9 Cowlitz Subbasin – Coweeman

Figure 9-1. Location of the Coweeman River Basin within the Lower Columbia River Basin.

9.1 Basin Overview

The Coweeman River basin comprises approximately 200 square miles within Cowlitz County. The Coweeman enters the Cowlitz River just upstream of the mouth near Longview, Washington. Principal tributaries include Goble, Mulholland, and Baird creeks. The basin is part of WRIA 26.

The Coweeman Basin will play a key role in the recovery of salmon and steelhead. The basin has historically supported populations of fall Chinook, winter steelhead, and coho. Today, Chinook and steelhead 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.

Coweeman 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. Direct harvest of listed salmon and steelhead is prohibited 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 Coweeman fish. Key ecological interactions of concern include effects of non-native 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 Coweeman Subbasin.

The Coweeman Basin is almost entirely privately owned (98%) and forestry is the dominant land use. Commercial forestland makes up over 90% of the basin. Much of the lower river valleys are in agricultural and residential uses, with substantial impacts to riparian areas and floodplains in places.

The mainstem Coweeman reaches provide the most spawning and rearing habitat for anadromous fish populations. The middle and upper reaches are most important for winter steelhead. Degraded conditions in these reaches currently limit steelhead production. Intensive upper basin forest harvest and road building have the greatest impact on these channels.

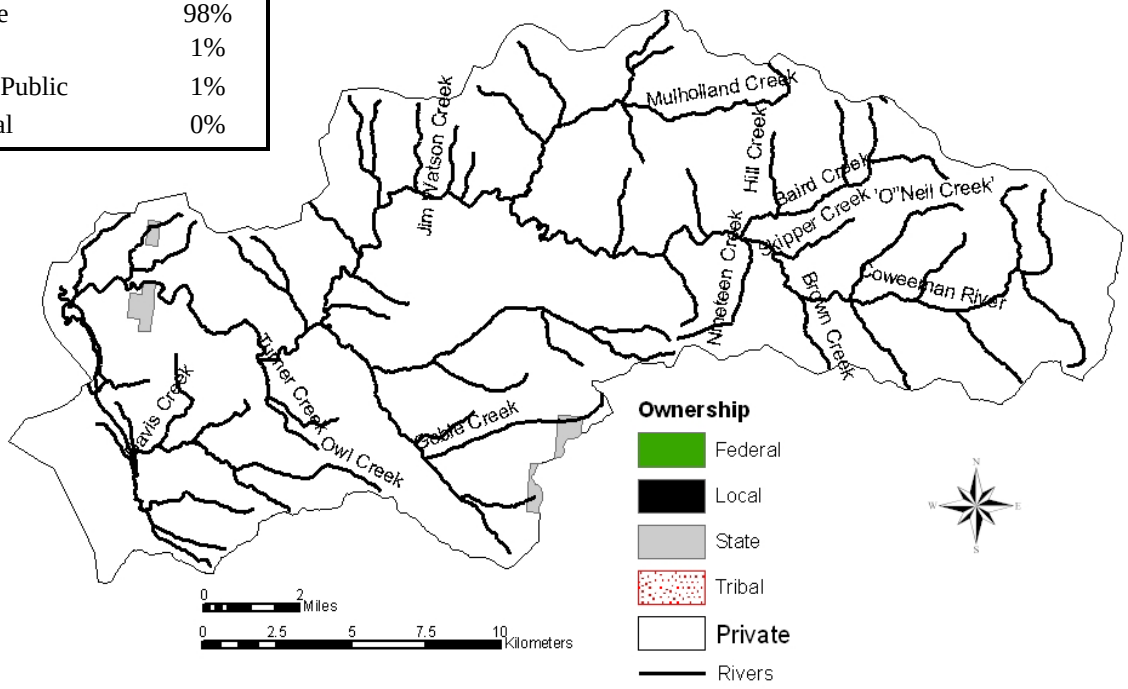
The lower and middle mainstem reaches are used heavily by fall Chinook for spawning. These reaches are impacted by agricultural development and timber harvest. Further degradation of these habitats would have a strong negative impact on the population. Efforts should focus on preventing further degradation as well as improving impaired conditions.

The lower mainstem historically provided productive habitat for chum, though few chum are believed to currently return to the Coweeman River. The reaches used by chum are largely impacted by urban development in the town of Kelso and agricultural and rural residential development just upstream.

The largest population center in the basin is Kelso, WA, located near the river mouth. Projected population change from 2000 to 2020 for unincorporated areas in WRIA 26 is 22%. The town of Kelso has a projected change of 42% by 2020 (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.

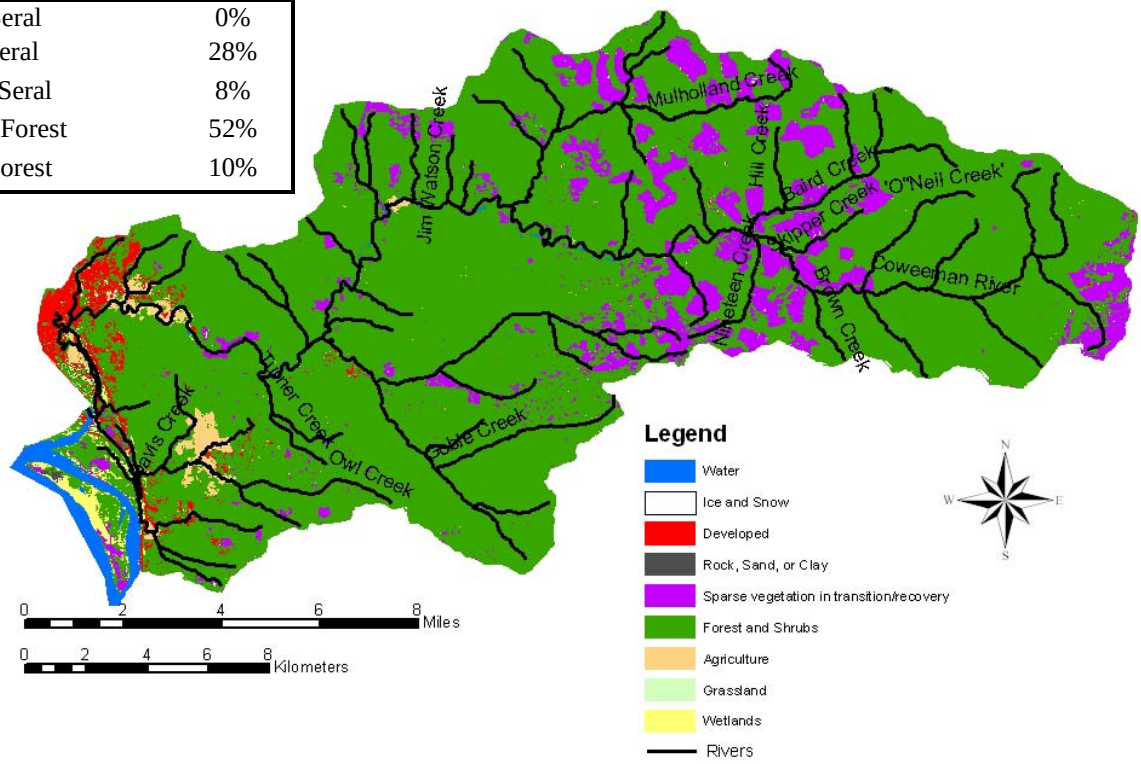
Land Ownership

Land Ownership	
Private	98%
State	1%
Other Public	1%
Federal	0%



Land Use / Cover

Vegitation Composition	
Late Seral	0%
Mid Seral	28%
Early Seral	8%
Other Forest	52%
Non Forest	10%



9.2 Species of Interest

Focal salmonid species in the Coweeman River include fall Chinook, winter steelhead, and coho. The chum population is considered part of the lower Cowlitz population. The health or viability of these populations is currently medium for fall Chinook, low to medium for winter steelhead, and low for coho. 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 three 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 Coweeman Subbasin 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 Coweeman Subbasin although specific spawning and rearing habitat requirements of lamprey are not well known.

Table 9-1. Current viability status of Coweeman populations and the biological objective status that is necessary to meet the recovery criteria for the Cascade strata and the lower Columbia ESU.

	ESA	Hatchery	Current		Objective	
Species	Status	Component	Viability	Numbers	Viability	Numbers
Fall Chinook	Threatened	No	Medium	100-2,100	High+	3,000-4,100
Winter steelhead	Threatened	Yes	Low+	100-1,100	High	800-1,200
Coho	Candidate	No	Low	unknown	High	unknown

Fall Chinook – The historical adult population is estimated from 4,000-7,000 fish. The current natural spawning returns ranges from 100-2,100. There is no hatchery fall Chinook production in the Coweeman. Spawning occurs in the mainstem Coweeman, primarily from Mulholland Creek to the Jeep Club Bridge (about 6 miles). Juvenile rearing occurs near and downstream of the spawning areas. Juveniles migrate from the Coweeman in the spring and early summer of their first year.

Winter Steelhead – The historical adult population is estimated from 3,000-7,000 fish. Current natural spawning returns range from 100-1,100. In-breeding with Chambers Creek or Skamania Hatchery produced steelhead is thought to be low because of differences in spawn timing. Spawning occurs primarily in the mainstem Coweeman, and Goble, Mulholland, and Baird creeks. Juvenile rearing occurs both downstream and upstream of the spawning areas. Juveniles rear for a full year or more before migrating from the Coweeman.

Coho – The historical adult population is estimated from 10,000-25,000, with the majority of returns being late stock which spawn from late November to March. Some early stock coho were also historically present with spawning occurring primarily in early to mid November. Current returns are unknown but assumed to be low. There is no hatchery coho production in the Coweeman. Natural spawning occurs primarily in the mainstem Coweeman, Mulholland Creek, and Baird Creek. Juvenile rearing occurs upstream and downstream of spawning areas. Juveniles rear for a full year in the Coweeman Basin before migrating as yearlings in the spring.

Coastal Cutthroat – Coastal cutthroat abundance in the Coweeman has not been quantified but the population is considered depressed. Both anadromous and resident forms of cutthroat trout are found in the basin. Anadromous forms have access upstream to Washboard Falls (RM 31). Anadromous cutthroat trout enter the Coweeman from July-December and spawn from December through June. Most juveniles rear 2-4 years before migrating from their natal stream. A hatchery cutthroat program was discontinued in 1993.

Pacific lamprey – Information on lamprey abundance is limited and does not exist for the Coweeman population. However, based on declining trends measured at Bonneville Dam and Willamette Falls it is assumed that Pacific lamprey have declined in the Coweeman River also. 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 Coweeman Basin. Juveniles rear in freshwater up to 6 years before migrating to the ocean.

Figure 9-2. Summary of habitat limiting factors, population status, expected population improvement trend with existing programs and biological objectives depicted for the Coweeman Basin.

9.3 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 Washougal 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 quantity and quality has significant impacts on winter steelhead and coho populations. For fall Chinook, loss of tributary habitat is of moderate importance. Loss of estuary habitat is moderately important to fall Chinook, but is of minor importance to both winter steelhead and coho.
- Harvest impacts are of high importance to both fall Chinook and coho, but is of relatively minor importance to winter steelhead.
- Predation is moderately important to all three populations in the Coweeman.
- Impacts from hatcheries and the hydrosystem are relatively minor for each population.

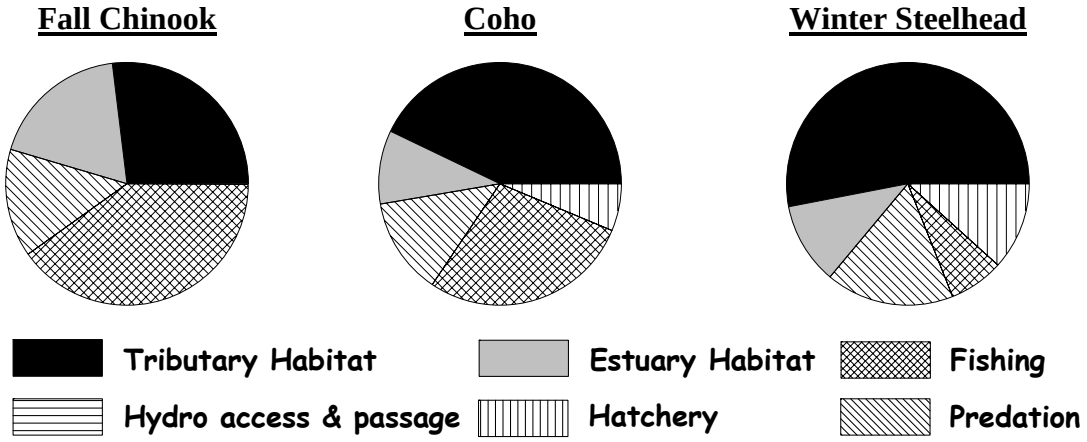


Figure 9-3. Relative contribution of potentially manageable impacts for Coweeman populations.

9.4 Limiting Factors, Threats, and Measures

9.4.1 Hydropower Operation and Configuration

There are no hydro-electric dams in the Coweeman River Basin. However, Coweeman 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.

9.4.2 Harvest

Most harvest of wild Coweeman salmon and steelhead is 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 can be significant for fall Chinook. Coweeman fall Chinook are harvested in ocean and Columbia River commercial sport fisheries as well as in-

basin sport fisheries. Harvest of Coweeman fall Chinook is controlled by an ESA harvest limit associated with a recovery exploitation rate established by NOAA Fisheries. Harvest of Coweeman coho occur in the ocean commercial and recreational fisheries off the Washington and Oregon Coasts and Columbia River. Wild coho impacts are limited by fishery management to retain marked hatchery fish and release unmarked wild fish. There are no sport fisheries for Chinook or coho in the Coweeman River. Incidental mortality of steelhead occurs in Columbia River commercial fisheries directed at Chinook and freshwater sport fisheries directed at hatchery steelhead. All recreational fisheries are managed to selectively harvest marked hatchery fish 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 generally more applicable to steelhead while regional management is more applicable to salmon. Harvest measures with significant application to Coweeman subbasin populations are summarized in the following table:

Table 9-2. Regional harvest measures from Volume I, Chapter 7 with significant application to Coweeman Subbasin.populations.

Measure	Description	Comments
F.M.13	Develop a regional mass marking program for tule fall Chinook	Retention of fall Chinook is prohibited in the Coweeman sport fishery, however marking of other hatchery tule fall Chinook may provide regional selective fishery options
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.

9.4.3 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.

There are no hatcheries operating in the Coweeman Basin. A rearing pond on the Coweeman is used to acclimate winter steelhead tranferres in from the Elochoman Hatchery as pre-smolts. The winter steelhead program provides for harvest opportunity in the Coweeman River. Elochoman Hatchery early timed winter steelhead are a composite stock and are genetically different from the naturally produced steelhead in the Coweeman. The main threats from hatchery steelhead are potential domestication of the naturally produced steelhead as a result of adult interactions or ecological interactions between natural juvenile salmon and hatchery released juvenile steelhead.

Table 9-3.Coweeman Basin hatchery production.

Hatchery	Release Location	Winter Steelhead
Elochoman	Coweeman	20,000

Regional hatchery strategies and measures are focused on evaluating and reducing biological risks and increasing the benefits to natural populations. Regional hatchery measures identified in Volume I, Chapter 7 with specific applications within the Coweeman subbasin are summarized in the following table:

Table 9-4. Regional hatchery measures from Volume I, Chapter 7 with specific implementation actions in the Coweeman Subbasin.

Measure	Description	Comments
H.M36	Evaluate supplementation of natural coho population with appropriate hatchery coho stock.	Research appropriate brood stock source and consider use of Coweeman rearing ponds as part of a coho supplementation strategy.
H.M32	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.M17,34,41	Mark hatchery steelhead, coho, fall Chinook 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.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.

9.4.4 Ecological Interactions

Ecological interactions focus on how salmon and steelhead, other fish species, and wildlife interact with each other and the subbasin ecosystem. Coweeman salmon and steelhead are affected throughout their lifecycle by ecological interactions with non-native species, food web components, and predators. Interactions are similar for Coweeman populations to those of most other subbasin salmonid populations. Ecological Interactions are addressed by regional strategies and measures identified in Volume I.

9.4.5 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 Coweeman populations to those of most other subbasin salmonid populations. Effects are likely to be greater for chum and fall Chinook than spring Chinook, steelhead, and coho. Estuary and mainstem effects on Coweeman 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.

9.4.6 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 Coweeman River basin 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 9-4. A summary of the primary habitat limiting factors and threats are presented in Table 9-6. Habitat measures and related information are presented in Table 9-7. Results of IWA watershed process modeling are depicted for subwatersheds in Figure 9-5. Reach- and subwatershed-scale limiting factors generated from the technical assessment are included in Table 9-5. 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 Coweeman basin include the following:

- Lower mainstem – Coweeman 1-4

- Middle mainstem and Goble Creek – Canyon 1-2; Coweeman 5-12; Goble Creek 1, 4
- Upper mainstem and tributaries – Coweeman 13 – 22; Mulholland 2-3; Baird 1

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.

The lower mainstem reaches contain potentially productive habitat for chum, coho, and fall Chinook, especially reach Coweeman 4, which is just downstream of the Canyon reach. This reach is impacted by changes to the channel, riparian area, and floodplain due primarily to agricultural uses. Reaches 1-3 are impacted by development around the outskirts of Kelso, WA. These reaches have preservation as well as restoration value. The most effective recovery measures will involve riparian and floodplain restoration.

The middle mainstem reaches and Goble Creek are utilized most by winter steelhead, fall Chinook, and coho. They are impacted mostly by forest practices and to a limited degree by agriculture and rural residential uses. These reaches have preservation as well as restoration value. The most effective recovery measures will include riparian restoration and recovery of basin-wide watershed processes.

The upper Coweeman reaches (including Mulholland and Baird Creeks) contain potentially productive habitat for coho, winter steelhead, and fall Chinook. These reaches have preservation as well as restoration value. They are heavily impacted by forest practices occurring throughout the upper Coweeman Basin. Restoration of basin-wide runoff and sediment supply conditions will yield the greatest benefits to fish habitat.

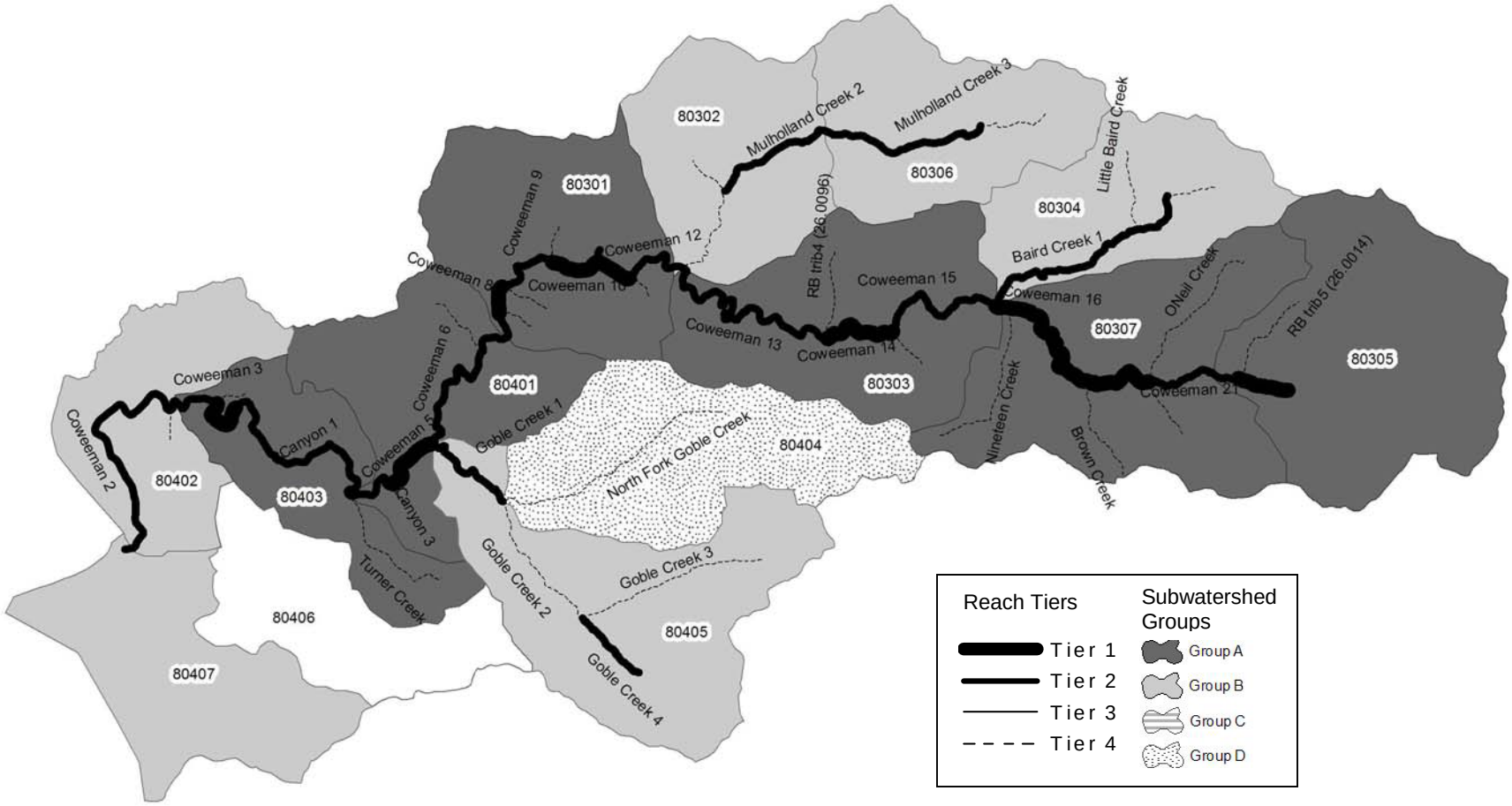


Figure 9-4. Reach tiers and subwatershed groups in the Coweeman Basin. Tier 1 reaches and Group A subwatersheds represent the areas where recovery actions would yield the greatest benefits with respect to species recovery objectives. The subwatershed groups are based on Reach Tiers. Priorities at the 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.

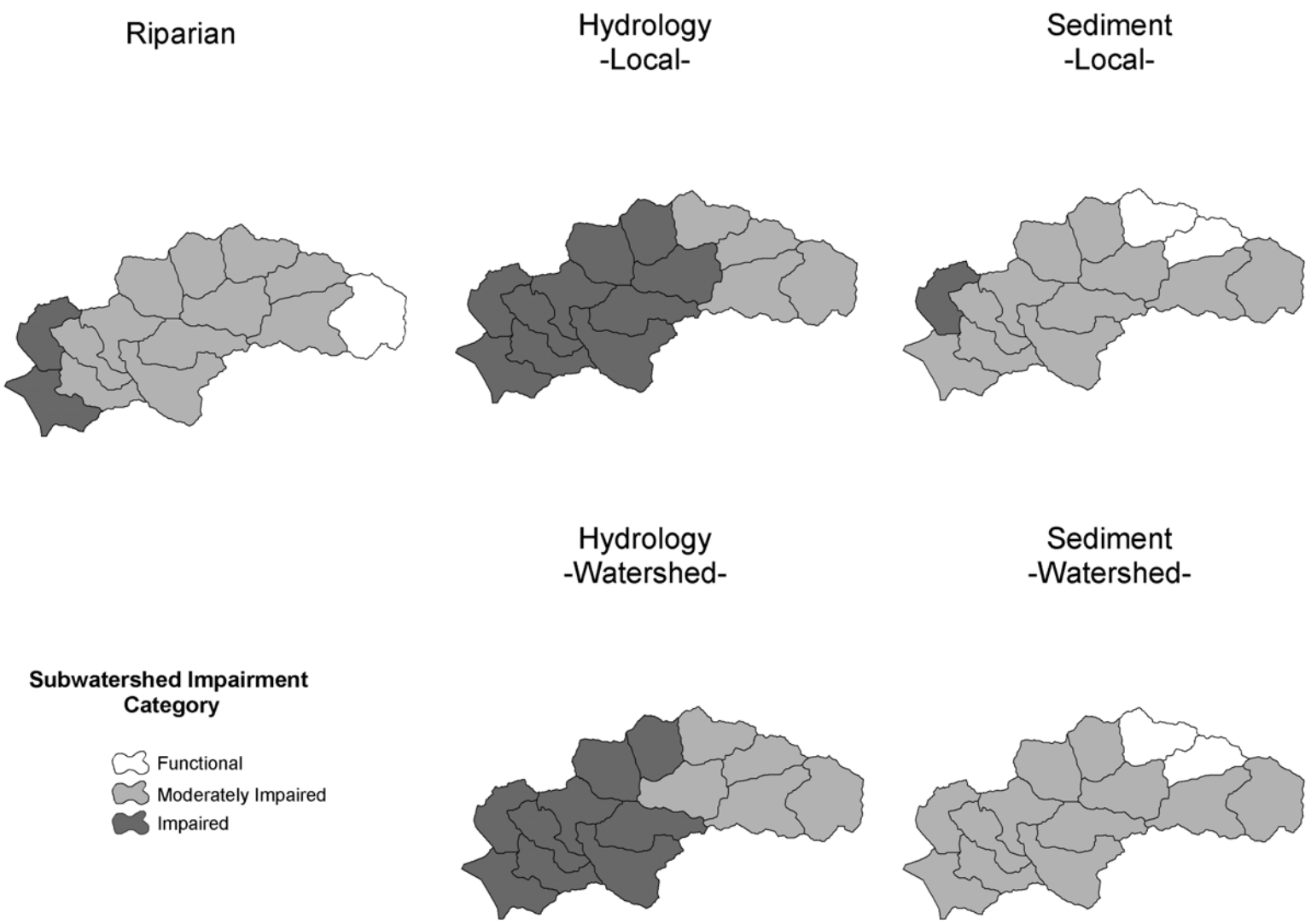


Figure 9-5. IWA subwatershed impairment ratings by category for the Coweeman Basin. Watershed process impairment ratings are based on landscape conditions that influence the hydrologic regime, the sediment regime, and riparian function. See Volume II and Volume V of the Recovery Plan Technical Foundation for additional information.

Table 9-5. 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-watersheds	Reaches within subwatersheds	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	80403	Canyon 1 Coweeman 3 Coweeman 4 Turner Creek RB trib1 (26.0019)	ChF	Coweeman 4	spawning egg incubation early rearing adult holding	temperature sediment	PR	I	M	M	I	M
			Coho	Coweeman 4	egg incubation summer rearing winter rearing	channel stability habitat diversity temperature sediment	R					
			Chum	Coweeman 4	spawning egg incubation fry colonization adult holding	habitat diversity sediment key habitat quantity	P					
			StW	none								
	80401	Canyon 2 Canyon 3 Coweeman 5 Coweeman 6 Coweeman 7 RB trib2 (26.0068) Nye Creek	ChF	Canyon 3 Coweeman 5	spawning egg incubation fry colonization early rearing	temperature sediment	PR	I	M	M	I	M
			Coho	Canyon 3 Coweeman 5	egg incubation summer rearing winter rearing	channel stability habitat diversity sediment	R					
			StW	Coweeman 5	egg incubation summer rearing	habitat diversity	R					
	80303	Coweeman 13 Coweeman 14 Coweeman 15 Coweeman 16 LB trib4 (26.0097) RB trib4 (26.0096)	ChF	Coweeman 16	egg incubation fry colonization adult holding	habitat diversity sediment	P	I	M	M	I	M
			Coho	Coweeman 16	egg incubation summer rearing winter rearing	habitat diversity flow sediment	PR					
			StW	Coweeman 14 Coweeman 16	egg incubation fry colonization summer rearing winter rearing	habitat diversity flow sediment	PR					
	80301	Coweeman 10 Coweeman 11 Coweeman 12 Coweeman 8 Coweeman 9 Sam Smith Creek LB trib2 (26.0071) LB trib3 (26.0072) RB trib3 (26.0079) Jim Watson Creek	ChF	Coweeman 8 Coweeman 10	spawning egg incubation fry colonization early rearing	temperature sediment	PR	I	M	M	I	M
			Coho	Coweeman 8 Coweeman 10 Coweeman 11	egg incubation summer rearing winter rearing	habitat diversity sediment	R					
			StW	Coweeman 8 Coweeman 11	egg incubation summer rearing winter rearing	habitat diversity sediment	PR					
	80307	Brown Creek	ChF	none				M	M	M	M	M
		Coweeman 17	Coho	none								
		Coweeman 18 Coweeman 19 Coweeman 20 Coweeman 21 Nineteen Creek ONeil Creek Martin Creek	StW	Coweeman 17 Coweeman 18 Coweeman 19 Coweeman 20	egg incubation fry colonization summer rearing winter rearing	habitat diversity flow sediment	PR					
	80305	Coweeman 22 RB trib5 (26.0014)	Coho	none				M	M	M	M	M
			StW	Coweeman 22	egg incubation fry colonization summer rearing winter rearing	habitat diversity sediment	R					
B	80407	Coweeman 1 tidal Lower Cowlitz-1	All	none				I	M	I	I	M
	80402	Coweeman 2	All	none				I	I	I	I	M
	80405	Goble Creek 1 Goble Creek 2 Goble Creek 3 Goble Creek 4	Coho	none				I	M	M	I	M
			StW	none								
	80306	Mulholland Creek 3 Mulholland Creek 4	Coho	none				M	F	M	M	F
			StW	none								
	80304	Baird Creek 1 Baird Creek 2 Baird Creek 3 Little Baird Creek	Coho	none				M	F	M	M	F
			StW	none								
	80302	Mulholland Creek 1 Mulholland Creek 2	ChF	none				I	M	M	I	M
			Coho	none								
			StW	none								
D	80404	North Fork Goble Creek	Coho	none				I	M	M	I	M
			StW	none								

Table 9-6. Salmonid habitat limiting factors and threats in priority areas. Priority areas include the lower mainstem (LM), middle mainstem and Goble Creek (MM), and upper mainstem and tributaries (UM) portions of the Coweeman Basin. Linkages between each threat and limiting factor are not displayed – each threat directly and indirectly affects a variety of habitat factors.

Limiting Factors				Threats			
	LM	**MM**	**UM**		**LM**	**MM**	**UM**
Habitat diversity				***Agriculture/ grazing***			
Lack of stable instream woody debris	✓	✓	✓	Clearing of vegetation	✓	✓	
Altered habitat unit composition	✓	✓	✓	Riparian grazing	✓	✓	
Loss of off-channel and/or side-channel habitats	✓	✓		Floodplain filling	✓	✓	
Channel stability				***Rural development***			
Bed and bank erosion		✓		Clearing of vegetation		✓	
Riparian function				Roads – riparian/floodplain impacts		✓	
Reduced stream canopy cover	✓	✓		***Forest practices***			
Reduced bank/soil stability	✓	✓		Timber harvests –sediment supply impacts	✓	✓	✓
Exotic and/or noxious species	✓	✓		Timber harvests – impacts to runoff	✓	✓	✓
Reduced wood recruitment	✓	✓		Riparian harvests (historical)		✓	✓
Floodplain function				Forest roads – impacts to sediment supply	✓	✓	✓
Altered nutrient exchange processes	✓	✓		Forest roads – impacts to runoff	✓	✓	✓
Reduced flood flow dampening	✓	✓		Forest roads – riparian/floodplain impacts			✓
Restricted channel migration	✓	✓		Splash-dam logging (historical)	✓	✓	✓
Disrupted hyporheic processes	✓	✓		***Channel manipulations***			
Stream flow				Bank hardening	✓		
Altered magnitude, duration, or rate of change	✓	✓	✓	Channel straightening	✓		
Water quality				Artificial confinement	✓		
Altered stream temperature regime	✓	✓					
Bacteria	✓						
Substrate and sediment							
Excessive fine sediment	✓	✓	✓				
Embedded substrates	✓	✓	✓				

Table 9-7. 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 (Tier 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***					
Lower mainstem Coweeman 1-4 ***Middle mainstem+ Goble*** Coweeman 4-12, Goble 1	• Bed and bank erosion • Altered habitat unit composition • Restricted channel migration • Disrupted hyporheic processes • Reduced flood flow dampening • Altered nutrient exchange processes	• 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 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. Create new off-channel or side-channel habitats (i.e. spawning channels)***					
Lower mainstem Coweeman 1-4 ***Middle mainstem and Goble*** Coweeman 5-12, Goble 1	• 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. Potential benefit is limited by moderate probability of success with creation of new habitats. There are challenges with implementation due to 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*** ***D. Invasive species eradication*** ***E. Hardwood-to-conifer conversion***					
Lower mainstem Coweeman 1-4 ***Middle mainstem and Goble***	• Reduced stream canopy cover • Altered stream temperature regime	• Timber harvest – riparian harvests • Riparian grazing • Clearing of	• 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

Location	Limiting Factors Addressed	Threats Addressed	Target Species	Time	Discussion
Canyon 1 - Coweema n 12, Goble 1, 4 ***Upper mainstem + tribs*** Coweeman 13-22, Mulholland 2-3, Baird 1	• Reduced bank/soil stability • Reduced wood recruitment • Lack of stable instream woody debris • Exotic and/or noxious species	vegetation due to rural development and agriculture			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***					
Middle mainstem+ Goble Canyon 1 - Coweema n 12, Goble 1, 4 ***Upper mainstem + tribs*** Coweeman 13-22, Mulholland 2-3, Baird 1	• Reduced bank/soil stability • Excessive fine sediment • Embedded substrates	• Artificial confinement • Clearing of vegetation • Roads – riparian / floodplain impacts • Riparian grazing	• Fall Chinook • Coho • Winter steelhead	5-50 years	Most areas of bank instability are located between river mile 17 and 26. Bio-engineered approaches that rely on structural as well as vegetative measures are the most appropriate. 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 • Embedded substrates	• Timber harvest – impacts to sediment supply • Forest roads – impacts to sediment supply • Agricultural practices – impacts to sediment supply	• All species	5-50 years	High potential benefit due to sediment effects on egg incubation and early rearing. Improvements are expected on timber lands due to requirements under the new Forest Practices Rules (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***					

Location	Limiting Factors Addressed	Threats Addressed	Target Species	Time	Discussion
Entire basin	• Stream flow – altered magnitude, duration, or rate of change of flows	• Timber harvest – impacts to runoff • Forest roads – impacts to runoff • Clearing of vegetation due to agriculture and rural development	• 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 Forest Practices Rules (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 Coweeman basin have been identified as part of Watershed Planning for WRIA 26 (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***					
Entire basin	• Altered stream temperature regime • Bacteria	• Riparian harvests • Riparian grazing	• All species	1-50 years	Primary emphasis for restoration should be placed on stream segments that are listed on the 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***					
Lower mainstem Coweeman 1-4 ***Middle mainstem and Goble*** Canyon 1 - Coweema n 12, Goble 1, 4 ***Upper mainstem and tribs*** Coweeman 13-22, Mulholland 2-3, Baird 1	• 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.

Location	Limiting Factors Addressed	Threats Addressed	Target Species	Time	Discussion
10. Protect and restore fish access to channel habitats ***A. Culverts on tributary streams***					
Culverts on several small tributaries throughout basin	• Blockages to channel habitats	• Dams, culverts, in-stream structures	• Coho • Winter steelhead	immediate	As many as 9 miles of potentially accessible habitat are blocked by culverts or other barriers (approximately 15 barriers total). The blocked habitat is believed to be marginal in most cases and no individual barriers account for a substantial share of the blocked habitat. Passage restoration projects should focus on cases where it can be demonstrated that there is good potential benefit and reasonable project costs.
11. 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 mechanisms need to be put in place to restore currently degraded habitats.
12. 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.

9.5 Program Gap Analysis

The Coweeman Basin (~200 sq mi) is located exclusively in Cowlitz County:
- There is no federal land ownership in the Coweeman Basin.
- Large industrial forest lands (~175 sq miles) are the largest land use.
- Small private forest lands (~20 sq mi) are found in the lower reaches of the Coweeman Basin.
- Department of Natural Resources managed state lands represent a minor public land holding (~2 sq mi) has minor public land holdings within the Coweeman Basin.
- All of the Coweeman Basin is located in Cowlitz County.
- Population in the Coweeman Basin is primarily found along Rose Valley Road (parallel with the river) and can be expected to increase relative to growth in the Longview/Kelso area (Kelso is expected in grow 42% by 2020).

Protection Programs

The principle programs for watershed and stream habitat protection in the Coweeman Basin are Washington forest practice regulations administered by the Department of Natural Resources and Cowlitz County land use regulations. Protection programs in this analysis include those programs that protect habitat conditions or watershed functions through regulatory measures, incentives, acquisition of properties or easements, or by applying standards to new development that protects resources by avoiding damaging impacts. Key programs implementing measures are identified below:

Federal Programs

- ***U.S. Army Corps of Engineers*:**
  - Regulatory Programs: U.S. Army Corps of Engineers 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 ESA listed fish. [M.1A; M.2A; M.2B; M.4A; M.9A; M.9B]

State Programs

- ***Department of Natural Resources***
  - State Forest Land Habitat Conservation Plan (HCP):
    State forest lands are managed under the provisions of a HCP. The HCP 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]

  - State Forest Practice Rules:
    Riparian areas and watershed functions on small- and industrial forest lands are protected under the State of Washington Forest Practices Rules, including the Forest and Fish

Module. These rules provide for riparian buffers, harvest restrictions, sensitive area protections, and protective standards for new road construction. [M.3A; M.3B; M.5A; M.5B; M.6A; M.6B; M.8A]

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

  - Hydraulics Project Approval (HPA): The Department administers the state Hydraulic Code. The purpose of this program is to protect stream conditions and habitat. The regulations apply to such activities as streambank 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.3A; M.4A; M.8A; M.9A; M.9B; M.10A; M.11A; M.11B; M.11C]

- ***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 Coweeman Basin to 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. [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) 26 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.6C; M.7A; M.7B; M.7C; M.7D; M.7E; M.8A; M.8B]

- ***Salmon Recovery Funding Board (SRFB)/ Lower Columbia Fish Recover 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, no habitat grants under this program have been awarded for work in the Coweeman watershed. [M.1A; M.2A; M.2B; M.3A; M.4A; M.8A; M.8B; M.9A; M.9B; M.10A; M.12A; M.12B; M.12C]

- ***State Conservation Commission/Cowlitz Conservation District***

- The District works directly with agriculture interests in the Coweeman watershed. The Farm Plan Program and Conservation Reserve Enhancement Program both provide landowners voluntary incentives to protect watershed and habitat conditions. [M.3C; M.4A; M.5C; M.8A]

Local Government Programs

➢ ***Cowlitz County***

- Land Use:

  ✓ Comprehensive Plan/ Land Use Zoning: With the exception of the requirement to adopt a Critical Areas Ordinance, the County is exempt from the Washington Growth Management Act (GMA). It adopted a comprehensive plan in 1976 to guide growth and development. Zoning in the Coweeman watershed allows one dwelling per 2 acres along the Rose Valley Road and other County roads and one dwelling per 5 acres along non-county roads

  ✓ Critical Areas Ordinance: Pursuant to the GMA, Cowlitz County has adopted a Critical Areas Ordinance addressing wetlands, fish and wildlife habitat, flood prone areas, geologic hazards, and critical aquifer recharge areas. The ordinance is generic and provides limited protection of watershed and habitat critical to listed fish. It focuses heavily on mitigation, rather than protection. No stream buffers have been adopted. Wetland buffers vary from 25' to 200' and are based upon soil type and wildlife utilization

  ✓ Grading Ordinance: The County is considering the adoption of a state mandated grading ordinance. [M.11A; M.11B; M.11C]

- Road Maintenance: The County has not yet developed or implemented a road maintenance program with measures to protect habitat. [M.6C; M.10A]

Restoration Programs

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

Federal Programs

No active programs.

State 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 requires barrier upgrades and road abandonment and/or other improvements [M.3A; M.3B; M.4A; M.5A; M.5B; M.6A; M.6B; M.8A; M.10A]

- State Forest Practice Rules: Large Industrial forests within the Coweeman 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. 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.4A; M.5A; M.5B; M.6A; M.6B; M.8A; M.10A]

➢ ***Department of Ecology***

Local Programs

➢ ***Cowlitz County*****:** The County has corrected a number of blocking culverts on county roads. None have been identified for work in the Coweeman watershed. [M.10A]

➢ ***Cowlitz Noxious Weed Control Board*****:** Invasive plant species such as Japanese knotweed, threaten properly function riparian conditions by displacing native species. The Board has three primary programs that address weed control in the Coweeman Basin; [M.3D]
- Public education to prevent the spread of noxious weeds;
- Survey County lands to assess emerging issues; and
- Enforcement of noxious weed control

Community Programs

No active programs.

Gap Analysis

Forest-related Programs: In the Coweeman Basin, forest-related programs have a substantial role in protecting and restoring watershed functions and habitat conditions at levels supporting recovery goals. These programs apply to over 98% of the basin. 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: The regulatory programs of the U.S. Army Corps of Engineers and the state Department of Fish and Wildlife provide good protection for instream habitat conditions, but little or no protection for riparian areas and upland watershed processes. Lands not managed for timber in the Coweeman Basin are covered by Cowlitz County land use regulatory regulations. County programs lack effective provisions that commonly are used to proactively direct growth, protect streams and wetlands, and manage stormwater. There are very limited regulatory mechanisms for agricultural practices relative to protection riparian areas and hydrologic processes. Voluntary incentive programs and technical assistance from the Conservation District helps promote stewardship and protection of watershed processes and habitat conditions.

Restoration-related Programs: Over the long-term, improvements to the Coweeman watershed will occur as a result of improved forest management practices that are already in place. Active restoration in the lower mainstem should focus on floodplain function and channel migration, as well as restoring off-channel and side-channel habitats. Programs to address these issues are currently not in place or not active in the watershed.

Table 9-8. Actions to Address Gaps

Action #	Lead Agency	Proposed Action
COWEE.1	Cowlitz County	Develop and implement controls to adequately protect riparian areas to maintain currently functional habitat as well as restored habitat needed habitat conditions around all rivers, estuaries, streams, lakes, deepwater habitats, and intermittent streams. Require mitigation, where necessary, to offset unavoidable damage to habitat conditions in riparian management areas
COWEE.2	Cowlitz County	Develop and implement stormwater discharge controls to protect water quality and quantity and reduce localized stream flow impacts detrimental to fish —including peak and base flows
COWEE.3	Cowlitz County	Protect historic stream meander patterns and channel migration zones and avoid hardening stream banks and shorelines
COWEE.4	Cowlitz County	Zoning and development standards to adequately protect wetlands, wetland buffers, and wetland function.
COWEE.5	Cowlitz County	Develop and implement controls to address erosion and sediment run-off during (and after) construction to prevent sediment and pollutant discharge to streams, wetlands and other water bodies
COWEE.6	Cowlitz County	Apply land use code enforcement across jurisdictions in a consistent manner, using appropriate funding levels and application
COWEE.7	State of Washington	Provide state funding for small forest owners in the Coweeman 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
COWEE.8	Forest Managers LCFRB, and DFW	Identify and sequence 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
COWEE.9	Cowlitz County,	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
COWEE.10	WRIA 27/28 PU, DOE, DFW	Close the Coweeman Basin to further surface water withdrawals, including groundwater in connectivity with surface waters; curtail unauthorized withdrawals
COWEE.11	LCFRB, Cowlitz County, DFW	Build institutional capacity for agencies and organizations to undertake additional protection and restoration projects, including noxious weed control
COWEE.12	SRFB, Fish and Wildlife Foundation, BPA, NOAA, DOE	Increase available funding for projects that implement measures and addresses underlying threats
COWEE.14	State of Washington (Dept of Agriculture)	Develop and implement agricultural practices and regulations to protect riparian conditions and water quality
COWEE.15	LCFRB, Cowlitz CD, Cowlitz County	Address threats proactively by building agreement on priorities among the various program implementers
COWEE.16	FEMA	Update Floodplain Maps