3 Grays River Subbasin

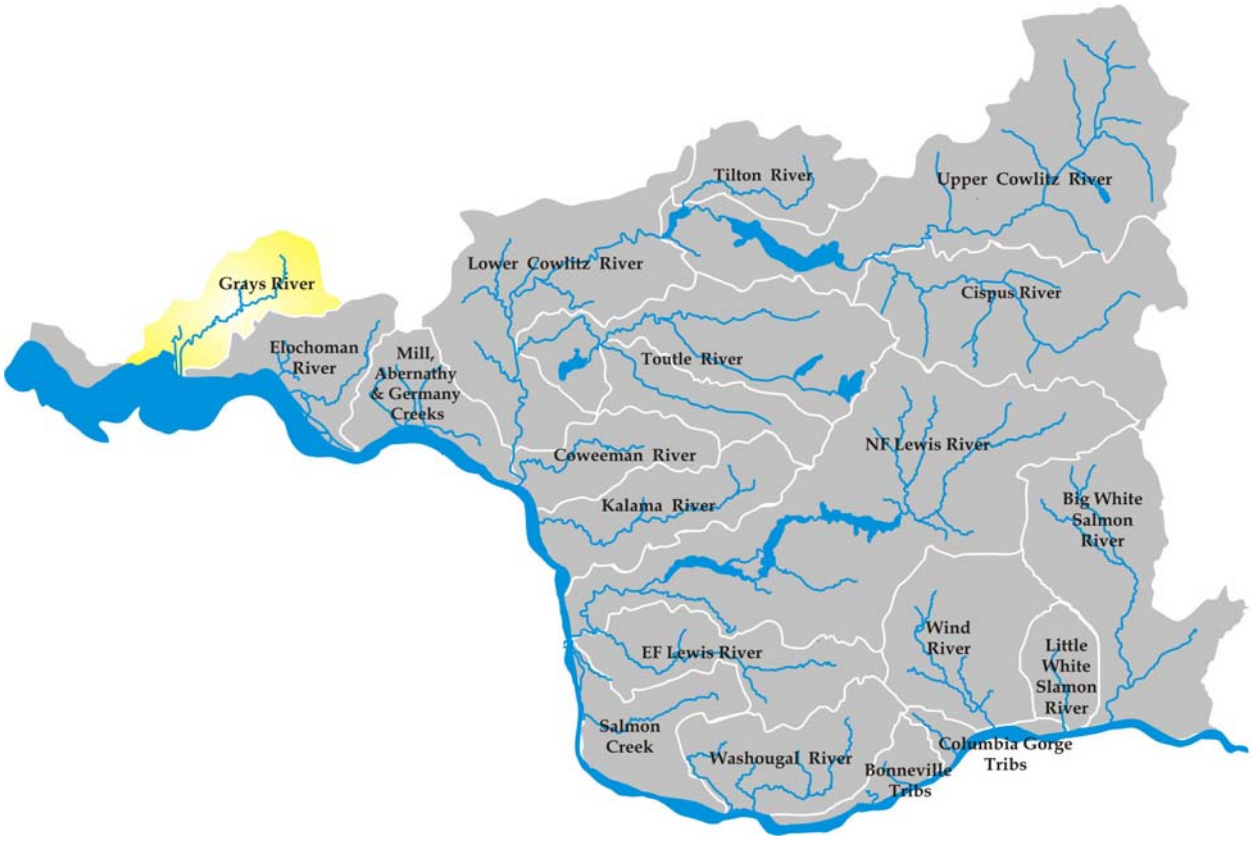


Figure 3-1. Location of the Grays River Subbasin within the Lower Columbia River Basin.

3.1 Basin Overview

The Grays River Subbasin comprises approximately 124 square miles, in Wahkiakum and Pacific counties. The river enters the Columbia at RM 21, near the town of Oneida, Washington. Tidal influence extends upriver for 6 miles. Principal tributaries include Hull Creek, and the East, West, North and South Forks. The subbasin is part of WRIA 25.

The Grays Subbasin will play a key role in the recovery of salmon and steelhead. The subbasin has historically supported populations of fall Chinook, winter steelhead, chum, and coho. Today, Chinook, steelhead and chum are listed as threatened under the ESA. Coho salmon are a candidate for listing. Other fish species of interest are Pacific lamprey and coastal cutthroat trout – these species are also expected to benefit from salmon protection and restoration measures.

Grays salmon and steelhead are affected by a variety of in-basin and out-of basin factors including stream, Columbia River mainstem, estuary, and ocean habitat conditions; harvest; hatcheries; and ecological relationships with other species. Analysis has demonstrated that recovery cannot be achieved by addressing only one limiting factor. Recovery will require action to reduce or eliminate all manageable factors or threats. The deterioration of habitat conditions in the Columbia River mainstem, estuary, and plume affect all anadromous salmonids within the Columbia Basin. There is no direct harvest of listed salmon and steelhead but sport and commercial fisheries focusing on hatchery fish and other healthy wild populations, primarily in the mainstem Columbia and ocean, incidentally affect ESA-listed Grays fish. Grays River and Sea Resources hatcheries operate within the basin with the potential to both adversely affect wild

salmon and steelhead populations and to assist in recovery efforts. Key ecological interactions of concern include effects of nonnative species; nutrient inputs from salmon carcasses; and predation by species affected by development including Caspian terns, northern pikeminnow, seals, and sea lions. Discussions of out-of-basin factors, strategies, and measures common to all subbasins may be found in Volume I, Chapters 4 and 7. This subbasin chapter focuses on habitat and other factors of concern specific to the Grays Subbasin.

Approximately 95% of the Grays Subbasin is forested and commercial timber companies own 73% of the land. State ownership comprises the bulk of the remaining lands. Much of the basin has been impacted by timber harvest and is primarily composed of young forest stands. Approximately 500 acres of the lower Grays River has been acquired by the Columbia Land Trust for protection of natural resources.

Although the majority of the basin is commercial forest land, there is also substantial agricultural development in the lower mainstem river valley and along the lower reaches of mainstem tributaries. Forest harvest and agricultural development have left the subbasin with nearly 70% of vegetation in young forest or non-forested conditions. A major impact on native fish populations is the reduction in backwater habitats in the lower river within tidal influence, which is associated with agricultural development near the mouth. These changes have sharply reduced the habitats available to chum.

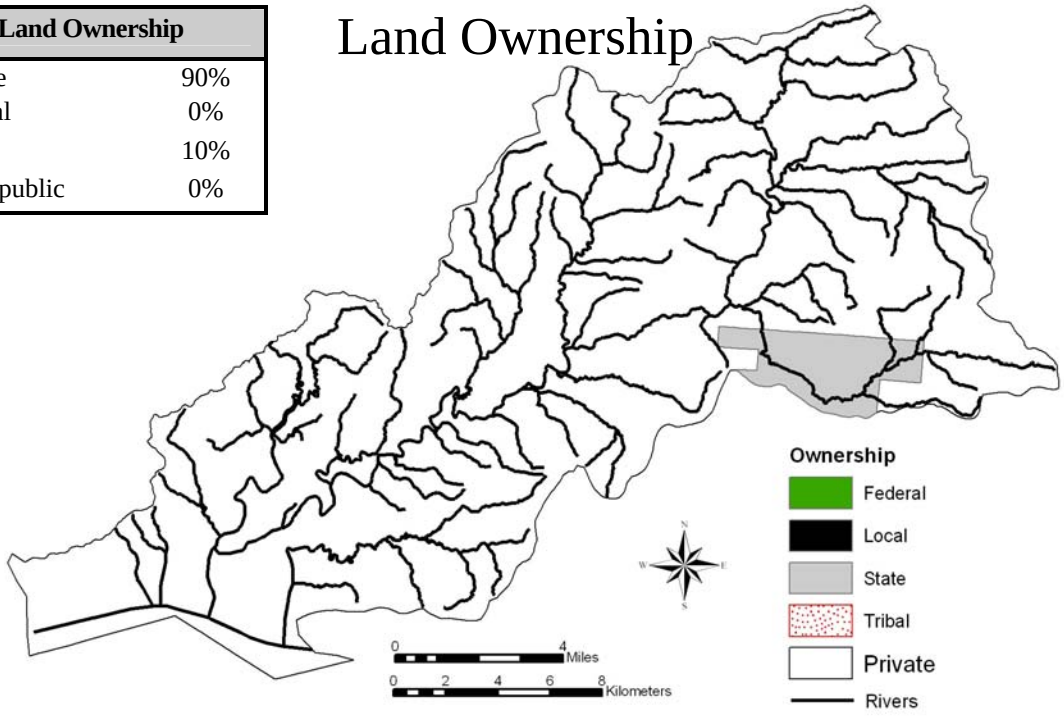
Several general areas of importance can be identified from the Grays assessments. First, forest harvest and related road building on steep, unstable slopes have contributed to increased sedimentation of stream channels and elevated risk of peak flow increases. These conditions affect nearly all of the key habitats for fish populations in the subbasin, especially the critical mainstem spawning and rearing reaches. Furthermore, the potential for continued degradation is high due to the dominance of private timber land in the subbasin. New forest practices regulations regarding timber harvest on steep slopes will likely allow for some degree of passive restoration of impaired sediment delivery processes over time.

A second area of importance is the severe channelization (and subsequent loss of backwater habitats) and riparian degradation that has negatively affected conditions for chum, coho, fall Chinook, and to some degree winter steelhead, in the lower mainstem. Channelization and riparian degradation are mostly related to extensive agricultural development. The spawning reaches Grays 1G tidal and Grays 2 are particularly important for preservation and restoration measures that would provide benefits to multiple species.

The only population centers in the basin are the unincorporated towns of Grays River, Rosburg, and Chinook. Projected population change from 2000-2020 for unincorporated areas in WRIA 25 is 37% (LCFRB 2001). Population growth will result in the conversion of forestry and agricultural land uses to residential uses, with potential impacts to habitat conditions. It is important that growth management policy adequately protect critical habitats and the conditions that create and support them.

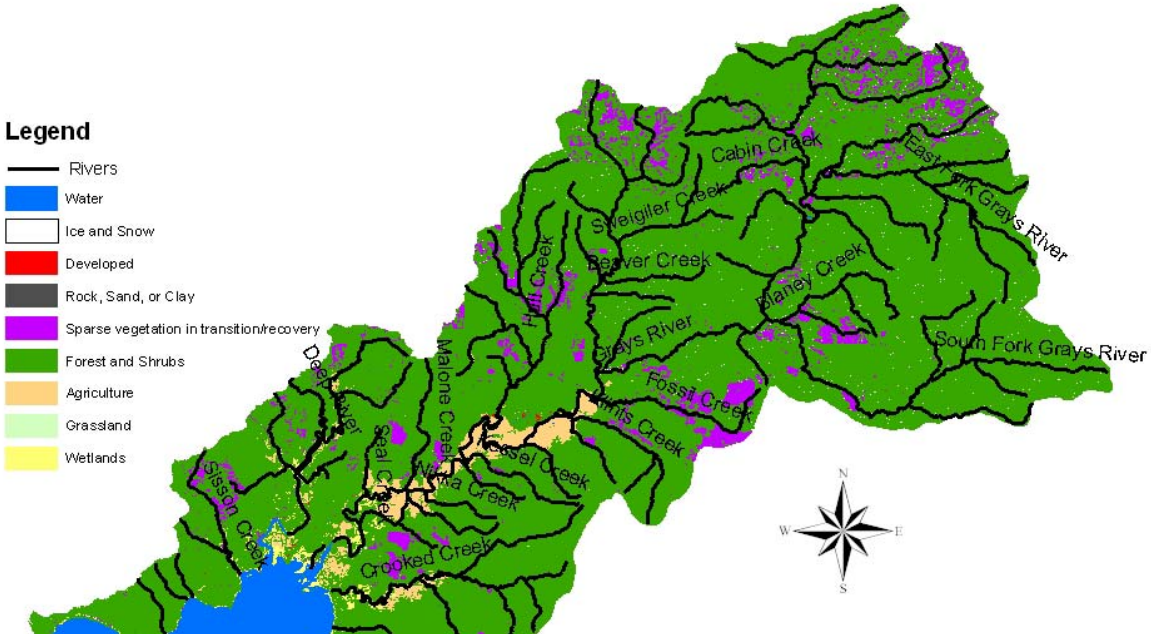
Land Ownership	
Private	90%
Federal	0%
State	10%
Other public	0%

Land Ownership



Vegetation Composition	
Late Seral	1%
Mid Seral	30%
Early Seral	14%
Other Forest	43%
Non Forest	4%

Land Use / Cover



3.2 Species of Interest

Focal salmonid species in the Grays River and Chinook River watersheds include fall Chinook, winter steelhead, chum and coho. The current health or viability of the focal populations ranges from low for coho to low-medium for chum, fall Chinook, and winter steelhead. Focal populations need to improve to a targeted level that contributes to recovery of the species (see Volume I, Chapter 6). Recovery goals call for restoring all four populations to a high or very high viability level. This level will provide for a 95% or better probability of population survival over 100 years.

Other species of interest in the Grays/Chinook area include coastal cutthroat trout and Pacific lamprey. Regional objectives for these species are described in Volume I, Chapter 6. Recovery actions targeting focal salmonid species are also expected to provide significant benefits for these other species. Cutthroat will benefit from improvements in stream habitat conditions for salmonids. Lamprey are also expected to benefit from habitat improvements in the estuary, Columbia River mainstem, and Grays subbasin although specific spawning and rearing habitat requirements of lamprey are not well known.

Table 3-1. Current viability status of Grays/Chinook populations and the biological objective status that is necessary to meet the recovery criteria for the Coastal strata and the lower Columbia ESU.

	ESA	Hatchery	Current		Objective	
Species	Status	Component	Viability	Numbers	Viability	Numbers
Fall Chinook	Threatened	No	Low+	100-300	High	1,400-1,400
Winter steelhead	Threatened	Yes	Low+	400-600	High	600-2,300
Chum	Threatened	Yes	Low+	500-10,000	High+	4,300-7,800
Coho	Candidate	Yes	Low	unknown	High	unknown

Fall Chinook – The historical Grays/Chinook adult population is estimated from 1,500-10,000 fish. The majority of fish returned to the Grays River. Current natural spawning returns to the Grays River range from 100-300 fish. Spawning in the Grays occurs primarily in the mainstem Grays between tidewater and the West Fork, and in the West Fork downstream of the Grays River Hatchery. Juvenile rearing occurs near and downstream of the spawning areas. Juveniles emerge in early spring and migrate to the Columbia in spring and summer of their first year.

Winter Steelhead – The historical Grays River adult population is estimated to be about 4,500 fish. Current natural spawning returns range from 400-600. Interaction with Chambers Creek/Beaver Creek stock hatchery steelhead is likely lower due to different spawn timing. Spawning occurs in the mainstem, East, West, and South Forks of the Grays River, and in Mitchell Creek. Spawning time is March to early June. Juvenile rearing occurs both downstream and upstream of the spawning areas. Juveniles rear for a full year or more before migrating to the Columbia River.

Coho – The historical Grays River/Chinook adult population is estimated from 5,000-40,000 fish, with the returns being late stock which spawn from late November to March. Current returns are unknown but assumed be low. A number of hatchery produced fish spawn naturally. Natural spawning occurs primarily in upper mainstem, South Fork, West Fork, Crazy Johnson Creek, and Hull Creek. Spawning also occurs in vicinity streams, including Crooked, Hitchcock, and Jim Crow creeks. Juvenile rearing occurs upstream and downstream of spawning

areas. Juveniles rear for a full year in these basins basin before migrating as yearlings in the spring.

Chum – The historical Grays/Chinook adult population is estimated from 8,000-14,000 fish. Current returns range from 500-10,000 fish. Spawning in the Grays River occurs in the lower mainstem (RM 9.5-13), the lower 1.4 miles of the West Fork, the lower 0.5 miles of Crazy Johnson Creek, and in Gorley Creek. The current returns to the Grays River are predominately from natural production except for a minor contribution from a small enhancement hatchery program at Grays River Hatchery. In the Chinook River, natural spawning occurs in the lower 5 miles of the mainstem. Most fish are produced from Sea Resources Hatchery, which is using Grays River stock chum to supplement natural production. Peak spawning occurs in late November-early December. Juveniles emerge in the early spring and migrate to the Columbia after a short rearing period.

Coastal Cutthroat – Coastal cutthroat abundance in the Grays/Chinook area has not been quantified but the population is considered depressed. Cutthroat trout are present throughout the basin. Both anadromous and resident forms of cutthroat trout are present in the basin. Anadromous cutthroat enter the Grays from late July-mid April and spawn from January through April. Most juveniles rear 2-3 years before migrating from their natal stream.

Pacific lamprey – Information on lamprey abundance is limited and does not exist for the Grays/Chinook population. However, based on declining trends measured at Bonneville Dam and Willamette Falls it is assumed that Pacific lamprey have also declined in the Grays and Chinook rivers. The adult lamprey return from the ocean to spawn in the spring and summer. Spawning likely occurs in the small to mid-size streams of the basins. Juveniles rear in freshwater up to 6 years before migrating to the ocean.

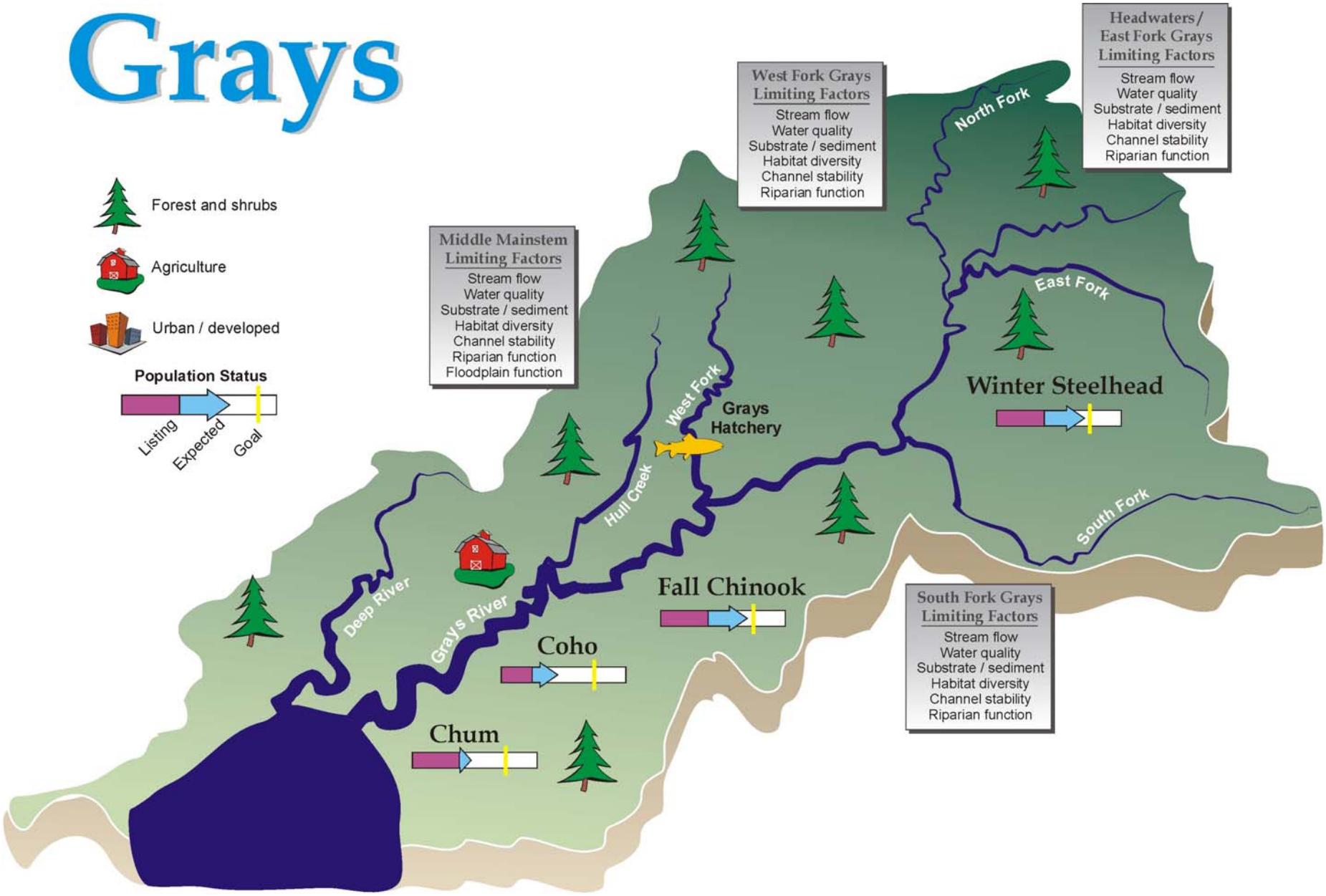


Figure 3-2. Summary of habitat limiting factors, population status, expected population improvement trend with existing programs, and biological objectives depicted for the Grays Subbasin.

3.3 Potentially Manageable Impacts

Stream habitat, estuary/mainstem habitat, harvest, hatchery and predation effects have all contributed to reduced salmonid productivity, numbers, and population viability in the Grays Subbasin. The pie charts below represent the relative order of magnitude of quantifiable effects for each of these factors for each focal species. The preferred recovery scenario targets an equivalent reduction in each impact factor in proportion to the magnitude of the effect. Population-specific targets are discussed in further detail in Volume I, Chapter 6.

- Loss of tributary habitat quality and quantity accounts for the largest relative impact on all species. Loss of estuary habitat quality and quantity is also relatively important for all species, but less so for coho.
- Harvest has a sizeable effect on fall Chinook, but is relatively minor for chum and winter steelhead; harvest impact on coho is intermediate.
- Hatchery impacts are substantial for coho, moderate for fall Chinook, and relatively low for chum and winter steelhead.
- Predation impacts are moderate for all species.
- Hydrosystem access and passage impacts appear to be relatively minor for all species.

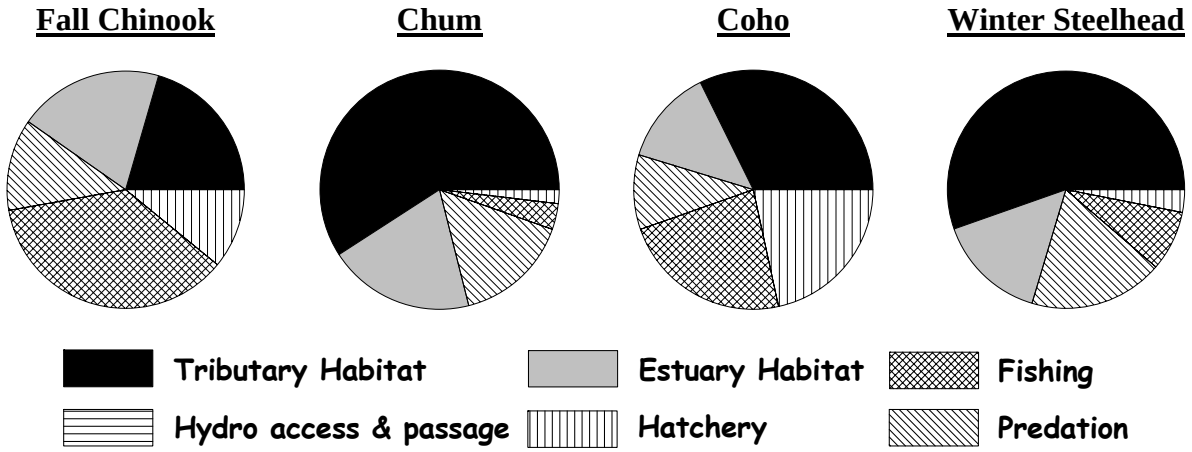


Figure 3-3. Relative contribution of potentially manageable impacts for Grays populations.

3.4 Limiting Factors, Threats, and Measures

3.4.1 Hydropower Operation and Configuration

There are no hydro-electric dams in the Grays River Basin. However, Grays species are affected by mainstem Columbia hydro operations and flow regimes which affect habitat in migration corridors and in the estuary. Mainstem hydro factors and threats are addressed by regional strategies and measures identified in Volume I.

3.4.2 Harvest

Most harvest of wild Grays River salmon and steelhead occurs incidental to the harvest of hatchery fish and healthy wild stocks in the Columbia estuary, mainstem, and ocean. This mortality is very low for chum and steelhead, but is more significant for fall Chinook. Grays River fall Chinook are harvested in ocean and Columbia River commercial sport fisheries Harvest is controlled by an ESA harvest limit associated with Coweeman natural fall Chinook. In-basin sport fisheries are closed to the retention of Chinook. No harvest of chum occurs in ocean fisheries, there is no directed Columbia River or Grays basin chum fisheries and retention of chum is prohibited in Columbia River and Grays/Chinook River sport fisheries. Chum are impacted incidental to fisheries directed at coho and winter steelhead. Harvest of Grays coho occurs in the ocean commercial and recreational fisheries off the Washington and Oregon coasts and Columbia River as well as recreational fisheries in the Grays basin. Wild coho impacts are limited by fishery management to retain marked hatchery fish and release unmarked wild fish. Incidental mortality of steelhead occurs in freshwater commercial fisheries directed at Chinook and coho and freshwater sport fisheries directed at hatchery steelhead and salmon. All recreational fisheries are managed to selectively harvest fin-marked hatchery steelhead and commercial fisheries cannot retain hatchery or wild steelhead.

Measures to address harvest impacts are generally focused at a regional level to cover fishery impacts accrued to lower Columbia salmon as they migrate along the Pacific Coast and through the mainstem Columbia River. The regional measures cover species from multiple watersheds which share the same migration routes and timing, resulting in similar fishery exposure. Regional strategies and measures for harvest are detailed in Volume I, Chapter 7. A number of regional strategies for harvest involve implementation of measures within specific subbasins. In-basin fishery management is applicable to steelhead and salmon while regional management is more applicable to salmon. Harvest measures with significant application to the Grays Subbasin populations are summarized in the following table:

Table 3-2. Regional harvest measures from Volume I, Chapter 7 with significant application actions to the Grays Subbasin populations.

Measure	Description	Comments
F.M13	Develop a regional mass marking program for tule fall Chinook	Retention of salmon is prohibited in Grays River sport fisheries, however marking of other hatchery tule Chinook would provide regional selective fishing options.
F.M17	Monitor chum handle rate in winter steelhead and late coho tributary sport fisheries.	State agencies would include chum incidental handle assessments as part of their annual tributary sport fishery sampling plan.
F.M18	Monitor and evaluate commercial and sport impacts to naturally-spawning steelhead in salmon and hatchery steelhead target fisheries.	Includes monitoring of naturally-spawning steelhead encounter rates in fisheries and refinement of long-term catch and release handling mortality estimates. Would include assessment of the current monitoring programs and determine their adequacy in formulating naturally-spawning steelhead incidental mortality estimates.
F.M19	Continue to improve gear and regulations to minimize incidental impacts to naturally-spawning steelhead.	Regulatory agencies should continue to refine gear, handle and release methods, and seasonal options to minimize mortality of naturally-spawning steelhead in commercial and sport fisheries.
F.M24	Maintain selective sport fisheries in ocean, Columbia River, and tributaries and monitor naturally-spawning stock impacts.	Mass marking of lower Columbia River coho and steelhead has enabled successful ocean and freshwater selective fisheries to be implemented since 1998. Marking programs should be continued and fisheries monitored to provide improved estimates of naturally-spawning salmon and steelhead release mortality.

3.4.3 Hatcheries

As noted in the regional strategies, hatcheries can adversely affect wild salmon and steelhead populations in several ways. These include domestication or the reduction in the fitness of wild fish due to interbreeding with hatchery fish, direct competition between wild and hatchery fish for habitat and nutrients, and the introduction of disease. Hatcheries can also assist in recovery efforts by providing fish needed to reestablish extirpated populations or to augment wild populations that have reached critically low levels.

Grays River Hatchery (since 1961) produces coho, spring Chinook, and steelhead for harvest opportunity and chum for natural population enhancement. The coho program includes releases into the Grays River as well as transfers to Deep River net pens. The spring Chinook are imported to Grays River Hatchery as eggs for incubation and rearing prior to transfer to the Deep River net pens. Winter steelhead are transferred from the Elcohoman Hatchery to Grays River Hatchery as eggs and released into the Grays River as smolts. The Elochoman Hatchery steelhead are a composite stock and are genetically different from the naturally-produced steelhead in the Grays River. The main threats from hatchery steelhead are domestication of the naturally-produced steelhead as a result of adult interactions or ecological interactions between natural juvenile salmon and hatchery released juvenile steelhead. The main threats of the hatchery coho program are ecological interactions between natural juvenile salmon and hatchery coho in the Grays River and potential domestication of natural coho. The Deep River programs result in fish for harvest returning to Deep River, with negligible threats to natural populations

The Sea Resources Hatchery (since 1895) is operated by the non-profit Sea Resources Watershed Learning Center. It produces smaller numbers of chum, fall Chinook, and coho.

Since 1996, the goal of the hatchery programs is to restore naturally reproducing populations of salmon in the Chinook River in conjunction with habitat restoration projects.

Table 3-3. Grays/Chinook subbasin hatchery production.

Hatchery	Release Location	Fall Chinook	Spring Chinook	Chum	Coho	Winter Steelhead
Grays River	Grays River			300,000	150,000	40,000
	Deep River		200,000		400,000	
Sea Resources	Chinook River	107,500		147,500	52,000	

Regional hatchery strategies and measures are focused on evaluating and reducing biological risks and reducing the risks to natural populations. Artificial production programs within the Grays/Chinook facilities will be evaluated in detail through the WDFW Benefit-Risk Assessment Procedure (BRAP) relative to risks to natural populations. The resulting program specific actions will be developed, evaluated, and documented through the Hatchery and Genetic Management Plan for public review and consideration by NOAA Fisheries (details in programs Technical Foundation, Volume IV). Regional hatchery measures identified in Volume I, Chapter 7 with potential applications at facilities within the Grays/Chinook subbasin are summarized in Table 3-4.

Table 3-4. Regional hatchery measures from Volume I, Chapter 7 with potential implementation actions in the Grays/Chinook Subbasin.

Measure	Description	Comments
H.M32,40	Juvenile release strategies to minimize interactions with naturally spawning fish.	Release strategies are aimed at reducing or avoiding interactions with wild steelhead, fall Chinook, coho by release timing and release location strategies.
H.M34,41	Mark hatchery steelhead and coho with an adipose fin-clip for identification and selective harvest.	Marking hatchery fish allows for identification of hatchery fish in the natural spawning grounds and at collection facilities which enables accurate accounting of wild fish. Marking also enables selective fisheries to retain hatchery fish and release wild fish.
H.M24,36	Hatchery programs utilized for supplementation and enhancement of wild chum and coho populations.	The Grays Hatchery is currently used for supplementation and risk management of the Grays River chum population and Sea Resources Hatchery for enhancement of Chinook River chum, coho, and fall Chinook. Grays River Hatchery could be considered for a natural coho supplementation program.
H.M8	Adaptively manage hatchery programs to further protect and enhance natural populations and improve operational efficiencies.	Appropriate research, monitoring, and evaluation programs along with guidance from regional hatchery evaluations will be utilized to improve the survival and contribution of hatchery fish, reduce impacts to natural fish, and increase benefits to natural fish.
H.M2,6	Evaluate Grays River and Sea Resources Hatcheries facility operations.	Both facilities would be evaluated in the BRAP process for potential hazards associated with barriers to fish passage, adequacy of screens, and water quality.

3.4.4 Ecological Interactions

Ecological interactions focus on how salmon and steelhead, other fish species, and wildlife interact with each other and the subbasin ecosystem. Grays salmon and steelhead are affected throughout their lifecycle by ecological interactions with non native species, food web

components, and predators. Interactions are similar for Grays populations to those of most other subbasin salmonid populations. Ecological Interactions are addressed by regional strategies and measures identified inVolume I.

3.4.5 Habitat – Estuary and Lower Columbia Mainstem

Conditions in the Columbia River mainstem, estuary, and plume affect all anadromous salmonid populations within the Columbia Basin. A variety of human activities in the mainstem and estuary have decreased both the quantity and quality of habitat used by juvenile salmonids. These include floodplain development; loss of side channel habitat, wetlands and marshes; and alteration of flows due to upstream hydro operations and irrigation withdrawals. Effects are similar for Grays populations to those of most other subbasin salmonid populations. Effects are likely to be greater for chum and fall Chinook than steelhead and coho. Estuary and mainstem effects on Grays salmon and steelhead populations are addressed by regional strategies and measures identified in Volume I and the Columbia Mainstem and Estuary Subbasin sections of Volume II.

3.4.6 Habitat – Subbasin Streams and Watersheds

Decades of human activity have significantly altered watershed processes and reduced both the quality and quantity of habitat needed to sustain viable populations of salmon and steelhead. Moreover, with the exception of fall Chinook, stream habitat conditions within the Grays River subbasin have the greatest impact on the health and viability of salmon and steelhead relative to the other limiting factors and threats discussed in this chapter.

Subwatersheds, reaches, and habitat attributes have been prioritized for protection and/or restoration based on the plan's biological objectives, fish distribution, critical life history stages, current habitat conditions, and potential fish population performance. Priority areas for habitat preservation and restoration are identified in Figure 3-4. A summary of the primary habitat limiting factors and threats are presented in Table 3-6. Habitat measures and related information are presented in Table 3-7. Results of IWA watershed process modeling are depicted for subwatersheds in Figure 3-5. Reach- and subwatershed-scale limiting factors generated from the technical assessment are included in Table 3-5. Details on species-specific spatial priorities and limiting factors at the subbasin level may be found in Volume II of the Technical Foundation. A description of the methodology used to generate composite (multi-species) reach and subwatershed priorities can be found in the introduction to this volume of the recovery plan.

The areas with the greatest current or potential contribution to focal salmonid population health and productivity are listed below. Tier 1 and 2 reaches within these priority areas are included in the list. The habitat limiting factors, threats, and measures included in this chapter focus primarily on the priority areas and the Tier 1 and 2 reaches within them. Tier 3, 4, and non-tiered reaches are considered secondary priority, but in many cases, these lower priority areas will also require restoration and preservation actions in order to achieve recovery objectives. Watershed process measures generally focus on the entire basin as opposed to being limited only to high priority areas because conditions in high priority areas are often influenced by cumulative watershed effects. High priority areas and reaches in the Grays Subbasin include the following:

- Middle mainstem & tributaries – Grays 1F-3; Thadbar Cr lower; King Cr lower; Klints Cr lower; Fossil Cr lower; Gorley Cr 1; Crazy Johnson Cr
- Headwaters & East Fork Grays – Grays 3B-4C; Grays LF; Grays RF; Beaver Cr; EF Grays 1, 3-4, 6
- South Fork Grays – SF Grays 1-3; Blaney Cr 1

- West Fork Grays – WF Grays 1-4

The following paragraphs provide a brief overview of each of these priority areas, including species most affected, land-use threats, and the general type of measures that will be necessary for recovery. Additional detail can be found in the tables and figures that follow.

While reach level habitat conditions often result from local factors, they are also affected or shaped by systemic watershed processes. Limiting factors such as temperature, high and low flows, sediment input, and large woody debris recruitment are often affected by or result from upstream conditions and degraded watershed processes. Access to key reaches may also be affected by barriers that occur downstream of a reach. Accordingly, restoration of a priority reach may require action outside the targeted reach. The IWA analysis was used to identify potential upstream watershed areas that could influence reach level habitat attributes. EDT was used to allow a relative comparison of reaches and habitat attributes within a reach.

Chum, coho, and fall Chinook are most impacted by conditions within the middle mainstem and the lower portion of middle mainstem tributaries (i.e., Fossil Creek, Crazy Johnson Channel). Agricultural uses dominate the riparian areas and floodplains of these reaches, with forestry activities as the primary use on the surrounding hillslopes. The channel has been altered significantly due to past splash-damming, channel straightening, streambank hardening, and more recent flood control activities. Effective recovery measures in these areas will entail restoring riparian areas, re-connecting floodplains, and addressing sites where mass wasting has contributed to large sediment loads and turbidity problems.

The mainstem headwaters, EF Grays River, SF Grays River, and WF Grays River primarily support winter steelhead spawning and rearing. These reaches have been impacted most by recent and historical forest practices (including splash dam logging), which have disrupted riparian function, hydrology, and sediment supply processes. Effective recovery measures will involve the passive restoration of mature riparian and hillslope forests as well as the restoration of sediment supply conditions through addressing the basin-wide road network and mass wasting sites in the stream corridor.

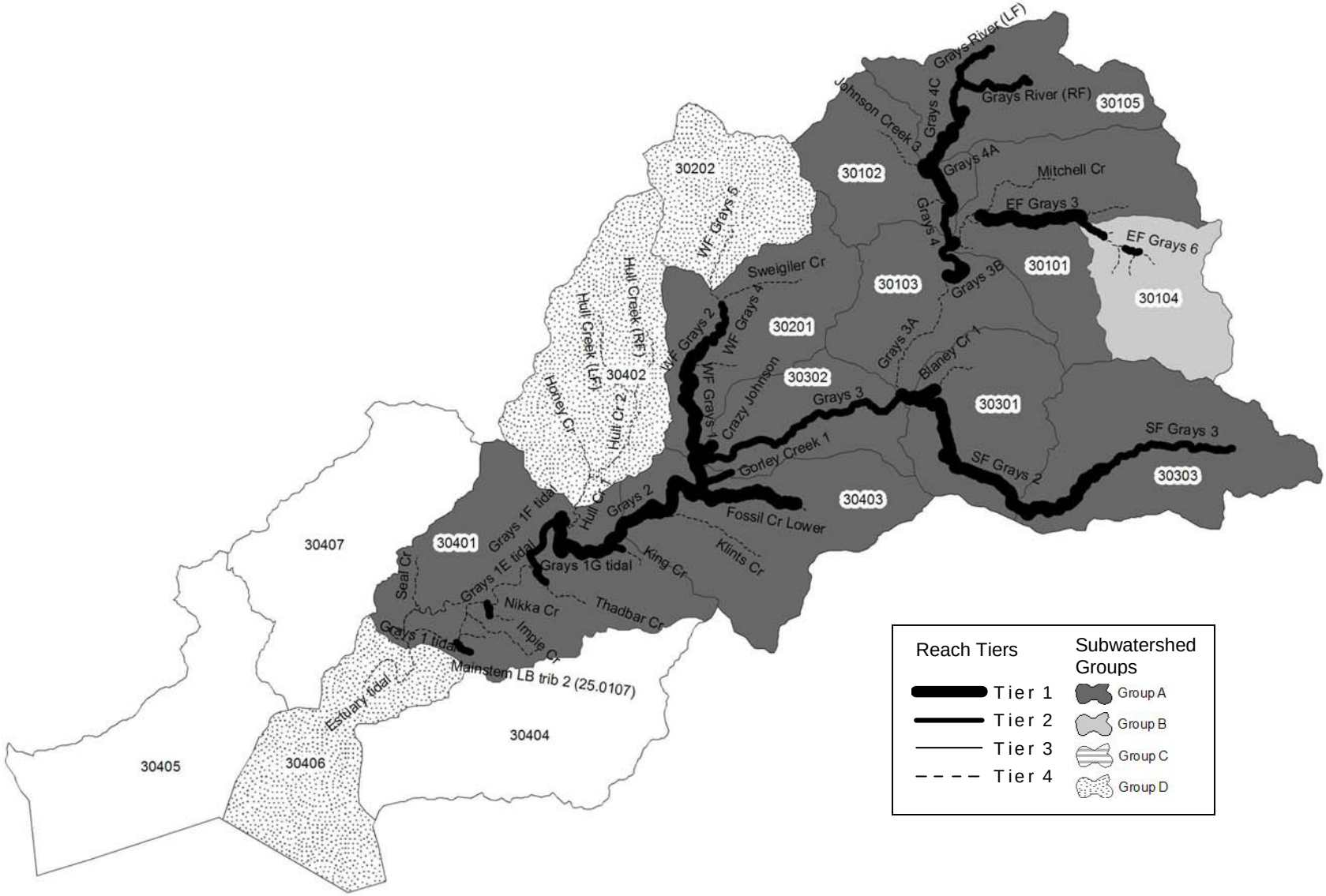


Figure 3-4. Reach tiers and subwatershed groups in the Grays Basin. Tier 1 reaches and Group A subwatersheds represent the areas where recovery actions would yield the greatest benefits with respect to species recovery objectives. The subwatershed groups are based on Reach Tiers. Priorities at the reach scale are useful for identifying stream corridor recovery measures. Priorities at the subwatershed scale are useful for identifying watershed process recovery measures. Watershed process recovery measures for stream reaches will need to occur within the surrounding (local) subwatershed as well as in upstream contributing subwatersheds.

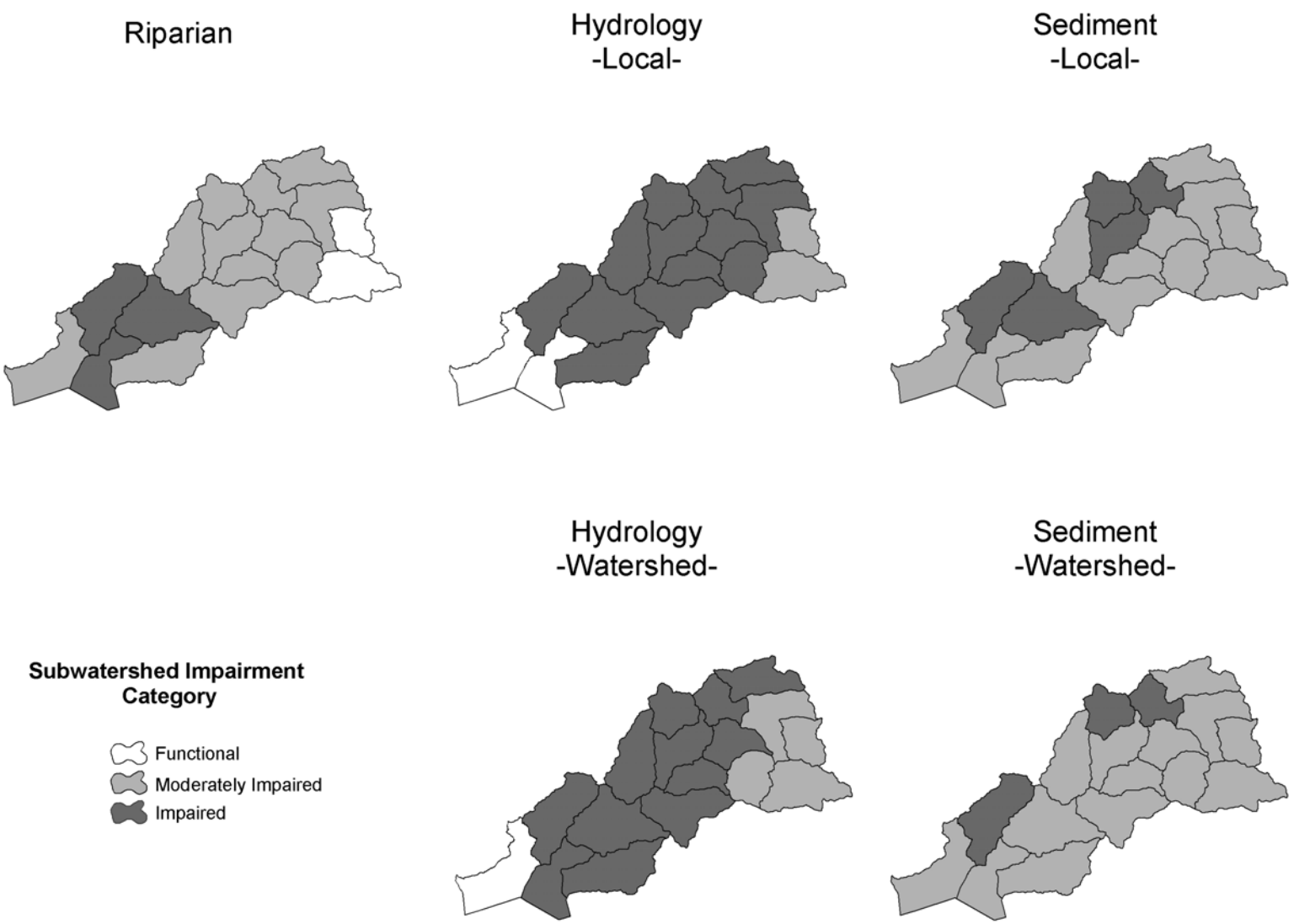


Figure 3-5. IWA subwatershed impairment ratings by category for the Grays Basin. Watershed process impairment ratings are based on landscape conditions that influence the hydrologic regime, the sediment regime, and riparian function. See Volume II and Volume V of the Recovery Plan Technical Foundation for additional information.

Table 3-5. Summary Table of reach- and subwatershed-scale limiting factors in priority areas. The table is organized by subwatershed groups, beginning with the highest priority group. Species-specific reach priorities, critical life stages, high impact habitat factors, and recovery emphasis (P=preservation, R=restoration, PR=restoration and preservation) are included. Watershed process impairments: F=functional, M=moderately impaired, I=impaired. Species abbreviations: ChS=spring Chinook, ChF=fall Chinook, StS=summer steelhead, StW=winter steelhead.

Sub-watershed Group	Sub-watershed	Reaches within subwatershed	Species Present	High priority reaches by species	Critical life stages by species	High impact habitat factors	Preservation or restoration emphasis	Watershed processes (local)			Watershed processes (watershed)	
								Hydrology	Sediment	Riparian	Hydrology	Sediment
A	30403	Grays 2B	ChF	none				I	M	M	I	M
		Grays 2A Fossil Cr Lower Klints Cr Lower Gorley Creek 1 Gorley Creek 2 Fossil Cr Klints Cr	Chum	Grays 2B Fossil Cr Lower Klints Cr Lower	Spawning Egg incubation Fry colonization Adult holding Adult migrant	habitat diversity sediment	PR					
			StW	Grays 2B	Egg incubation Summer rearing	none	PR					
			Coho	Grays 2B Grays 2A	Egg incubation Fry colonization Summer rearing	channel stability temperature sediment key habitat quantity	R					
	30401	Grays 2 Grays 1G tidal Grays 1F tidal King Cr Lower Nikka Cr Lower Thadbar Cr Lower Mainstem LB trib 1 (25.0105)	ChF	Grays 2	Spawning Egg incubation Fry colonization Adult holding	sediment	P	I	I	I	I	M
			Chum	Grays 2	Egg incubation Fry colonization Adult holding	none	PR					
		Grays 1 tidal	StW	none								
		Grays 1B tidal Grays 1C tidal Grays 1D tidal Grays 1E tidal Hull Cr 1 Impie Cr Lower Seal Slough 1 Impie Cr King Cr Malone Cr Malone Cr Lower Nikka Cr Seal Slough 2 Thadbar Cr Mainstem LB trib 2 (25.0107) Seal Cr	Coho	Grays 2 Grays 1G tidal	Egg incubation Summer rearing Winter rearing Adult holding	channel stability temperature predation sediment key habitat quantity	R					
	30302	Grays 2C	ChF	none				I	M	M	I	M
		Grays 2D Crazy Johnson Grays 3	Chum	Grays 2C Grays 2D Crazy Johnson	Spawning Egg incubation Fry colonization Adult holding	habitat diversity sediment	PR					
			StW	none								
			Coho	Grays 2C	Egg incubation Summer rearing Winter rearing	channel stability temperature sediment key habitat quantity	R					
	30301	Blaney Cr 1 Blaney Cr 2 SF Grays 1 SF Grays 2	StW	Blaney Cr 1 SF Grays 1 SF Grays 2	Spawning Egg incubation Fry colonization Summer rearing Winter rearing Adult holding		R	I	M	M	M	M
	30201	WF Grays 1 Lower	ChF	none				I	I	M	I	M
		WF Grays 1 WF Grays 2 WF Grays 3 WF Grays 4	Chum	WF Grays 1 Lower	Spawning Egg incubation Fry colonization Adult holding	habitat diversity key habitat quantity	PR					
		Shannon Cr Sweigiler Cr	StW	WF Grays 1 Lower WF Grays 1 WF Grays 2 WF Grays 3	Egg incubation Fry colonization Summer rearing Winter rearing	habitat diversity temperature flow sediment pathogens	PR					
			Coho	none								
	30105	Beaver Cr Grays 4B Grays 4C Grays River (LF)	StW	Beaver Cr Grays 4B	Egg incubation Fry colonization Summer rearing Winter rearing	habitat diversity flow sediment key habitat quantity	R	I	M	M	I	M
		Grays River (RF)	Coho	none								
	30103	Grays 3B Grays 3C Grays 3A	StW	Grays 3B	Egg incubation Summer rearing	habitat diversity temperature flow sediment	R	I	M	M	I	M
	30102	Grays 4A Grays 4 Cabin Creek Johnson Creek 1 Johnson Creek 2 Johnson Creek 3	StW	Grays 4A	Egg incubation Summer rearing Winter rearing	habitat diversity sediment	R	I	I	M	I	I

Sub-watershed Group	Sub-watershed	Reaches within subwatershed	Species Present	High priority reaches by species	Critical life stages by species	High impact habitat factors	Preservation or restoration emphasis	Watershed processes (local)			Watershed processes (watershed)	
								Hydrology	Sediment	Riparian	Hydrology	Sediment
A	30101	EF Grays 1 EF Grays 3 EF Grays 4 EF Grays 2 EF LB Trib 1 (not listed) EF RB trib 1 (not listed) Mitchell Cr	StW	EF Grays 1 EF Grays 3	Egg incubation Fry colonization Summer rearing Winter rearing	flow sediment	PR	I	M	M	M	M
	30303	SF Grays 2 SF Grays 3	StW	SF Grays 2	Spawning Egg incubation Fry colonization Summer rearing Winter rearing Adult holding	sediment key habitat quantity	R	M	M	F	M	M
B	30104	EF Grays 6 EF Grays 5 EF Grays 7 EF LB Trib 2 (not listed) EF LB Trib 3 (not listed) EF RB trib 2 (not listed)	StW	none				M	M	F	M	M
D	30402	Hull Cr 2	Chum	none				I	M	M	I	M
		Honey Cr	StW	none								
		Honey Cr Lower Hull Creek (LF) Hull Creek (RF)	Coho	none								
	30202	WF Grays 5	StW	none				I	I	M	I	I
	30406	Estuary tidal	All	none				F	M	I	I	M

Table 3-6. Salmonid habitat limiting factors and threats in priority areas. Priority areas include the middle mainstem & tributaries (MM), headwaters/EF Grays (HW), South Fork Grays (SF), and West Fork Grays (WF). Linkages between each threat and limiting factor are not displayed – each threat directly and indirectly affects a variety of habitat factors.

Limiting Factors	MM	HW	SF	WF
Habitat connectivity				
Blockages to off-channel habitats	✓			
Habitat diversity				
Lack of stable instream woody debris	✓	✓	✓	✓
Altered habitat unit composition	✓	✓	✓	✓
Loss of off-channel and/or side-channel habitats	✓			
Channel stability				
Bed and bank erosion	✓	✓	✓	✓
Channel down-cutting (incision)	✓		✓	
Mass wasting		✓	✓	
Riparian function				
Reduced stream canopy cover	✓	✓	✓	✓
Reduced bank/soil stability	✓	✓	✓	✓
Exotic and/or noxious species	✓			
Reduced wood recruitment	✓	✓	✓	✓
Floodplain function				
Altered nutrient exchange processes	✓			
Reduced flood flow dampening	✓			
Restricted channel migration	✓			
Disrupted hyporheic processes	✓			
Stream flow				
Altered magnitude, duration, or rate of change	✓	✓	✓	✓
Water quality				
Altered stream temperature regime	✓	✓	✓	✓
Excessive turbidity	✓		✓	✓
Bacteria	✓			
Substrate and sediment				
Excessive fine sediment	✓	✓	✓	✓
Embedded substrates	✓	✓	✓	✓

Threats	MM	HW	SF	WF
Agriculture / grazing				
Clearing of vegetation	✓			
Riparian grazing	✓			
Floodplain filling	✓			
Forest practices				
Timber harvests –sediment supply impacts	✓	✓	✓	✓
Timber harvests – impacts to runoff	✓	✓	✓	✓
Riparian harvests (historical)		✓	✓	✓
Forest roads – impacts to sediment supply	✓	✓	✓	✓
Forest roads – impacts to runoff	✓	✓	✓	✓
Forest roads – riparian/floodplain impacts		✓		
Splash-dam logging (historical)	✓	✓	✓	
Channel manipulations				
Bank hardening	✓			
Channel straightening	✓			
Artificial confinement	✓			
Dredge and fill activities	✓			

Table 3-7. Habitat measures in priority areas, with reference to limiting factors addressed, threats addressed, target species, and estimated time until benefits would be realized (time). Tier 1 and 2 reaches, or other areas of known priority, are listed under the location column for some measures (i.e., stream corridor measures). Reaches not included in the table (Tiers 3, 4, and non-tiered reaches) are considered secondary priority.

Location	Limiting Factors Addressed	Threats Addressed	Target Species	Time	Discussion
1. Protect and restore floodplain function and channel migration processes ***A. Set back, breach, or remove artificial channel confinement structures***					
Middle mainstem + tribs Grays 1F-2D; Thadbar lower; King lower; Klints lower; Fossil lower	• Bed and bank erosion • Altered habitat unit composition • Restricted channel migration • Disrupted hyporheic processes • Reduced flood flow dampening • Altered nutrient exchange processes • Channel incision	• Floodplain filling • Channel straightening • Artificial confinement	• chum • Coho • Fall Chinook	2-15 years	Great potential benefit due to improvements in many limiting factors. This passive restoration approach can allow channels to restore naturally once confinement structures are removed. There are challenges with implementation due to private lands, existing infrastructure already in place, potential flood risk to property, and large expense.
2. Protect and restore off-channel and side-channel habitats ***A. Restore historical off-channel and side-channel habitats where they have been eliminated*** ***B. Provide access to blocked off-channel habitats*** ***C. Create new off-channel or side-channel habitats (i.e., spawning channels)***					
Middle mainstem + tribs Grays 1F-2D; Thadbar lower; King lower; Klints lower; Fossil lower	• Blockages to off-channel habitats • Loss of off-channel and/or side-channel habitat • Altered habitat unit composition	• Floodplain filling • Channel straightening • Artificial confinement	• Chum • Coho	2-15 years	Good potential benefit especially for chum, which have lost a significant portion of historically available off-channel habitat for spawning. There has already been good success with this type of restoration in the Grays Basin (Gorley Creek, Crazy Johnson Creek). There are challenges with further implementation due to private lands, existing infrastructure already in place, potential flood risk to property, and large expense.
3. Protect and restore riparian function ***A. Reforest riparian zones*** ***B. Allow for the passive restoration of riparian vegetation*** ***C. Livestock exclusion fencing***					

Location	Limiting Factors Addressed	Threats Addressed	Target Species	Time	Discussion
D. Invasive species eradication ***E. Hardwood-to-conifer conversion***					
Middle mainstem + tribs Grays 1F-2D; Thadbar lower; King lower; Klints lower; Fossil lower ***Headwaters/EF Grays*** Grays 3B-4C, LF, RF; Beaver Cr; EF Grays 1, 3-4, 6 ***SF Grays*** SF Grays 1-3; Blaney 1 ***WF Grays*** WF Grays 1-4	• Reduced stream canopy cover • Altered stream temperature regime • Reduced bank/soil stability • Reduced wood recruitment • Lack of stable instream woody debris • Exotic and/or noxious species	• Timber harvest – riparian harvests • Riparian grazing • Clearing of vegetation due to residential development and agriculture	• All species	20-100 years	High potential benefit due to the many limiting factors that are addressed. Riparian impairment is related to most land-uses and is a concern throughout the basin. Riparian protections on forest lands are provided for under current harvest policy. Riparian restoration projects are relatively inexpensive and are often supported by landowners. Whereas the specified stream reaches are the highest priority for riparian measures, riparian restoration and preservation should occur throughout the basin since riparian conditions affect downstream reaches. Use IWA riparian ratings to help identify restoration and preservation opportunities.
4. Protect and restore streambank stability ***A. Restore eroding streambanks*** ***B. Restore mass wasting (landslides, debris flows) within river corridors***					
Middle mainstem + tribs Grays 2C-2D; King lower; Klints lower; Fossil lower ***Headwaters mainstem*** Grays 4B-4C ***West Fork Grays*** WF Grays 1-4 ***South Fork Grays*** SF Grays 1-2 ***South Fork Grays*** SF Grays	• Reduced bank/soil stability • Excessive fine sediment • Excessive turbidity • Embedded substrates	• Artificial confinement • Clearing of vegetation • Roads – riparian / floodplain impacts • Riparian grazing • Timber harvest – riparian harvests	• All species	5-50 years	There are several areas of bank instability on the mainstem, including primarily the Gorley Spring area. Mass wasting sites (debris flows, landslides) create turbidity problems on middle mainstem tributaries, mainstem headwaters, WF, and SF reaches. Bio-engineered approaches that rely on structural as well as vegetative measures are the most appropriate restoration measures. These projects have a high risk of failure if causative factors are not adequately addressed.
5. Protect and restore natural sediment supply processes ***A. Address forest road related sources*** ***B. Address timber harvest related sources*** ***C. Address agricultural sources***					
Entire basin	• Excessive fine sediment	• Timber harvest –	• All species	5-50 years	High potential benefit due to sediment effects on egg incubation and early rearing.

Location	Limiting Factors Addressed	Threats Addressed	Target Species	Time	Discussion
	• Excessive turbidity • Embedded substrates	impacts to sediment supply • Forest roads – impacts to sediment supply • Agricultural practices – impacts to sediment supply			Improvements are expected on timber lands due to requirements under the new FPRs and forest land HCPs. There are challenges with implementation on agricultural lands due to few sediment-focused regulatory requirements for agricultural lands. Use IWA impairment ratings to identify restoration and preservation opportunities.
6. Protect and restore runoff processes ***A. Address forest road impacts*** ***B. Address timber harvest impacts*** ***C. Limit additional watershed imperviousness***					
Entire basin	• Stream flow – altered magnitude, duration, or rate of change of flows	• Timber harvest – impacts to runoff • Forest roads – impacts to runoff	• All species	5-50 years	High potential benefit due to flow effects on habitat formation, redd scour, and early rearing. Improvements are expected on timber lands due to requirements under the new FPRs and forest land HCPs. Use IWA impairment ratings to identify restoration and preservation opportunities.
7. Protect and restore instream flows ***A. Water rights closures*** ***B. Purchase or lease existing water rights*** ***C. Relinquishment of existing unused water rights*** ***D. Enforce water withdrawal regulations*** ***E. Implement water conservation, use efficiency, and water re-use measures to decrease consumption***					
Entire basin	• Stream flow – altered magnitude, duration, or rate of change of flows	• Water withdrawals	• All species	1-5 years	Instream flow management strategies for the Grays basin have been identified as part of Watershed Planning for WRIA 25 (LCFRB 2004). Strategies include water rights closures, setting of minimum flows, and drought management policies.
8. Protect and restore water quality ***A. Restore the natural stream temperature regime*** ***B. Reduce fecal coliform bacteria levels*** ***C. Reduce turbidity sources***					
Entire basin	• Altered stream temperature regime	• Riparian harvests • Timber harvests –	• All species	1-50 years	Primary emphasis for restoration should be placed on stream segments that are on the

Location	Limiting Factors Addressed	Threats Addressed	Target Species	Time	Discussion
	• Bacteria • Excessive turbidity	sediment supply impacts • Forest roads – sediment supply impacts • Clearing of vegetation for agricultural uses • Riparian grazing			2004 303(d) list.
9. Protect and restore instream habitat complexity ***A. Place stable woody debris in streams to enhance cover, pool formation, bank stability, and sediment sorting*** ***B. Structurally modify stream channels to create suitable habitat types***					
Middle mainstem + tribs Grays 1F-2D; Thadbar lower; King lower; Klints lower; Fossil lower ***Headwaters/EF Grays*** Grays 3B-4C, LF, RF; Beaver Cr; EF Grays 1, 3-4, 6 ***SF Grays*** SF Grays 1-3; Blaney 1 ***WF Grays*** WF Grays 1-4	• Lack of stable instream woody debris • Altered habitat unit composition	• None (symptom-focused restoration strategy)	• Coho • Winter steelhead	2-10 years	Moderate potential benefit due to the high chance of failure. Failure is probable if habitat-forming processes are not also addressed. These projects are relatively expensive for the benefits accrued. Moderate to high likelihood of implementation given the lack of hardship imposed on landowners and the current level of acceptance of these type of projects.
10. Protect habitat conditions and watershed functions through land-use planning that guides population growth and development ***A. Plan growth and development to avoid sensitive areas (e.g., wetlands, riparian zones, floodplains, unstable geology)*** ***B. Encourage the use of low-impact development methods and materials*** ***C. Apply mitigation measures to off-set potential impacts***					
Entire basin	***Preservation Measure*** – addresses many potential limiting factors and threats		• All species	5-50 years	The focus should be on management of land-use conversion and managing continued development in sensitive areas (e.g., wetlands, stream corridors, unstable slopes). Many critical areas regulations do not have a mechanism for restoring existing degraded areas, only for preventing additional degradation. Legal and/or voluntary

Location	Limiting Factors Addressed	Threats Addressed	Target Species	Time	Discussion
					mechanisms need to be put in place to restore currently degraded habitats.
11. Protect habitat conditions and watershed functions through land acquisition or easements where existing policy does not provide adequate protection ***A. Purchase properties outright through fee acquisition and manage for resource protection*** ***B. Purchase easements to protect critical areas and to limit potentially harmful uses*** ***C. Lease properties or rights to protect resources for a limited period***					
Entire basin	***Preservation Measure*** – addresses many potential limiting factors and threats		• All species	5-50 years	Land acquisition and conservation easements in riparian areas, floodplains, and wetlands have a high potential benefit. These programs are under-funded and have low landowner participation. In the lower, estuarine portion of the basin, the Columbia Land Trust has purchased approximately 500 acres and intends to restore estuarine habitats where feasible.

3.5 Program Gap Analysis

The Grays Basin (~124 sq mi) is located in Pacific and Wahkiakum Counties. The Basin can be characterized as predominantly forested, with agricultural uses occurring in the lower mainstem river valley and the lower reaches of mainstem tributaries.

- There is no federal land ownership in the Grays River Basin.
- The Washington Department of Natural Resources public lands comprise approximately 12 square miles.
- Approximately 91 square miles of the Grays River Basin are owned and managed by commercial timber companies.
- Much of the Grays River headwaters, including the West Fork and upper Grays River mainstem are in Pacific County.
- The lower mainstem river valley and much of the South Fork Grays are located in Wahkiakum.

Protection Programs

Protection programs in the Grays River Basin are implemented by private forest owners under the state forest practice rules, Pacific and Wahkiakum Counties, the Grays River Habitat Enhancement District, the Department of Natural Resources, and nonprofit organizations, such as the Columbia Land Trust. Protection programs in this analysis include those programs that protect habitat conditions or watershed functions through regulatory measures, through the acquisition of sensitive habitats or protective easements, incentives, or by applying standards to new development that protects resources by avoiding damaging impacts. Major programs implementing protection measures are identified below.

Federal Protection Programs

- ***U.S. Army Corps of Engineers***

  - Regulatory Program: The Corps administers the Section 10 (Rivers and Harbor Act) and Section 404 (Clean Water Act) permit processes. Section 10 requires approval of any activity in, above, or below a navigable river, which affects course, location, condition, or capacity of navigable waters. Section 404 requires prior approval of dredging, filling, grading, clearing, and bank hardening. In waters used by listed fish species, the permits are subject to ESA Section 7 consultation with NOAA Fisheries to ensure that any approved action is adequately protective of the fish; [M.1A; M.2A; M.2B; M.4A; M.9A; M.9B]

State Protection Programs

- ***Department of Natural Resources***

  - State Forest Land HCP:

    State forestlands are managed under the provisions of a Habitat Conservation Plan (HCP). The Habitat Conservation Plan protects riparian areas through the use of buffers,

mitigates impacts on watershed processes through harvest restrictions and new road construction standards that are more stringent than Forest Practices Rules. [M.3A; M.3B; M.5A; M.5B; M.6A; M.6B; M.8A; M.8C]

- State Forest Practices:

  Riparian zones and harvest restrictions represent significant protections under the State of Washington Forest Practices Rules, including the Forest and Fish Module. These rules also establish standards for new road construction addressing management of runoff, sediment, and slope failure. [M.3A; M.3B; M.5A; M.5B; M.6A; M.6B; M.8A; M.8C]

➢ ***Washington Department of Fish and Wildlife***

- Washington State Hydraulic Code

  The Washington State Hydraulic Code is administered through the Washington Department of Fish and Wildlife. The purpose of this program is to protect stream conditions and habitat. The regulations apply to such activities as stream bank protection, instream construction, culvert installation, channel changes or realignments, debris removal, and water diversion facilities. Those proposing such actions must obtain a Hydraulic Project Approval (HPA) permit. [M.1A; M.2A; M.2B; M.4A; M.9A; M.9B]

- Habitat Program: The Department provides advice to local governments and landowners interested in measures to protect habitat values on their property. [M.1A; M.2A; M.2B; M.3A; M.4A; M.4B; M.6C; M.8A; M.8C; M.9A; M.9B; M.10A; M.10B; M.10C]

➢ ***Washington Department of Ecology***

- Water Resources Program/Water Rights: Department of Ecology, in consultation with the Department of Fish and Wildlife, has administrative closed selected areas within the Grays Basin to further surface and groundwater withdraws (where groundwater is in continuity with surface water). Existing administrative closures by the Department of Ecology protect surface waters from further withdrawals. Formal rule making would strengthen the closures. The extent of unauthorized surface water withdrawals is unknown, but could exacerbate summer low flows on smaller tributaries. [M.7A; M.7B; M.7C; M.7D]

- Water Resources Program/Watershed Planning: In cooperation with the Lower Columbia Fish Recovery Board, other state and federal agencies, tribes, local governments, and citizens, the Department funds and participates in a state authorized watershed planning process for Water Resource Inventory Area (WRIA) 25 pursuant to RCW 90.82. The goal of the plan is to ensure adequate water for people and fish. The planning process is dealing with water quantity and quality, stream flows and fish habitat. Once approved by counties within the WRIA, the plan will be binding on state agencies and local governments. [M.7A; M.7B; M.7C; M.7D]

➢ ***Department of Transportation***

- Road Maintenance Program

WSDOT has an ESA Section 4(d) Road Maintenance Program. The Maintenance Program uses trained crews to primarily manage roadside vegetation, litter control, and maintenance of safety rest areas associated with SR 4. [M.10A]

- ***Salmon Recovery Funding Board (SRFB)/ Lower Columbia Fish Recovery Board (LCFRB)***

  - Washington Salmon Recovery Act (RCW 77.85): The SRFB and the LCFRB jointly administer a grant program that allocates federal Pacific Salmon Recovery Funds and State funds for habitat protection and restoration projects by state and local agencies, nonprofit organizations, and landowners. To date the SRFB has granted $2.26 million for acquisition and restoration efforts in the Grays. [M.1A; M.2A; M.2B; M.3A; M.4A; M.4B; M.8A; M.8B; M.8C; M.9A; M.9B; M.11A; M.11B]

- ***Conservation Commission/ Wahkiakum Conservation Districts*** provides technical assistance and incentives (e.g., Conservation Reserve and Enhancement Program) to encourage agricultural landowners to protect riparian areas and stream habitat. The Wahkiakum Conservation District has been actively involved in the Grays watershed. These programs could help address measure M.3A; M.3C; M.4A; M.5C; M.8A; M.8C; M.9A; M.9B]

Local Government Programs

- ***Pacific County***

  - Lands within Pacific County in the Grays River Basin are zoned 'Commercial Forestry District; While the number of acres are relatively large, the only land use within Pacific county portion of the Grays River is commercial forestry and it is regulated primarily under Washington State Forest Practices Rules; [M.10A; M.10B; M.10C]

- ***Wahkiakum County***

  - Comprehensive Planning and Land Use Zoning: M.10A; M.10B; M.10C]
    - The County has adopted a comprehensive plan and zoning. The County land use program is subject to the Washington Growth Management Act (GMA), except for the requirement to adopt a Critical Areas Ordinance.
    - The County Critical Areas Ordinance provides for stream buffers from 25 to 200 feet depending on stream type and intensity of use. Wetland buffers also vary from 25 to 200 feet.
    - The County has adopted a Shoreline Master Program to regulate development.

Community Programs

- ***Columbia Land Trust*** is a nonprofit organization whose mission is to preserve and restore unique landscapes, natural areas, and sensitive habitats. It has acquired approximately 500 acres in the lower, estuarine portion of the basin and continues to acquire additional lands in

the lower reaches of Deep River and the Grays River for subsequent restoration activities. [M.11A; M.11B]

Restoration Programs

Restoration programs in the Grays River Basin are implemented by a variety of agencies, organizations, and private interests. Major programs implementing protection measures are identified below:

Federal Restoration Programs

- ***U.S. Army Corps of Engineers***

  - Ecosystem Restoration: The Corps entered into a Section 1135 ecosystem restoration agreement for the Grays River with the Washington Department of Fish And Wildlife, Wahkiakum County, the Grays River Habitat Enhancement District, the Lower Columbia Fish Recovery Board, the Columbia Land Trust and other interested parties. The project is on hold due to a Corps funding rescission. [M.1A; M.2A; M.2B; M.3A; M.4A; M.8A; M.8C]

State Restoration Programs

- ***Department of Natural Resources*:**

  - State Forest Land Habitat Conservation Plan (HCP): The Department manages state forest lands pursuant to a Habitat Conservation Plan (HCP). The HCP road maintenance and restoration objectives require barrier upgrades and road abandonment and/or other improvements. [M.3A; M.3B; M.5A; M.5B; M.6A; M.6B; M.8A; M.8C]

  - State Forest Practices Act:
    - ✓ Industrial forests within the Grays Basin are governed by Forest and Fish regulations and have rigid schedules for maintaining and improving roads and removing barriers. Industrial landowners have 15 years to bring roads and barriers into compliance with regulations [M.3A; M.3B; M.5A; M.5B; M.6A; M.6B; M.8A; M.8C]
    - ✓ Small private forest owners are governed by Forest and Fish regulations; however their road and barrier maintenance and improvement programs are tied to state funding. In the State 2003-05 Biennial Budget, 2 million dollars was allocated statewide to support small private forest owners [M.3A; M.3B; M.5A; M.5B; M.6A; M.6B; M.8A; M.8C]

- ***Department of Fish and Wildlife***

  - Habitat Program: The Department provides advice to local governments and landowners interested in measures to restoring watershed processes and stream habitat. [M.1A; M.2A; M.2B; M.3A; M.4A; M.4B; M.6C; M.8A; M.8C; M.9A; M.9B; M.10A; M.10B; M.10C]

- ***Department of Ecology***

  - Water Quality Program: The Grays and West Fork have been listed on the WA State 303(d) list for temperature. [M.8A; M.8B; M.8C]

  - Water Resources Program/Watershed Planning:
    The planning process for WRIA 25 is dealing with water quantity and quality, stream flows and fish habitat. Potential restoration efforts address improving summer low flows through conservation and acquisition of water rights. Once approved by counties within the WRIA, the plan will be binding on state agencies and local governments. [M.7A; M.7B; M.7C; M.7D; M.8A; M.8B; M.8C; M.10A]

- ***Salmon Recovery Funding Board (SRFB)/ Lower Columbia Fish Recovery Board***

  - Washington Salmon Recovery Act (RCW 77.85): As noted under preservation programs above, the SRFB and the LCFRB jointly administer a grant program that allocates federal Pacific Salmon Recovery Funds and State funds for habitat protection and restoration projects by state and local agencies, nonprofit organizations, and landowners. To date the SRFB has granted $2.26 million for acquisition and restoration efforts in the Grays River to restore wetlands, remove dikes and preserve old growth in Deep and Grays Rivers and Brook Slough. [M.1A; M.2A; M.3A; M.4.A; M.4B; M.8A; M.8C; M.9A; M.9B

- ***Conservation Commission/ Wahkiakum Conservation District*** provides technical assistance (e.g., farm plans) and incentives (e.g., Conservation Reserve and Enhancement Program) to encourage agricultural landowners to restore riparian areas and stream habitat. The Wahkiakum Conservation District has been active in the Grays basin. These programs could help address measures M.1A; M.2A; M.2B; M.3A; M.4A; M.5C; M.8A; M.8C; M.9A; M.9B]

Local Government Restoration Programs

- ***Wahkiakum County***

  - Public Works Program: The County maintains an active and ongoing program of identifying and replacing culverts that are a barrier to fish passage.

  - County Noxious Weed Control Board: The Board has three primary programs that address weed control in the Mill/Abernathy/Germany Basin; [M.3D]

    - ✓ Public education to prevent the spread of noxious weeds;
    - ✓ Survey of the County to assess emerging issues; and
    - ✓ Enforcement of noxious weed control

- **Grays River Habitat Enhancement District:**
  This mission of special purpose district is to enhance fish habitat and provide flood protection in the lower Grays basin. The District is supported landowner assessments and grants. They are currently conducting an assessment of the Grays and have applied for SRFB and NFWF funding for restoration projects. [M.11A; M.11B]

- [M.1A; M.2A; M.2B; M.3A; M.4A; M.4B]

Community Programs

- ***Lower Columbia Fish Enhancement Group*** is one of many nonprofit enhancement groups authorized by state law. The group focuses on restoration projects and has participated in projects in the Mill, Germany, and Abernathy watersheds. M.3A; M.4A; M.8A; M.8C]

- ***Columbia Land Trust*** is a nonprofit organization whose mission is to preserve and restore unique landscapes, natural areas, and sensitive habitats. It is pursuing several projects in the Mill, Germany, and Abernathy watersheds. [M.11A; M.11B; M.11C]

- ***Lower Columbia River Estuary Partnership*** provides guidance and funding to implement habitat restoration activities in the estuary [M.1A; M.2A; M.2B]

- ***Ducks Unlimited*** in collaboration with Columbia Land Trust, the Lower Columbia Fish Recovery Board and other agencies, Ducks Unlimited is restoring wetlands and riparian habitats in the Grays and Deep River watersheds; [M.1A; M.2A; M.2B; M.2C; M.3A; M.3B; M.4A; M.9A]

Gap Analysis

Forest-related Programs: Ninety-five percent of the Grays River Basin is in forest use. Accordingly, forestry programs play a substantial role in protecting and restoring watershed functions and habitat conditions at levels supporting recovery goals. Certainty of forestry-related protection and restoration programs is relatively high because programs are being implemented and, for the most part, fully funded. Program areas of concern include state funding for small commercial forest landowners and the continued potential for hydrologic impacts caused by past harvest practices. Monitoring of watershed processes and habitat conditions will be required to confirm the effectiveness of these measures.

Protection-related Programs: Lands in the Grays River Basin have protections through Pacific and Wahkiakum County's regulatory authority. Pacific County's lands within the Grays Basin are zoned Commercial Forestry. Wahkiakum County's land use programs are significantly more important fro protection of watershed processes and habitat due to the number of land uses in the basin. Wahkiakum County's Critical Areas Ordinances and Shoreline Master Plan should be improved by updating for Best Available Science and recent habitat studies. Other areas of concern include limited protections for habitat and watershed processes on agricultural lands within the Grays River Basin.

Restoration-related Programs: Over a long period of time, improvements to the mid- and lower Grays River will occur as a result of improved forest management practices that are already in place. To the degree possible, programs should focus on restoring floodplain function and channel migration, as well as restoring off- and side-channel habitats.

Table 3-8. Programmatic Actions to Address Gaps

Action #	Lead Agency	Proposed Action
GRAYS.1	Wahkiakum County, Pacific County	Adequately protect riparian areas well enough to attain or maintain Properly Functioning Conditions around all rivers, estuaries, streams, lakes, deepwater habitats, and intermittent streams. Utilize mitigation, where necessary, to offset unavoidable damage to Properly Functioning Conditions in riparian management areas
GRAYS.2	Wahkiakum County, Pacific County	Adequately protect wetlands, wetland buffers, and wetland function. Activities on the landscape must protect wetlands and the vegetation surrounding them to avoid disturbing soils, vegetation, and local hydrology
GRAYS.3	Wahkiakum County	Adequately protect historical stream meander patterns and channel migration zones and avoid hardening stream banks and shorelines
GRAYS.4	Wahkiakum County, Pacific County	Apply land use code enforcement across jurisdictions in a consistent manner, using appropriate funding levels and application
GRAYS.5	State of Washington	Provide state funding for small forest owners in the Grays Basin to a level sufficient to achieve the road and barrier improvements of Forest and Fish on a schedule parallel to private industrial forest owners
GRAYS.6	Forest Managers LCFRB, and DFW	Identify early action forest-wide restoration projects that analysis indicates could provide significant benefits. In these cases, it may be appropriate to identify outside funding to initiate these early actions
GRAYS.7	Commercial Forest Owners, DNR	Monitor watershed functions and habitat conditions over time to evaluate hydrologic impacts
GRAYS.8	LCFRB, DOE, DFW, NOAA, USFWS, ACOE, BPA	Increase available funding for projects that implement measures and addresses underlying threats
GRAYS.9	Wahkiakum County, Wahkiakum CD, Grays Habitat Group	Utilize a combination of public outreach/education, incentives, and authority to positively influence landowner behaviors toward land stewardship in practices not covered by land use regulations
GRAYS.10	WRIA 25/26 PU, DOE, DFW	Close the Grays River to further surface water withdrawals, including groundwater in connectivity with surface waters
GRAYS.11	LCFRB, Wahkiakum County, DFW	Build institutional capacity for agencies and organizations to undertake additional protection and restoration projects (e.g., noxious weed control)
GRAYS.12	SRFB, Fish and Wildlife Foundation	Increase available funding for projects that implement measures and addresses underlying threats
GRAYS.13	LCFRB, Wahkiakum County, Commercial Foresters, Grays Habitat Group	Address threats proactively by building agreement on priorities among the various program implementers
GRAYS.14	FEMA	Update floodplain maps based on Best Available Science