

Lower Columbia Recovery Plan

Current Status

- **Background**
 - Why the plan is important, formal guidance and mandates
 - **In Prep**
- **ESU Structure**
 - Species, Strata, Independent populations
 - **TRT Final Report**
- **Desired Status**
 - Viability Criteria, Recovery Scenarios, Broad Sense Recovery Goals
 - **Draft Viability Criteria and BS Recovery Goal**
- **Current Status and Gap**
 - Population, strata, and ESU status, Gap between current status and viability criteria
 - **Draft Products**

Lower Columbia Recovery Plan

Current Status

- **Limiting Factors and Threats**
 - All-H, full life cycle
 - **Draft Products**
- **Management Actions**
 - addressing limiting factors/threats
 - **In Prep**
- **Time and cost estimates (N/A)**
 - to implement actions
- **Preferred Management Scenarios (N/A)**
 - based on biological and cost effectiveness as well as social-political feasibility
- **Implementation, Adaptive Management, and Monitoring and Evaluation Framework (N/A)**

Timeline

Sept 05: draft Work Plan

Mar 06: Stakeholder Team

March 07: Draft Recovery Plan

Apr – May 07: Peer/Public review

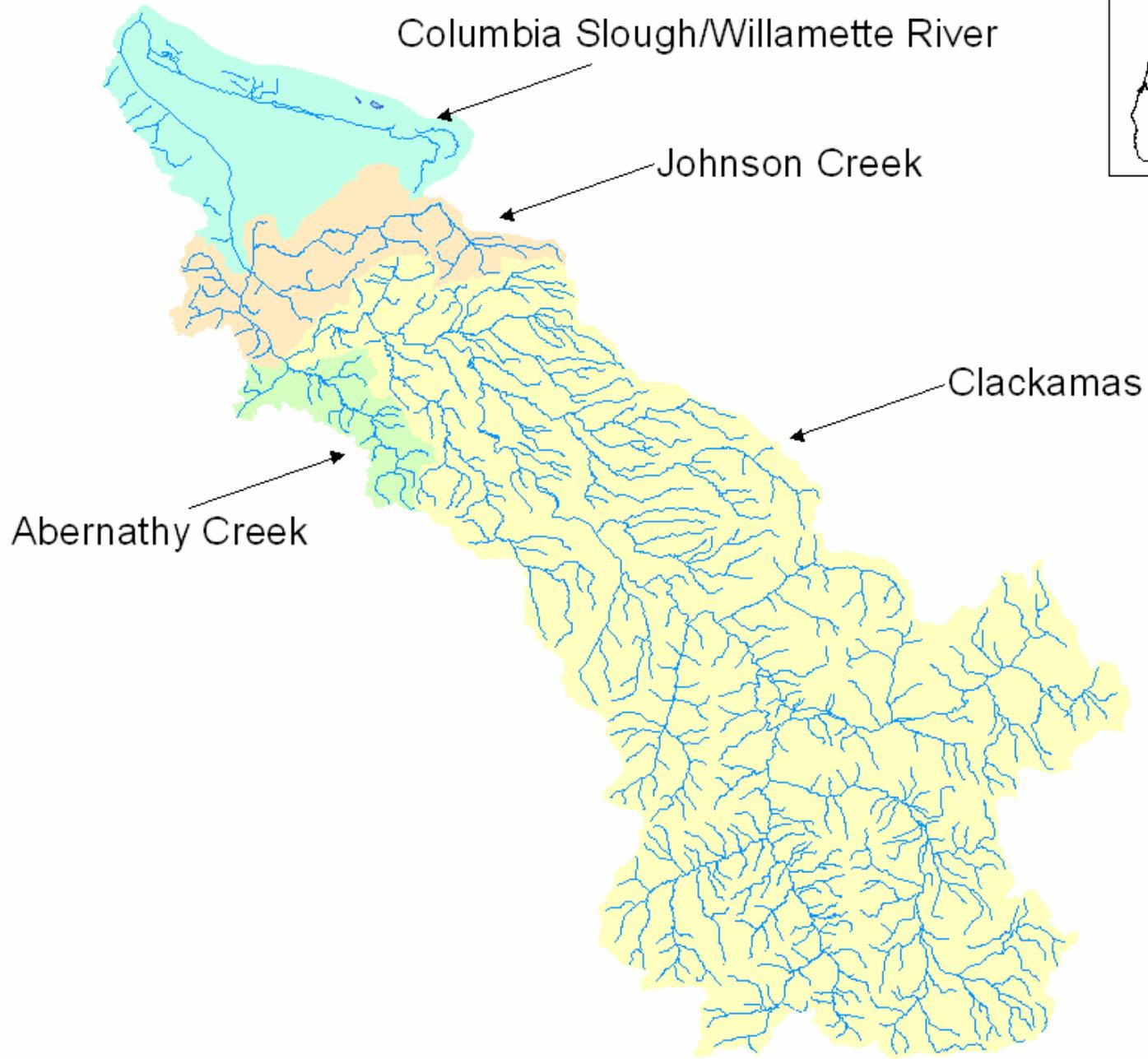
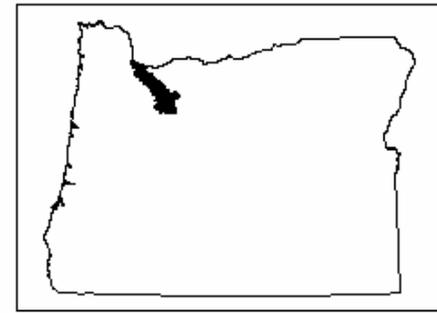
July 07: Final Plan to NOAA

Developing Measures and Actions to Address Limiting Factors and Threats

Clackamas Populations



Clackamas Population



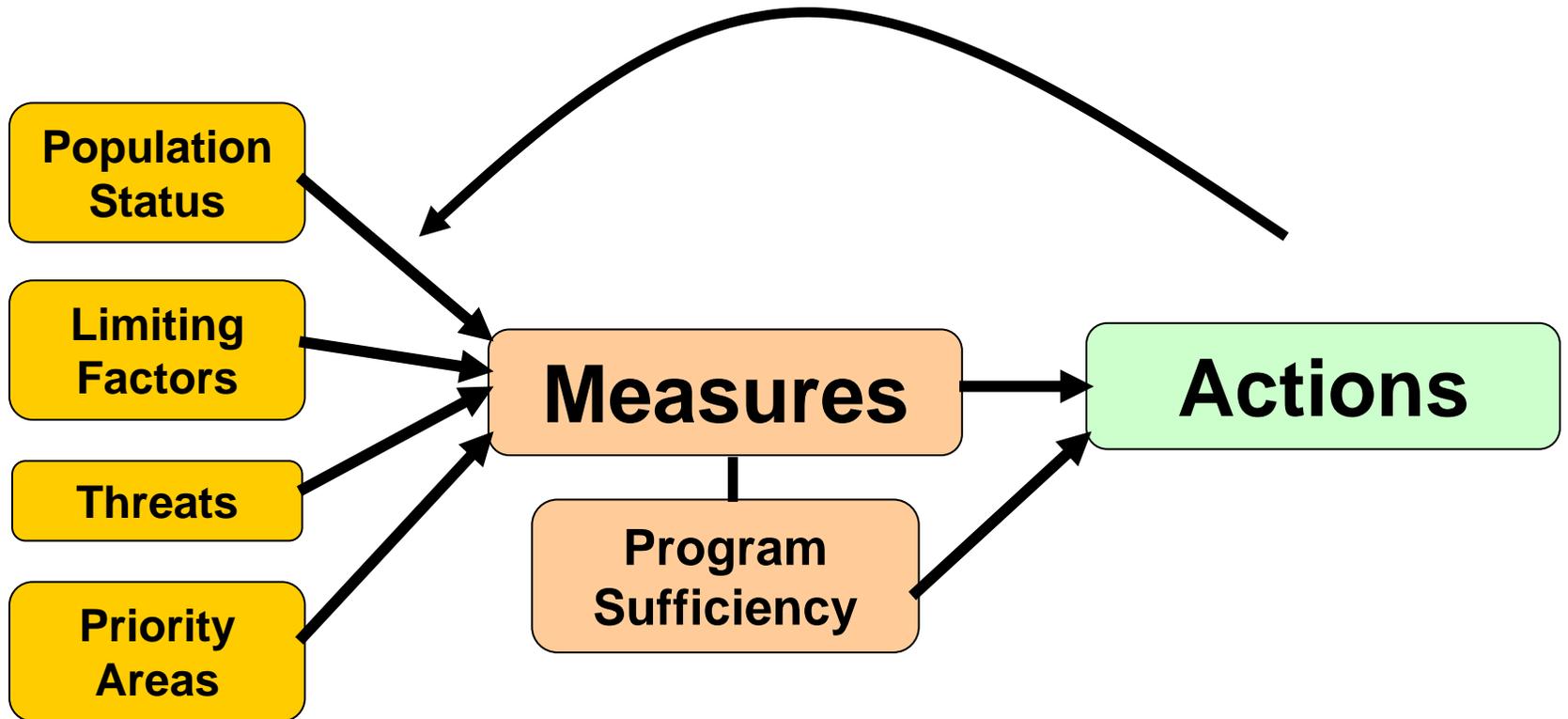
Columbia Slough/Willamette River

Johnson Creek

Clackamas

Abernathy Creek

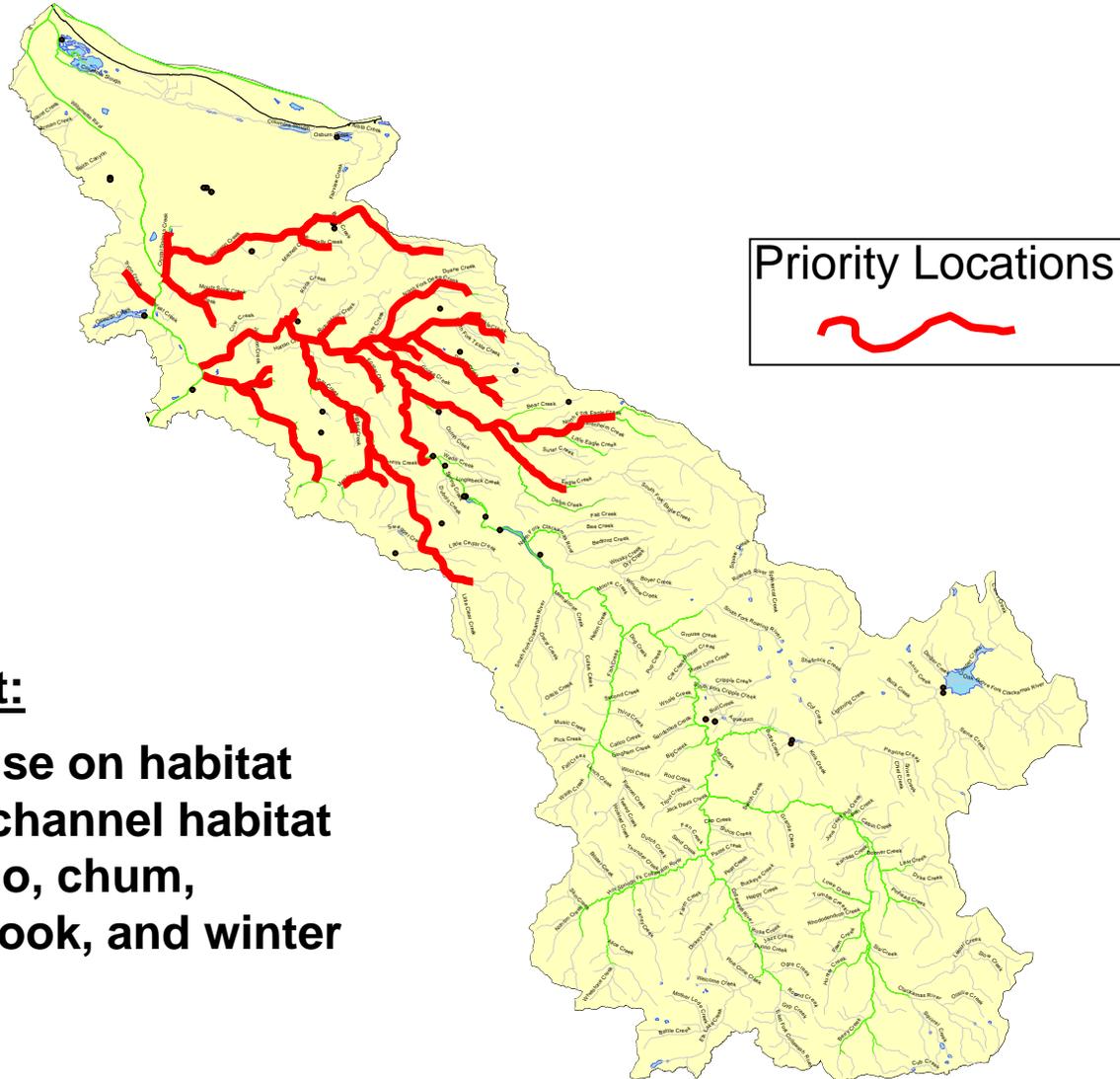
Flowchart for Developing Measures/Actions



Limiting Factors/Threats Assessment for Clackamas

Threats	Population	Tributaries (Includes mainstem Clackamas and Johnson Creek)								Estuary (below Bonneville and Willamette Falls - includes tidal portions of tributaries)				Ocean
		Eggs	Alevins	Fry	Summer Parr	Winter Parr	Smolts	Returning Adults	Spawners	Fry	Parr	Smolts	Returning Adults	
Harvest	Coho												1 ^a	
	Chum													
	Fall Chinook												1 ^a	1 ^a
	Spring Chinook							1 ^g					1 ^f	1 ^a
	Steelhead												1 ^f	
Hatchery	Coho								3			4 ^a		
	Chum										6 ^c			
	Fall Chinook											4 ^a		
	Spring Chinook								3			4 ^a		
	Steelhead											4 ^a		
Hydro	Coho						1 ^b					5 ^a		
	Chum										5 ^a	6 ^a		
	Fall Chinook			8 ^c						7 ^c		5 ^a	6 ^a	9 ^a
	Spring Chinook				8 ^c			1 ^b		7 ^c		5 ^a		
	Steelhead							1 ^b				5 ^a		
Landuse	Coho	7 ^a	8 ^a	9 ^a	8 ^a							5 ^b	6 ^b	
	Chum	7 ^a	8 ^a					2 ^d			5 ^b			
	Fall Chinook	7 ^a	8 ^a								5 ^b	6 ^b		
	Spring Chinook	9 ^a		8 ^a	9 ^a	8 ^a					5 ^b	6 ^b		
	Steelhead	7 ^a		9 ^a		8 ^a						5 ^b	6 ^b	
Introduced Species	Coho											6 ^{aaa}		
	Chum										6 ^{aaa}			
	Fall Chinook											6 ^{aaa}		
	Spring Chinook											6 ^{aaa}		
	Steelhead											6 ^{aaa}		

Priority Areas



Specific Threat:

Impact of landuse on habitat complexity/off channel habitat for juvenile coho, chum, fall/spring Chinook, and winter steelhead

Developing Measures and Actions

- **Measures and actions will be prioritized based on a strategic framework that recognizes the importance of protection, enhancement, and restoration throughout the life cycle of the species.**
- **Measures will be directly linked to threats**
- **Actions will describe what is being done or what needs to be done.**

High Priority Actions

- Provide long-term protection for major life history strategies,
- Provide long-term protection of habitat conditions that support viability,
- Protect or enhance viability of multiple listed populations,
- Enhance and restore habitat and natural processes to increase survival, connectivity and reproductive success of the populations, and
- Target the key limiting factors that contribute the most to closing the gap between current status and desired future status.

High Priority Actions (cont'd)

All things being equal, actions that demonstrate the following have high priority:

- Actions where opportunity for success is high (rather than those of limited feasibility),
- Actions that complement other land management, water quality, environmental management and recreational plans developed with and supported by subbasin stakeholders (rather than those that are isolated, stand-alone efforts).
- Actions that have landowner support and participation.
- Actions that demonstrate cost effectiveness relative to alternative means of achieving the same objectives.

Addressing LF/Threats for Clackamas Populations

Threats	Population	Tributaries (Includes mainstem Clackamas and Johnson Creek)								Estuary (below Bonneville and Willamette Falls - includes tidal portions of tributaries)				Ocean
		Eggs	Alevins	Fry	Summer Parr	Winter Parr	Smolts	Returning Adults	Spawners	Fry	Parr	Smolts	Returning Adults	Adults
Harvest	Coho												1 ^a	
	Chum													
	Fall Chinook												1 ^a	1 ^a
	Spring Chinook								1 ^g				1 ^f	1 ^a
	Steelhead												1 ^f	
Hatchery	Coho											4 ^a		
	Chum											6 ^c		
	Fall Chinook											4 ^a		
	Spring Chinook											4 ^a		
	Steelhead											4 ^a		
Hydro	Coho											5 ^a		
	Chum											5 ^a		
	Fall Chinook											6 ^a		
	Spring Chinook				8 ^c							9 ^a		
	Steelhead									7 ^c		5 ^a		
Landuse	Coho		7 ^a	8 ^a	9 ^a	8 ^a						5 ^b		
	Chum		7 ^a	8 ^a					2 ^d			5 ^b		
	Fall Chinook	9 ^a	7 ^a	8 ^a								5 ^b		
	Spring Chinook			8 ^a	9 ^a	8 ^a						5 ^b		
	Steelhead		7 ^a		9 ^a	8 ^a						5 ^b		
Introduced Species	Coho											6 ^{aaa}		
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	Fall Chinook											6 ^{aaa}		
	Spring Chinook											6 ^{aaa}		
	Steelhead											6 ^{aaa}		

Preliminary!

Harvest Threats

Threats	Population	Tributaries (Includes mainstem Clackamas and Johnson Creek)							Estuary (below Bonneville and Willamette Falls - includes tidal portions of tributaries)				Ocean	
		Eggs	Alevins	Fry	Summer Parr	Winter Parr	Smolts	Returning Adults	Spawners	Fry	Parr	Smolts	Returning Adults	Adults
Harvest	Coho												1 ^a	
	Chum													
	Fall Chinook												1 ^a	1 ^a
	Spring Chinook							1 ^g					1 ^f	1 ^a
	Steelhead												1 ^f	
Hatchery	Coho								3			4 ^a		
	Chum									6 ^c				
	Fall Chinook										4 ^a			
	Spring Chinook								3		4 ^a			
	Steelhead											4 ^a		
Hydro	Coho						1 ^b					5 ^a		
	Chum									5 ^a				
	Fall Chinook			8 ^c					7 ^c		6 ^a	5 ^a		
	Spring Chinook				8 ^c			1 ^b		7 ^c		9 ^a	5 ^a	
	Steelhead						1 ^b					5 ^a		
Landuse	Coho	7 ^a	8 ^a	9 ^a	8 ^a							5 ^b	6 ^b	
	Chum	7 ^a	8 ^a					2 ^d			5 ^b			
	Fall Chinook	7 ^a	8 ^a									5 ^b	6 ^b	
	Spring Chinook		8 ^a	9 ^a	8 ^a							5 ^b	6 ^b	
	Steelhead	7 ^a		9 ^a	8 ^a							5 ^b	6 ^b	
Introduced Species	Coho											6 ^{aaa}		
	Chum									6 ^{aaa}				
	Fall Chinook										6 ^{aaa}			
	Spring Chinook											6 ^{aaa}		
	Steelhead												6 ^{aaa}	

Key Threats

- **Coho**

- **Threat**

- Indirect Mortality from Selective Fishery in mainstem Columbia Exceed Limits of Harvest Matrix

- **Management Action**

- Reduce indirect mortality consistent with harvest matrix
 - NOAA/ODFW/WDFW implementing new program Fall 2006

- **Is Action Sufficient to Address Threat?**

- Uncertain
 - New Program Under Evaluation
 - Evaluate Matrix in Relationship to Recovery Goal

- **Modifications Needed?**

- None pending new evaluations; revise as necessary based on results

- **Timelines**

- Matrix Sufficiency part of recovery plan
 - Managing within Matrix – annual review, revisions as needed

- **Fall Chinook**

- **Threat**

- Directed Harvest of Non-Selective fisheries in Ocean and Columbia on Returning Adults (current harvest rate 40-45%)

- **Proposed Management Action**

- Mark all hatchery fish and evaluate potential for selective fisheries
 - Marking begins Fall 2006

- **Is Action Sufficient to Address Threat?**

- Uncertain

- New Program, will take several years to develop and implement
 - Evaluate in relationship to support recovery goals?

- **Modifications Needed?**

- None pending new evaluations; revise as necessary based on results

- **Timelines**

- Evaluate in relationship to recovery goals – Recovery Plan
 - Develop and evaluate selective fishery options – 3 years

Secondary Threats

- **Spring Chinook**

- **Specific Threats**

- Directed Harvest in Ocean Fishery
 - Incidental Mortality from Gillnet Fishery in Columbia
 - Incidental Mortality from catch and release in Clackamas River

- **Proposed Management Actions**

- Not determined

- **Is Action Sufficient to Address Threat?**

- Not determined; Evaluate in relationship to recovery goals

- **Modifications Needed?**

- Not determined

- **Timelines**

- Not determined

- **Winter Steelhead**

- **Specific Threat**

- **Incidental Mortality from Gillnet Fishery in Columbia**

- **Proposed Management Actions**

- **Not determined**

- **Is Action Sufficient to Address Threat?**

- **Not determined; Evaluate in relationship to recovery goals**

- **Modifications Needed?**

- **Not determined**

- **Timelines**

- **Not determined**

Hatchery Threats

Threats	Population	Tributaries (Includes mainstem Clackamas and Johnson Creek)							Estuary (below Bonneville and Willamette Falls - includes tidal portions of tributaries)				Ocean	
		Eggs	Alevins	Fry	Summer Parr	Winter Parr	Smolts	Returning Adults	Spawners	Fry	Parr	Smolts	Returning Adults	Adults
Harvest	Coho												1 ^a	
	Chum													
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	Spring Chinook								1 ^g				1 ^f	1 ^a
	Steelhead												1 ^f	
Hatchery	Coho								3			4 ^a		
	Chum									6 ^c				
	Fall Chinook											4 ^a		
	Spring Chinook								3			4 ^a		
	Steelhead												4 ^a	
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	Spring Chinook	9 ^a		8 ^a	9 ^a	8 ^a						5 ^b	6 ^b	
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	Steelhead											6 ^{aaa}		

Key Threats

- **Coho**

- **Specific Threat**

- Hatchery Strays from Eagle Creek Hatchery interbreeding with naturally produced fish in lower Clackamas

- **Management Action**

- Currently Under evaluation by HSRG
 - Proposals range from maintaining current program, reducing smolt releases, changing broodstock, to elimination of the program

- **Is Action Sufficient to Address Threat?**

- Unknown; evaluate in relationship to recovery goal

- **Modifications Needed?**

- None pending new evaluations; revise as necessary based on results

- **Timelines**

- HSRG Review 11/06 LC Hatcheries

Secondary Threats

- **Spring Chinook**

- **Specific Threat**

- Hatchery Strays from Clackamas Hatchery interbreeding with naturally produced fish in lower Clackamas

- **Management Action**

- Changes to hatchery practices need to be implemented to reduce straying.

- **Is Action Sufficient to Address Threat?**

- Unknown; No decision has been made regarding program direction
 - Potential actions will be evaluated in relationship to recovery goals

- **Modifications Needed?**

- Not determined at this time

- **Timelines**

- Evaluation and Recommendations – Recovery Plan
 - Implementation - unknown

Hydro Threats

Threats	Population	Tributaries (Includes mainstem Clackamas and Johnson Creek)								Estuary (below Bonneville and Willamette Falls - includes tidal portions of tributaries)				Ocean
		Eggs	Alevins	Fry	Summer Parr	Winter Parr	Smolts	Returning Adults	Spawners	Fry	Parr	Smolts	Returning Adults	Adults
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Landuse	Coho		7 ^a	8 ^a	9 ^a	8 ^a							5 ^a	
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	Fall Chinook												6 ^{aaa}	
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Key Threats

- **Spring Chinook**

- **Specific Threat**

- Mortality of smolts at hydropower facilities (2nd Threat for coho/StHd)

- **Management Action**

- Retrofitting of hydro facilities to reduce juvenile mortality per FERC Settlement Agreement

- **Is Action Sufficient to Address Threat?**

- Uncertain

- Potential survival gains have not been demonstrated or evaluated in relationship to recovery goals
 - FERC license not issued

- **Modifications Needed?**

- None pending new evaluations; propose changes based on recovery scenarios

- **Timelines**

- Review and Recommendations – Recovery Plan
 - Implementation – per Settlement Agreement

Secondary Threats

- **Fall and Spring Chinook**

- **Specific Threat**

- Loss of riverine habitat due to inundation by reservoirs

- **Management Action**

- Restore or mitigate for habitat lost/modified through inundation by reservoirs per FERC Settlement Agreement

- **Is Action Sufficient to Address Threat?**

- Uncertain

- Not clear if actions will be effective or adequate to meet the goals of the recovery plan

- **Modifications Needed?**

- None pending new evaluations; propose changes based on recovery scenarios

- **Timelines**

- Evaluation and Recommendations – Recovery Plan
- Implementation – per Settlement Agreement

- **Fall and Spring Chinook**

- **Specific Threat**

- Loss of spawning gravel due to impaired sediment transport below projects

- **Management Action**

- Add spawning gravel below projects annually per FERC Settlement Agreement

- **Is Action Sufficient to Address Threat?**

- Uncertain

- Not clear if actions will be effective or adequate to meet the goals of the recovery plan

- **Modifications Needed?**

- None pending new evaluations; propose changes based on recovery scenarios

- **Timelines**

- Evaluation and Recommendations – Recovery Plan
 - Implementation – per Settlement Agreement

Landuse Threats

Threats	Population	Tributaries (Includes mainstem Clackamas and Johnson Creek)								Estuary (below Bonneville and Willamette Falls - includes tidal portions of tributaries)				Ocean
		Eggs	Alevins	Fry	Summer Parr	Winter Parr	Smolts	Returning Adults	Spawners	Fry	Parr	Smolts	Returning Adults	Adults
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	Steelhead												1 ^f	
Hatchery	Coho								3			4 ^a		
	Chum									6 ^c				
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	Spring Chinook				8 ^c			1 ^b	7 ^c		5 ^a			
	Steelhead						1 ^b				5 ^a			
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	Spring Chinook		8 ^a	9 ^a	8 ^a						5 ^b 6 ^b			
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Clackamas River Basin Action Plan



**Clackamas River Basin Council
2005**

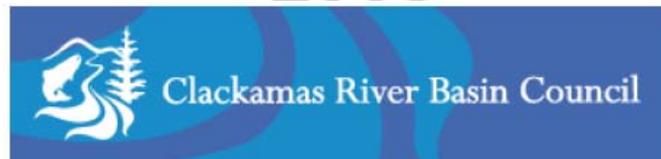


Table 1. Factors limiting fish populations in each of the 17 geographic areas in the Clackamas River Basin¹.

Number	Geographic Area	Channel Function	Flow	Habitat Diversity	Sediment Load	Water Temp	Key Habitat Quantity
1	Lower Clackamas Mainstem	High	Moderate	Extreme	High	High	High
3	Middle Clackamas Mainstem	Low	Moderate	High	Low	Low	Moderate
4	Upper Clackamas Mainstem	Low	Low	Moderate	Low	Low	Moderate
5	Lower Clackamas Tribs.						
5a	Cow Creek	Moderate	Moderate	High	High	High	High
5b	Sieben Creek	Moderate	Moderate	High	High	High	High
5c	Edna/Johnson Creek	Moderate	Moderate	High	High	High	High
5d	Foster Creek	High	Moderate	High	High	High	High
5e	Goose Creek	High	Moderate	High	High	High	High
6	Rock / Richardson Creeks						
6a	Rock Creek	High	High	High	High	High	High
6b	Richardson Creek	High	High	High	High	High	High
7	Clear Creek						
7a	Lower Clear Creek	Moderate	Moderate	High	High	High	High
7b	Little Clear Creek	Low	Low	Moderate	Low	Low	Moderate
7c	Middle Clear Creek	Low	Low	High	Moderate	Moderate	Moderate
7d	Upper Clear Creek	Low	Low	Moderate	Low	Low	Moderate
8	Deep Creek						
8a	Lower Deep Creek	Moderate	Moderate	High	High	High	High
8b	Upper Deep Creek	High	Moderate	High	High	High	High
8c	N.F. Deep Creek	Extreme	Moderate	Extreme	High	High	Extreme
8d	Tickle Creek	Moderate	Moderate	High	High	Moderate	High
9	Eagle Creek						
9a	Lower Eagle Creek	Moderate	Low	High	Moderate	High	High
9b	Upper Eagle Creek	Low	Low	Moderate	Moderate	Moderate	Moderate
10	North Fork Eagle Creek	Low	Low	Moderate	Moderate	Moderate	Moderate
11	Middle Clackamas Tribs.						
11a	N.F. Clackamas River	Low	Low	Moderate	Low	Low	Moderate
11b	S.F. Clackamas River	Low	Low	Low	Low	Low	Low
11c	Pup/Cat/Whale/Sandstone/ Big	Low	Low	Low	Low	Low	Low
11d	Dinner/3 Lynx/Cripple/Bull	Low	Low	Low	Low	Low	Low
12	Fish Creek	Moderate	Low	High	Moderate	Moderate	Moderate
13	Roaring River	Low	Low	Low	Low	Low	Low
14	Oak Grove Fork	Moderate	Moderate	High	Moderate	Low	High
15	Upper Clackamas Tribs.						
15a	Tag/Switch Creeks	Low	Low	Low	Low	Low	Low
15b	Trout Creek	Low	Low	Low	Low	Low	Low
15c	Headwaters Tributaries	Low	Low	Low	Low	Low	Low
16	Collawash River	Low	Low	Moderate	Low	Low	Moderate

Specific Threat
Road crossings and other land use related passage impediments impairs the upstream migration of returning adult chum.
High water temperatures due to degraded riparian conditions result in increase stress and mortality on coho summer parr, spring Chinook summer parr, steelhead fry and summer parr, and potentially fall chinook eggs.
Impact of land use practices on physical habitat complexity and off channel habitat availability for coho fry and winter parr, chum fry, fall Chinook fry, spring Chinook fry and winter parr, and steelhead winter parr.
Fine sediment inputs from variety of sources that impacts the survival of coho, fall Chinook, chum, and steelhead eggs and alevins.

¹ Adapted from Clackamas River Basin Assessment Report, 2008.

Table 7. Strategies By Geographic Area.

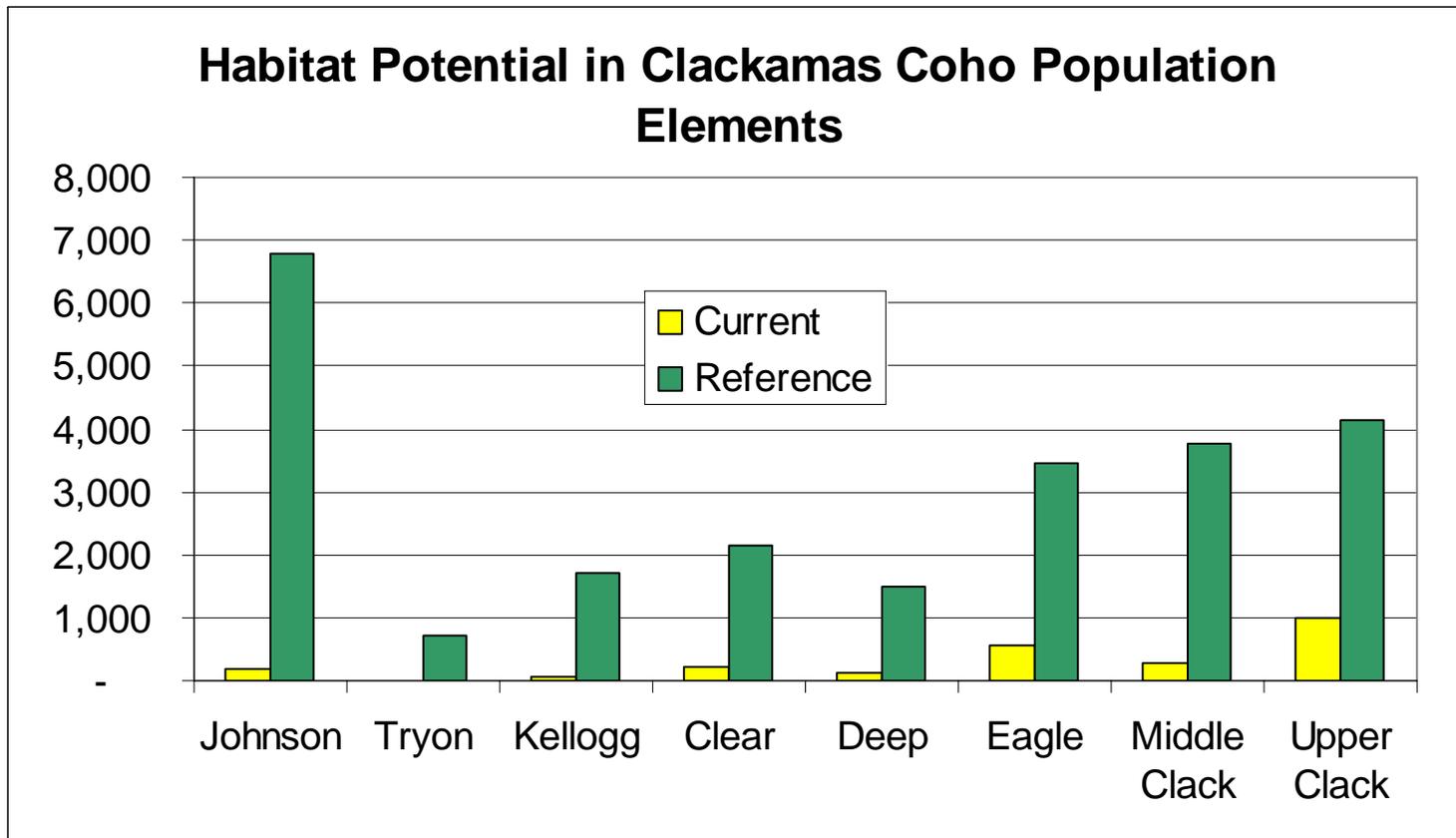
STRATEGIES	Clear Cr.	Foster Cr.	Deep Cr.	Goose Cr.	Rock Cr.	Richardson Cr.	Eagle Cr.
Improve Fish Passage Barriers	X	X	X	X	X	X	X
Restore And Enhance Riparian Areas	X	X	X	X	X	X	X
Restore Stream And River Channels	X	X	X	X		X	X
Decrease Stream Temperatures	X	X	X	X	X	X	X
Decrease Nutrient Levels			X		X		
Decrease Bacteria Levels	X		X		X		
Decrease Pesticide Levels			X		X		
Decrease Fine Sediment	X	X	X				
Increase Summertime Flows	X	X	X	X	X	X	X
Improve Key Wildlife Habitat	X		X		X	X	X
Improve Wildlife Habitat Connectivity	X	X	X	X	X	X	X
Manage Invasive Weeds	X	X	X	X	X	X	X

Priority Locations

“In general terms ecological integrity is generally higher on forestland, and decreases in agricultural and urban landscapes. Restoration and enhancement actions will therefore generally focus on the much smaller but more altered landscapes in the lower Clackamas River basin that is primarily in private ownership.”

“Strategies and actions are organized by ten major geographic groupings. These groupings are based on land ownership and land use considerations as well as natural characteristics. Emphasis is placed on the private lands area in the Lower Basin, consistent with the Council’s mission.”

EDT Assessment of Aquatic Habitat for Coho



Limiting Factors Analysis

	Productivity Factors												
	Channel Structure	Habitat Diversity	Temperature	Predation	Competition	Oxygen	Flow	Sediment	Food	Pollutants	Obstructions	Nutrient Enrichment	Pathogens
Middle Clackamas													
Egg incubation	-2%	0%	0%	0%	0%	0%	0%	-7%	0%	0%	0%	0%	0%
Summer rearing	0%	-22%	-1%	-1%	-1%	0%	-1%	0%	-1%	0%	0%	0%	0%
Winter rearing	-1%	-32%	0%	0%	0%	0%	-1%	0%	-1%	0%	0%	0%	0%

	Productivity Factors												
	Channel Structure	Habitat Diversity	Temperature	Predation	Competition	Oxygen	Flow	Sediment	Food	Pollutants	Obstructions	Nutrient Enrichment	Pathogens
Upper Clackamas													
Egg incubation	0%	0%	0%	0%	0%	0%	0%	-5%	0%	0%	0%	0%	0%
Summer rearing	0%	-5%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Winter rearing	0%	-16%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

In general, **summer and winter rearing**, along with **egg incubation** were most limiting. These results are consistent with Expert Panel findings.

Federal Land Management Northwest Forest Plan

- Ecosystem Management approach
- Aquatic Conservation Strategy
 - Key Watersheds
 - Riparian Reserves
 - Watershed Analysis
 - Watershed Restoration

Specific Threat

High water temperatures due to degraded riparian conditions result in increase stress and mortality on coho summer parr, spring Chinook summer parr, steelhead fry and summer parr, and potentially fall chinook



Northwest Forest Plan Aquatic Conservation Strategy:



- Maintain and restore water quality necessary to support healthy riparian, aquatic, and wetland ecosystems.
- Maintain and restore in-stream flows sufficient to create and sustain riparian, aquatic, and wetland habitats and to retain patterns of sediment, nutrient, and wood routing.

Riparian Reserve Designations

Fish-bearing streams (300' buffer on either side of stream)

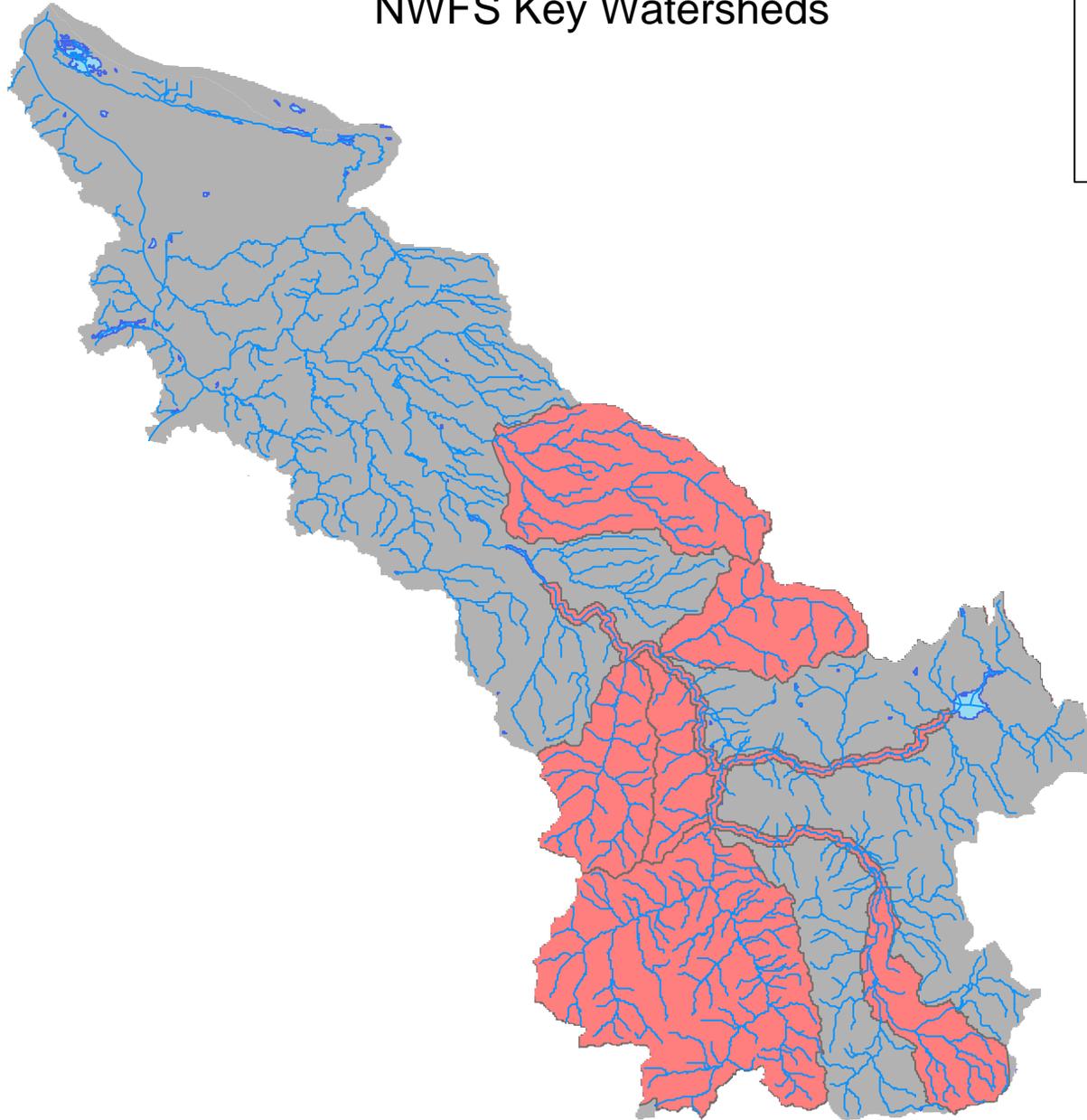
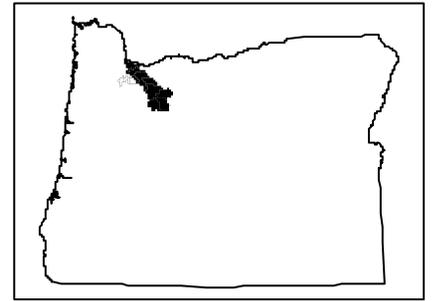
Permanently flowing non fish-bearing streams (150' buffer on either side of stream)

Lakes and natural ponds (300' buffer from edge of water body)

Seasonally flowing or intermittent streams (100' on either side of stream)

Clackamas Population

NWFS Key Watersheds



Landuse Summary

- **Action Plan provides solid technical basis for tributary-based recovery actions**
 - Need to evaluate in relationship to other H's
 - Focus on private lands where **restoration potential** is greatest
 - Need evaluation of program sufficiency
- **Portland Watershed Management Plan provides additional support**
- **Federal mgmt provides **protection and restoration** strategy for best habitats**

Estuary Threats

Threats	Population	Tributaries (Includes mainstem Clackamas and Johnson Creek)							Estuary (below Bonneville and Willamette Falls - includes tidal portions of tributaries)				Ocean	
		Eggs	Alevins	Fry	Summer Parr	Winter Parr	Smolts	Returning Adults	Spawners	Fry	Parr	Smolts	Returning Adults	Adults
Harvest	Coho												1 ^a	
	Chum													
	Fall Chinook												1 ^a	1 ^a
	Spring Chinook								1 ^g				1 ^f	1 ^a
	Steelhead												1 ^f	
Hatchery	Coho								3				4 ^a	
	Chum										6 ^c			
	Fall Chinook												4 ^a	
	Spring Chinook								3				4 ^a	
	Steelhead												4 ^a	
Hydro	Coho												1 ^b	
	Chum											5 ^a		
	Fall Chinook											6 ^a		
	Spring Chinook											5 ^a		
	Steelhead												5 ^a	
Landuse	Coho												8 ^c	
	Chum												7 ^c	
	Fall Chinook												5 ^a	
	Spring Chinook												6 ^a	
	Steelhead												9 ^a	
Introduced Species	Coho												5 ^a	
	Chum												5 ^a	
	Fall Chinook												5 ^a	
	Spring Chinook												5 ^a	
	Steelhead												5 ^a	
Landuse	Coho	7 ^a	8 ^a	9 ^a	8 ^a								5 ^b	
	Chum	7 ^a	8 ^a						2 ^d				6 ^b	
	Fall Chinook	7 ^a	8 ^a										5 ^b	
	Spring Chinook	9 ^a											6 ^b	
	Steelhead	7 ^a	8 ^a	9 ^a	8 ^a								5 ^b	
Introduced Species	Coho												6 ^b	
	Chum												6 ^b	
	Fall Chinook												5 ^b	
	Spring Chinook												6 ^b	
	Steelhead												5 ^b	
Introduced Species	Coho												6 ^b	
	Chum												6 ^b	
	Fall Chinook												6 ^{aaa}	
	Spring Chinook												6 ^{aaa}	
	Steelhead												6 ^{aaa}	

Estuary Module

- **Integrate LF/T that are tributary-based into LCR management actions**
- **Evaluate relevant actions in module to LCR Recovery Goals**

Estuary Threats

TABLE 4-2
Prioritization of Threats to Ocean- and Stream-Type Salmonids

Threat	Threat Index*	Threat Priority
Flow regulation	15	
Dikes and filling	15	
Impaired sediment transport	15	HIGH
Reservoir phytoplankton production	15	
Entrapment of sediment in reservoirs	12	
Urban and industrial practices	12	
Agricultural practices	12	
Reservoir heating	12	
Riparian practices	12	
Climate cycles and global warming	10	
Water withdrawal	10	
Pile dikes and navigational structures	8	
Altered predator/prey relationships	6	
Ship wakes	6	
Dredging	6	
Ship ballast practices	3	
Over-water structures	2	LOW

Tributary Actions



Potential Management Actions

Water quality-related threats	Agricultural practices	CRE-20: Implement pesticide and fertilizer best management practices to reduce estuary and upstream sources of toxic contaminants entering the estuary.
	Urban and industrial practices	CRE-21: Identify and reduce industrial, commercial, and public sources of pollutants.
		CRE-22: Monitor the estuary for contaminants and restore contaminated sites.
		CRE-23: Implement stormwater best management practices in cities and towns.
		<i>CRE-1: Protect intact riparian areas in the estuary and its tributaries and restore riparian areas that are degraded.</i>
	Riparian practices	<i>CRE-1: Protect intact riparian areas in the estuary and its tributaries and restore riparian areas that are degraded.</i>
Reservoir heating	<i>CRE-2: Modify hydrosystem operations to reduce the effects of reservoir surface heating, or conduct mitigation measures.</i>	

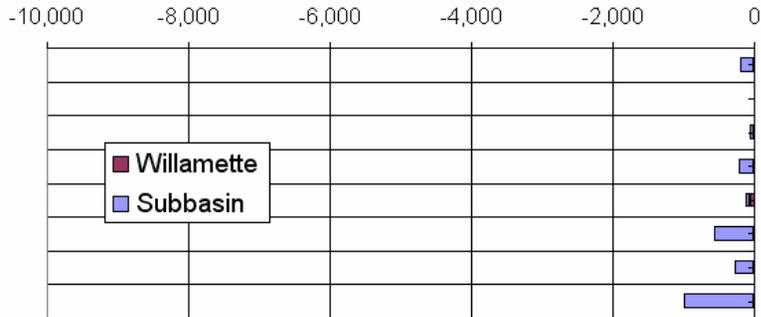
Questions?

Table 8. Strategies By Geographic Area (part 2).

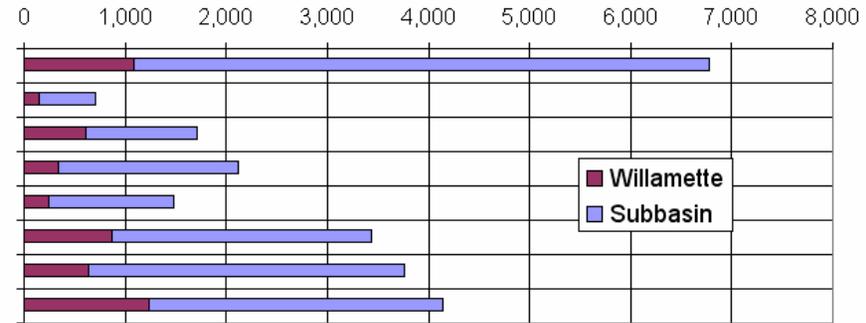
STRATEGIES	Wade Cr.	Oak Grove Fork	Collaw ash River	Cow Cr.	Sieben Cr.	Clackamas River	Basin Tributaries	Clackamas Flood Plain
Improve Fish Passage Barriers	X					X	X	
Restore And Enhance Riparian Areas	X					X	X	X
Restore Stream And River Channels	X	X	X			X	X	X
Decrease Stream Temperatures	X			X	X	X	X	
Decrease Nutrient Levels				X	X			
Decrease Bacteria Levels				X	X			
Decrease Pesticide Levels					X			
Decrease Fine Sediment								
Increase Summertime Flows		X				X	X	
Improve Key Wildlife Habitat		X				X		X
Improve Wildlife Habitat Connectivity								X
Manage Invasive Weeds	X			X	X	X	X	X

Ranking of Restoration and Protection Priorities

Protection: Potential loss with further degradation



Restoration: Potential gain with restoration



Johnson
Tryon
Kellogg
Clear
Deep
Eagle
Middle Clack
Upper Clack

Specific Threat

Road crossings and other land use related passage impediments impairs the upstream migration of returning adult chum.



Northwest Forest Plan Aquatic Conservation Strategy:



- Maintain and restore spatial and temporal connectivity within and between watersheds.
- Maintain and restore habitat to support well-distributed populations of native plant, invertebrate, and vertebrate riparian-dependent species.

Specific Threat

Impact of land use practices on physical habitat complexity and off channel habitat availability for coho fry and winter parr, chum fry, fall Chinook fry, spring Chinook fry and winter parr, and steelhead winter parr.



Northwest Forest Plan Aquatic Conservation Strategy:



- Maintain and restore the distribution, diversity, and complexity of watershed and landscape-scale features to ensure protection of the aquatic systems to which species, populations and communities are uniquely adapted.
- Maintain and restore spatial and temporal connectivity within and between watersheds.
- Maintain and restore physical integrity of the aquatic system, including shorelines, banks, and bottom configurations.
- Maintain and restore the species composition and structural diversity of plant communities in riparian areas and wetlands to provide adequate summer and winter thermal regulation, nutrient filtering, appropriate rates of surface erosion, bank erosion, and channel migration and to support amounts and distributions of coarse woody debris sufficient to sustain physical complexity and stability.

Specific Threat

Fine sediment inputs from variety of sources that impacts the survival of coho, fall Chinook, chum, and steelhead eggs and alevins.



Northwest Forest Plan Aquatic Conservation Strategy:



- Maintain and restore the sediment regime under which aquatic ecosystems evolved.