

Limiting Factors and Threats to the Recovery of Oregon Coho Populations in the *Southern Oregon-Northern California Coast* Evolutionarily Significant Unit:
Results of Expert Panel Deliberations

Introduction

This document describes the results of a one-day facilitated meeting of 10 individuals with extensive scientific, technical, and local expertise on issues confronting Oregon's coho populations (Figure 1) in the Southern Oregon-Northern California Coast (SONCC) evolutionarily significant unit (ESU). This meeting, henceforth referred to as the "Expert Panel", was convened by the State of Oregon, through its Oregon Department of Fish and Wildlife (ODFW), and was the initial step in ODFW's development of a recovery plan for Oregon's SONCC coho populations. Deliberations of the Expert Panel provided ODFW with initial, strategic guidance on limiting factors and threats to the recovery of Oregon populations of coho in the SONCC ESU. Refinement of the limiting factors and threats will continue after the Expert Panel during further development of a recovery plan. A Planning Team will use the Expert Panel conclusions along with input from a Stakeholders Team to develop a final prioritized list of life-stage specific limiting factors and threats that will guide short- and long-term recovery actions.

The effort to identify the most significant limiting factors and threats to population viability is a critical element of Oregon's effort to create future conditions that will recover and support viability of listed salmonid populations. Whereas many traditional conservation and restoration efforts attempted to broadly and simultaneously address all factors for decline, Oregon's approach is intended to provide more effective guidance for prioritizing short- and long-term conservation and restoration work.

At the Expert Panel meeting, limiting factors and threats were identified for each SONCC coho independent¹ and dependent² population in Oregon (as defined by Williams et al., 2006)³ by considering impacts across the entire life cycle (gravel to gravel), rather than considering only impacts that might occur in tributaries that define the populations. This distinction is especially

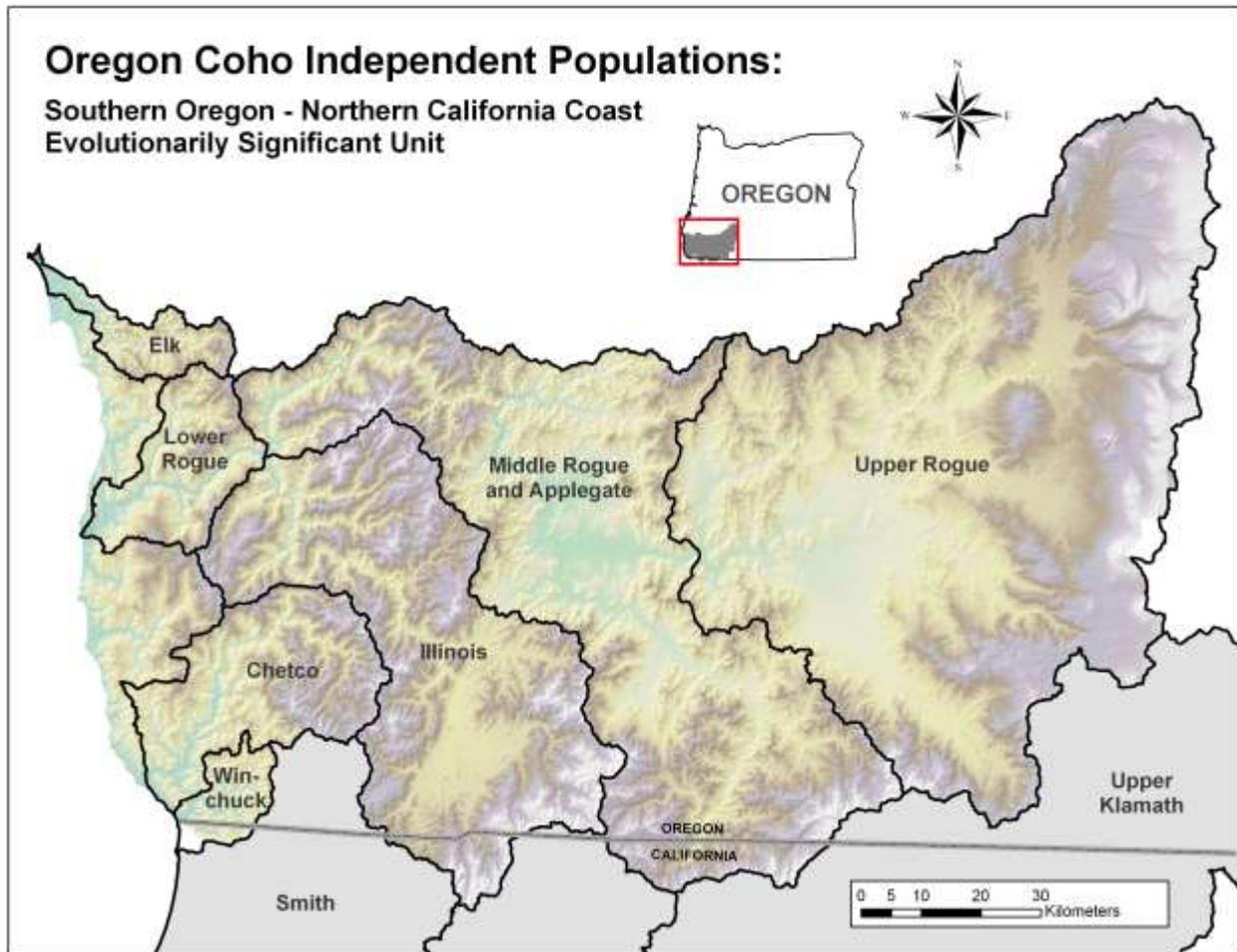
¹ Functionally independent and potentially independent populations were assessed. Functionally independent populations are defined as populations with a high likelihood of persisting over 100-year time scales, and whose population dynamics or extinction risk over a 100-year time period is not substantially altered by exchanges of individuals with other populations (Williams et al., 2006). Potentially independent populations are defined as populations with a high likelihood of persisting in isolation over 100-year time scales, but too strongly influenced by immigration from other populations to exhibit independent dynamics (Williams et al., 2006).

² Dependent and ephemeral populations were assessed and included together as dependent populations. Dependent populations are defined as populations that do not have a high likelihood of sustaining themselves over a 100-year time period in isolation, yet receive sufficient immigration to alter their dynamics and extinction risk (Williams et al., 2006). Ephemeral populations are defined as populations that do not have a high likelihood of sustaining themselves over a 100-year time period in isolation, and do not receive sufficient immigration to affect this likelihood (habitats that support such populations are expected to be occupied only rarely; Williams et al., 2006).

³ Williams, T.H., E.P. Bjorkstedt, W.G. Duffy, D. Hillemeier, G. Kautsky, T.E. Lisle, M. McCain, M. Rode, R.G. Szerlong, R.S. Schick, M.N. Goslin, and A. Agrawal. 2006. Historical population structure of coho salmon in the Southern Oregon/Northern California Coasts evolutionarily significant unit. U.S. Department of Commerce, NOAA Technical Memorandum NOAA-TM-NMFS-SWFSC-390.

important because it will advise potential management actions that might be needed across the entire life cycle to improve viability of the populations. Threats were described in terms of the limiting factor(s) primarily affected, life stage(s) primarily affected, and specific nature of the threat. To provide strategic guidance to recovery actions, the panel also prioritized limiting factors and threats into categories for each population.

Figure 1. Oregon independent populations of coho in the SONCC ESU. Note that nine dependent populations are not depicted.



Definition of Terms

Limiting Factors

Limiting factors are the physical, biological, or chemical conditions and interactions experienced by the fish that may influence viable salmonid population (VSP) parameters (i.e., abundance, productivity, spatial structure, and diversity).

Limiting Factor Categories

The categories of limiting factors and definitions used in Oregon's Expert Panel deliberations for SONCC coho were similar, but not identical, to those used in other recovery domains and within

the National Marine Fisheries Service's (NMFS) guidelines. For SONCC, the categories and their description are as follows:

1. **Water quantity/hydrograph** – Timing and magnitude of flow conditions.
2. **Water quality** – Water characteristics including temperature, dissolved oxygen, suspended sediment, pH, toxics, etc.
3. **Predation** – Consumption of naturally produced fish by one or more species (excluding fishery mortality).
4. **Competition** – Interaction between naturally produced fish and other species, populations, or hatchery-origin fish over a limited resource (i.e., food or space).
5. **Food base** – Amount, quality, and selection of food available for metabolic maintenance and growth (e.g., salmon carcasses; note: limits originating more than one trophic level away were considered).
6. **Disease** – Pathological condition in naturally produced fish resulting from infection.
7. **Physical habitat quality** – Quality of physical habitat. Examples include floodplain connectivity and function, channel structure and complexity, channel morphology, riparian condition and large wood recruitment, sediment routing (fine and coarse sediment, sand), and upland processes.
8. **Habitat access** – Impaired access to spawning and/or rearing habitat. Examples include partial or complete artificial obstructions, delayed migration, and de-watered stream channels. Access to on- and off-channel habitat should be considered. If habitat to which access has been eliminated is in impaired condition, it also should be considered as a physical habitat quality limiting factor.
9. **Other factors** – Factors affecting population parameters or individual fitness of naturally produced fish that are not addressed by other limiting factors, such as injury, genetic integrity, human take (direct, indirect, or incidental), and other impacts. Note that many of these factors will be human-caused impacts that *directly affect the population rather than other limiting factors*. In addition, although population traits are largely determined by limiting factors, they may *also* and independently be a limiting factor (e.g., low abundance limits pairing and reproductive success).

Threats

Threats are the human actions that *cause or contribute to* limiting factors. Natural disturbances (e.g., flood, drought, volcano, tsunami, etc.) may also affect limiting factors, but were not considered as part of the deliberations because they will not be addressed by recovery plan strategies and actions. Threats may be associated with one or more specific life cycle stages and may occur in the past, present, or future. Also, a threat may act through exacerbation of natural interactions (e.g., natural predation would not be considered a threat under the working definition, but increased predation by native predators in reservoirs, which exist only because there is a dam present, would be considered a threat associated with the dam).

Threat Categories

Five categories of threats were used to describe causes of limiting factors:

1. **Harvest Management** – Direct and indirect mortality associated with fisheries on naturally produced fish.

2. **Hatchery Management** – Negative impact of hatchery practices on naturally produced fish. Hatchery practices include: number of fish released, removal of adults for broodstock, breeding practices, rearing practices, release practices, water quality management, blockage of access to habitat, etc.
3. **Water Management** – Impact of hydropower, flood control, water withdrawal, and water storage systems on naturally produced fish. Specific threats include dam and dike construction and operations, conversion of riverine habitat to reservoir, conversion of off-channel habitat, wetlands, and floodplains to other uses, modification of water quality and sediment transport, and flow alterations. Note that dams associated with fish hatcheries should be considered under the Hatchery Management threat.
4. **Land Management** – Impacts of past and current land use activities on naturally produced fish. Land use practices include timber harvest, agriculture, urbanization, transportation, mining, grazing, industrial production, etc. This category includes both current land use practices that are causing limiting factors and impairing fish populations as well as current practices that are not adequate to restore limiting factors caused by past practices.
5. **Introduced Species** – Impact of non-native plants or animals on naturally produced fish or their habitat.

Life Stages

Limiting factors and threats are identified for each population by considering impacts across the entire life cycle (gravel to gravel) rather than considering only impacts that might occur in tributaries that define the populations. In order to be as spatially explicit as possible given the time constraints of the process, the Expert Panel considered life stage specific limiting factors and threats for three specific geographic areas that together encompass the entire lifecycle of the target salmonid populations. These *geographic areas* and the specific *life stages* considered are:

1. **Tributaries** – All streams and rivers within a specific population area (life stages: eggs, alevins, fry, summer parr, winter parr, smolts, returning adults, spawners).
2. **Estuary** – All tidally-influenced areas (i.e., to the head of tidewater) through which a specific population passes (life stages: pre-smolts, smolts, returning adults).
3. **Ocean** – All saltwater areas that the target populations spend part of their life cycle in that are outside of the estuary (life stages: sub-adults, adults).

Panel Composition

The Expert Panel was composed of 10 individuals with a broad range of science and technical experience. The names and affiliations of these panelists, along with those of the two facilitators of the process are shown in Table 1. Some panel members had expertise across all potential limiting factors and threats and others were familiar with local conditions and data specific to individual populations. An effort was made to enlist panel members with diverse employment perspectives (e.g., Oregon, federal, local, private sector, academic). Panelists were selected by Oregon in consultation with NOAA Fisheries Service. Participation by panel members was by assignment within ODFW and was voluntary for others.

Table 1. Names and affiliations of expert panelists and facilitators.

Name	Title	Affiliation
Todd Confer	South Coast District Fish Biologist	ODFW – Gold Beach
Jay Doino	Upper Rogue Assistant District Fish Biologist	ODFW – Central Point
Kim Jones	Aquatic Habitat Inventories Program Leader	ODFW – Corvallis
Cindy Myers	Water Quality Monitoring Program Leader	S. Coast and L. Rogue Watershed Councils
Steve Namitz	Biological Sciences Program Manager	USFS – Rogue River-Siskiyou NF
Tom Nickelson	Fish Biologist	Consultant
Tom Satterthwaite	Fish Research Program Leader	ODFW – Grants Pass
Jerry Vogt	Region Environmental Coordinator	ODOT – White City
Jim Waldvogel	Cooperative Extension Advisor	California Sea Grant (UC Davis)
Chuck Wheeler	Fishery Biologist	NMFS – Roseburg
Kevin Goodson	Conservation Planning Coordinator	ODFW – Salem (facilitator)
Tom Stahl	Conservation and Recovery Asst. Prog. Mngr.	ODFW – Salem (facilitator)

Overview of Panel Deliberation Process

The panel's deliberations consisted of seven stages. Stages 1-4 were designed primarily to get panel members focused on considering limiting factors and threats in the context of Oregon's recovery planning effort and to provide a starting point for detailed discussions and final guidance regarding life stage specific key and secondary limiting factors and threats. Stages 5-7 were designed to provide panel members with a forum to identify, discuss, and reach consensus on the details of the life stage specific key and secondary limiting factors and threats they were tasked with developing. Below are more detailed descriptions of each stage.

It is important to note that the Expert Panel discussions centered on the limiting factors and threats affecting the populations, rather than the process or categorization of these items provided by the facilitators. There are many valid ways to think about limiting factors and threats categories. The structure chosen for this Expert Panel for Oregon's SONCC coho populations was intended to stimulate discussions that led to detailed life stage-specific descriptions of limiting factors and threats.

Stage One

Panelists review background information and rank limiting factors and threats.

Prior to convening, a spreadsheet was sent to each panelist, completed, and returned prior to the Expert Panel meeting. The spreadsheet contained worksheets for each target population. An example of the essential content of each worksheet is shown in Table 2. Each panel member was also provided with several documents containing background information on Oregon's SONCC coho. Background information included descriptions of life history, harvest management, population status and abundance, stream habitat status and descriptions by population, hatchery programs, and smolt capacity by population.

For each population, panelists assigned a *limiting-factor-category score* to each limiting factor category to indicate the relative effect they believed the limiting factor has on VSP parameters for the specific population they were scoring. Allowable limiting-factor-category scores were: 0 = no effect; 1 = minor effect; 2 = moderate effect; and 3 = major effect. Next, each panelist assigned a *threat-category score* for each threat category on each limiting factor to indicate the relative impact they believed each threat category has on the individual limiting factors. Allowable threat-factor-category scores were: 0 = no impact; 1 = minor impact; 2 = moderate impact; and 3 = major impact. An example of a completed population spreadsheet is shown in Table 3. Panelists did not score populations for which they had no specific knowledge.

Table 2. Example of worksheet used by expert panelists in Stage One to assign relative scores to the effect of limiting factors on population viability, and impact of potential threats on limiting factors.

Score limiting factors in relation to effect on population viability (based on VSP parameters): 0=no effect 1=minor effect 2=moderate effect 3=major effect		Tributary, Estuary, or Ocean								
		Limiting Factors								
		Water Quantity - Hydrograph	Water Quality	Predation	Competition	Food Base	Disease	Physical Habitat Quality	Habitat Access	Other Factors
Threats	Harvest Mngmnt.									
	Hatchery Mngmnt.									
	Water Mngmnt.									
	Land Mngmnt.									
	Introduced Species									
		Score threats based on their impact on limiting factors: 0=no impact 1=minor impact 2=moderate impact 3=major impact								

Table 3. Example of completed Stage One worksheet depicting an individual panelist's view of the relative effect of limiting factors on VSP parameters and impact of threats on limiting factors for one of the SONCC coho populations (red numbers were completed by panelist).

Score limiting factors in relation to effect on population viability (based on VSP parameters): 0=no effect 1=minor effect 2=moderate effect 3=major effect		Tributary, Estuary, or Ocean								
		Limiting Factors								
		Water Quantity - Hydrograph	Water Quality	Predation	Competition	Food Base	Disease	Physical Habitat Quality	Habitat Access	Other Factors
		1	2	0	0	1	0	3	2	0
Threats	Harvest Mngmnt.	0	0	1	0	0	0	0	0	1
	Hatchery Mngmnt.	0	0	0	0	0	0	0	0	0
	Water Mngmnt.	1	2	0	0	1	0	1	1	0
	Land Mngmnt.	2	3	0	0	2	0	3	2	0
	Introduced Species	0	0	0	0	0	0	0	0	0
		Score threats based on their impact on limiting factors: 0=no impact 1=minor impact 2=moderate impact 3=major impact								

Once each panelist completed Stage One, the raw scores were returned to the Expert Panel facilitators prior to the Expert Panel meeting.

Stage Two

Calculate composite threat/limiting factor category score for each panelist.

For each panelist, a *composite score* (the product of the *limiting-factor-category scores* and the *threat-category scores*) for each population for the relative importance of each threat category within a limiting factor category was calculated by the facilitators prior to the Expert Panel meeting. Table 4 shows the results of this stage for the panelist worksheet shown in Table 3.

Table 4. Example of calculation of Stage Two *composite scores* (red numbers) for one panelist, calculated from limiting factor and threat scores presented in Table 3.

		Limiting Factors								
		Water Quantity - Hydrograph	Water Quality	Predation	Competition	Food Base	Disease	Physical Habitat Quality	Habitat Access	Other Factors
Threats	Harvest Mngmnt.	0 (1x0)	0 (2x0)	0 (0x1)	0 (0x0)	0 (1x0)	0 (0x0)	0 (3x0)	0 (2x0)	0 (0x1)
	Hatchery Mngmnt.	0 (1x0)	0 (2x0)	0 (0x0)	0 (0x0)	0 (1x0)	0 (0x0)	0 (3x0)	0 (2x0)	0 (0x0)
	Water Mngmnt.	1 (1x1)	4 (2x2)	0 (0x0)	0 (0x0)	1 (1x1)	0 (0x0)	3 (3x1)	2 (2x1)	0 (0x0)
	Land Mngmnt.	2 (1x2)	6 (2x3)	0 (0x0)	0 (0x0)	2 (1x2)	0 (0x0)	9 (3x3)	4 (2x2)	0 (0x0)
	Introduced Species	0 (1x0)	0 (2x0)	0 (0x0)	0 (0x0)	0 (1x0)	0 (0x0)	0 (3x0)	0 (2x0)	0 (0x0)

Stage Three

Calculate average composite score for Expert Panel.

An *average composite score* for all panelists (sum of all *composite scores* divided by the number of panelists that completed scoring for the population) was calculated by the facilitators prior to the Expert Panel meeting.

Stage Four

Determine initial prioritization of relative threat/limiting factor categories.

An initial prioritization of key and secondary threats and limiting factors based on the *average composite scores* was established by the panel facilitators prior to the Expert Panel meeting.

Break points between key, secondary, and other threats/limiting factors categories were as follows: key: ≥ 4 ; secondary: 1.50-3.99; other: < 1.5 . An example of this prioritization is shown in Table 5.

It is important to realize that the outcome of this and the preceding stages was only intended to serve as a focal point for panel discussions leading to the final limiting factor and threats identification and prioritization as outlined in Stages 5-6. Because the information generated in Stages 1-4 was designed to stimulate panel deliberations and does not represent the final consensus of the Expert Panel, the specific results generated by Stages 1-4 are not included in this final report.

Table 5. Example of Stage Four application of break points to the *average composite scores* for a population to identify key (black cells) and secondary (gray cells) limiting factor and threat concerns.

		Limiting Factors								
		Water Quantity - Hydrograph	Water Quality	Predation	Competition	Food Base	Disease	Physical Habitat Quality	Habitat Access	Other Factors
Threats	Harvest Mngmnt.	0.00	0.00	0.14	0.00	0.43	0.00	0.00	0.00	0.43
	Hatchery Mngmnt.	0.00	0.00	0.29	0.29	0.00	0.00	0.00	0.00	0.43
	Water Mngmnt.	2.00	4.14	0.14	0.14	0.29	0.00	2.57	1.29	0.29
	Land Mngmnt.	2.86	4.00	0.14	0.14	0.71	0.00	6.71	2.71	0.29
	Introduced Species	0.00	0.00	0.14	0.14	0.14	0.00	0.00	0.00	0.29

Stage Five (Expert Panel Meeting)

Panelists develop final threat/limiting factor categories prioritizations.

Panelists reviewed and discussed the initial prioritization of key and secondary threats at the Expert Panel meeting. This discussion allowed panelists to recall specific data or experience that may have been overlooked during initial scoring of limiting factors and threats. At this stage in the deliberation, agreement was reached regarding the *final* prioritization of key and secondary threats for each limiting factor.

Stage Six (Expert Panel Meeting)

Panelists identify specific life stages and geographic locations of key and secondary threat/limiting factor categories.

For each key and secondary threat/limiting factor category, at the Expert Panel meeting the panel identified specific life stages and geographic locations where the impact occurs. The Expert Panel also rated their certainty about the identification of key and secondary threats and limiting factors for independent populations. Certainty was based on a scale from 0-3, with 3 being the most certain. Certainty was evaluated for each population as a whole and only for specific threats and limiting factors where there was disagreement or some level of uncertainty.

Stage Seven

Panel facilitators complete a report of the Expert Panel's findings, after review by panelists.

Panel facilitators compiled the information generated in Stages 5-6 into a draft report with tables for target populations depicting the specific life stage and geographic location of each key and secondary threat/limiting factor category along with a description of the specific threat and limiting factor. The draft report was sent to each panel member for review. After review, the revised report tables represent the final guidance of the Expert Panel regarding key and secondary threats and limiting factors to target populations.

This information will be further used in the recovery planning process through review by a Planning Team, with input from a Stakeholder Team, and development of the *Limiting Factors and Threats* chapter of the recovery plan.

Conclusions of the Expert Panel

The following pages provide a detailed description of the key and secondary threats and limiting factors identified by the Expert Panel for each SONCC coho population in Oregon. Note that both independent and dependent populations were individually scored, although the recovery plan will primarily address recovery and viability of the independent populations. The work of the Expert Panel represents a valuable and timely building block for development within the recovery plan of a final list of limiting factors and threats to the recovery of Oregon's SONCC coho populations.

Codes Describing the Limiting Factors and Threats in the Summary Tables

The following numeric codes, which give further details about the specific limiting factors and threats, are used in the life cycle summary table for each population:

Code	Limiting Factor	Threat
1a	Habitat Quality (limited lowland habitat complexity due to straightening, channelization, revetting, filling, and/or dredging of stream channels)	Land Management (past and current agricultural practices)
1b	Habitat Quality (limited lowland habitat complexity due to straightening, channelization, revetting, filling, and/or dredging of stream channels)	Land Management (past and current urban, rural residential, and forestry development and practices)
1c	Habitat Quality (limited habitat complexity due to inadequate large wood recruitment resulting from impaired riparian conditions, stream blockages, and/or removal)	Land Management
1d	Habitat Quality (reduced habitat complexity due to non-native vegetation limiting riparian species (e.g., Japanese knotweed))	Introduced Species
1e	Habitat Quality (loss of floodplain connectivity and access to off-channel habitat due to stream down-cutting or diking)	Land Management
1f	Habitat Quality (sedimentation)	Land Management (roads and forest practices)
2a	Water Quality (high water temperature due to loss of riparian shade and channel straightening)	Land Management
2b	Water Quality (high water temperature due to reservoir heating, water withdrawal, and return irrigation flow)	Water Management
2c	Water Quality (high water temperature due to non-native vegetation limiting riparian species (e.g., gorse, blackberry, reed canary grass, and European beech grass))	Introduced Species
2d	Water Quality (poor water quality and toxins due to runoff)	Land Management (urban and agricultural development and practices)
3a	Habitat Access (loss of access due to road crossings)	Land Management
3b	Habitat Access (low stream flows and reduced available habitat due to water withdrawals, and loss of access due to diversion and flood control structures)	Water Management

4a	Other Factors (mortality associated with unscreened diversions or non-criteria screens at diversions)	Water Management
4b	Other Factors (genetic effect of hatchery strays on limited number of wild spawners)	Hatchery Management (primary concern was out-of-basin hatchery stocks)
5	Predation (predation by non-native fish)	Introduced Species

Independent Populations

Elk River Coho

Certainty: 3	Tributaries								Estuary			Ocean
	Eggs	Alevins	Fry	Summer Parr	Winter Parr	Smolts	Returning Adults	Spawners	Pre-Smolts	Smolts	Returning Adults	Adults
Harvest Mngmnt.												
Hatchery Mngmnt.												
Water Mngmnt.				2b								
Land Mngmnt.				1c,2a,3a	1a,1c,1e 3a		3a		1a,1c,1e			
Introduced Species				2c								

Black cells indicate key concerns; gray cells indicate secondary concerns.

Key Concerns:

- 1a – Land Management Impact on Habitat Quality: *limited lowland habitat complexity due to past and current agricultural practices such as straightening, channelization, revetting, filling, and/or dredging of stream channels*
- 1c – Land Management Impact on Habitat Quality: *limited habitat complexity due to inadequate large wood recruitment resulting from impaired riparian conditions, stream blockages, and/or removal*
- 1e – Land Management Impact on Habitat Quality: *loss of floodplain connectivity and access to off-channel habitat due to stream down-cutting or diking*

Secondary Concerns:

- 1c – Land Management Impact on Habitat Quality: *limited habitat complexity due to inadequate large wood recruitment resulting from impaired riparian conditions, stream blockages, and/or removal*
- 2a – Land Management Impact on Water Quality: *high water temperature due to loss of riparian shade and channel straightening*
- 2b – Water Management Impact on Water Quality: *high water temperature due to reservoir heating, water withdrawal, and return irrigation flow*
- 2c – Introduced Species Impact on Water Quality: *high water temperature due to non-native vegetation limiting riparian species (e.g., gorse, blackberry, reed canary grass, and European beech grass)*
- 3a – Land Management Impact on Habitat Access: *loss of access due to road crossings*

Summary: Key concerns were primarily loss of over-winter tributary and freshwater estuarine habitat complexity and floodplain connectivity for juveniles, especially in the lowlands which are naturally limited in this system and have been impacted by past and current agricultural practices. Secondary concerns were primarily related to high water temperatures in tributaries for summer parr (excluding the mainstem, where rearing is not expected) and loss of tributary habitat for juveniles and adults due to road crossings (especially in Bagley and Blackberry Creeks).

Additional Notes: In deliberations, the estuary was considered to extend to the head of tidewater. Pre-smolt impacts generally occur in the lower portions of tributaries that are located below the head of tidewater. While tidally influenced, these areas are largely freshwater (salinity less than 10 ppt).

During review of this draft report, one Expert Panel member noted that secondary concern "1c" for summer parr should also apply to fry, which require large wood for predator avoidance and refuge from spring freshets as well.

Lower Rogue River Coho

Certainty: 3	Tributaries							Estuary			Ocean	
Threat Category	Eggs	Alevins	Fry	Summer Parr	Winter Parr	Smolts	Returning Adults	Spawners	Pre-Smolts	Smolts	Returning Adults	Adults
Harvest Mngmnt.												
Hatchery Mngmnt.												
Water Mngmnt.												
Land Mngmnt.				2a	1b,1c				1c 1b	1b		
Introduced Species												

Black cells indicate key concerns; gray cells indicate secondary concerns.

Key Concerns:

1b – Land Management Impact on Habitat Quality: *limited lowland habitat complexity due to past and current urban, rural residential, and forestry development and practices such as straightening, channelization, revetting, filling, and/or dredging of stream channels*

1c – Land Management Impact on Habitat Quality: *limited habitat complexity due to inadequate large wood recruitment resulting from impaired riparian conditions, stream blockages, and/or removal*

Secondary Concerns:

1b – Land Management Impact on Habitat Quality: *limited lowland habitat complexity due to past and current urban, rural residential, and forestry development and practices such as straightening, channelization, revetting, filling, and/or dredging of stream channels*

2a – Land Management Impact on Water Quality: *high water temperature due to loss of riparian shade and channel straightening*

Summary: Key concerns were primarily loss of over-winter tributary habitat for juveniles, especially in the lowlands which are naturally very limited in this system and have been impacted by past and current forestry practices and rural residential development. Another key concern is limited habitat complexity for pre-smolts due to a loss of large wood transport into the freshwater portions of the estuary. Secondary concerns were related to high water temperatures in tributaries for summer parr (excluding the mainstem,

where rearing is not expected) due to land management and reduced estuarine habitat for pre-smolts and smolts due to past and current forestry practices and rural residential development.

Additional Notes: In deliberations, the estuary was considered to extend to the head of tidewater. Pre-smolt impacts generally occur in the lower portions of tributaries that are located below the head of tidewater. While tidally influenced, these areas are largely freshwater (salinity less than 10 ppt).

Urbanization is less of a threat here than for other populations.

Little mainstem rearing is thought to occur. Over-winter rearing occurs in the tributaries where lowland habitat is naturally limited. For example, Lobster Creek produces high numbers of coho, is limited in its amount of over-winter habitat, and has naturally high summer water temperatures which are not thought to be the primary limiting factor.

There was some discussion about pre-smolt and smolt use of the estuary and modifications which have occurred there. No value for certainty was placed on this factor, as it was for the Chetco population.

During review of this draft report, one Expert Panel member felt that secondary concern "1b" and unlisted concern "1e" should be the key concerns for pre-smolts in the estuary, rather than the key concern indicated ("1c").

Illinois River Coho

Certainty: 3	Tributaries								Estuary			Ocean
	Eggs	Alevins	Fry	Summer Parr	Winter Parr	Smolts	Returning Adults	Spawners	Pre-Smolts	Smolts	Returning Adults	Adults
Harvest Mngmnt.												
Hatchery Mngmnt.												
Water Mngmnt.			4a	2b,3b 4a		4a	3b					
Land Mngmnt.				2a 1a,1c,3a	1a,1c,3a 1e		3a			1b		
Introduced Species				2c								

Black cells indicate key concerns; gray cells indicate secondary concerns.

Key Concerns:

- 1a – Land Management Impact on Habitat Quality: *limited lowland habitat complexity due to past and current agricultural practices such as straightening, channelization, revetting, filling, and/or dredging of stream channels*
- 1c – Land Management Impact on Habitat Quality: *limited habitat complexity due to inadequate large wood recruitment resulting from impaired riparian conditions, stream blockages, and/or removal*
- 2a – Land Management Impact on Water Quality: *high water temperature due to loss of riparian shade and channel straightening*
- 2b – Water Management Impact on Water Quality: *high water temperature due to reservoir heating, water withdrawal, and return irrigation flow*
- 3a – Land Management Impact on Habitat Access: *loss of access due to road crossings*
- 3b – Water Management Impact on Habitat Access: *low stream flows and reduced available habitat due to water withdrawals, and loss of access due to diversion and flood control structures*

Secondary Concerns:

- 1a – Land Management Impact on Habitat Quality: *limited lowland habitat complexity due to past and current agricultural practices such as straightening, channelization, revetting, filling, and/or dredging of stream channels*
- 1b – Land Management Impact on Habitat Quality: *limited lowland habitat complexity due to past and current urban, rural residential, and forestry development and practices such as straightening, channelization, revetting, filling, and/or dredging of stream channels*

- 1c – Land Management Impact on Habitat Quality: *limited habitat complexity due to inadequate large wood recruitment resulting from impaired riparian conditions, stream blockages, and/or removal*
- 1e – Land Management Impact on Habitat Quality: *loss of floodplain connectivity and access to off-channel habitat due to stream down-cutting or diking*
- 2c – Introduced Species Impact on Water Quality: *high water temperature due to non-native vegetation limiting riparian species (e.g., gorse, blackberry, reed canary grass, and European beech grass)*
- 3a – Land Management Impact on Habitat Access: *loss of access due to road crossings*
- 3b – Water Management Impact on Habitat Access: *low stream flows and reduced available habitat due to water withdrawals, and loss of access due to diversion and flood control structures*
- 4a – Water Management Impact on Other Factors: *mortality associated with unscreened diversions or non-criteria screens at diversions*

Summary: Key concerns were related to loss of over-winter tributary habitat complexity and access and over-summer water temperatures and habitat access. Over-winter tributary habitat, especially in the lowlands, has been impacted by past and current agricultural practices and an interruption in the transport and presence of large wood. Access to habitat has been limited by road crossings. Summer habitat is limiting because high water temperatures have resulted from land management actions in the riparian zone and straightening of channels and water management actions for agricultural purposes. Water withdrawals and diversions have also limited the amount of, and access to, summer habitat and thermal refuge.

Secondary concerns spanned a number of life history stages and locations. Unscreened diversions and non-criteria screens at diversions affect fry, summer parr, and out-migrating smolts. Summer juvenile habitat has been impacted by a loss of tributary habitat complexity, especially in the lowlands, caused by past and current agricultural practices and an interruption in the transport and presence of large wood. Access to summer thermal refuge habitat by juveniles has also been affected by road crossings. Non-native vegetation is a secondary factor contributing to higher water temperatures affecting summer parr by limiting native riparian vegetation. A reduction in floodplain connectivity has affected winter parr. Access to spawning habitat by returning adults is limited by road crossings and diversion structures. Finally, reduced estuarine habitat for smolts due to past and current forestry practices and rural residential development is another impact.

Additional Notes: There are in-stream water rights on Illinois River tributaries, but, depending on the water year and because they are almost always junior to irrigation rights, these instream rights are not always being met during the summer when water quantity and quality are important for fish. Shade is limited. Land use practices have made a naturally warm river even warmer.

Diversion impacts are primarily for agricultural purposes, though some are municipal.

Almost all coho production comes from the alluvial plain portion of the Illinois Valley and not the lower basin.

The Illinois River is dynamic and mobile, with a wide active channel. Portions of the Illinois River are thought to be gravel rich by many members of the Expert Panel, although there is little if any information on gravel recruitment. Some areas have been armored to prevent channel movement.

During review of this draft report, one Expert Panel member noted that secondary concerns "1a" and "1c" for summer parr should also apply to fry, which require complex channel morphology and large wood for predator avoidance and refuge from spring freshets as well.

During review of this draft report, another Expert Panel member noted that past mining practices have altered stream channels (threat: Land Management) by, for example, widening them so riparian vegetation does not shade the stream (limiting factor: Water Quality) or placing tailings that block access (limiting factor: Habitat Access).

During review of this draft report, another Expert Panel member noted that diversions are the source of key and secondary concern "3b", as there are no flood control structures in the Illinois River basin.

Middle Rogue/Applegate Rivers Coho

Certainty: 3	Tributaries								Estuary			Ocean
	Eggs	Alevins	Fry	Summer Parr	Winter Parr	Smolts	Returning Adults	Spawners	Pre-Smolts	Smolts	Returning Adults	Adults
Harvest Mngmnt.												
Hatchery Mngmnt.												
Water Mngmnt.			4a	2b,3b 4a		4a	3b					
Land Mngmnt.				2a,3a 1a,1c	1a,1c,1e,3a		3a			1b		
Introduced Species				2c								

Black cells indicate key concerns; gray cells indicate secondary concerns.

Key Concerns:

- 1a – Land Management Impact on Habitat Quality: *limited lowland habitat complexity due to past and current agricultural practices such as straightening, channelization, revetting, filling, and/or dredging of stream channels*
- 1c – Land Management Impact on Habitat Quality: *limited habitat complexity due to inadequate large wood recruitment resulting from impaired riparian conditions, stream blockages, and/or removal*
- 1e – Land Management Impact on Habitat Quality: *loss of floodplain connectivity and access to off-channel habitat due to stream down-cutting or diking*
- 2a – Land Management Impact on Water Quality: *high water temperature due to loss of riparian shade and channel straightening*
- 2b – Water Management Impact on Water Quality: *high water temperature due to reservoir heating, water withdrawal, and return irrigation flow*
- 3a – Land Management Impact on Habitat Access: *loss of access due to road crossings*
- 3b – Water Management Impact on Habitat Access: *low stream flows and reduced available habitat due to water withdrawals, and loss of access due to diversion and flood control structures*

Secondary Concerns:

- 1a – Land Management Impact on Habitat Quality: *limited lowland habitat complexity due to past and current agricultural practices such as straightening, channelization, revetting, filling, and/or dredging of stream channels*

- 1b – Land Management Impact on Habitat Quality: *limited lowland habitat complexity due to past and current urban, rural residential, and forestry development and practices such as straightening, channelization, revetting, filling, and/or dredging of stream channels*
- 1c – Land Management Impact on Habitat Quality: *limited habitat complexity due to inadequate large wood recruitment resulting from impaired riparian conditions, stream blockages, and/or removal*
- 2c – Introduced Species Impact on Water Quality: *high water temperature due to non-native vegetation limiting riparian species (e.g., gorse, blackberry, reed canary grass, and European beech grass)*
- 3a – Land Management Impact on Habitat Access: *loss of access due to road crossings*
- 3b – Water Management Impact on Habitat Access: *low stream flows and reduced available habitat due to water withdrawals, and loss of access due to diversion and flood control structures*
- 4a – Water Management Impact on Other Factors: *mortality associated with unscreened diversions or non-criteria screens at diversions*

Summary: Key concerns were related to loss of over-winter tributary habitat complexity, floodplain connectivity, and access and over-summer water temperatures and habitat access. Over-winter tributary habitat and floodplain connectivity, especially in the lowlands, has been impacted by past and current agricultural practices and an interruption in the transport and presence of large wood. Access to habitat has been limited by road crossings. Summer habitat is limiting because high water temperatures have resulted from land management actions in the riparian zone and straightening of channels and water management actions for agricultural purposes. Water withdrawals and diversions and road crossings have also limited the amount of, and access to, summer habitat and thermal refuge.

Secondary concerns spanned a number of life history stages and locations. Unscreened diversions and non-criteria screens at diversions affect fry, summer parr, and out-migrating smolts. Summer juvenile habitat has been impacted by a loss of tributary habitat complexity, especially in the lowlands, caused by past and current agricultural practices and an interruption in the transport and presence of large wood. Non-native vegetation is a secondary factor contributing to higher water temperatures affecting summer parr by limiting native riparian vegetation. Access to spawning habitat by returning adults is limited by road crossings and diversion structures. Finally, reduced estuarine habitat for smolts due to past and current forestry practices and rural residential development is another impact.

Additional Notes: Floodplain connectivity is affected by diking activities, as well as channel straightening and a reduction in complexity resulting in downcutting.

There are in-stream water rights on Middle Rogue/Applegate Rivers tributaries, but, depending on the water year and because they are almost always junior to irrigation rights, these instream rights are not always being met during the summer when water quantity and quality are important for fish.

Water temperature in the mainstem Rogue River was discussed as a possible limiting factor, but the group felt as if this was natural rather than caused by humans (based on water temperature measures before and after Lost Creek Dam was constructed), and was thus not listed as a concern.

During review of this draft report, one Expert Panel member noted that secondary concerns "1a" and "1c" for summer parr should also apply to fry, which require complex channel morphology and large wood for predator avoidance and refuge from spring freshets as well.

During review of this draft report, another Expert Panel member noted that past mining practices have altered stream channels (threat: Land Management) by, for example, widening them so riparian vegetation does not shade the stream (limiting factor: Water Quality) or placing tailings that block access (limiting factor: Habitat Access).

Upper Rogue River Coho

Certainty: 3	Tributaries								Estuary			Ocean
	Eggs	Alevins	Fry	Summer Parr	Winter Parr	Smolts	Returning Adults	Spawners	Pre-Smolts	Smolts	Returning Adults	Adults
Harvest Mngmnt.												
Hatchery Mngmnt.												
Water Mngmnt.			4a	2b,3b 4a		4a	3b					
Land Mngmnt.				2a,3a 1a,1b,1c,2d	1a,1b,1c,1e,3a		3a	1c,1f		1b		
Introduced Species				2c								

Black cells indicate key concerns; gray cells indicate secondary concerns.

Key Concerns:

- 1a – Land Management Impact on Habitat Quality: *limited lowland habitat complexity due to past and current agricultural practices such as straightening, channelization, revetting, filling, and/or dredging of stream channels*
- 1b – Land Management Impact on Habitat Quality: *limited lowland habitat complexity due to past and current urban, rural residential, and forestry development and practices such as straightening, channelization, revetting, filling, and/or dredging of stream channels*
- 1c – Land Management Impact on Habitat Quality: *limited habitat complexity due to inadequate large wood recruitment resulting from impaired riparian conditions, stream blockages, and/or removal*
- 1e – Land Management Impact on Habitat Quality: *loss of floodplain connectivity and access to off-channel habitat due to stream down-cutting or diking*
- 2a – Land Management Impact on Water Quality: *high water temperature due to loss of riparian shade and channel straightening*
- 2b – Water Management Impact on Water Quality: *high water temperature due to reservoir heating, water withdrawal, and return irrigation flow*
- 3a – Land Management Impact on Habitat Access: *loss of access due to road crossings*
- 3b – Water Management Impact on Habitat Access: *low stream flows and reduced available habitat due to water withdrawals, and loss of access due to diversion and flood control structures*

Secondary Concerns:

- 1a – Land Management Impact on Habitat Quality: *limited lowland habitat complexity due to past and current agricultural practices such as straightening, channelization, revetting, filling, and/or dredging of stream channels*
- 1b – Land Management Impact on Habitat Quality: *limited lowland habitat complexity due to past and current urban, rural residential, and forestry development and practices such as straightening, channelization, revetting, filling, and/or dredging of stream channels*
- 1c – Land Management Impact on Habitat Quality: *limited habitat complexity due to inadequate large wood recruitment resulting from impaired riparian conditions, stream blockages, and/or removal*
- 1f – Land Management Impact on Habitat Quality: *sedimentation due to roads and forest practices*
- 2c – Introduced Species Impact on Water Quality: *high water temperature due to non-native vegetation limiting riparian species (e.g., gorse, blackberry, reed canary grass, and European beech grass)*
- 2d – Land Management Impact on Water Quality: *poor water quality and toxins due to runoff resulting from urban and agricultural development and practices*
- 3a – Land Management Impact on Habitat Access: *loss of access due to road crossings*
- 3b – Water Management Impact on Habitat Access: *low stream flows and reduced available habitat due to water withdrawals, and loss of access due to diversion and flood control structures*
- 4a – Water Management Impact on Other Factors: *mortality associated with unscreened diversions or non-criteria screens at diversions*

Summary: Key concerns were related to loss of over-winter tributary habitat complexity, floodplain connectivity, and access and over-summer water temperatures and habitat access. Over-winter tributary habitat and floodplain connectivity, especially in the lowlands, has been impacted by past and current agricultural, urban, rural residential, and forestry development and practices and an interruption in the transport and presence of large wood. Access to habitat has been limited by road crossings. Summer habitat is limiting because high water temperatures have resulted from land management actions in the riparian zone and straightening of channels and water management actions for agricultural purposes. Water withdrawals and diversions and road crossings have also limited the amount of, and access to, summer habitat and thermal refuge.

Secondary concerns spanned a number of life history stages and locations. Unscrened diversions and non-criteria screens at diversions affect fry, summer parr, and out-migrating smolts. Summer juvenile habitat has been impacted by a loss of tributary habitat complexity, especially in the lowlands, caused by past and current agricultural, urban, rural residential, and forestry development and practices and an interruption in the transport and presence of large wood. Non-native vegetation is a secondary factor contributing to higher water temperatures affecting summer parr by limiting native riparian vegetation. Runoff from urban and agricultural areas

impacts summer parr through poor water quality and the presence of toxins. Access to spawning habitat by returning adults is limited by road crossings and diversion structures. Spawners are affected by both a lack of gravel due to alteration of large wood processes (i.e., some tributaries have bedrock) and sedimentation of existing gravel. Finally, reduced estuarine habitat for smolts due to past and current forestry practices and rural residential development is another impact.

Additional Notes: There was discussion within the group on whether urban and agricultural runoff was affecting water quality and introducing toxins into streams. The group had no evidence for this, but felt it was possible. The group gave a certainty rating of "1" for this secondary concern for summer parr (# 2d).

There are in-stream water rights on Upper Rogue River tributaries, but, depending on the water year and because they are almost always junior to irrigation rights, these instream rights are not always being met during the summer when water quantity and quality are important for fish.

There was discussion that few beaver dams occur here, although the cause of this was unknown.

During review of this draft report, one Expert Panel member noted that secondary concerns "1a" and "1c" for summer parr should also apply to fry, which require complex channel morphology and large wood for predator avoidance and refuge from spring freshets as well.

During review of this draft report, another Expert Panel member noted that past mining practices have altered stream channels (threat: Land Management) by, for example, widening them so riparian vegetation does not shade the stream (limiting factor: Water Quality) or placing tailings that block access (limiting factor: Habitat Access).

Chetco River Coho

Certainty: 3 Threat Category	Tributaries							Estuary			Ocean	
	Eggs	Alevins	Fry	Summer Parr	Winter Parr	Smolts	Returning Adults	Spawners	Pre-Smolts	Smolts	Returning Adults	Adults
Harvest Mngmnt.												
Hatchery Mngmnt.								4b				
Water Mngmnt.												
Land Mngmnt.				1c,2a	1b,1c,1e				1b,1c,1e	1b		
Introduced Species												

Black cells indicate key concerns; gray cells indicate secondary concerns.

Key Concerns:

- 1b – Land Management Impact on Habitat Quality: *limited lowland habitat complexity due to past and current urban, rural residential, and forestry development and practices such as straightening, channelization, revetting, filling, and/or dredging of stream channels*
- 1c – Land Management Impact on Habitat Quality: *limited habitat complexity due to inadequate large wood recruitment resulting from impaired riparian conditions, stream blockages, and/or removal*
- 1e – Land Management Impact on Habitat Quality: *loss of floodplain connectivity and access to off-channel habitat due to stream down-cutting or diking*

Secondary Concerns:

- 1b – Land Management Impact on Habitat Quality: *limited lowland habitat complexity due to past and current urban, rural residential, and forestry development and practices such as straightening, channelization, revetting, filling, and/or dredging of stream channels*
- 1c – Land Management Impact on Habitat Quality: *limited habitat complexity due to inadequate large wood recruitment resulting from impaired riparian conditions, stream blockages, and/or removal*
- 2a – Land Management Impact on Water Quality: *high water temperature due to loss of riparian shade and channel straightening*
- 4b – Hatchery Management Impact on Other Factors: *genetic effect of out-of-basin hatchery strays on limited number of wild spawners*

Summary: Key concerns were primarily loss of over-winter tributary and freshwater estuarine habitat complexity and floodplain connectivity for juveniles, especially in the lowlands which are naturally very limited in this system and have been impacted by past and current urban, rural residential, and forestry development and practices. Secondary concerns were related to a loss of large wood and habitat complexity, high water temperatures in tributaries for summer parr (excluding the mainstem, where rearing is not expected), reduced estuarine habitat for smolts, and a very low spawner abundance susceptible to genetic impacts by out-of-basin hatchery fish.

Additional Notes: In deliberations, the estuary was considered to extend to the head of tidewater. Pre-smolt impacts generally occur in the lower portions of tributaries that are located below the head of tidewater. While tidally influenced, these areas are largely freshwater (salinity less than 10 ppt).

There was disagreement within the group on whether the reduced habitat quality and quantity in the estuary was a limiting factor for smolts given uncertainty about the short time, amount of time, or the importance of the time, spent in the estuary; certainty for the secondary concern (# 1b) for smolts was rated "1" (on a scale from 0-3, with 3 being the most certain). Follow-up discourse on this issue from one Expert Panel member indicating the potential importance of estuaries for these coho (inferred from studies of other systems given limited data for Oregon SONCC coho populations) did not gain consensus.

The Chetco River coho population has a very low abundance, verging on extirpation. There was discussion about whether the low abundance itself should be listed as a limiting factor. It was precluded as a separate limiting factor because a specific threat was not identified and population abundance in general will be addressed by recovery actions.

The Expert Panel was unsure how practicable recovery actions in the estuary would be given the extent of development. Therefore, tributary actions will likely be the focus for the recovery plan.

During review of this draft report, one Expert Panel member noted that secondary concern "1c" for summer parr should also apply to fry, which require large wood for predator avoidance and refuge from spring freshets as well.

Winchuck River Coho

Certainty: 3 Threat Category	Tributaries							Estuary			Ocean	
	Eggs	Alevins	Fry	Summer Parr	Winter Parr	Smolts	Returning Adults	Spawners	Pre-Smolts	Smolts	Returning Adults	Adults
Harvest Mngmnt.												
Hatchery Mngmnt.								4b				
Water Mngmnt.												
Land Mngmnt.					1a,1c,1e				1a,1c,1e			
Introduced Species				1d	1d							

Black cells indicate key concerns; gray cells indicate secondary concerns.

Key Concerns:

- 1a – Land Management Impact on Habitat Quality: *limited lowland habitat complexity due to past and current agricultural practices such as straightening, channelization, revetting, filling, and/or dredging of stream channels*
- 1c – Land Management Impact on Habitat Quality: *limited habitat complexity due to inadequate large wood recruitment resulting from impaired riparian conditions, stream blockages, and/or removal*
- 1e – Land Management Impact on Habitat Quality: *loss of floodplain connectivity and access to off-channel habitat due to stream down-cutting or diking*

Secondary Concerns:

- 1d – Introduced Species Impact on Habitat Quality: *reduced habitat complexity due to non-native vegetation limiting riparian species (e.g., Japanese knotweed)*
- 4b – Hatchery Management Impact on Other Factors: *genetic effect of out-of-basin hatchery strays on limited number of wild spawners*

Summary: Key concerns were primarily loss of over-winter tributary and freshwater estuarine habitat complexity and floodplain connectivity for juveniles, especially in the lowlands which are naturally limited in this system and have been impacted by past and current agricultural practices. Secondary concerns were reduced habitat complexity for summer and winter parr due to non-native

vegetation, especially Japanese knotweed, limiting riparian species and their recruitment to the stream. Very low spawner abundance susceptible to genetic impacts by out-of-basin hatchery fish was another secondary concern.

Additional Notes: In deliberations, the estuary was considered to extend to the head of tidewater. Pre-smolt impacts generally occur in the lower portions of tributaries that are located below the head of tidewater. While tidally influenced, these areas are largely freshwater (salinity less than 10 ppt).

Water temperature in the tributaries was thought to be adequate. The mainstem's temperature may not be adequate, but limited rearing is expected here.

The Winchuck River coho population has a very low abundance, verging on extirpation. The same discussion as was had for the Chetco River population about whether the low abundance itself should be listed as a limiting factor applies here. It was precluded as a separate limiting factor because a specific threat was not identified and population abundance in general will be addressed by recovery actions.

Smith River Coho – Oregon Only

Certainty: 3 Threat Category	Tributaries								Estuary			Ocean
	Eggs	Alevins	Fry	Summer Parr	Winter Parr	Smolts	Returning Adults	Spawners	Pre-Smolts	Smolts	Returning Adults	Adults
Harvest Mngmnt.												
Hatchery Mngmnt.												
Water Mngmnt.												
Land Mngmnt.					1c							
Introduced Species												

Black cells indicate key concerns; gray cells indicate secondary concerns.

Key Concerns:

1c – Land Management Impact on Habitat Quality: *limited habitat complexity due to inadequate large wood recruitment resulting from impaired riparian conditions, stream blockages, and/or removal*

Summary: The key concern was limited habitat complexity due to loss of large wood and an alteration of large wood transport through the system.

Additional Notes: The Expert Panel only considered parts of the Smith River within Oregon. It is expected that other limiting factors for Smith River coho will be identified as part of the California and/or ESU-wide recovery plans.

Dependent Populations

Hubbard, Mussel, Greggs, and Myers Creeks Coho

Certainty: not ranked	Tributaries							Estuary			Ocean	
Threat Category	Eggs	Alevins	Fry	Summer Parr	Winter Parr	Smolts	Returning Adults	Spawners	Pre-Smolts	Smolts	Returning Adults	Adults
Harvest Mngmnt.												
Hatchery Mngmnt.												
Water Mngmnt.												
Land Mngmnt.				2a	1b,1c,1e							
Introduced Species					1a							

Black cells indicate key concerns; gray cells indicate secondary concerns.

Key Concerns:

- 1b – Land Management Impact on Habitat Quality: *limited lowland habitat complexity due to past and current urban, rural residential, and forestry development and practices such as straightening, channelization, revetting, filling, and/or dredging of stream channels*
- 1c – Land Management Impact on Habitat Quality: *limited habitat complexity due to inadequate large wood recruitment resulting from impaired riparian conditions, stream blockages, and/or removal*
- 1e – Land Management Impact on Habitat Quality: *loss of floodplain connectivity and access to off-channel habitat due to stream down-cutting or diking*

Secondary Concerns:

- 1a – Land Management Impact on Habitat Quality: *limited lowland habitat complexity due to past and current agricultural practices such as straightening, channelization, revetting, filling, and/or dredging of stream channels*
- 2a – Land Management Impact on Water Quality: *high water temperature due to loss of riparian shade and channel straightening*

Summary: Key concerns were primarily loss of over-winter tributary habitat complexity and floodplain connectivity for juveniles, especially in the lowlands which are naturally very limited in these systems and have been impacted by past and current urban, rural residential, and forestry development and practices. Secondary concerns were related to a loss of over-winter, lowland habitat

complexity due to past and current agricultural practices. In addition, high water temperatures exist for summer parr due to a loss of riparian function and channel straightening.

Additional Notes: These are short, steep, and confined channels, where over-winter habitat is limiting.

Euchre and Hunter Creeks and Pistol River Coho

Certainty: not ranked	Tributaries							Estuary			Ocean	
	Eggs	Alevins	Fry	Summer Parr	Winter Parr	Smolts	Returning Adults	Spawners	Pre-Smolts	Smolts	Returning Adults	Adults
Harvest Mngmnt.												
Hatchery Mngmnt.												
Water Mngmnt.												
Land Mngmnt.				2a	1b,1c,1e 1a							
Introduced Species												

Black cells indicate key concerns; gray cells indicate secondary concerns.

Key Concerns:

- 1b – Land Management Impact on Habitat Quality: *limited lowland habitat complexity due to past and current urban, rural residential, and forestry development and practices such as straightening, channelization, revetting, filling, and/or dredging of stream channels*
- 1c – Land Management Impact on Habitat Quality: *limited habitat complexity due to inadequate large wood recruitment resulting from impaired riparian conditions, stream blockages, and/or removal*
- 1e – Land Management Impact on Habitat Quality: *loss of floodplain connectivity and access to off-channel habitat due to stream down-cutting or diking*
- 2a – Land Management Impact on Water Quality: *high water temperature due to loss of riparian shade and channel straightening*

Secondary Concerns:

- 1a – Land Management Impact on Habitat Quality: *limited lowland habitat complexity due to past and current agricultural practices such as straightening, channelization, revetting, filling, and/or dredging of stream channels*

Summary: Key concerns were a loss of over-winter tributary habitat complexity and floodplain connectivity for juveniles, especially in the lowlands which are naturally very limited in these systems and have been impacted by past and current urban, rural residential, and forestry development and practices. High water temperatures for summer parr due to a loss of riparian function and channel

straightening is also a key concern in these streams. The secondary concern was related to a loss of over-winter, lowland habitat complexity due to past and current agricultural practices.

Additional Notes: These are short, steep, and confined channels, where over-winter habitat is limiting.

Brush Creek Coho

Certainty: not ranked	Tributaries								Estuary			Ocean
	Eggs	Alevins	Fry	Summer Parr	Winter Parr	Smolts	Returning Adults	Spawners	Pre-Smolts	Smolts	Returning Adults	Adults
Harvest Mngmnt.												
Hatchery Mngmnt.												
Water Mngmnt.					4a							
Land Mngmnt.				2a	1b,1c,1e 1a							
Introduced Species												

Black cells indicate key concerns; gray cells indicate secondary concerns.

Key Concerns:

- 1b – Land Management Impact on Habitat Quality: *limited lowland habitat complexity due to past and current urban, rural residential, and forestry development and practices such as straightening, channelization, revetting, filling, and/or dredging of stream channels*
- 1c – Land Management Impact on Habitat Quality: *limited habitat complexity due to inadequate large wood recruitment resulting from impaired riparian conditions, stream blockages, and/or removal*
- 1e – Land Management Impact on Habitat Quality: *loss of floodplain connectivity and access to off-channel habitat due to stream down-cutting or diking*
- 4a – Water Management Impact on Other Factors: *mortality associated with unscreened diversions or non-criteria screens at diversions*

Secondary Concerns:

- 1a – Land Management Impact on Habitat Quality: *limited lowland habitat complexity due to past and current agricultural practices such as straightening, channelization, revetting, filling, and/or dredging of stream channels*
- 2a – Land Management Impact on Water Quality: *high water temperature due to loss of riparian shade and channel straightening*

Summary: Key concerns were primarily loss of over-winter tributary habitat complexity and floodplain connectivity for juveniles, especially in the lowlands which are naturally very limited in this system and have been impacted by past and current urban, rural

residential, and forestry development and practices. A diversion that flows over a cliff and into the ocean is also a key concern. Secondary concerns were related to a loss of over-winter, lowland habitat complexity due to past and current agricultural practices. In addition, high water temperatures exist for summer parr due to a loss of riparian function and channel straightening.

Additional Notes: This is a short, steep, and confined channel, where over-winter habitat is limiting.

During review of this draft report, one Expert Panel member noted that Highway 101 has a greater impact on lowland habitat complexity and floodplain connectivity than past and current urban, rural residential, and agricultural practices. The Expert Panel member also felt that the diversion that flows over a cliff should not be a key concern, given that it was re-constructed recently to only allow flows greater than the 15 year event to overtop it.

Mill Creek Coho

<i>Certainty: not ranked</i>	Tributaries							Estuary			Ocean	
Threat Category	Eggs	Alevins	Fry	Summer Parr	Winter Parr	Smolts	Returning Adults	Spawners	Pre-Smolts	Smolts	Returning Adults	Adults
Harvest Mngmnt.												
Hatchery Mngmnt.												
Water Mngmnt.												
Land Mngmnt.												
Introduced Species					5							

Black cells indicate key concerns; gray cells indicate secondary concerns.

Key Concerns:

5 – Introduced Species Impacts on Predation: *predation by non-native fish*

Summary: The key concern was the presence of non-native fish which prey upon coho juveniles in Garrison Lake.

Additional Notes: Mill Creek is naturally limited by spawning substrate. A habitat survey could confirm this.

The Expert Panel questioned whether there was ever a population of coho in Mill Creek and suggested the Recovery Planning Team potentially take this up with the Technical Recovery Team to see if the population could be removed from the list, pending the outcome of the habitat survey.