. Finally, the broad mission of the Oregon Plan does include water quality and watershed function as well as listed species restoration.

Oregon therefore concludes that it will often be more reasonable to simultaneously pursue remediation of both primary and secondary population bottlenecks, using local data to prioritize restoration funding at local spatial scales, rather than to adopt a narrow view of only attempting to remediate the primary risk factor bottleneck.

SYNTHESIS OF CONSERVATION EFFORTS: ADDRESSING THE FACTORS FOR DECLINE

The intent of this section is to report Oregon's evaluation of prominent management actions that address the factors for decline (Table 4) identified by NOAA. The State evaluated data and actions related to the following factors for decline: ocean conditions, fishery harvest, hatchery impacts, stream complexity, fish passage, water quality, and water quantity.

Addressing Factors for Decline by Changing Historical Management Practices

The current status of the Coastal coho ESU is a product of historical management practices, variable regional climatic and ocean conditions, contemporary management programs, and recently completed restoration work. The Oregon Plan effort – restoring water quality, watershed health and listed salmonids statewide – represents a recent programmatic strengthening of conservation commitment that has been growing since the 1950s. Oregon Plan work includes contributions from a broad range of participants and programs: e.g., federal and state environmental laws; participation by citizens via SWCDs and watershed councils; restoration work on private lands; ongoing management by state and federal agencies; active and passive restoration work on public and private lands; and an effective monitoring system capable of detecting changes in resource status and advising future management needs.

Oregon has reviewed conservation efforts in context with the analysis of ESU viability (Part 2). The term *conservation effort* is used broadly to indicate management practices, policies or programs that address factors for decline or risk factors (Table 4) that may potentially affect future ESU viability. A detailed description of conservation efforts may be found in Part 3A and Part 3B of this report, as well as the agency reports contained in Part 4.

The remainder of this section summarizes Oregon's evaluation of prominent actions that address the key factors for decline.

Ocean Conditions

This risk factor exerts strong influence on life-cycle survival; however, Oregon is unable to directly alter this environmental condition through management action. The State's management response to this risk factor consists of implementing conservative management that directly affects all other risk factors (e.g., fishery harvest, hatchery impacts, stream complexity, fish passage, etc.).

Fishery Harvest *(See also Part 4(C) ODFW (2) Harvest Report)*

<u>Historical Context</u>

Harvest management (regulating the number of coho salmon killed directly or indirectly in fisheries) has improved dramatically in the last 10 years. The fishery harvest rate for coastal coho was often greater than 70%, and was almost always over 50% during more than 4 decades prior to restrictions in 1994. Since 1997, harvest rates are defined in a regulatory *matrix* that was developed concurrently with The Oregon Plan. This harvest matrix was developed in recognition of the conservation needs of the species and was designed to impose appropriate limits on direct and indirect fishery mortality of coho salmon in context with ocean environment and the biological status of naturally produced coho throughout the range of the Oregon Coastal coho ESU.

Recent Management Action Related to Fishery Harvest

Oregon, as a member of the Pacific Fisheries Management Council (PFMC), now operates under the technical guidance of the *harvest matrix* that was developed concurrently with development of The Oregon Plan and refined through the PFMC process in 2000. The revised *matrix* stipulated more conservative exploitation rates (0-8%) at critically low parent spawner abundance and increased the maximum exploitation rate to 45% under high survival and abundance conditions. Oregon will seek formal adoption of the revised harvest matrix under the PFMC Amendment 15 process in 2005. Mortality of Oregon coastal coho has been maintained below 15% (Figure 2) since adoption of the harvest matrix preceding implementation of The Oregon Plan. Incorporation of the revised matrix under Amendment 15 in 2005 will strengthen future protection to the Coastal coho ESU.

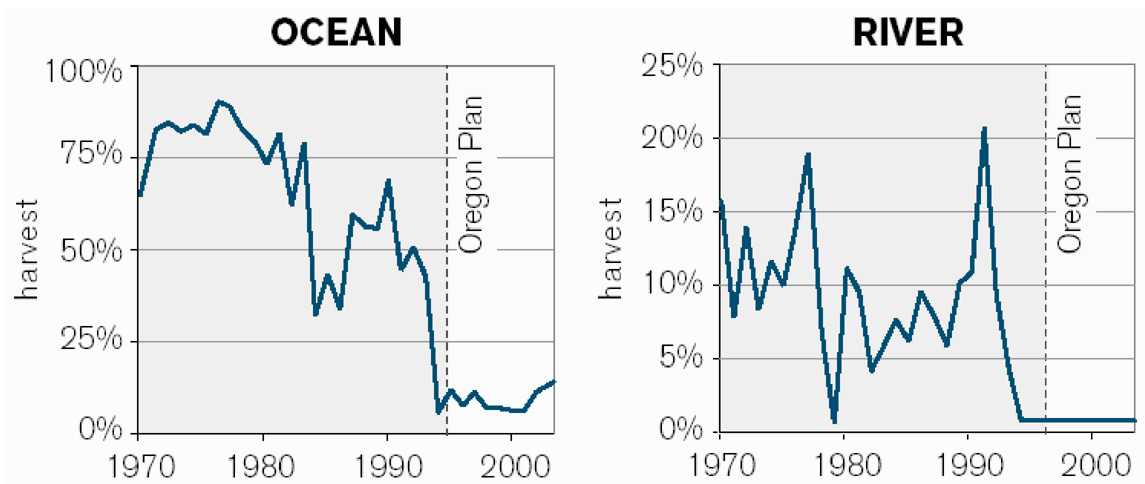

Figure 2. Estimated fishery mortality (harvest rate) of naturally produced coho salmon, (direct take plus indirect mortality). The graph at left presents estimates of fishery mortality in ocean fisheries; the graph at right presents estimates of mortality rate in river-based (terminal) recreational fisheries. Year indicates year of fishery. (*Source*: Part 4(C) ODFW (2) Harvest Report)

Conclusion: Fishery Harvest

On the basis of these changes in fishery harvest management policy and a decade-long track record of maintaining the conservative policy, Oregon concludes that *fishery harvest*, as a factor for decline, has been sufficiently addressed.

Hatchery Impacts *(See also Part 4(C) ODFW (1) Hatchery Management Report)*

Historical Context

During the 1960s through the early 1990s, the coho hatchery program in the Coastal coho ESU was characterized by the following conditions.

- High numbers of hatchery coho were released.
- Coho juveniles were released in most of the basins in the ESU.
- Adult coho were often out-planted from hatcheries to natural spawning streams.
- Hatchery broodstocks were often combined from returns to several hatcheries and non-native broodstocks were the norm.
- Releases of hatchery juveniles into streams in the ESU usually included fry, pre-smolts, and smolts.
- Hatchery–origin (stray) coho were common in natural spawning areas.

Recent Management Action Related to Hatchery Impacts

Many aspects of hatchery management have been improved in ways that are expected to reduce or eliminate potential risk from hatcheries to the viability of the Coastal coho ESU. Key elements of these changes are summarized following.

- *Reduction in Magnitude of Hatchery Fish Releases – R*eleases of hatchery coho in the Oregon Coastal coho ESU declined from a peak of ~35 million in 1981 to ~0.8 million in 2005 (Figure 3). As recently as the early1990s, hatchery coho juveniles were released in 17 of 19 ESU populations; in 2004, hatchery coho were released in 7 of 19 populations. Current hatchery programs are constrained to release no more than 200,000 smolts in any basin.

- *Reduction of Interactions in Spawning Areas* – The proportion of (stray) hatchery fish found in natural spawning streams in the Coastal coho ESU declined from levels of 15-25% during 1990-1998 to within established policy guidelines (about 9%) during 1999-2003 (Figure 3). Currently, only Salmon River and Upper Umpqua populations still average over 10% hatchery fish on the spawning grounds. Reduced proportions of hatchery coho in natural spawning areas are a product of reduced release numbers, reduced release locations, and increased returns of wild coho.

- *Reduction in Off- Station Releases* – Most hatchery coho smolts are either released from the hatchery or at acclimations sites; except in very limited circumstances (e.g., volunteer-based efforts involving small numbers of fish) or experimental circumstances hatchery coho fry or fingerlings have not been released into ESU streams since 1998.

- *Marking all Hatchery coho* – Since 1997, virtually all ODFW hatchery coho smolts released in the Coastal coho ESU were marked, facilitating accurate enumeration of wild coho in natural spawning areas.

- *Use of Native versus non-native Broodstocks* – in contrast with the historic practice of routinely releasing mixed-origin and non-native coho hatchery broodstocks, mixed-origin hatchery stocks are only released in 3 and non-native hatchery stock is only released in 1 of 19 populations in the ESU.

- *Water Withdrawals* – Water diversions at ODFW facilities are permitted under existing water rights. The amounts of water used are reported annually to the Oregon Water Resources Department.

- *Hatchery Effluent Discharge into Streams* – Effluent water quality from ODFW hatchery facilities is regulated under a general 330J NPDES permit as required by the Oregon Department of Environmental Quality. Improvements in hatchery programs and operations and improved training of hatchery personnel has resulted meeting permit requirements for at least the last 4 quarterly reporting periods.

- *Adult Passage at Hatchery Barriers – A*pproximately 155 miles of coho spawning habitat (roughly 3% of the coho spawning distribution) in the Oregon Coastal coho ESU is above some sort of barrier associated with an ODFW hatchery. Recent work planned or accomplished at Alsea, Fall Creek and Rock Creek hatcheries has reduced the impact of passage above hatchery barriers by converting complete barriers to selective barriers. These selective barriers will be operated to remove hatchery fish and pass wild fish to natural spawning areas.

- *Hatchery Programs in Areas Outside the ESU* – A reduction in OPI area (Oregon coast and Columbia River) hatchery coho smolt releases from over 60 million in 1982 to 26 million significantly reduces the potential for adverse impact to the Coastal coho ESU.

- *Coastal Hatchery Releases of Other Species* –ODFW hatcheries also release chinook and steelhead into streams across this ESU. Hatchery programs for these species have generally been changed over the past decade in the same ways that the coho hatchery programs have been changed (i.e., lower release number, fewer off-station releases, more native broodstocks, improved hatchery operation and maintenance, etc.). These changes are consistent with reducing potential for adverse impact on the coho ESU.

- *Hatchery Policy Guidance* – Three new policies effectively reduce the potential for adverse interactions between hatchery and wild fish throughout the ESU: (1) Native Fish Conservation Policy (2002), (2) Fish Hatchery Management Policy (2003), and (3) Fish Health Management Policy (2003). These three policies establish a conservative framework for hatchery management that requires reducing or eliminating adverse impacts on wild populations.

<u>Summary: Hatchery Management</u>

During the 1980s, hatchery coho releases in the Coastal coho ESU often exceeded 20 million smolts annually (Figure 3); stock transfers, out-planting of adult and juvenile coho were common practice. Private hatcheries virtually ceased operation in the early 1990s and a variety of changes were implemented in Oregon’s fish management program. As a result, releases of hatchery coho in the ESU have declined to just fewer than 1 million fish per year; broodstock selection and other aspects of hatchery management have been modified to minimize the potential for adverse impact on the Coastal coho ESU. The net result is that modest numbers of hatchery coho are now released in only seven of the nineteen populations and stray hatchery spawners now constitute <10% of coho in streams throughout the ESU.

Management of hatcheries across the Coastal coho ESU has changed dramatically since the mid 1990s, particularly the number of hatchery fish released. These changes now establish a strong risk-averse environment across the Coastal coho ESU. Collectively, current management practices have reduced the potential for hatchery programs to adversely affect the Coastal coho ESU via genetic interactions, competition, or predation.

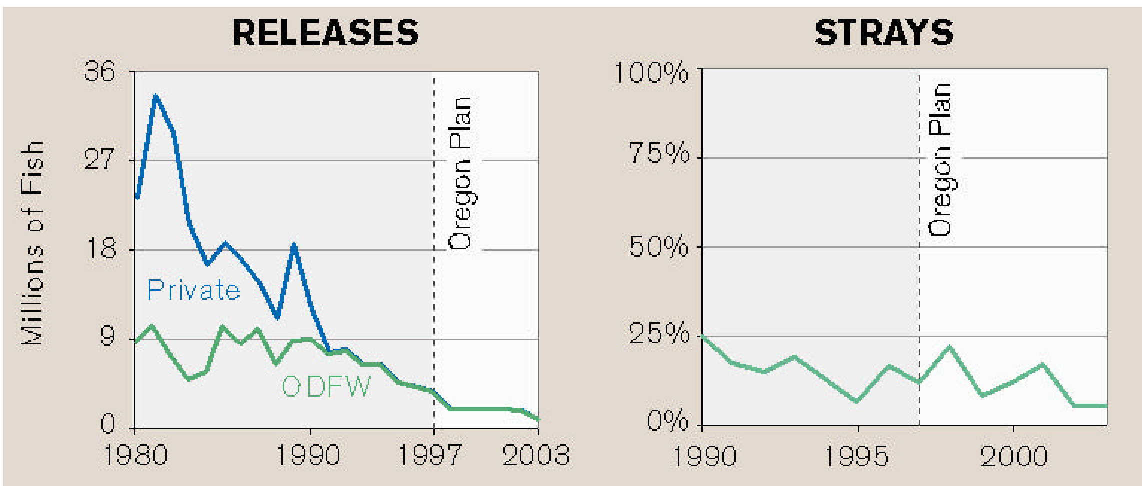

Figure 3. Estimated releases of hatchery coho salmon juveniles, and occurrence of stray hatchery coho adults in natural spawning streams, for the Coastal coho ESU. The graph at left represents estimated releases of hatchery coho juveniles by private and ODFW hatcheries; the graph at right represents estimated percent of coho observed in spawning areas that were stray hatchery fish. Year indicates year of release or return. (*Source*: Part 4(C) ODFW (1) Hatchery Management Report)

Conclusion: Hatchery Management

On the basis of these changes in fishery harvest management policy and a decade-long track record of maintaining the conservative policy, Oregon concludes that *hatchery impacts*, as a factor for decline, has been sufficiently addressed.

Stream complexity (*See also* Part 4(C) ODFW (3) Habitat Report)

This sub-section reports Oregon's evaluation of the historical context and Oregon's extensive management actions related to the risk factor *stream complexity*. The term *stream complexity* refers to any multivariate set of habitat conditions that create shelter for rearing juvenile coho salmon, especially habitat conditions that create shelter during the overwinter rearing period.

Historical Context

The regulatory regime and management practices that caused an alteration of habitat from conditions that were especially favorable to coho – to conditions that are less favorable to coho – were very different historically than what has evolved since the 1950s. State and federal laws including the National Forest Management Act, National Environmental Policy Act, Oregon Fill and Removal Law, Oregon Forest Practices Law, Oregon Land Use Law, Instream Water Rights Act, federal Coastal Zone Management Act, and federal Clean Water Act, for example, initiated protections to end or reverse the impact of historical land and water management practices. The positive impacts of these programs are expected to continue to accrue over time, but these and other laws and recent refinements to management practices certainly have established a different habitat management climate than was in effect for over a century in the ESU.

Examples of the historic habitat management practices illustrate the extent to which current practices have improved environmental trajectories for the Coastal coho ESU.

- *Splash Damming* – Splash dams were outlawed in 1956. Prior to that time, portions of many river basins in the Coastal coho ESU were severely altered by splash damming, and the practice of using small tributaries as logging roads continued until at least the late 1950s. Splash dams often scoured streams to bedrock and moved wood outside the normal active channel.

- *Riparian Protection* – Until the early 1960s it was rare for riparian buffers to be retained along streams on forestland. Beginning in 1963, the first riparian buffer strips were left on one side of the stream in state-owned timber harvest areas. In 1968, buffer strips were left on both sides of fish streams in some state-owned timber sales. A similar pattern occurred on federal lands. Oregon Forest Practices Act Rules (1972) required limited buffers along streams on private forestlands with "significant" fish use. Revisions in these rules in 1994 required riparian buffers and conifer retention that prevented a shift of stands from conifer to hardwood composition. These new rules also required buffers for all fish-bearing and some non fish-bearing streams. A management emphasis on conserving or establishing riparian buffers along streams in agricultural and urban settings only dates to the mid 1990s. The relatively simple process of riparian reestablishment and addition of large wood is relatively new and will yield more significant results in the next ten decades. Oregon expects that riparian areas will be protected in the future by relevant protections including a combination of existing state and federal programs, both regulatory and nonregulatory, that lead to protection or restoration of riparian vegetation for stream bank stability, shade, and physical habitat. This will lead to controlling degradation and improvement of conditions that affect water quality to meet state water quality standards in the future. The rate of improvement will be dependent on the watershed-specific impediments to meeting water quality standards and the mechanisms to reverse these impediments (growing large trees vs. forbs/shrubs, etc.). The completion of TMDL's for the coastal ESU will also bring more specificity to recovery processes.

- *Stream Cleaning* – Damage caused to streams and rivers by early logging operations (splash dams, slash disposal in streams, log drives, etc.) often created huge logjams and undoubtedly prevented or impeded anadromous fish passage in some areas. These spectacular cases prompted The Oregon Game Commission (in the 1930s) to require loggers to remove woody debris from streams. This effort gained more emphasis after WW II when caterpillar tractors became available for use in logging. Stream cleaning on state-owned forests began in the 1950s, and probably continued into the mid-1970s. The Oregon Game Commission conducted a stream improvement (cleaning) program throughout the ESU from about 1956-1976. It is difficult or impossible to comprehend the magnitude of these stream cleaning efforts on the productive capacity of coho streams. Current management programs recognize the role of large wood in creating stream complexity, thus providing a fundamentally different perspective on habitat management.

- *Reduction in Beaver Populations* – Because of their ability to create dam pools which are refugia from high winter water velocities, beavers have the potential of creating high quality habitat for juvenile coho. Historical trapping combined with land management practices reduced beaver populations, potentially minimizing an important influence that formerly shaped the riparian and physical habitat of coastal streams. More recently, harvest of beaver has declined significantly and programs have been put in place to avoid harvest in areas critical to coho rearing. Evidence suggests that beaver pond habitat may still be well below historic levels. Monitoring data at the ESU scale are currently capable of detecting a 5% annual rate of change in beaver pond habitat – and the data do not detect any recent trend in this parameter (See Part 4(C) ODFW (7) Beaver Report). Any future increases in beaver pond habitat that might occur would be expected to benefit by creating high quality overwintering habitat for juvenile coho.

- *Tidelands Diking* – Alteration of coastal tidelands through diking has been extensive (~40%) and occurred as early as the 1880s; however, the majority of the existing dikes were constructed between 1930 and 1960 under the federal Flood Control Act authorities. Federal polices and programs that were active until the 1970’s supported stream diking and drainage of coastal wetlands. With the change in federal and state policy from a position of encouraging and funding wetland drainage – to a position of severely limiting wetland alteration plus funding wetland restoration – the likelihood that there will be further loss or degradation of these habitats in the foreseeable future is low.

- *Channelization* – Extensive alterations of rivers, tidelands, and wetlands were implemented under a range of federal programs and authorities up through late 1960s. These efforts, usually characterized as stream *improvements*, included construction of dikes, placement of riprap to armor streambanks, and dredging river channels. For example Flood Control Acts in the 1940s authorized projects on the Nehalem, Yaquina, and Umpqua rivers and tributaries. These historical channelization efforts probably reduced access by juvenile coho to many suitable overwintering areas. Although the legacy of these practices largely remains, the practices themselves have been stopped.

- *Roads* – Roads were historically constructed without regard to any possible adverse impact to watershed function, fish, or water quality. Historic settlement patterns and relative ease-of-construction led to preferential location of roads in valley bottoms near streams. These roads often parallel low gradient streams (historically the most productive coho habitat) and cross many tributaries. Standards for design of roads and stream crossing structures have been gradually established and strengthened since the 1970s. Design and construction standards established in the mid 1990s require designs to accommodate 50-year flood events on private forest lands and 100-year flood events on federal forestlands. Current standards for road location and construction are based on best management practices and seasonal restrictions that are designed to protect fish habitat, provide fish passage at stream crossings, and reduce sediment inputs to streams. Considerable restoration investments have recently been made related to upgrading roads and stream crossings to current standards.

<u>Recent Management Action Related to Stream Complexity</u>

The contemporary regulatory climate (1997 – 2005) has been constructive with respect to watershed and fisheries concerns, providing additional state and federal tools and management practices designed to conserve and restore the productive capacity of habitats that support the Coastal Coho ESU. Key elements of these changes are summarized following.

- *Programmatic improvements* – include the Northwest (Federal) Forest Management Plan, Northwest Oregon (State) Forest Management Plan, Elliot State Forest Management Plan, Agricultural Water Quality Management Area Plans, Total Maximum Daily Load Plans, revisions to Oregon Forest Practices Rules, Confined Animal Feeding Operation Program, Pesticide Program, and Weed Control and Invasive Species Program. Intensively managed forestlands now must be reforested with species suitable for the site. Incentives are available to promote continued conversion of agricultural lands to forest.

- *State and federal forestland management* -- substantial portions of forestlands across the ESU (~9% are in State management and ~38% are in federal management) are now managed under some combination of forest reserves, structure based management, or multi-resource management emphasis (*See also* Part 4(J) OP TR 3. Environmental, Land Use and Land Cover Characteristics in the Coastal Coho ESU). This diverse and geographically dispersed combination of forest management strategies is expected to yield an array of stand types, adequately arranged on the landscape that will contribute to the habitat needs of all native species including coho salmon. For example, a large portion of the State forested landscape across the ESU (perhaps 40-60%) is expected to be comprised of medium and large diameter trees found in layered and older forest structure indicative of 175-250 year old forests. A similar or greater portion of the federal forested landscape is expected to be comprised of medium to larger diameter trees and older forest structure. These estimates do not include the substantial contribution of riparian areas to the land base which is managed for mature forest condition.

- *Future condition modeling* – Analyses by the Coastal Landscape Analysis and Modeling Study (CLAMS) suggest that the future availability of larger riparian trees in forestlands will increase on fish-bearing streams regardless of land ownership. In contrast, the future potential for wood recruitment is likely to vary across forestland ownerships, with the higher potentials on public lands and lower potentials on private lands. Oregon concludes that these projections suggest that future habitat conditions for coho across the ESU will be at least similar to and perhaps improved over current conditions. CLAMS analyses did not consider what is likely to happen to riparian vegetation on agricultural or urban portions of the landscape. The State concludes that modest improvement in riparian vegetation is likely to accrue on agricultural lands under current rules but acknowledges that considerable uncertainty exists regarding specificity of improvement.

- *Land Use Change* – Oregon's 1973 land use law (Land Conservation and Development Act) was established in large part to protect productive forest and farmland from conversion to nonresource uses. An analysis of land use changes in Western Oregon from 1973 to 2000 suggests the law has significantly slowed conversion of farm and forestland to residential and urban uses. A separate study focused on the Oregon coast demonstrated that from 1973 to 2000 there was no loss in forestland, a 1% loss in agricultural lands and a 7% loss in mixed forest-agricultural lands.

- *Estuarine and Wetland Habitat* (*See also* Part 4(G) DSL Wetlands, Estuaries, Dredge, Fill and Inwater Construction Report) – Although the historical (1850-1970) loss of estuarine tidelands and wetland habitat in the ESU is significant (~40% and ~70%, respectively), recent analysis indicates that estuary and wetland loss has been negligible during the most recent 3 decades. The State of Oregon is currently contracting with the U.S. Fish and Wildlife Service, National Wetland Inventory (NWI) to conduct a wetland change study along the Oregon Coast. Analyses have been completed for the Tillamook and Nestucca watersheds that may serve as indicators of conditions in other coastal areas. Results in these two estuaries indicate that ~3% of wetland area has been converted from one wetland type to another and that net loss of wetland area was ~0.1 to 0.3%. These results, if representative of other estuaries, are an encouraging indication that regulatory and restoration efforts are effectively conserving wetland habitat. Also, Oregon has recently assisted in the conservation acquisition of more than 1,500 acres of coastal wetlands and lowland streams in the ESU.

- *Current Conditions* (*See also* Part 4(C) ODFW (3) Habitat Report) – Coho streams in this ESU (compared to conditions in reference – *relatively undisturbed* – streams) are characterized by a scarcity of large wood instream, lack of large conifers in riparian areas, reduced interactions with off-channel alcoves and flood plains, and accumulations of fine sediment in gravels. These habitat components are critical for stream complexity to shelter and support juvenile coho during harsh winter conditions. Even considering that the ESU is currently viable, a contemporary scarcity of high quality rearing habitat (compared to what is believed to have existed historically in the ESU) is of concern. Nothing in this Assessment is intended to imply that current management or habitat conditions are optimum for coho salmon. Current habitat and fishery management conditions and programs, however, are adequate to avoid any foreseeable adverse change in ESU viability.

Conclusion: Stream Complexity

A wide variety of laws and conservative management practices related to habitat have been implemented from the 1950s through the present. Taken as a whole, these laws and policies represent a huge improvement over legal protections and management practices that were historically common in the ESU. On the basis of these changes in habitat management policies, a several decade track record of implementing progressively more conservative habitat management practices, and recent data from the monitoring program that do not note declines in habitat over the most recent decade, Oregon concludes that loss of *stream complexity*, as a factor for decline, has been sufficiently addressed. The legacy effects of past management practices that reduced stream complexity and that could potentially affect the future viability of the ESU are being addressed by existing conservation efforts (*See also SYNTHESIS* – CONSERVING EXISTING CONDITIONS THAT SUPPORT VIABILITY OF THE ESU BY ADDRESSING CURRENT AND FUTURE THREATS TO ESU VIABILITY in this document). This conclusion includes an acknowledgment that the State must remain diligent in conducting future monitoring because the ability to detect changes in habitat will improve considerably within the next 3-8 years, as more data are available.

Fish Passage (*See also* Part 4(J) OP TR 2 A Spatial Evaluation of Habitat Access Conditions and Oregon Plan Fish Passage Improvement Projects in the Coastal Coho ESU

Historical Context and Recent Management Action Related to Fish Passage

Historical road construction practices led to very adverse conditions for fish passage. Many roads were constructed adjacent to lowland river reaches; these roads crossed many tributaries used by spawning and rearing coho and a large number of the crossing structures (typically culverts) did not provide adequate passage for juvenile and adult fish. Construction design standards have been gradually improving since the 1970s and were considerably improved in the late 1990s. Considerable recent work has been done by federal, state, county, and private parties to provide improved fish passage throughout the ESU by replacing deficient culverts with structures designed to meet current standards.

Current Fish Passage Conditions in the ESU
During 1997-2003, $25M was invested in this ESU to improve fish passage (*See also* http://mtjune.uoregon.edu/website/OWEB/Assessment). As a result, coho now have improved access within 16% of their distribution in the ESU. Currently, it appears that access by coho may be impaired to some extent over ~10% of the species distribution within the ESU. Access to about 10% of coho streams remains impaired to some extent and the status of access to about 30% of coho streams remains poorly documented. Oregon's identification of population bottlenecks and these recent analyses of fish passage will allow future restoration and inventory efforts to focus on providing passage to high quality overwintering habitat.

Conclusion: Fish Passage
On the basis of restoration work accomplished to date, the population bottleneck determinations, the recent analysis of fish passage conditions in the ESU, and a commitment by the State to focus future fish passage remediation and inventory work on areas of high quality overwintering habitat, Oregon concludes that *fish passage*, as a factor for decline, has been sufficiently addressed.

Water Quality (*See also* Part 4(B) DEQ Water Quality Report)

Oregon's Regulatory Responsibilities
The Oregon Department of Environmental Quality has responsibilities for protecting Oregon's waters from point source and non-point source pollution and restoring Oregon's waters when water quality standards are not being met. The general framework for this program is (1) identify water quality goals (standards), (2) prevent pollution and protect water quality by administering permits and various technical and financial assistance programs, (3) monitor and assess water quality, and (4) implement and oversee efforts needed to restore water quality when standards are not being met. This comprehensive approach ensures that water quality factors for decline will be addressed when they present a threat to listed species. DEQ carries out its responsibilities through a variety of programs and activities that are briefly described below.

- *Water Quality Standards*: DEQ establishes water quality standards to protect beneficial uses of the State's waters, such as fish and aquatic life, recreation, irrigation and domestic water supply. The standards are established at the levels needed to protect the most sensitive beneficial uses. For example, cold water species such as salmonids are generally the most sensitive to water temperature, so the temperature standard is established based upon the need to protect salmonid spawning, rearing and migration. Several water quality standards have been approved by EPA following consultation with NMFS, including temperature, dissolved oxygen and intergravel dissolved oxygen. EPA is currently working with NMFS in reviewing DEQ's submission of revisions to over 250 water quality criteria for toxics.

- *Point Source Permits:* DEQ issues and enforces point source permits under its delegated Clean Water Act authorities to ensure that the discharge of wastewaters into waters of the state does not cause a violation of water quality standards. The permits set limits for the discharge of pollutants from each source. DEQ also implements state laws that protect groundwater quality by requiring permits for installing subsurface sewage disposal systems (septic systems) and for the application of wastewaters to land. DEQ periodically inspects permitted facilities to ensure compliance and responds promptly to incidents of non-compliance. DEQ recently completed an in-depth review of its wastewater permitting program by an external review committee and is currently implementing a number of the group's recommendations aimed at strengthening compliance efforts and reducing the backlog of permit applications.

- *Non-point Sources:* DEQ protects Oregon’s waters from nonpoint source pollution by providing technical assistance and financial incentives for nonpoint source pollution control activities. The program is guided by a 5-year plan that DEQ develops and EPA approves.

- *Water Quality Monitoring*: DEQ implements two primary monitoring programs that assess the status and trends of the water quality: a statewide ambient monitoring program focused on large rivers and a network of randomly selected sites on wadeable streams (1^{st} through 3^{rd} order). DEQ also collects water quality data through a variety of special studies, such as those needed for developing TMDL and permits. Every two years (as required by EPA under Section 303(d) of the Clean Water Act), DEQ prepares a report of statewide water quality conditions and identifies water bodies that are not meeting water quality standards.

- *Development of Total Maximum Daily Loads*: Waterbodies that are identified as being impaired are addressed through the development and implementation of a Total Maximum Daily Load (TMDL). A TMDL is a determination of the total amount of a pollutant the waterbody can assimilate and still meet water quality standards. The TMDL then allocates the pollutant load among point sources, non-point sources, background levels, reserve capacity and a margin of safety.

<u>Current Water Quality Conditions in the ESU</u>

Two contrasting views of current water quality conditions are offered by probabilistic and Ambient Site monitoring in the ESU. Based on probabilistic sampling, significant reaches (~50%). of coastal rivers did not meet water quality standards, especially for temperature However, nearly half of the large river water quality monitoring sites recorded slightly improving water quality over the past 10 years, and none demonstrated a declining trend. Sampling at large river sites (Ambient Site sampling) is not designed to account for variation in water quality over the course of a day (e.g., water temperature may only be in violation of numeric criteria in the afternoon in some streams).

Monitoring data also indicate that water quality in coho streams in this ESU is not significantly different from water quality in relatively undisturbed (reference) streams.

Oregon recognizes that water quality remains a legitimate concern as an aspect of watershed function and Clean Water Act compliance throughout much of the ESU, the role of water quality is thought to be secondary to the role of stream complexity with respect to the viability of coho populations. In other words, immediate improvements in the availability of complex habitat must occur *first or concurrently*, before improvements in water quality could strengthen population viability.

Summary: Water Quality

Oregon DEQ programs have a clearly defined framework to establish water quality standards, prevent pollution through permitting, provide technical and financial assistance, and conduct monitoring. Once water quality problems are documented, TMDL development and implementation is the primary mechanism Oregon uses to address problems. Four TMDL's have been developed in the ESU and approved by EPA since the Oregon Plan was implemented. The remaining TMDLs for the ESU are scheduled to be completed by 2008.

TMDLs are implemented and water quality problems are addressed in a variety of ways, including Agricultural Water Quality Management Area Plans (AWQMP), Forest Practices Act implementation, permitting, and storm water management. AWQMPs have been completed for the entire ESU and are in the early phases of implementation. These plans are designed to meet water quality standards on agricultural and rural lands through tools including riparian management.

Oregon believes that, for federal lands, the Northwest Forest Plan makes significant positive contribution toward meeting ESA and Clean Water Act needs. Oregon recognizes, however, that NOAA/NMFS consulted with federal land managers on amendments to land management plans and concluded that on a programmatic level these plans, which incorporate the aquatic conservation strategy of the NWFP, did not jeopardize ESA listed species or destroy critical habitat. Oregon also notes that NMFS concluded that the amount and extent of incidental take of ESA-listed species could not be determined at the plan level and subsequent consultations would be needed on certain land management actions at finer scales than the plans. Finally, Oregon recognizes that NMFS is not responsible for determining whether the NWFP meets the requirements of the Clean Water Act and has made no such determination.

Private and state forest lands rely on forest practices rules to meet water quality standards. Oregon DEQ and ODF are working to constructively engage with USEPA and NOAA to resolve technical issues and advise proposed changes to forest practices by ODF. Oregon has continued to demonstrate a willingness and capacity to modify management programs in response to new information and changing needs.

Conclusion: Water Quality

On the basis of a broad range of existing Oregon and federal programs to address water quality, the population bottleneck determinations, the recent analysis of water quality conditions in the ESU, and a commitment by the State complete and implement Agricultural Water Quality Area Management Plans and TMDLs, Oregon concludes that *water quality*, as a factor for decline, has been sufficiently addressed.

Water Quantity (*See also* Part 4(I) OWRD Water Quantity Report)

Oregon's Regulatory Responsibilities

The Oregon Department of Water Resources (WRD) regulatory and restoration programs are administered to achieve the following overarching biological objectives : 1) protect and maintain existing streamflows in areas providing significant salmon habitat value and 2) restore streamflows in areas providing significant salmon habitat value. Maintaining streamflows occurs through the following regulatory programs.

- Establishment of instream water rights
- Water distribution and regulation by priority date of water rights of record, including instream water rights
- Protection of instream water rights from injury during review of water right transfers
- Public interest review, water right conditions, and water allocation policy in considering new out of stream water uses

Restoring streamflows occurs through the following conservation programs.

- Voluntary instream lease agreements
- Voluntary instream transfers
- Allocations of conserved water

Current Water Quantity Conditions in the ESU

Instream water rights were established by Oregon statute in 1987. The Instream Water Right law allows the Oregon Departments of Fish and Wildlife (ODFW), Environmental Quality (DEQ), and the Parks and Recreation (OPRD) to apply for instream water rights for the purpose of fish protection, minimizing the effects of pollution, or maintaining recreational uses. The law gives instream water rights the same status as other water rights. Once issued, these instream water rights are held by WRD as trustee for the people of the State of Oregon. Approximately 800 ISWRs exist in the coastal Oregon basins. Key findings of a recent analysis by WRD yielded the following conclusions.

- Within the ESU, over 3,700 miles of stream are protected by an ISWR.

- At an 80% exceedance flow (the amount of flow that exists at 80 percent of the time, on average), water is not available for new appropriations during August in 94% of the ESU area.

- 70% of the ESU had an August consumptive use of water that was less than 10% of the 80% exceedance flow.

- Over 90% of the ESU had no change in August consumptive use between 1997 and 2004

Summary: Water Quantity

Within the constraints of the prior appropriation doctrine, the Oregon Water Resources Department's current program is protective of instream uses and prevents additional consumptive uses of water when water availability becomes limited. Flow protection and restoration programs are currently directed at the areas of greatest need (Umpqua and Mid-South Coast). Future demands for water as the human population grow in the ESU will continue, but Oregon predicts that this water will have to come from sources other than summer flows.

Conclusion: Water Quantity

On the basis of existing Oregon programs to address water quantity, the population bottleneck determinations, the recent analysis of water use and availability conditions in the ESU, and a commitment by the State to focus streamflow conservation and restoration efforts in targeted areas within the ESU, Oregon concludes that *water quantity*, as a factor for decline, has been sufficiently addressed.

SYNTHESIS – CONSERVING EXISTING CONDITIONS THAT SUPPORT VIABILITY OF THE ESU BY ADDRESSING CURRENT AND FUTURE THREATS TO ESU VIABILITY

The intent of this section is to report Oregon's evaluation of management actions in relation to conserving the *existing* viability of the ESU. As noted in the previous section of this document, Oregon concludes that historical land, water and fish management activities (i.e., *factors for decline*) that contributed most to the legacy of coho declines have been sufficiently addressed by a broad-based set of regulatory and programmatic work that has been strengthening and evolving since the 1950s. Whereas the historical factors for decline have been extensively addressed by these regulatory and programmatic changes, risk factors still present a potential future threat to ESU viability.

The remainder of this section summarizes prominent protective and restoration mechanisms in place that address future threats to the viability of the Coastal coho ESU including Oregon's evaluation regarding the sufficiency of these protective mechanisms to conserve the *existing* viability of the Coastal coho ESU. This evaluation is organized by the following risk factors: ocean conditions, fishery harvest, hatchery impacts, stream complexity, fish passage, water quality, and water quantity.

Ocean Conditions

This risk factor exerts strong influence on life-cycle survival; however, Oregon is unable to directly alter this environmental condition through management action. The State's management response to this risk factor consists of implementing conservative management that directly affects all other risk factors (e.g., fishery harvest, hatchery impacts, stream complexity, etc.).

Fishery Harvest

Oregon, as a member of the Pacific Fisheries Management Council (PFMC), manages under the technical guidance of the *harvest matrix* that was developed concurrently with development of The Oregon Plan and refined through the PFMC process in 2000. The revised *matrix* stipulated more conservative exploitation rates (0-8%) at critically low parent spawner abundance and increased the maximum exploitation rate to 45% under high survival and abundance conditions. Incorporation of the revised matrix under Amendment 15 in 2005 will strengthen future protection to the Coastal coho ESU.

Oregon concludes that the *fishery harvest* management frameworks and policies currently in effect are sufficient to conserve the existing viability of the Coastal coho ESU in the foreseeable future.

Hatchery Management

Management of hatcheries across the Coastal coho ESU has changed dramatically since the mid 1990s; these changes now establish a strong risk-averse environment across the Coastal coho ESU. Collectively, current management practices have reduced the potential for hatchery programs to adversely affect the Coastal coho ESU via genetic interactions, competition, or predation. Continued implementation of Oregon policies including Native Fish Conservation Policy, Hatchery Management Policy, and Genetic Management Policy will continue to support the viability of the ESU.

Key aspects of Oregon's conservative hatchery management program are listed following.

- Numbers of hatchery coho are constrained in basins consistent with minimizing adverse impacts on wild fish.
- Hatchery programs are managed to limit the proportion of strays in natural spawning streams to within policy guidelines (<10%).
- Hatchery fish are released at hatcheries or at acclimation sites in order to reduce straying to natural spawning areas.
- All hatchery coho are marked, facilitating accurate determination of rearing origin of spawners in streams.
- Hatcheries are developing native-origin or local broodstocks.
- Water withdrawals for hatcheries are complying with applicable legal requirements.
- Hatchery effluent discharged into streams meets permit requirements.
- Improved design of barriers at several hatcheries is providing access by wild fish to spawning areas.
- Hatchery policy guidance is requiring monitoring, public involvement in planning, documentation of objectives and criteria, and periodic review to determine of future changes are warranted.

Oregon concludes that the *hatchery management* frameworks and policies currently in effect are sufficient to conserve the existing viability of the Coastal coho ESU in the foreseeable future.

Stream complexity

Oregon's viability analysis (Part 2) indicates that the ESU is viable. This conclusion, alone, is in fact the basis for asserting that current habitat conditions must therefore be sufficient (in quantity and quality) to support the ESU through a future period of adverse ocean, drought and flood conditions similar or slightly more adverse than the most recent period of poor survival conditions (most of the 1980s and 1990s). Oregon is not asserting that contemporary habitat is necessarily sufficient to achieve viability for every population within the ESU, because several populations failed to meet viability criteria.

Further, Oregon is not asserting that habitat supporting ESU viability is *optimum*. Oregon recognizes that contemporary habitats across the ESU reflect substantial loss of estuarine and wetland habitats, reduction in channel complexity, loss of large wood, degradation of riparian habitats and the like. The conservation and recovery planning process that is currently underway with Oregon, NOAA and stakeholder participation will explore the desirability of improving habitat conditions in specific geographic areas to increase population and ESU viability and production potential.

Management of habitat across Oregon has changed dramatically since the 1950s; these changes now establish a more risk-averse environment across the Coastal coho ESU. Key elements of a broad-based, protective habitat management program are listed following.

- The Northwest (Federal) Forest Management Plan
- Oregon's land use law
- Fill and Removal law
- Northwest Oregon Forest Management Plan
- Elliot State Forest Management Plan
- Agricultural Water Quality Management Area Plans
- Total Maximum Daily Load Plans
- Recent revisions to Oregon Forest Practices Rules
- Confined Animal Feeding Operation Program
- Pesticide Program
- Weed Control and Invasive Species Program
- Restoration efforts on state, federal, and private lands

Oregon concludes that the *habitat* management frameworks and policies currently in effect are sufficient to conserve the existing viability of the Coastal coho ESU in the foreseeable future. With only six years of data available for this assessment, the current ability to detect trends in habitat conditions is limited. However, the ability to detect changes in habitat will improve considerably within the next 3-8 years, as more data are available. The State must remain diligent in conducting future monitoring to detect any possible trends in stream complexity that may occur.

Fish passage (*See also* Part 4(J) OP TR 2. A Spatial Evaluation of Habitat Access Conditions and Oregon Plan Fish Passage Improvement Projects in the Coastal Coho ESU)
Fish passage inventory and restoration work has been extensive across the Coastal coho ESU since 1997 (as previously noted in this document). The analysis of fish passage data done as part of this Assessment will help the State focus future effective action regarding this risk factor. Collectively, actions to date plus the State's commitment to focus future fish passage restoration and inventory establish a strong risk-averse environment with regard to this risk factor. Collectively, management practices have reduced the potential for impaired fish passage to adversely affect viability of the Coastal coho ESU.

Oregon concludes that the *fish passage* management and restoration frameworks and policies currently in effect are sufficient to conserve the existing viability of the Coastal coho ESU in the foreseeable future.

Water Quality *(See also* Part 4(B) DEQ Water Quality Report)
Key elements of a broad-based, protective water quality management program are listed following. These programs, plus ongoing voluntary work to address legacy water quality

problems on state, federal, and private lands, should tend to conserve existing ecological conditions to conserve the existing viability of the Coastal coho ESU.

- Water Quality Standards
- Point Source Permits
- Non-point Sources
- Water Quality Monitoring
- Development of Total Maximum Daily Loads
- Implementation of Total Maximum Daily Loads
- Confined Animal Feeding Program rules
- Pesticides rules
- Agricultural Water Quality Area management Plans
- Soil and Water Conservation Districts
- Watershed Councils

Oregon concludes that the *water quality* management frameworks and policies currently in effect are sufficient to conserve the existing viability of the Coastal coho ESU in the foreseeable future.

Water Quantity (*See also* Part 4(I) OWRD Water Quantity Report)
Given that the ESU is currently judged to be biologically viable, we conclude that water quantity conditions in the ESU, although not ideal, are sufficient to sustain coho populations. Key elements of a broad-based, protective water quantity management program are listed following. These programs, plus ongoing nonregulatory actions work to address water quantity problems in priority areas should tend to conserve existing ecological conditions to conserve the existing viability of the Coastal coho ESU.

- Establishment of instream water rights
- Water distribution and regulation by priority date of water rights of record, including instream water rights
- Protection of instream water rights from injury during review of water right transfers
- Public interest review, water right conditions, and water allocation policy in considering new out of stream water uses
- Restoring streamflows occurs through voluntary instream lease agreements, voluntary instream transfers, and allocations of conserved water.

Oregon concludes that the *water quantity* management frameworks and policies currently in effect are sufficient to conserve the existing viability of the Coastal coho ESU in the foreseeable future.

SYNTHESIS – CREATING FUTURE CONDITIONS THAT FURTHER STRENGTHEN ESU VIABILITY AND SUPPORT ACHIEVEMENT OF BROAD OREGON PLAN OBJECTIVES

The intent of this section is to report Oregon's evaluation of management actions in relation to creating future conditions that will strengthen the *existing* viability of the ESU. As noted in the two previous sections of this document, Oregon concluded:

1. Historical factors for decline have been sufficiently addressed by a broad-based set of environmental protection laws and programmatic work.
2. The same broad range of environmental protection laws and programmatic work is sufficient to conserve the *existing* viability of the ESU.

The remainder of this section summarizes Oregon's evaluation regarding whether additional focused conservation action would be expected to strengthen future ESU viability. This evaluation is organized by the following risk factors: ocean conditions, fishery harvest, hatchery impacts, stream complexity, fish passage, water quality, and water quantity; additional information is considered in relation to 1) abundance and distribution of coho in the ESU and 2) conservation and restoration delivery mechanisms.

Ocean Conditions

Additional focused action is not required to strengthen future ESU viability. This risk factor exerts strong influence on life-cycle survival; however, Oregon is unable to directly alter this environmental condition through management action. The State's management response to this risk factor consists of implementing conservative management that directly affects all other risk factors (e.g., fishery harvest, hatchery impacts, stream complexity, etc.).

Fishery harvest

Additional focused action is not required to strengthen future ESU viability. This factor for decline has been addressed effectively. The present harvest regulation matrix also provides sufficient protection to conserve existing ESU viability and is consistent with strengthening future ESU viability by continuing to manage harvest.

Hatchery Management

Additional focused action related to hatchery impacts would be expected to strengthen future ESU viability. This factor for decline has been addressed effectively in all but two of the populations that comprise the Coastal coho ESU. Oregon's current hatchery management policies provide sufficient protection to conserve existing ESU viability and are consistent with strengthening future ESU viability. Opportunities still exist to alter hatchery programs in a small number of basins. Managers and stakeholders will consider possible programmatic responses that could effectively strengthen viability of specific populations in the ongoing conservation planning process.

Habitat (Stream complexity)
Additional focused action related to stream complexity would be expected to strengthen future ESU viability. Existing regulatory programs and implementation of a comprehensive restoration effort have addressed this factor for decline sufficiently; however, the relative scarcity of stream complexity (high quality habitats that support over-wintering juvenile coho) dictates continued vigilance and maintenance of conservation and restoration work to increase the future availability of these habitats.

Opportunities exist to focus restoration work on stream complexity in several basins where populations failed viability criteria and in many populations that are currently viable.

1. Regulatory programs currently in place are likely to create improved habitat conditions (more stream complexity) on federal, state, and private lands.

2. Restoration on all land ownerships is also likely to increase availability of stream complexity. Restoration investments in the Coastal coho ESU during 1997-2003 are summarized in Figure 4 and may be viewed on the internet by population unit at: http://mtjune.uoregon.edu/website/OWEB/Assessment. Restoration investments to date: (1) have primarily addressed sediment delivery to streams (roads), fish passage, and stream complexity (riparian and instream), (2) have been supported by private, federal, and state funds in nearly equal proportions, (3) and have been well distributed across the ESU throughout the post-1997 Oregon Plan era.

Oregon's broad-based restoration program is an effective tool to address primary and secondary *population bottlenecks* that were identified for the vast majority of the independent populations in the ESU (e.g., stream complexity and water quality were the most commonly identified bottlenecks to these coho populations). Stream complexity was identified as the primary risk factor bottleneck for four populations that did not pass viability criteria. For these populations in particular, (Tillamook, Siletz, Alsea, and Sixes) future restoration investments should be prioritized to improve the availability of complex stream habitat used by over-wintering coho. Oregon may also consider whether or not to prioritize restoration investments in basins where populations did not pass criteria over restoration in basins where populations did pass viability criteria. On one hand, restoration to bring populations from failing to passing status would seem to be the most direct approach to strengthening ESU viability. On the other hand, restoration in populations that currently pass criteria, if directed to primary bottlenecks would also strengthen ESU viability. The conservation/recovery planning process currently underway with NOAA and stakeholder participation will be able to consider alternative future approaches to prioritize restoration that are consistent with an overall strategy of strengthening the existing viability of the ESU.

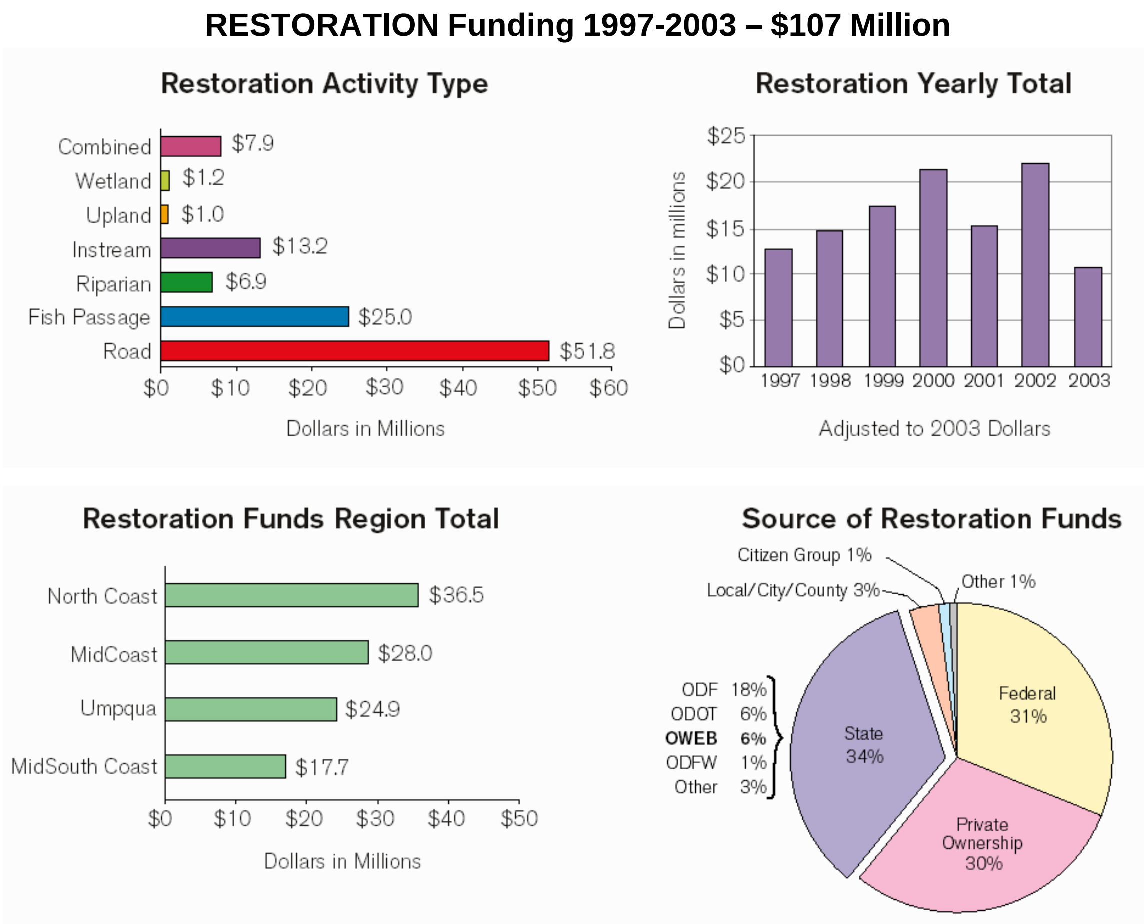

Figure 4. Restoration funding data for the Coastal coho ESU. (*Source*: OWEB Restoration Database and federal Regional Ecosystem Office. *See also* maps by population: http://mtjune.uoregon.edu/website/OWEB/Assessment).

Fish Passage (culverts)

Additional focused action related to fish passage would be expected to strengthen future ESU viability. Oregon's analysis indicates that access by coho may be somewhat impaired within 10% of the species distribution within the ESU; and that the condition of passage structures allowing access to ~30% of the species distribution is not clearly documented. Oregon concludes that the restoration work done during 1997-2004 to improve fish passage has made substantial progress in resolving concerns related to this risk factor. Presently, *impaired fish passage* is identified as a low level of risk to ESU viability and is not a primary risk factor for any populations in the ESU. Future restoration work should focus on (1) documenting the fish passage status of the culverts that have not been surveyed or lack sufficient documentation and (2) providing passage preferentially above culverts that impair passage to streams that will immediately provide high quality, complex over-winter habitat.

Water quality
Additional focused action related to water quality would be expected to strengthen future ESU viability. Current regulatory and programmatic elements of Oregon's water quality program provide sufficient protection to conserve and strengthen existing ESU viability. AWQMPs and forest practices are monitored and will be adjusted based upon adaptive management principles. New actions should focus on site-specific issues and those populations identified with potential water quality threats. As noted previously, restoration work should probably be directed toward both the primary and secondary population bottlenecks (*See also* Applying Bottleneck Determinations to Restoration Prioritization in this document). This conclusion also recognizes that programmatic and restoration work to address water quality across the ESU is likely to support conservation and creation of stream complexity.

Water quantity
Additional focused action related to water quantity would be expected to strengthen future ESU viability. Current regulatory and restoration elements of the WRD water quantity program provide sufficient protection to conserve existing ESU viability. Improvements in water management that produce increased streamflow in the Middle and South Fork Umpqua population would directly target strengthening viability of these two specific populations. WRD conservation and restoration efforts will be responsive to the conclusions of Oregon's determination of population bottlenecks and will provide increased emphasis on this population. Other opportunities may also exist at local spatial scales for water conservation or restoration to strengthen the existing viability of the ESU. The conservation and recovery planning process currently underway may consider these opportunities as are identified.

Abundance and Distribution of Coho in the ESU
Additional focused action related to abundance and distribution of coho across the ESU is not required to strengthen future ESU viability. When the Oregon Plan was being developed and the Coastal coho ESU was first proposed for ESA listing, the abundance and density (number of spawning fish per mile of stream) of coho that were observed during the mid 1990s was a matter of serious concern. However, nearly all of the populations appeared to have *stabilized at low levels* during that extended period of poor ocean survival; and then increased rapidly when the ocean environment improved coho survival in the late 1990s.

This rapid improvement in abundance was essentially an order of magnitude increase from around twenty thousand spawners to over two hundred thousand spawners in 2002 and 2003. The increase in wild coho occurred throughout the ESU with only 1 of 21 populations (the upper Umpqua) obviously lagging. This rapid and ESU-wide response in abundance was somewhat unexpected – previous population modeling had indicated that improvements in abundance would occur more gradually after the ocean environment improved. Average abundance of wild coho spawners in the ESU during 2001-2003 was greater than the average for any of the previous five decades (Figure 5). These observations offer encouraging signs that the ESU retained considerable resilience and inherent productivity through the period of extended low spawner abundance that extended from the 1950s through the late 1990s and support the conclusion that the viability of the ESU was not as precarious as was perceived in the mid- to late 1990s after significant changes to harvest and hatcheries, but before the ocean environment improved.

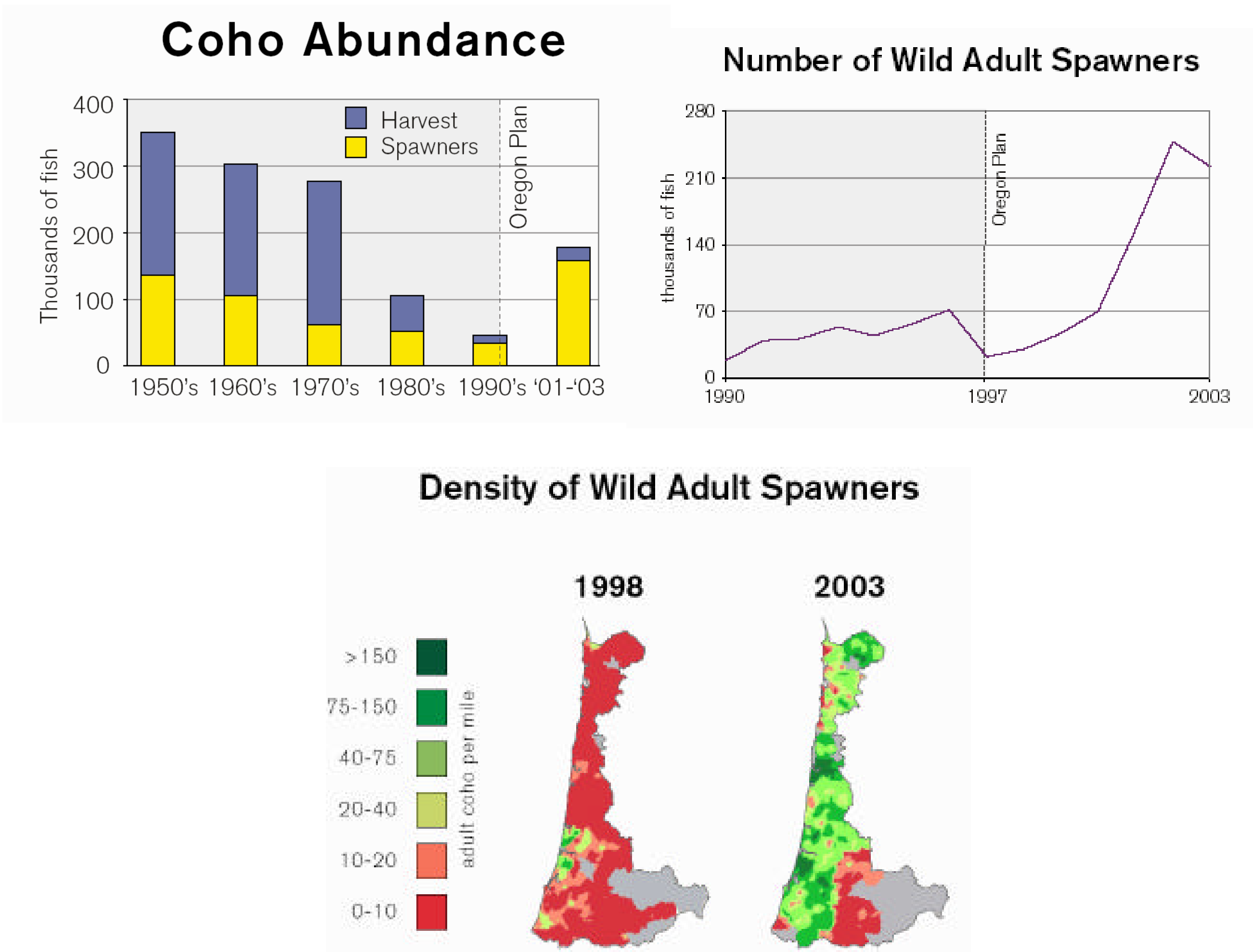

Figure 5. Adult coho abundance and spawner escapement during the past five decades and spawner distribution patterns resulting from unfavorable (1998) and favorable (2003) ocean conditions (*Source*: ODFW unpublished data; Coastal Salmonid Inventories Project).

These observed improvements in abundance and distribution of spawners in the Coastal coho ESU, in context with performance prior to and during the recent period of adverse ocean survival, provide a basis for viability analysis and suggest the ESU is more resilient than previously recognized. The improved densities and distribution of coho spawners in recent years should result in improved inputs of marine nutrients derived from coho carcasses. Recent levels of marine nutrient input from coho carcasses are likely lower than historical levels (compared to pre-development coho populations), however, current marine nutrient input has improved considerably over nutrient levels during the last five decades.

Oregon concludes that the recent abundance and distribution of coho spawners across the ESU supports optimism that the ESU will remain viable. Monitoring programs would promptly detect a decline in number and distribution of coho in populations across the ESU.

Conservation and Restoration Delivery Mechanisms

Additional focused action related to conservation and restoration delivery mechanisms is not required to strengthen future ESU viability. Oregon currently possesses both regulatory and non-regulatory programs and funding necessary to implement a broad based effort to both maintain and strengthen the current viability of the Coastal coho ESU under the Oregon Plan for Salmon and Watersheds. The Oregon legislature has enacted several pieces of legislation that codify the Oregon Plan. The state agencies that participate in the Oregon Plan have the legal and regulatory authority, resources, authorizations, staffing, and commitment to carry out their conservation efforts. A broad range of Oregon laws supports Oregon Plan conservation efforts. Key laws are listed in Table 7. A diverse and long-standing body of laws strongly supports Oregon's judgment that the current viability of the ESU will be protected in the future.

Table 7. Oregon statutes (laws) related to and included in the Oregon Plan under SB945.

Statute	Topic
196.105 to 196.125	Columbia Gorge Protection
196.600 to 196.905	Wetlands
197	Land Use Planning Coordination
274	Submerged & Submersible Lands
366	State Highways
390	State & Local Parks; Recreational Programs; Scenic Waterways; Recreation Trails
465,466, 468 and 468b	Hazardous Waste & Materials; Environmental Quality; Water Quality
469.300 to 469.563, 469.590 to 469.619, 469.930 and 469.992	Regulation of Energy Facilities
477	Fire Protection of Forests & Vegetation
496, 497, 498, 501, 506, 507, 508, 509, and 511	Fish & Wildlife Laws
517.702 to 517.989	Mineral Exploration
527.310 to 527.370, 527.610 to 527.770, 527.990 (1) and 527.992	Insect & Disease Control; Forest Practices
530	Acquisition & Development of State Forests
536 to 543A	Water Resources Administration, Watershed Enhancement
543A.005 to 543A.415	Hydroelectric Projects
568.210 to 568.808 and 568.900 to 568.933	Soil & Water Conservation Districts, Agricultural Water Quality Management Program

Oregon also has established an 8-year track record of implementing the Oregon Plan, ranging from supporting watershed councils (Table 8), funding restoration (Figures 4 and 6), conducting monitoring, reporting the results of independent scientific oversight by the IMST, and improving state management programs based on new data and the conservation needs of the ESU. This track record is substantive and broad based, and offers strong evidence that the state will continue to implement the Oregon Plan as currently defined in statute. Oregon has a reliable long-term source of funding for restoration under Ballot Measure 66, including a review to consider funding The Oregon Plan after 2014.

Table 8. Watershed councils in the Coastal coho ESU.

Monitoring Unit	Watershed Council
North Coast	Necanicum, Lower Nehalem, Upper Nehalem; Ecola; Tillamook Bay; Nestucca-Neskowin
Mid Coast	MidCoast Council, including Salmon, Drift Creek, Yaquina, Alsea, Siletz; Siuslaw
Umpqua	Umpqua; Elk; Smith
Mid-South Coast	Tenmile Lakes; Coos; Coquille; Floras/New; and Elk-Sixes

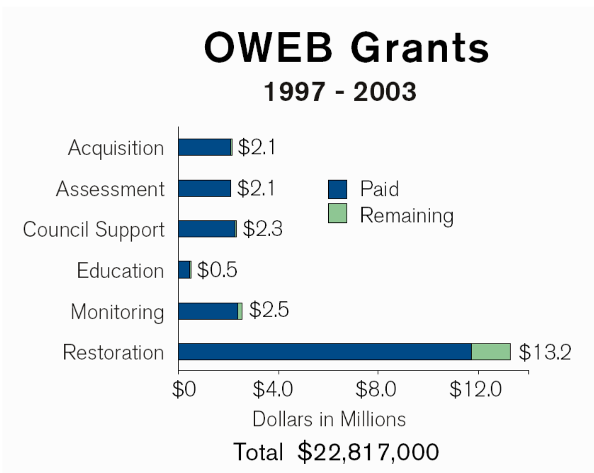

Figure 6. Funding commitment of the Oregon Watershed Enhancement Board (OWEB) to support conservation and restoration efforts in the Coastal coho ESU, 1997-2003. In context with previously provided information on restoration within the ESU, this shows that OWEB has provided roughly 10% of the funding for restoration in the ESU (*Source*: Oregon Watershed Enhancement Board Grants Program Fiscal Database).

Examples of the diverse array of mechanisms to deliver restoration public and private lands in the Coastal coho ESU are listed following.

- ***Local Watershed Councils (LWC) –*** In 1993, Oregon created an LWC program under House Bill 2215. Since that time approximately 95 watershed councils have formed across the state. In the Coastal coho ESU there are 16 councils currently in existence as shown in Table 2. Watershed councils are well distributed across the Coastal coho ESU and the functionally independent populations within each of the 4 Monitoring Units in the ESU.

- ***Soil and Water Conservation Districts (SWCDs) –*** Oregon's 45 Soil and Water Conservation Districts (SWCDs) are organized under Oregon Revised Statutes (ORS) Chapter 568 and are governed by an elected board of directors who serve without pay. SWCDs identify and address natural resource concerns within their respective boundaries and work with local, state, federal and private interests to deliver conservation services. SWCDs provide direct technical assistance to landowners to plan, design, survey, and implement conservation practices and systems. The coastal SWCDs include Clatsop, Coos, Curry County, Lincoln, Siuslaw, Tillamook County, and Umpqua SWCDS. SWCDS effectively address riparian condition, sediment, water temperature, pH, dissolved oxygen, bacteria, and excessive nutrients from agricultural and rural lands.

- ***ODFW Western Oregon Stream Restoration Program –*** This program provides trained fish biologists to assist private landowners in the design and accomplishment of restoration work. The Program is described in a separate report provided as part of this overall assessment (*See* Part 4(C) ODFW (9) Western Oregon Stream Restoration Program). Work accomplished is reported to the OWEB restoration database and is summarized as work accomplished in this ESU.

- ***Federal Lands Restoration Program –*** Restoration work on federal lands consists of both passive and active restoration work. Specifically, the Riparian Reserve program as part of the Key Watershed Program contributes passive restoration of watershed function that supports the sustainability of the Coastal coho ESU. Active restoration on federal lands in this ESU is also provided by activities that include placement of wood, culvert improvements, and road upgrades and de-commissioning. The contribution of restoration work on federal lands is described in a separate report provided as part of this overall assessment (*See* Part 4 (E) Federal Forest Management). Work accomplished is reported to the federal IDRIS restoration database and shared with OWEB.

- ***State Lands Restoration Program –*** Restoration work on state lands consists of both passive and active restoration work. Active restoration on federal lands in this ESU is provided by activities that include placement of wood, culvert improvements, and road upgrades and de-commissioning. The contribution of restoration work on state lands is described in a separate report provided as part of this overall assessment (*See* Part 4(D) Chapter A2 State Forests Program). Work accomplished is reported to the OWEB restoration Database and is summarized as work accomplished in this ESU.

- ***Private Landowner Initiative*** – Private landowners voluntarily funded roughly one-third of the reported restoration in the ESU during 1997-2003. Landowners initiated and conducted restoration independently, or in partnership with watershed councils, SWCDs, or government programs.

SYNTHESIS – MONITORING TO DETECT FUTURE TRENDS AND SUPPORT ADAPTIVE MANAGEMENT

The intent of this section is to describe Oregon's monitoring program and explain how it will permit the State to detect future changes in the status of the ESU or the management or habitat conditions that currently support viability of the ESU.

Monitoring context
Oregon has made significant investments ($16 million, 1997-2003) in new and enhanced monitoring of fish, habitat, and water quality since the initiation of the Oregon Plan (Figure 7). Monitoring implemented in 1997 to evaluate status and trend in fish abundance, habitat and water quality across the Coastal coho ESU provided essential data to conduct this assessment.

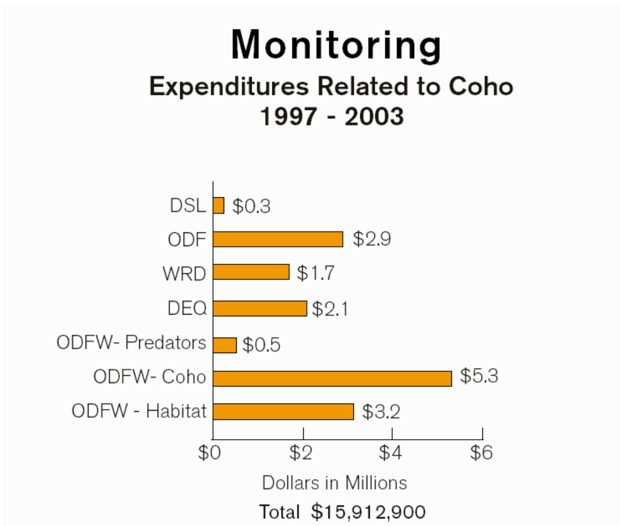

Figure 7. Monitoring expenditures by state agency programs in the Oregon Coastal coho ESU, related to coho salmon, 1997-2003. These values do not include monitoring by federal agencies, private landowners, or watershed councils. (*Source*: Unpublished responses to enquiry posed to state agencies participating in the Oregon Coastal coho ESU Assessment)

These key subjects of Oregon's monitoring effort are detailed following.

- Fishery harvest
- Hatcheries
- Coho
- Habitat
- Watersheds Research Cooperative
- Headwaters Research Cooperative (OHRC)
- Forest Practices Program Monitoring
- Restoration
- Watershed assessments
- Fish passage
- Water quality

- Water Quantity
- Abundance and distribution of coho within the ESU
- Ocean conditions

Fishery Harvest Monitoring (ODFW)
An extensive system exists to monitor the direct and indirect mortality of coho salmon caused by commercial and recreational fisheries along the western coast of North America. Monitoring is conducted by states, coordinated through the PFMC. In Oregon, commercial and recreational landings occur in five major catch areas including twelve individual ports. Port sampling is conducted via an established sampling plan using a stratified random design. Samplers gather biological data, coded-wire-tags, catch composition, and catch. Harvest in freshwater fisheries is monitored through angler catch-record cards with some creel census data available for some basins/areas. Oregon recreational anglers are required to record all salmon or steelhead on a catch-record card and return the completed card to ODFW at the end of the year. Harvest of non-hatchery coho salmon has not been permitted in Oregon estuaries or coastal rives since the mid 1990s. No commercial fishery catch occurs in freshwater.

Hatchery Monitoring (ODFW)
ODFW's Fish Hatchery Management Policy requires monitoring and evaluation to evaluate success meeting hatchery program and fish management objectives, improve understanding of the reasons for success or failure, evaluate impacts of the hatchery program on naturally produced native fish, contain impacts of hatchery programs within policy limits, and support adaptive management. Each hatchery program management plan describes how operations and objectives will be monitored and evaluated. Monitoring and evaluation programs use generally accepted scientific procedures and gather information to evaluate hatchery programs relative to measurable criteria.

Coho Monitoring
Coho Spawner Monitoring (ODFW)
ODFW's Coastal Salmonid Inventory Project conducts "standard" and "probabilistic" surveys to monitor the abundance and distribution of wild and hatchery coho spawning in streams in the ESU. Standard surveys are conducted annually at sites selected 30-50 years ago. While these sites were not chosen at random, they do provide the best long-term information on coho population trends in the ESU. Probabilistic survey sites are selected randomly across the ESU and can be used to statistically describe the status and trend of coho spawners down to the scale of independent and potentially independent coho populations units within the ESU.
http://oregonstate.edu/Dept/ODFW/spawn/index.htm

Juvenile Fish Monitoring (ODFW)
ODFW's Western Oregon Rearing Project conducts "probabilistic" surveys to provide statistically rigorous information on the abundance and distribution of juvenile coho in the ESU. Surveys are primarily conducted by snorkel count, with electrofishing used in situations necessitated by poor underwater visibility.
http://oregonstate.edu/dept/pacrim/index.htm

Marine and Freshwater Survival Monitoring (ODFW)
ODFW's Life Cycle Monitoring Project traps upstream migrating adult and downstream migrating juvenile coho at five sites in the ESU. This information is used to monitor trends in freshwater and marine survival rates of naturally spawning fish in the ESU. http://oregonstate.edu/Dept/ODFW/life-cycle/index.html

Habitat Monitoring (ODFW)
Since 1998, ODFW has conducted a monitoring program designed to provide unbiased, statistically rigorous data on instream physical habitat condition, riparian condition, and geomorphic characteristics of streams at the scale of the ESU and four Monitoring Areas within the ESU. ODFW habitat surveys are designed to assess habitat in all wadeable streams within the distribution of coho in the ESU. Specifically, the sample frame is derived from 1st through 3rd order streams coho bearing streams depicted on a 1:100,000 scale digital hydrography layer developed by the USGS. Streams above dams that block anadromous fish passage are removed from the selection frame. The sample plan protocol results in a pool of random, spatially balanced sites across the landscape, thereby reducing potential site selection bias. Roughly 10 percent of the sites per year in each monitoring area are resampled by a separate two-person crew to measure variation within season and crew variation crews in four monitoring areas in the ESU. http://oregonstate.edu/Dept/ODFW/freshwater/inventory/index.htm

Federal Forest Aquatic Riparian Effectiveness Monitoring Plan (AREMP)
The USFS and BLM are conducting monitoring to assess progress toward the Northwest Forest Plan's Aquatic Conservation Strategy objectives across the Northwest Forest Plan area. The Aquatic Riparian Effectiveness Monitoring Plan (AREMP) was approved in March 2001 and published in 2004. Under the AREMP, the condition of various watersheds across the Northwest Forest Plan area will be evaluated. Over time, AREMP will assess trends in watershed condition. Parameters measured include channel condition, riparian condition, and upland condition. The results of this work are broadly applicable to federal forestland in the Coastal coho ESU.

State Managed Forest Lands Monitoring (ODF)
The State Forests Program conducts extensive monitoring to evaluate effectiveness and implementation of the integrated resource management strategies described in the Northwest and Southwest Forest Management Plans. Monitoring includes: (1) road systems, (2) watershed scale effectiveness, and (3) effects analysis. The State Forests Program is currently involved in a collaborative effort with Private and Community Forests Program to evaluate site-scale effectiveness of riparian and aquatic strategies. www.odf.state.or.us.
http://www.odf.state.or.us/divisions/protection/forest_practices/fpmp/default.asp

Watersheds Research Cooperative
The Watersheds Research Cooperative (Oregon State University Colleges of Forestry and Agriculture) is implementing paired watershed studies evaluating the effects of modern forest practices (e.g., harvesting and roads) on physical and biological watershed characteristics. A paired watershed project at Hinkle Creek is already well underway

and two replicates are planned to be located elsewhere. These studies are designed to address two key questions: (1) what are the effects of contemporary forest practices on water quality and aquatic habitat in headwater or non-fishbearing streams, and (2) what are the direct and cumulative effects of timber harvesting in headwater basins on fish populations downstream?

Headwaters Research Cooperative (OHRC)

The Oregon Headwaters Research Cooperative is a broad coalition of agencies, associations, and corporations that share an interest in research regarding small, generally non-fish bearing streams commonly referred to as "headwater" streams. The OHRC seeks participation from state and federal agencies, private industry, and non-governmental organizations in Oregon. The purpose of the OHRC is to investigate local and downstream effects of forest management on biota and habitat characteristics of headwater stream systems. The goals of the research cooperative are: (1) to gain scientific understanding of the physical and biological processes of headwater stream systems; and (2) to test the local and downstream response of headwater streams to a range of forest management prescriptions.

Forest Practices Program Monitoring

Over the years, the Forest Practices Act rules have adapted in response to improved knowledge about interactions between forest management and resource protection. The FPMP objective is to evaluate forest practices on private forestland and coordinate with research and monitoring at the state and national level. The focus of the monitoring efforts are currently on evaluating riparian protection and water temperature interactions, impacts of headwater streams on downstream wood and temperature functions, and data collection related to recently proposed changes to forest practices.

Restoration Monitoring

OWEB and Federal Restoration Databases

The OWEB Restoration Database and the federal restoration reporting systems provide data on restoration work accomplished. Data available include spatial location of work, type of work done, cost of work done, source of funds to do the work, amount of work done (miles of stream bank treated, miles of instream structure treated number of culverts replaced, and so on).

ODFW Western Oregon Habitat Restoration Program

Stream habitat restoration monitoring is used to track change that occurs as a result of stream enhancement projects. Types of enhancement activities include in-stream wood and boulder placement, construction of off channel ponds, culvert replacement and bridge placement, conifer and hardwood riparian plantings, fencing and livestock management, removal of artificial barriers, and road decommissioning. Monitoring of restoration activities consist of pre-treatment and post-treatment assessments of stream conditions using the methods of the ODFW's Aquatic Inventories Project.
http://oregonstate.edu/Dept/ODFW/freshwater/inventory/restoratn.htm

Watershed Assessments

Watershed assessments are a fundamental basis for the conduct of effective restoration work. When the Oregon Plan was first implemented in 1997, assessments had been completed for about 30% of the ESU. At the time of this report (2004) assessments have been completed for about 97% of the ESU. These assessments have employed OWEB protocols or federal assessment protocols (on federal lands), and watershed action plans have been completed for all of the watersheds in the ESU except the Tillamook Basin.

Fish Passage

An extensive database of information related to fish passage has been compiled as part of the Coastal coho ESU Assessment. The database includes the location and condition of fish passage structures (culverts, road crossings) on county roads, state highways, private roads, state forest lands, and federal forest lands, plus information regarding fish passage improvements implemented since 1997 on public and private lands. This database has been a key element in Oregon's evaluation of fish passage improvement status, accomplishments, and future needs.

Water Quality Monitoring

Probabilistic Survey Water Quality Monitoring (ODEQ)

ODEQ conducts monitoring in the ESU using a probabilistic approach to describe water quality conditions on a regional basis. The probabilistic monitoring design allows for an assessment of the status of water quality conditions of wadeable, 1st through 3rd order streams, across the entire Coastal coho ESU and within subunits (four monitoring units and five land use categories) of the ESU for which sufficient data were collected. Because of the random site selection design, the results from individual sites can be used to estimate the status of all wadeable stream miles within the ESU and subunits with a known level of confidence.

Ambient Site Water Quality Monitoring (ODEQ)

ODEQ maintains a statewide network of more than 130 ambient water quality monitoring stations; 31 of these sites are located within the Coastal coho ESU. These sites are located on larger non-wadeable streams (4th order and larger), and are typically sampled for long-term water quality status and trending. Sites were selected to represent conditions at the lower ends of major watersheds or basins. The water quality variables measured at these sites are temperature, dissolved oxygen (percent saturation and concentration), biochemical oxygen demand, pH, total solids, ammonia and nitrate, total phosphorus, and bacteria (E. coli).

TMDL Monitoring (ODEQ)

Under the federal Clean Water Act, Oregon is required to calculate pollution load limits, known as Total Maximum Daily Loads (TMDLs), for each pollutant entering a body of water for those waterbodies on the State's 303(d) List. TMDLs describe the amount of each pollutant a waterbody can receive and still not exceed water quality criteria in accordance with Oregon's water quality standards. ODEQ reviews existing data and conducts monitoring to determine what pollutant is causing water quality problems and in what amounts it is entering the water.

Water Quantity Monitoring
As required by Oregon Revised Statute (ORS) 537.099, WRD monitors and reports "water use" by instream water rights (ISWRs) in regular reports to the Water Resources Commission. There have been up to 35 continuous recording streamflow gages operated by WRD or the US Geological Survey (USGS) that measure streamflows at instream water right locations within the Oregon Coastal coho ESU. Published streamflow data for these sites is available on the Department's website at**:**
http://www.wrd.state.or.us/OWRD/SW/index.shtml#Surface_Water_Data

Ocean Conditions Monitoring

This risk factor *Ocean Conditions* exerts strong influence on life-cycle survival; however, Oregon is unable to directly alter this environmental condition through management action. The State's management response to this risk factor consists of implementing conservative management that directly affects all other risk factors (e.g., fishery harvest, hatchery impacts, stream complexity, fish passage, etc.).

Survival of coho returning to Oregon hatcheries has been monitored for decades, and survival of wild coho has been estimated at several life-cycle monitoring sites throughout the ESU since 1998. Data from these distinct sources support a conclusion that the ocean environment exerts a very strong influence on returns of coho salmon. The ocean was relatively favorable to coho survival during the 1950s and 1960s, and then became very unfavorable to coho survival during the late 1980s and 1990s. This period of harsh ocean environment was indicated by very poor returns of hatchery fish and low abundance of wild coho. The ocean environment became much more favorable to survival of both hatchery and wild coho in the late 1990s, coinciding with initial implementation of the Oregon Plan (Figure 8).

The recent survival shift supported by favorable ocean conditions has allowed us to document a positive response by wild coho (that were at very low levels of abundance and spawner density in the ESU) to levels that have not been observed for the last five decades (Figure 5). Whether ocean conditions will remain favorable for one or more decades, as has apparently been the regional pattern, or become adverse again shortly, is a matter that cannot be reliably predicted. However, the recent performance of the Coastal coho ESU lends confidence that the ESU, which it at higher average levels of spawner escapement than during the last five decades, will be capable of maintaining viability during a future period of poor ocean environment similar or slightly more adverse than the 1990s.

Future declines (of unknown duration and severity) in the ocean survival of coho salmon are expected; however, future declines in ocean survival of the coho ESU would be detected at hatcheries, response of wild fish would be detected at life-cycle monitoring sites and in spawning areas, and appropriate management responses *(harvest regulations are especially important, see the next section for a discussion)* could be implemented to manage impacts of fisheries consistent with the conservation of the ESU.

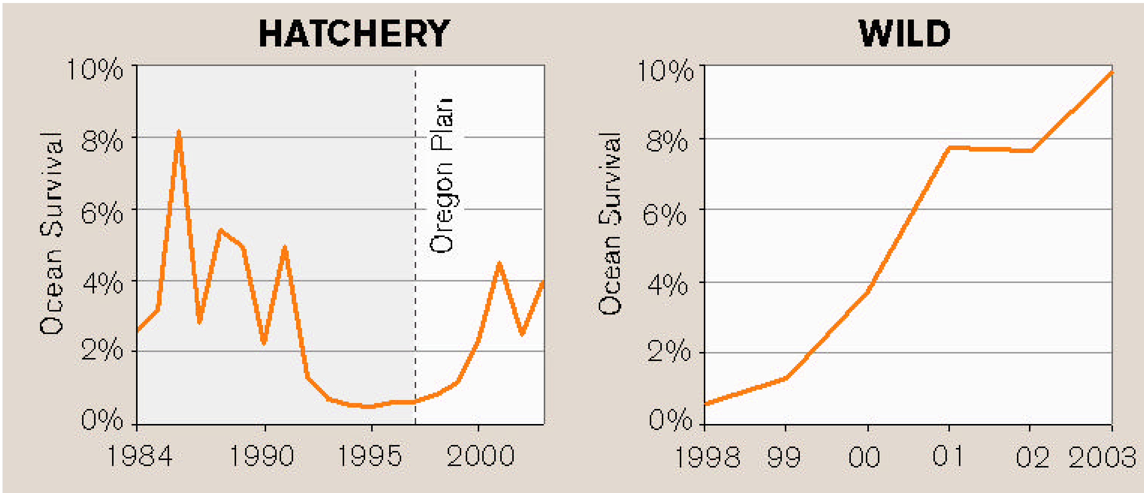

Figure 8. Survival of hatchery and wild coho salmon is strongly influenced by ocean conditions. The graph at left represents an average survival for all coho returning to Oregon hatcheries; the graph at right represents an average survival of wild coho returning to 5 life-cycle monitoring sites in the ESU. Year indicates year of return. (*Source*: ODFW unpublished data; personal communication Tom Nickelson)

Other Elements of Oregon's Monitoring Effort

In addition to the key elements of Oregon's monitoring efforts noted above, a diverse set of monitoring programs and efforts provide additional information that allow Oregon to assess of environmental and management conditions that could affect future viability the Coastal coho ESU. The following list includes the more prominent of these efforts and notes the entity conducting the monitoring.

- Riparian conditions (ODA)
- Water quality (volunteers)
- Pesticide law compliance (ODA)
- Forest practice rule compliance (ODF)
- Fish presence/absence surveys (ODFW and
- ODF)Confined animal feeding operation program requirements (ODA)
- Monitoring by Watershed Councils and Soil and Water Conservation Districts
- Dredge, fill, and inwater construction (ODSL)
- Streamflow (OWRD)
- Fish disease (ODFW)
- Predator abundance trend and impacts (ODFW)
- Exotic Fish (ODFW)
- Scientific and educational take (ODFW)
- Illegal take and habitat violation (OSP)

Future Monitoring Needs
This assessment has initiated extensive re-examination of monitoring plans, data storage and analysis systems, and processes for integrating analyses and sharing information among agencies and watershed councils. The recent definition of ESU population structure by the NOAA Fisheries TRT poses unanticipated challenges to the Monitoring Plan established when the Oregon Plan was initiated. Overall, the assessment has provided stimulus to improve sampling design and enhance future multi-disciplinary analytical efforts. Oregon is in the process of implementing four refinements to the existing broad based monitoring and analysis effort in the Coastal coho ESU.

1. OWEB is in the process of developing an effectiveness monitoring plan. Monitoring implemented as a result of this plan will be funded from a combination of sources including OWEB, NOAA Fisheries, BLM, and USFS.
2. Much of the monitoring of fish, habitat, and water quality in the ESU is currently designed at the spatial scale of Monitoring Areas rather than populations or population strata. At the conclusion of this assessment, Oregon will examine the possibility of modifying monitoring sampling plans to provide estimates at finer spatial scales, consistent with the current understanding of ESU population structure.
3. Oregon has established an Internet based *Data Library* to house and distribute data and information related to this coho ESU assessment. The goal is to improve Oregon's information archiving and retrieval capability by developing a tool based on the Coastal coho ESU assessment – a tool that can be applied statewide in the future.
4. ODFW, ODEQ, and statisticians at Oregon State and Colorado State University are conducting a review of the statistical needs of monitoring conducted under The Oregon Plan. The results of this review will include a development of needed statistical tools and will be published in a special issue of the journal Environmetrics.

Summary Conclusion – Monitoring
Considering Oregon's extensive array of monitoring effort in the Coastal coho ESU, it is unlikely that conditions currently supporting viability of the ESU could change so rapidly as to preclude future, timely detection and protective action under state and federal management programs.

SYNTHESIS – EVALUATING CURRENT THREATS TO ESU VIABILITY

The Coastal coho ESU Assessment has provided Oregon an opportunity to evaluate current threats to ESU viability. This re-evaluation is based on a broad review of scientific data, programmatic implementation, and policy analysis. Oregon's analysis of threats to ESU viability was organized around the factors for decline identified as part of the initial NOAA status review and decision to list this ESU under the federal Endangered Species Act. The preceding sections of this document provide a basis for the threat level determinations that are presented in this section. Determination of current threats to ESU viability required a progressive deliberation for each risk factor that sequentially considers three elements of Oregon's coho Assessment.

1. Oregon's finding that the ESU is viable.
2. Oregon's identification of population bottlenecks.
3. Oregon's evaluation of management and restoration programs that address historic *Factors for Decline* and create future conditions intended to conserve or improve ESU viability provide overall context for threat determinations.

Threat level determinations were established by consensus of principle members of Oregon's Assessment Team.

Previous Threats to ESU Viability

Oregon recognizes that many risk factors (*Factors for Decline, see* Table 4) have caused an erosion of the Coastal coho ESU viability during the last two centuries. It is instructive to reflect on levels of threat to ESU viability that were being discussed when the species was first listed in 1997 and when the listing was again being evaluated in 2003. Threat levels that were implied in NOAA documents (Table 9) were not based on a formal analysis of ESU viability.

Table 9. Oregon's interpretation of NOAA's threat determinations in 1997 and 2003. Oregon conferred with NOAA to verify that these are fair representations of NOAA's determinations.

Risk Factor (*Also*: Factor For Decline)	**1997 Threat to ESU Viability**	**2003 Threat to ESU Viability**
Ocean Conditions	High	Moderate
Fishery Harvest	High	Low
Hatchery Impacts	High	Low
Habitat (Stream complexity)	High	High
Fish Passage	High	Low
Water Quality	High	Low
Water Quantity	Moderate	Low
Other factors: toxics, DO, hydro power, disease, exotic fish interactions, predation, etc.	Low	Low

Source of 1997 threat level: NMFS 1997. Status Review Update of Coho Salmon from the Oregon and Northern California Coasts. West Coast Coho Salmon Biological Review Team. March 28, 1997. 101 p. Available on the Internet at: http://www.nwr.noaa.gov/1salmon/salmesa/pubs/sru970403.pdf
Source of 1997 threat level: NMFS 2003. Updated Status of Federally Listed ESUs of West Coast Salmon and Steelhead. West Coast Salmon Biological Review Team. July 2003. Available on the Internet at: http://www.nwr.noaa.gov/AlseaResponse/20040528/brtusr.html

The change in perceived threats to ESU viability in 2003 versus 1997 reflected three key thoughts.

1. NOAA concluded that Oregon had effectively altered harvest & hatchery management programs to address these two factors for decline.
2. NOAA noted that coho survival rates and escapement had demonstrated positive improvements.
3. NOAA still had significant concern regarding the potential impact of an adverse marine environment and degraded (and possibly still deteriorating) stream complexity conditions in freshwater rearing environment.

Current Threats to ESU Viability
Oregon provides the following rationale for assigning current relative risk level associated with key risk factors.

Risk Factor: *Ocean conditions*.
Oregon's 2005 risk level determination: *Moderate.*
Rationale: Oregon's rationale starts from a finding that the ESU is currently viable. Oregon also recognizes that the ocean environment exerts a very large influence on life-cycle survival of coho salmon and that the ocean environment has and will continue to cause cyclic and annual variation in coho survival. Persistence modeling predicts that future downturns in ocean survival of greater duration than observed between 1950 and 2000 would not significantly impair ESU viability, but ESU viability may be in doubt if survival is more than 15% worse than has been observed. Oregon does not have reliable predictions regarding the relative effect of future ocean conditions, but recognizes the significance of the ocean environment on ESU viability. Extensive coho population monitoring is in place and will be able to detect annual variation in adult spawner numbers and rearing juvenile densities. Thus, Oregon would be able to detect future declines in coho across the ESU and will be able to weigh appropriate management response to declines, including future listing under Oregon or federal Endangered Species laws.

Oregon now therefore assigns a *moderate threat-level* to this risk factor in recognition of the great influence ocean environment exerts on coho, the inability to directly affect the risk factor, and uncertainty regarding future ocean conditions that may actually occur.

Risk Factor: *Fishery harvest*.
Oregon's 2005 risk level determination: *Low*.
Rationale: Oregon's rationale starts from a finding that the ESU is currently viable. Oregon also recognizes fishery harvest and related mortality is potentially capable of exerting a very large influence on life-cycle survival of coho salmon. Harvest related mortality on the Coastal coho ESU was clearly greater than the species could sustain during several decades before the mid 1990s. The current fishery management regime is regulated by PFMC and both Oregon and NOAA participate in the fishery management process. The Coho harvest matrix defined under PFMC Amendment 13 is constructed to

provide protection to the coho ESU under adverse ocean and population conditions. This fishery management matrix is in place to protect the ESU from excessive harvest related mortality during any future periods of poor ocean survival or population performance. Extensive coho population monitoring is in place that is considered in ocean fishery and harvest level setting.

Oregon now therefore assigns a *low threat-level* to this risk factor in consideration of the State's conclusion that the ocean and in-river fishery management processes are currently consistent with conserving and recovering the ESU.

Risk Factor: *Hatchery impacts*.
Oregon's 2005 risk level determination: *Low*.
Rationale: Oregon's rationale starts from a finding that the ESU is currently viable. Oregon also recognizes a variety of interactions with hatchery fish and the operation of hatcheries is potentially capable of exerting a very large influence on life-cycle survival of coho salmon. Hatchery related impacts on the Coastal coho ESU were clearly much greater during several decades before the mid 1990s than it has been recently. The current coho hatchery programs in the ESU are at relatively low levels and practices have been modified consistent with new ODFW policies; current and planned hatchery programs for coho and other species in the ESU are being managed consistent with conservation and recovery needs of the species. Extensive coho population monitoring is in place that it would detect stray hatchery coho in natural spawning areas.

Oregon concludes that the hatchery management programs and policies are currently consistent with conserving and improving the ESU viability because (1) the number of hatchery fish released in the ESU is very small compared to historic release levels; (2) hatchery strays generally comprise less than 10% of coho in spawning areas, a value smaller than historic values and consistent with the Native Fish Conservation Policy; (3) continued implementation of Oregon policies including Native Fish Conservation Policy (NFCP), Hatchery Management Policy (HMP), and Hatchery and Genetic Management Plans will continue to support the viability of the ESU; and (4) hatchery impacts designated as a bottleneck to individual populations within the ESU will be considered and addressed through ongoing development of a conservation plan based on the NFCP and HMP.

Oregon now therefore assigns a *low threat-level* to this risk factor.

Risk Factor: *Stream complexity*.
Oregon's 2005 risk level determination: *Moderate*.
Rationale: Oregon's rationale starts from a finding that the ESU is currently viable. Oregon also has concluded that a scarcity of stream complexity was a bottleneck for 13 of 21 independent populations that compose the ESU. Thus, stream complexity is the most common risk factor that limits populations across the ESU. That said, it is also crucial to note that 16 of these 21 populations passed viability criteria. The fact that stream complexity is the primary bottleneck for so many populations highlights the

sensitivity of the ESU to this habitat feature. Oregon concludes that current state and federal policies and programs are consistent with conservation and improvement of stream complexity in the ESU, recognizing some uncertainty associated with this conclusion. Also, although extensive habitat monitoring is in place that will improve the State's ability to detect significant declines in future habitat conditions, the sensitivity of the data at present is limited.

Oregon now therefore assigns a *moderate* threat-level to this risk factor in recognition of the great influence that stream complexity exerts on coho, the long time span required to significantly improve the feature across the ESU, and uncertainty regarding the cumulative future conditions that management and restoration programs will produce across the ESU.

Risk Factor: ***Fish passage***.
Oregon's 2005 risk level determination: *Low*.
Rationale: Oregon's rationale starts from a finding that the ESU is currently viable. Oregon also recognizes that recent restoration work on federal, state, and private lands has significantly improved access by coho salmon. Coho salmon require access as juveniles and adults to spawning and rearing habitats and that timing of access to these habitats can be critical. Fish passage concerns received considerable attention when the Oregon Plan was initiated in 1997 and a relatively high priority has been given to restoration work designed to improve fish passage throughout the ESU. At that time, simply providing more access in the watersheds was thought of as being a straightforward way to improve the status of the ESU.

Overall, Oregon estimated that coho salmon in 2003 versus 1997 had improved access to 6% of the high intrinsic potential coho streams and to 10% of the remainder of the coho distribution. Oregon estimated that access by coho remained impaired to approximately 10% of the species distribution (including access to 10% of high intrinsic potential habitat) and that the status of access to about 30% of the coho distribution is currently unknown (not documented in such a manner that could be determined during the Assessment). Oregon concludes that improved population viability will only accrue from providing access to high quality overwintering habitat as opposed to improving access to all habitat. Since high quality overwintering habitat is relatively scarce across the ESU, upgrading or replacing many remaining passage barriers would only provide access to marginal habitats and therefore would not improve population viability. Oregon concludes that the current fish passage policies and rules, including fish passage guidelines and restoration efforts underway, are consistent with conserving and recovering the ESU. Also, Oregon intends to focus future fish passage (culvert) inventories and habitat surveys in a manner that will identify high quality habitat that exists above passage barriers and to identify impaired passage structures in high intrinsic potential habitat.

Oregon now therefore assigns a *low* threat-level to this risk factor.

Risk Factor: ***Water quality.***
Oregon's 2005 risk level determination: *Low*.
Rationale: Oregon's rationale starts from a finding that the ESU is currently viable. Although water quality was not identified as a primary risk factor bottleneck for a single coho population, this risk factor was identified as a secondary risk factor bottleneck for 15 of 21 populations. Oregon recognizes that water quality exerts a strong influence on coho survival and that significant water quality concerns exist across the ESU. Improving water quality across the ESU and in the 15 populations previously mentioned (only 3 failed viability criteria – 12 passed) is consistent with improving watershed function and addressing Oregon's responsibilities under the federal Clean Water Act. However, Oregon concludes that improving water quality, absent immediate increase in the availability of stream complexity, will not improve viability of coho populations. The fact that water quality is impaired across the ESU highlights the State's interest in management and restoration action that will improve water quality. Oregon concludes that current state and federal policies and programs are consistent with conservation and improvement of stream complexity in the ESU, and also recognizes some uncertainty associated with this conclusion.

Oregon now therefore assigns a *low* relative risk-level to this risk factor.

Risk Factor: ***Water quantity.***
Oregon's 2005 risk level determination: *low*.
Rationale: Oregon's rationale starts from a finding that the ESU is currently viable. Water quantity was identified as a primary risk factor bottleneck for 2 of 21 coho population. Oregon recognizes that water quantity exerts a strong influence on coho survival and that availability of water during summer low flow periods is limited across the ESU. Maintaining water quantity across the ESU and improving summer flows in the 2 populations previously mentioned is consistent with improving watershed function and supporting juvenile coho rearing. However, Oregon concludes that improving water quantity, absent an immediate resolution of the primary population bottlenecks (e.g., stream complexity) will not improve viability of coho populations. Oregon concludes that current state policies and programs are consistent with conservation and improvement of water quantity in the ESU, and also recognizes some uncertainty associated with this conclusion.

Oregon now therefore assigns a *low* risk-level to this risk factor.

Risk Factor: ***Other factors***: toxics, DO, Hydro Power, disease, exotic fish interactions, predation, etc.
Oregon's 2005 risk level determination: *Low*.
Rationale: Oregon's rationale starts from a finding that the ESU is currently viable. Oregon identified *other* risk factors as primary bottlenecks for 4 of 21 coho populations in the ESU; however, all of these populations met viability criteria. Of these 4 populations, one was thought to be bottlenecked by availability of spawning gravel and 3 populations are thought to be limited by exotic fish species interactions. Oregon

recognizes that predation by protected marine mammals and birds could exert significant adverse impact on specific populations. Predation was not identified as a primary bottleneck for a single population, however, perhaps reflecting a lack of sufficient data to document effects that might be occurring. Oregon is open to considering the possible impacts of other risk factors on the viability of coho populations that comprise the ESU.

Oregon now therefore assigns a *low* risk-level to these risk factors.

Summary: Current Threats to ESU Viability

The following table summarizes Oregon's assessment of the current level of risk (threat) posed by risk factors at the ESU scale (**Table 10**).

Table 10. Oregon's 2005 determination of threats to ESU viability.

Risk Factor	2005 Threat to ESU Viability
Ocean Conditions	Moderate
Fishery Harvest	Low
Hatchery Impacts	Low
Stream complexity	Moderate
Fish Passage	Low
Water Quality	Low
Water Quantity	Low
Other factors: toxics, DO, Hydro Power, disease, exotic fish interactions, predation, etc.	Low

CONCLUSIONS OF THE ASSESSMENT

1. The Coastal coho ESU is viable, that is, coho populations generally demonstrate sufficient abundance, productivity, distribution and diversity to be sustained under current conditions. In fact, the ESU should be sustainable through a future period of adverse ocean, drought and flood conditions similar to or somewhat more adverse (up to 15% worse) than the most recent period of poor survival conditions (most of the 1980s and 1990s).

2. Oregon reasons that, because the ESU is viable, therefore it must currently be supported by a sufficient quantity and quality of habitat. This reasoning does not imply that habitat conditions are optimum for coho nor that habitat is currently sufficient to achieve broader Oregon Plan or recovery goals for the ESU.

3. A diverse set of conditions supports the conclusion that this ESU will maintain its viability into the foreseeable future. This set of conditions includes laws, management programs, monitoring, the contemporary environment, and societal networks. In concert, these conditions serve to sustain and improve future viability of the ESU by: (1) reversing many of the environmental alterations and fishery impacts caused by historical management practices, (2) conserving existing conditions that support viability of the ESU, (3) creating future environmental conditions, based on an understanding of primary threats to individual populations, that will further improve the viability of the ESU in fulfillment of Oregon Plan objectives; and (4) maintaining a comprehensive monitoring program to allow adaptive management of conservation efforts as new information is gained.

4. It is unlikely that circumstances currently supporting viability of the ESU will change so rapidly or dramatically as to preclude future, timely detection and protective action under Oregon management programs or the federal ESA.

5. Ongoing vigilance regarding conservation and restoration programs is necessary to sustain and improve viability of the ESU, most notably the responsiveness of these programs to variation in marine survival.

6. Recognizing that some uncertainty does indeed exist in relation to data, modeling, and interpretation of future trends, Oregon concludes nevertheless, that a modest level of optimism is warranted regarding the overall status and management of this ESU.

7. Oregon also concludes that future evaluation of data will be conducted and that this future analysis will provide sufficient accountability to detect any errors that may have been made in interpreting the present status of the ESU.

8. Oregon's conclusions regarding sufficiency of conservation efforts and threats to future ESU viability are presented in Table 11.

Table 11. Summary of Oregon's conclusions regarding the sufficiency of conservation efforts. The term *conservation effort* refers to a broad set of state and federal laws, policies, programs, and nonregulatory restoration actions. Detailed discussions of the rationale for conclusions reported here are contained in the body of this report.

Risk Factor	**Have conservation efforts sufficiently addressed factors for decline?** [A]	**Are conservation efforts sufficient to conserve the *existing* viability of the ESU in the foreseeable future?** [B]	**Would *additional* focused action be expected to strengthen future viability of the ESU?** [C]
Ocean Conditions [D]	*n/a*	*n/a*	*n/a*
Fishery Harvest	Yes	Yes	No
Hatchery Impacts	Yes [E]	Yes	**Yes –** Opportunities exist to alter hatchery programs in a small number of basins. Such changes could potentially improve viability of the affected populations.
Stream complexity	Yes [F]	Yes	**Yes –** Opportunities exist to focus restoration work on stream complexity in several basins where populations failed viability criteria and in many populations that are currently viable.
Fish Passage	Yes	Yes	**Yes –** Restoration and inventory opportunities exist that would provide access to high quality overwintering habitats.
Water Quality	Yes	Yes	**Yes –**Opportunities exist to focus restoration work on water quality in several basins where populations failed viability criteria and in many populations that are currently viable.
Water Quantity	Yes	Yes	**Yes –** Opportunities exist to focus restoration work on water quantity in two basins where populations failed viability criteria.
Other factors: toxics, DO, Hydro Power, disease, exotic fish interactions, predation, etc.	Yes	Yes	**Uncertain**. Opportunities may or may not exist to focus restoration or management on specific *other factors* that might be limiting certain populations.

***A* –** *See SYNTHESIS* OF CONSERVATION EFFORTS: ADDRESSING THE FACTORS FOR DECLINE in this document.

***B* –** *See SYNTHESIS* – CONSERVING EXISTING CONDITIONS THAT SUPPORT VIABILITY OF THE ESU BY ADDRESSING CURRENT AND FUTURE THREATS TO ESU VIABILITY in this document.

***C* –** *See SYNTHESIS* – CREATING FUTURE CONDITIONS THAT FURTHER STRENGTHEN ESU VIABILITY AND SUPPORT ACHIEVEMENT OF BROAD OREGON PLAN OBJECTIVES in this document.

D – Ocean conditions exerts strong influence on life cycle survival, however this risk factor must be addressed indirectly by management action directed at all other risk factors.

E – Although action has been taken to address hatchery impacts in several populations that did not pass viability criteria, it is likely to require more time before legacy effects are remediated by current practices.

F – Loss of *stream complexity*, as a factor for decline, has been sufficiently addressed. The legacy effects of past management practices that reduced stream complexity and that could potentially affect the future viability of the ESU are being addressed by existing conservation efforts.

LESSONS LEARNED AND ADAPTIVE MANAGEMENT

The Coastal coho ESU Assessment represents one example of Oregon's long-standing effort to learn and adapt management programs through time. Examples of adaptive management that have already been discussed include adoption of Fill and Removal Rules, adoption of Forest Practices Rules, reductions in fishery harvest rates, and re-design of hatchery management policies. Implementation of the Oregon Plan for Salmon and Watersheds in 1997 also represents a significant and constructive departure from historic practices. In addition, Oregon provides the following description of three key lessons (revelations) from this Coastal coho ESU Assessment and makes the following commitments regarding Oregon's intended action in response to each lesson.

Assessment Lesson 1. Although considerable on-the-ground work has occurred under the Oregon Plan umbrella since 1997, adequate resources have not been devoted to analysis and interpretation and monitoring sampling designs were not always scaled appropriately for inferences at the fish population level. Collaborative analysis is a difficult, resource-demanding process that does not occur as a routine part of agency workloads – it requires specific assignments and deadlines. Also, current systems for storage, inventory, and sharing of data collected by state and federal agencies (including work programs within agencies) are so distinct and disparate that collaborative analysis is hampered; most of these data systems were never designed to facilitate integrated analyses.

Oregon's Commitment to Action. The Oregon Plan Core Team will direct state agencies to:

1. Produce a comprehensive assessment detailing the status of the Oregon Coast coho ESU at 5 year intervals. The first report would be produced in 2010 and contain data collected though 2008. The report will update information on coho viability, instream habitat, riparian conditions, water quality, water quality, effectiveness monitoring, and conservation efforts undertaken to conserve and recover the ESU.

2. Determine if (monitoring) sampling designs should be modified to answer key questions related to species recovery and other Oregon Plan effectiveness issues, specifically at the fish population scale. Focus this evaluation first in the Coastal coho ESU and complete prior to the 2006 field season.

3. Improve state agency capability to store, retrieve, and share data collected by all parties. Implement this action first in data systems that incorporate information related to the Coastal coho ESU.

Assessment Lesson 2. An effort to improve the viability of a listed fish species is likely to be most effective if restoration is focused on *bottlenecks* identified for specific populations. For example, there has been considerable investment in a broad range of restoration work across the Coastal coho ESU since the Oregon Plan was implemented in

1997 – well over 110 million dollars. All of this restoration investment is consistent with the Oregon Plan, i.e., conserving or restoring watershed function and water quality. However, much of the restoration work did not specifically address population bottlenecks that are now thought to be limiting coho viability. The broad scope of the Oregon Plan (native salmonids, water quality, and watershed health) is not sufficient to guide prioritization of restoration resources. This prioritization does not exclude more general actions to maintain current watershed health, nor does it preclude prioritized actions that are custom-tailored to meet site-specific needs.

Oregon's Commitment to Action. Develop a draft conservation plan for the Oregon Coast coho ESU by December 2005. The conservation/recovery plan that is currently being developed for the Coastal coho ESU will consider the results of the viability analysis in context with population bottlenecks identified in the Assessment. This information will provide a basis for focusing future conservation, management, and restoration action to most effectively conserve viability of the ESU and meet Oregon Plan goals (that are being established through the conservation/recovery planning process) for the ESU.

Assessment Lesson 3. The resiliency observed in coastal coho is an important part of their population dynamics and their ability to meet viability criteria. The mechanism for this resiliency is likely a combination of a strong density-dependent response in productivity at low spawner density as well as an increased importance of habitats that are of sufficiently high quality (especially over-wintering refuge habitats) to sustain populations during periods of extremely poor ocean survival. Given this observed resiliency and hypothesized habitat relationship, it is very important to define, map and track the status of these high quality habitats over time to ensure they are conserved or enhanced consistent with the conservation/recovery plan that is currently being developed.

Oregon's Commitment to Action: Oregon will build on existing information to ensure that high quality habitats are well defined and mapped. Monitoring will be adjusted to increase sensitivity to measure potential deterioration in key habitat parameters. Restoration activities that provide increased access to high quality habitats or that maintain/enhance currently accessible high quality habitats will be given higher priority for implementation. Oregon anticipates that certain of the already mapped areas of High Intrinsic Potential (HIP) may offer the greatest opportunity for future conservation and restoration efforts.