4 Elochoman Subbasin – Elochoman & Skamokawa

Figure 4-1. Location of the Elochoman & Skamokawa basins within the Lower Columbia River Basin.

4.1 Basin Overview

The Elochoman and Skamokawa basins comprise approximately 73 square miles, primarily in Wahkiakum County. The Elochoman enters the Columbia River near the town of Cathlamet at RM 38. The Skamokawa enters the Columbia approximately 5 miles west of the Elochoman. Major tributaries to the Elochoman include Beaver Creek and the West Fork Elochoman. Principal tributaries to the Skamokawa include the West Fork and Wilson Creek. The subbasin is part of WRIA 25.

The Elochoman and Skamokawa basins will play a key role in the recovery of salmon and steelhead. The basin 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.

Elochoman and Skamokawa 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 Elochoman and Skamokawa fish. Elochoman Hatchery operates 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 Elochoman and Skamokawa Subbasin.

The Elochoman / Skamokawa basin is almost entirely comprised of private and state owned lands, the bulk of which is commercial timber land. Considerable logging occurred in the past without regard for riparian and instream habitat, resulting in sedimentation of salmonid spawning and rearing habitat (WDF 1990). Nearly 0% of the forest cover is in late-seral stages, however, as the forest matures, watershed conditions are recovering.

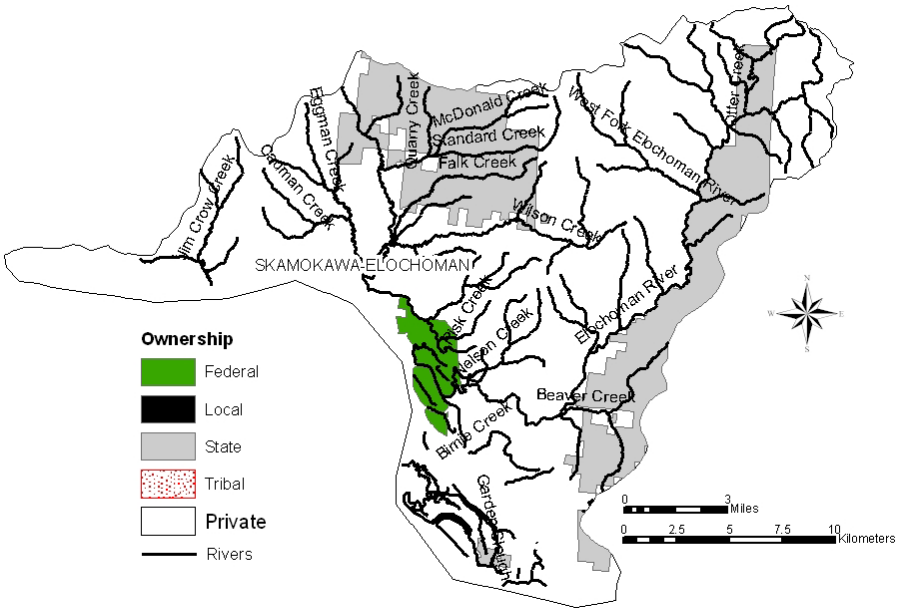
A broad agricultural valley extends up the mainstem Skamokawa, West Fork Skamokawa, and Wilson Creek. There are considerable agricultural impacts to fish habitat in these areas, which suffer from non-forested riparian zones and disconnected floodplains. Chum, fall Chinook, and coho utilize these lower valley reaches and are therefore heavily impacted by agricultural land-uses. The upper reaches of the mainstem and all major tributaries are impacted most heavily by forest harvest and the forest road network. Winter steelhead and coho occupy upper basin reaches, and are therefore affected most by forest practices.

A similar land-use pattern can be found in the Elochoman basin, with the exception being that the agricultural valley is found primarily only along the mainstem. The species effects are also similar, with agricultural uses having the greatest impact on chum and fall Chinook and forest practices having the greatest effect on winter steelhead and coho.

The projected population change from 2000 to 2020 for unincorporated areas in WRIA 25 is 37% (LCFRB 2001). Current and expected growth will occur predominantly in the broad agricultural valleys along the major stream courses, resulting in land-use conversion from agricultural to residential uses. This pattern is already apparent in many areas. It will be important for land-use planning and critical areas policy to provide adequate protection of habitat and habitat-forming processes in sensitive areas.

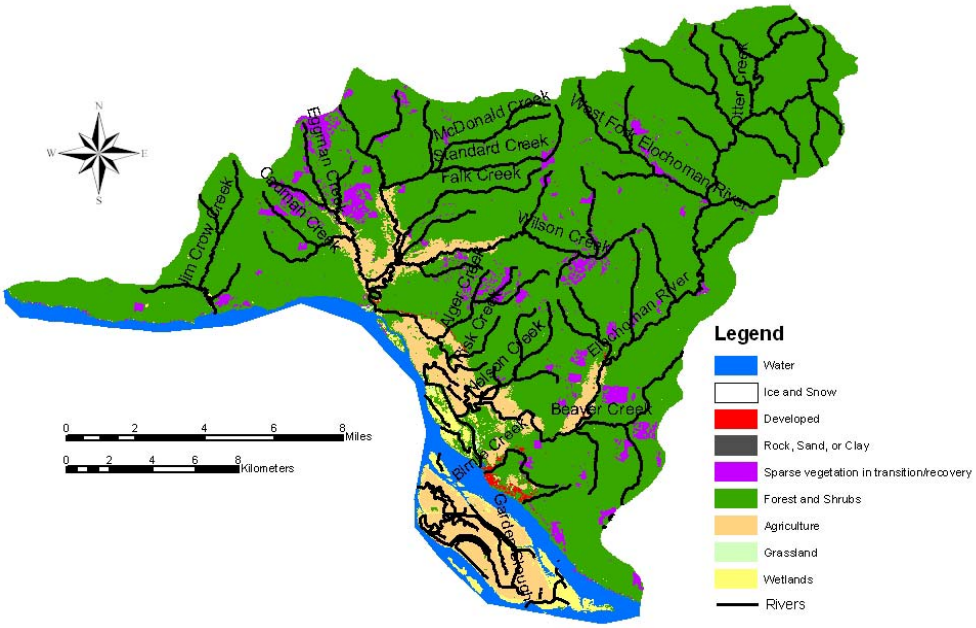
Land Ownership	
Private	77%
State	21%
Federal	2%

Land Ownership



Vegetation Composition	
Late Seral	0%
Mid Seral	26%
Early Seral	10%
Other Forest	45%
Non Forest	13%

Land Use / Cover



4.2 Species of Interest

Focal salmonid species in the Elochoman and Skamokawa watersheds include fall Chinook, winter steelhead, chum and coho. The current health or viability of the focal populations ranges from very low for chum and coho to low-medium for 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 fall Chinook, chum and coho to a high or very high viability level. This level will provide for a 95% or better probability a population survival over 100 years. Winter steelhead recovery goals call for restoration to medium levels which will provide for a 75-95% probability of survival over 100 years.

Other species of interest in the Elochoman/Skamokawa 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 Elochoman and Skamokawa subbasin although specific spawning and rearing habitat requirements of lamprey are not well known.

Table 4-1.Current viability status of Elochoman/Skamokawa 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	Yes	Low+	100-2,300	High+	1,400-4,500
Winter Steelhead	Threatened	Yes	Low+	200-700	Medium	600-1,000
Chum	Threatened	No	Low	<200	High+	1,100-8,200
Coho	Candidate	Yes	Low	Unknown	High	unknown

Fall Chinook – The historical Elochoman/Skamokawa adult population is estimated from 5,000-10,000 fish. The vast majority of fish returned to the Elochoman River. Current natural spawning returns range from 100-2,300 in the Elochoman River and 50-500 in Skamokawa Creek. The majority of current returns are hatchery origin fish. Spawning occurs in the lower Elochoman from above tidewater (RM 4 to the Elochoman Hatchery (RM 9). Spawning occurs in Skamokawa Creek from Wilson Creek upstream to Standard and McDonald creeks (4.5 miles). 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 Elochoman/Skamokawa adult population is estimated to be about 1,400 fish. Current natural spawning returns range from 100-400 in the Elochoman River and 100-300 in Skamokawa Creek. Interaction with Chambers Creek/Beaver Creek stock hatchery steelhead is likely lower due to different spawn timing. Spawning in the Elochoman occurs in the mainstem, West, North, and East Forks, as well as Otter, Rock, Clear, Beaver, and Duck creeks. Spawning in Skamokawa Creek occurs throughout the mainstem, Wilson, Left Fork, Quartz, McDonald, and Standard creeks, as well as several smaller tributaries. 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 Elochoman/Skamokawa adult population is estimated from 15,000-40,000 fish, with the returns being late stock which spawn from late November to March. Current returns are unknown but assumed to be low. A number of hatchery produced fish spawn

naturally. Natural spawning occurs in most areas of the Elochoman Basin accessible to coho, principally in the upper watershed, in particular the West Fork Elochoman. Duck Creek is an important spawning area in the lower river. In Skamokawa Creek, important spawning areas include the mainstem, and Wilson, Left Fork, Quartz, Standard, and McDonald 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 Elochoman/Skamokawa adult population is estimated from 15,000-50,000 fish. Current returns are about 200 fish or less. Recent year counts have been higher in Skamokawa Creek than in the Elochoman River. Natural spawning primarily occurs in the lower maintem Elochoman between tidewater and the Elochoman Hatchery and in Skamakowa Creek between tidewater and Standard and McDonald creeks. Jim Crow Creek, which flows directly into the Columbia downstream of Skamokawa Creek, is also an important chum spawning area. Peak spawning occurs in December. Juveniles emerge in the early spring and migrate to the Columbia after a short rearing period.

Coastal Cutthroat – Coastal cutthroat abundance in Elochoman/Skamokawa 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 Elochoman River and Skamokawa Creek from August to 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 Elochoman/Skamokawa population. However, based on declining trends measured at Bonneville Dam and Willamette Falls it is assumed that Pacific lamprey have also declined in the Elochoman River and Skamokawa Creek. 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 seven years before migrating to the ocean.

Figure 4-2. Summary of habitat limiting factors, popoulation status, expected population improvement trend with existing programs and biological objectives depicted for the Elochoman and Skamokawa basins.

4.3 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 Elochoman and Skamokawa 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 is an important impact for all species, particularly for chum but less so for fall Chinook. Loss of estuary habitat quality and quantity is also important, accounting for relative impacts of about 20% for chum and fall Chinook, 15% for winter steelhead, and 10% for coho.
- Harvest accounts for the largest relative impact on fall Chinook, but is a minor factor for other species.
- Hatchery impacts are substantial for coho and fall Chinook and moderately important to coho, but of lesser importance for winter steelhead and chum.
- Predation impacts are moderate for winter steelhead and chum, but are relatively low for coho and fall Chinook.
- Hydrosystem access and passage impacts appear to be relatively minor for all species.

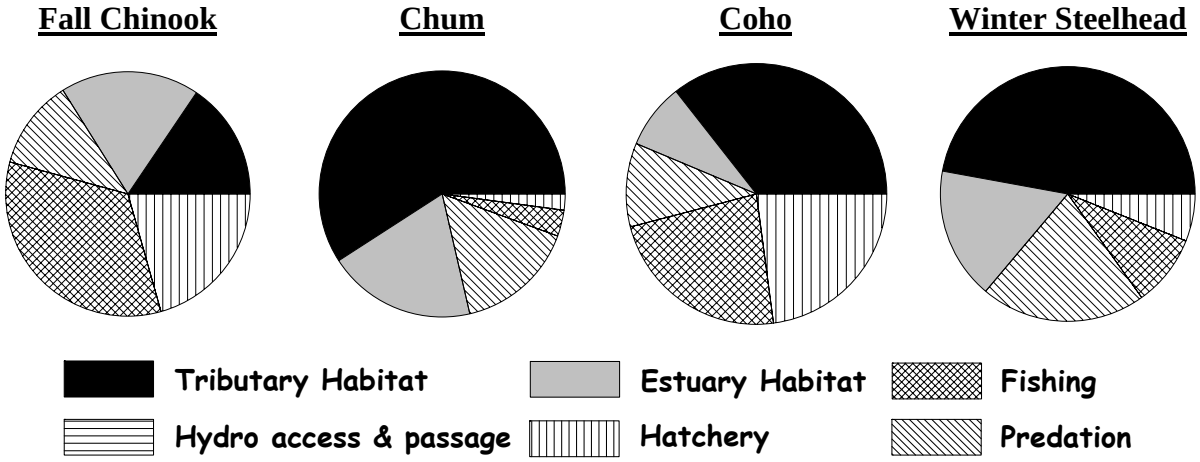


Figure 4-3. Relative contribution of potentially manageable impacts for Elochoman and Skamokawa populations.

4.4 Limiting Factors, Threats, and Measures

4.4.1 Hydropower Operation and Configuration

There are no hydro-electric dams in the Elochoman and Skamokawa subbasins. However, Elochoman and Skamokawa 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.

4.4.2 Harvest

Most harvest of wild Elochoman and Skamokawa 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. Elochoman fall Chinook are harvested in ocean and Columbia River commercial sport fisheries as well as in-basin sport fisheries. Harvest is controlled by an ESA harvest limit associated with Coweeman natural fall Chinook. No harvest of chum occurs in ocean fisheries, there is no directed Columbia River or Elochoman Basin chum fisheries and retention of chum is prohibited in Columbia River and Elochoman basin sport fisheries. Some chum can be impacted by fisheries directed at coho and winter steelhead. Harvest of Elochoman 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 Elcohoman 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 Elochoman/Skamokawa Subbasin populations are summarized in the following table:

Table 4-2. Regional harvest measures from Volume I, Chapter 7 with significant application to the Elochoman/Skamokawa Subbasin populations

Measure	Description	Comments
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.M13	Develop a mass marking plan for hatchery tule Chinook for tributary harvest management and for naturally-spawning escapement monitoring.	Provides the opportunity to implement selective tributary sport fishing regulations in the Elochoman watershed. Recent legislation passed by Congress mandates marking of all Chinook, coho, and steelhead produced in federally funded hatcheries that are intended for harvest. Details for implementation are currently under development by WDFW, ODFW, treaty Indian tribes, and federal agencies.
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.

Measure	Description	Comments
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.

4.4.3 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.

The Elochoman Hatchery (since 1954) produces winter and summer steelhead, fall Chinook, and coho for harvest opportunity. The winter steelhead program includes both a composite stock from Beaver Creek Hatchery and a local stock program. The summer steelhead are Skamania stock. The Elcohoman Hatchery also provides coho for net pen rearing and harvest in Steamboat Slough and winter steelhead for release into the Coweeman River. There are no hatchery fish released into Skamokawa Creek. 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. The main threats from the Elochoman Hatchery salmon programs are domestication of natural fall Chinook and coho and potential ecological interactions between hatchery and natural juvenile salmon.

The Beaver Creek Hatchery (since 1957) historically reared early-run winter steelhead for distribution to several lower Columbia basins. The hatchery was closed in 1999.

Table 4-3.Elochoman Hatchery Production.

Hatchery	Release Location	Fall Chinook	Early Coho	Late Coho	Local Winter Steelhead	Winter Steelhead	Summer Steelhead
Elochoman	Elochoman	2,000,000	418,000	512,000	30,000	60,000	30,000
	Coweeman					20,000	
	Steamboat Slough		200,000				

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 Elochoman Subbasin 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 Elochoman Subbasin are summarized in Table 4-4.

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

Measure	Description	Comments
H.M5,13,38	Integrated hatchery and wild program for fall Chinook. Evaluate potential for integration of a late stock coho program.	Assures fitness of the natural produced fish which will improve population productivity. Integrated programs would be developed specific to the Elochoman populations in the BRAP procedure.
H.M14	Use only local brood stock in the fall Chinook hatchery program.	This measure will preclude transfer of outside basin stock into the Elochoman Hatchery program. This will enable a hatchery and wild integrated program to be developed with fall Chinook that are ecologically adapted to the Elochoman Basin
H.M15,32,40	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.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.M24,36	Hatchery program utilized for supplementation and enhancement of wild coho and chum populations.	Supplementation programs for Elochoman natural coho could be developed with appropriate brood stock in the Elochoman Hatchery. Beaver Creek Hatchery could be considered for a coastal area chum enhancement 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 Elochoman Hatchery facility operations.	The facility would be evaluated in the BRAP process for potential hazards associated with barriers to fish passage, adequacy of screens, and water quality.

4.4.4 Ecological Interactions

Ecological interactions focus on how salmon and steelhead, other fish species, and wildlife interact with each other and the subbasin ecosystem. Elochoman and Skamokawa salmon and steelhead are affected throughout their lifecycle by ecological interactions with non - native species, food web components, and predators. Interactions are similar for Elochoman and Skamokawa populations to those of most other subbasin salmonid populations. These interactions are described in further detail in Volume I, Chapter 6. Ecological Interactions are addressed by regional strategies and measures identified inVolume I, Chapter 7.

4.4.5 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 Skamokawa and Elochoman 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 Skamokawa and Elochoman 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.

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

- Upper Skamokawa & tributaries – Skamokawa 4-8; LF Skamokawa 2; McDonald 1,3; Falk 1-2
- Wilson Creek – Wilson 1-4
- Lower Elochoman & tributaries – Elochoman 3-7; Clear Creek 1-3; Duck 1-6
- Upper Elochoman & tributaries – Elochoman 8-14; WF Elochoman 1-2; NF Elochoman 1; EF Elochoman 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 upper Skamokawa and tributaries provide potentially productive habitat for all species. Wilson Creek primarily supports winter steelhead and coho. These reaches are heavily impacted by agriculture and rural residential development. Effective recovery measures will include riparian reforestation, cattle exclusion fencing, and floodplain re-connection.

The lower Elochoman and the lower reaches of mainstem tributaries have been impacted by agriculture and rural residential development. Effective recovery measures will involve riparian and floodplain restoration. Winter steelhead make the greatest use of upper Elochoman reaches. These reaches are predominantly impacted by forest practices occurring in the upper basin. Effective recovery of these reaches will involve basin-wide recovery of runoff and sediment supply function.

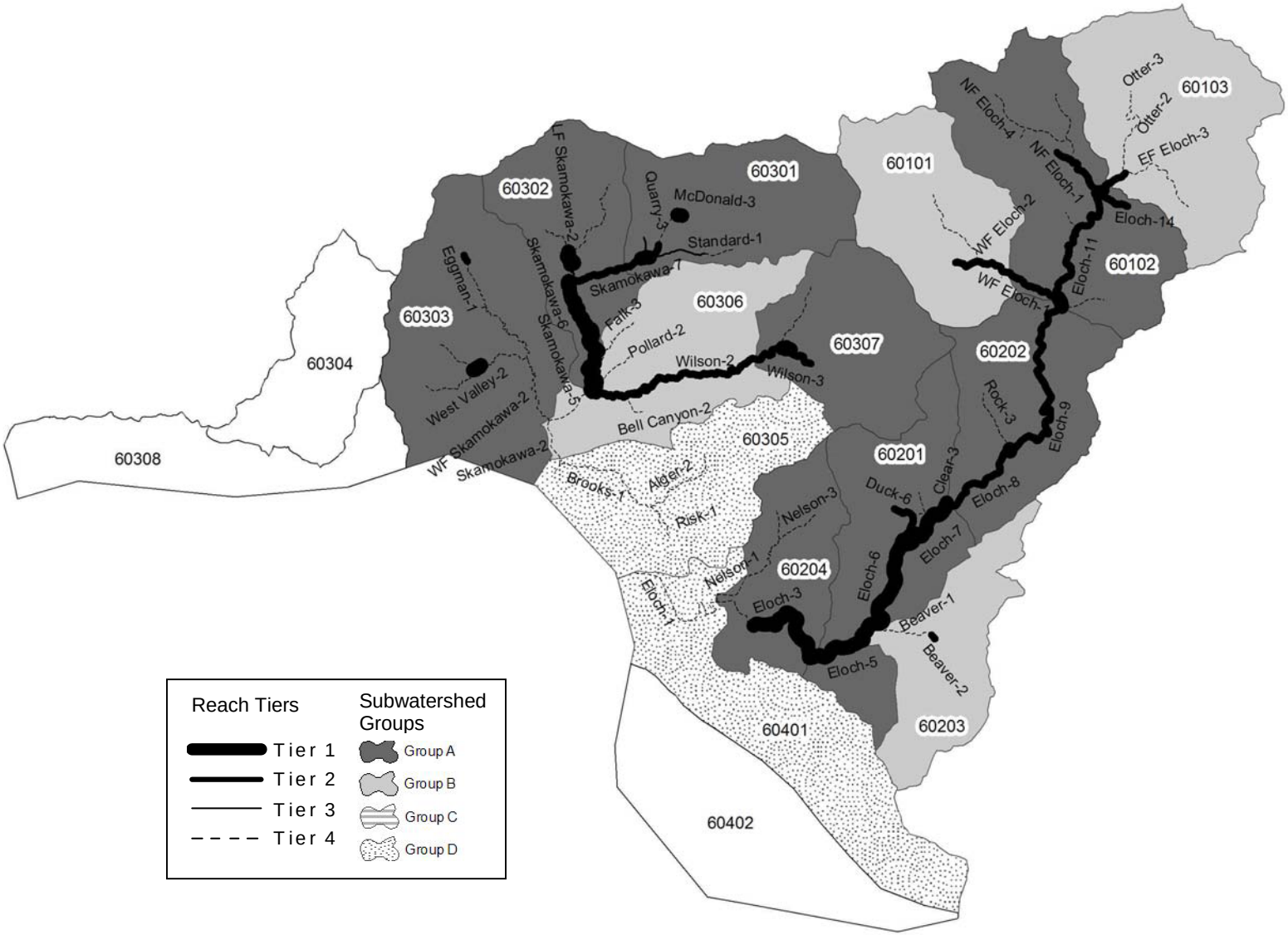


Figure 4-4. Reach tiers and subwatershed groups in the Elochoman/Skamokawa Basin. Tier 1 reaches and Group A subwatersheds represent the areas where recovery actions would yield the greatest benefits with respect to species recovery objectives. The subwatershed groups are based on Reach Tiers. Priorities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

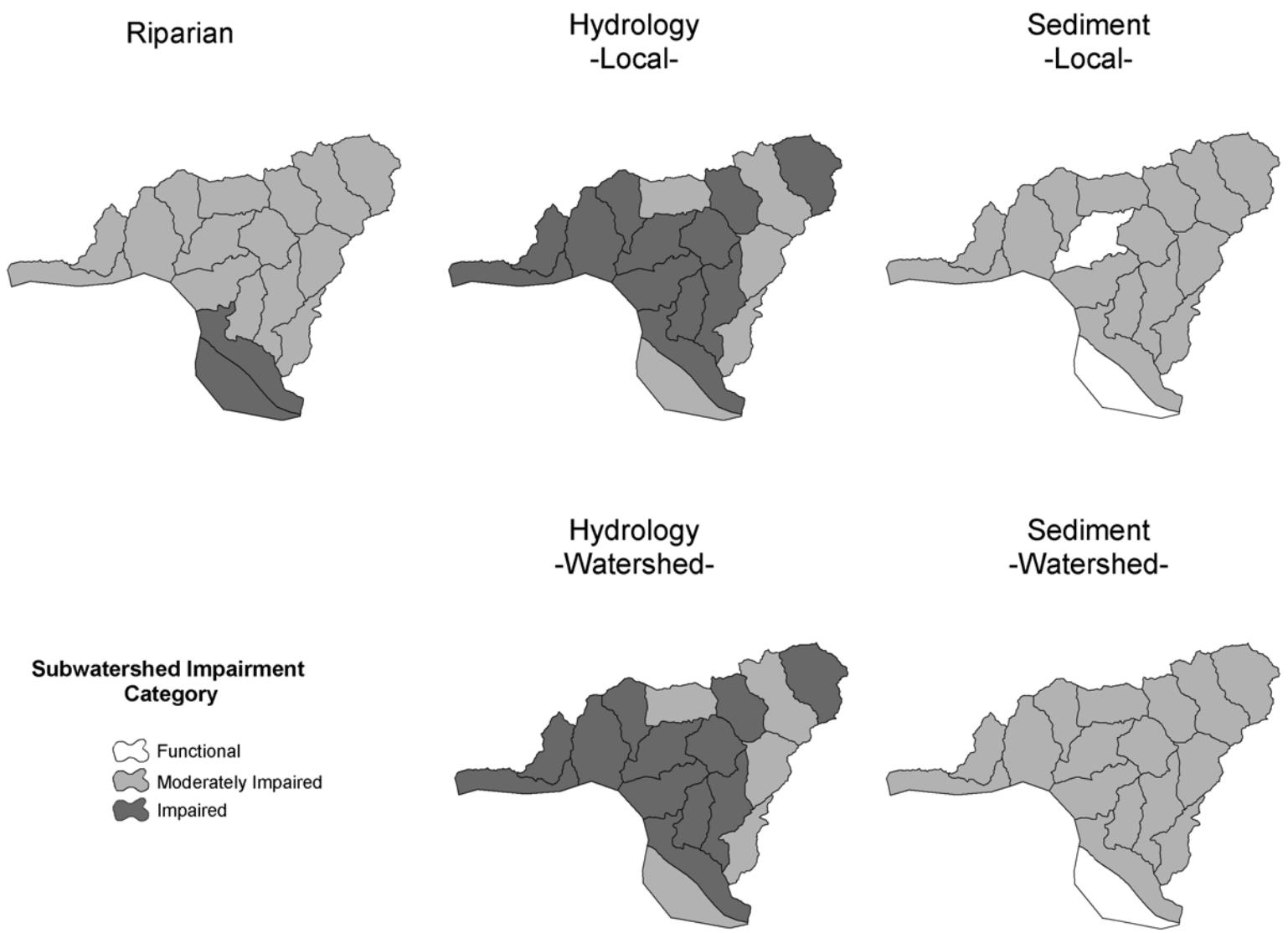


Figure 4-5. IWA subwatershed impairment ratings by category for the Elochoman/Skamokawa Basin. Watershed process impairment ratings are based on landscape conditions that influence the hydrologic regime, the sediment regime, and riparian function. See Volume II and Volume V of the Recovery Plan Technical Foundation for additional information.

Table 4-5. 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.

Skamokawa

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	60307	Trib1233686463037 Wilson-3 Wilson-4	Coho	Wilson-3	egg incubation fry colonization summer rearing	habitat diversity sediment food key habitat quantity	PR	I	M	M	I	M
			StW	Wilson-3 Wilson-4	egg incubation fry colonization summer rearing winter rearing adult holding	habitat diversity flow sediment key habitat quantity	PR					
	60303	Cadman-1 Cadman-2 Cadman-3 Eggman-1 Eggman-2 West Valley-1 West Valley-2 West Valley-3 WF Skamokawa-1 WF Skamokawa-2 WF Skamokawa-3 WF Skamokawa-4 WF Skamokawa-5	Coho	West Valley-2	spawning egg incubation summer rearing winter rearing	habitat diversity sediment	PR	I	M	M	I	M
			StW	none								
	60302	LF Skamokawa-1 LF Skamokawa-2 LF Skamokawa-3 LF Skamokawa-4 Skamokawa-5 Skamokawa-6 Skamokawa-7 Trib1234547463284-1 Trib1234547463284-2	ChF	Skamokawa-5	egg incubation fry colonization adult holding	sediment	P	I	M	M	I	M
			Chum	Skamokawa-6 Skamokawa-5	spawning egg incubation adult holding	habitat diversity sediment	P					
			Coho	Skamokawa-6 LF Skamokawa-2 Skamokawa-5	egg incubation fry colonization summer rearing winter rearing	habitat diversity temperature sediment food	PR					
			StW	Skamokawa-7	egg incubation summer rearing	temperature sediment	PR					
	60301	McDonald-1 McDonald-2 McDonald-3 Quarry-1 Skamokawa-8 Standard-1 Standard-2	ChF	Skamokawa-8	spawning egg incubation fry colonization adult holding	channel stability sediment	P	M	M	M	M	M
			Coho	McDonald-3	spawning egg incubation fry colonization summer rearing winter rearing adult holding	habitat diversity sediment key habitat quantity	P					
			StW	Skamokawa-8 McDonald-1	egg incubation fry colonization summer rearing	habitat diversity temperature flow sediment food key habitat quantity	PR					
B	60306	Bell Canyon-1 Falk-1 Falk-2 Falk-3 Pollard-1 Skamokawa-2 Skamokawa-3 Skamokawa-4 Wilson-1 Wilson-2	All	none				I	F	M	I	M
D	60305	Alger-1 Alger-2 Brooks-1 Brooks-2 Skamokawa-1	All	none				I	M	M	I	M

Elochoman

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	60202	Eloch-5 Eloch-6 Rock-1 Rock-3	ChF	Eloch-6	egg incubation fry colonization adult holding	sediment	PR	M	M	M	M	M
			Chum	none								
			Coho	Eloch-5 Eloch-6 Rock-1	spawning fry colonization egg incubation summer rearing winter rearing adult holding	habitat diversity temperature sediment key habitat quantity	PR					
			StW	Rock-1	spawning egg incubation fry colonization adult holding	habitat diversity sediment	P					
	60201	Clear-1 Clear-3 Duck-1 Duck-3 Duck-4 Duck-6 Eloch-2 Eloch-4 Trib1233126462580	ChF	Eloch-4	spawning egg incubation fry colonization	sediment	PR	I	M	M	I	M
			Chum	Eloch-4	spawning egg incubation adult holding	sediment	PR					
			Coho	Clear-1 Clear-3 Duck-1 Eloch-4	spawning fry colonization egg incubation summer rearing juvenile (age-0) migrant winter rearing adult holding		PR					
			StW	Clear-1 Clear-3	egg incubation fry colonization adult holding	sediment	P					
	60102	Eloch-10 Eloch-11 Eloch-12 Eloch-13 Eloch-14 Eloch-7 Eloch-8 Eloch-9 NF Eloch-1 NF Eloch-2 NF Eloch-3 NF Eloch-4 Trib1232509463400 Trib1232540463591 Trib1232562463641 Trib1232567463186 Trib1232728463673 WF Eloch-1	ChF	Eloch-10 Eloch-7	spawning egg incubation fry colonization adult holding	channel stability habitat diversity sediment	PR	M	M	M	M	M
			Coho	Eloch-10 Eloch-13	egg incubation fry colonization summer rearing winter rearing		R					
			StW	Eloch-10 Eloch-11 Eloch-13 Eloch-8 WF Eloch-1	egg incubation fry colonization summer rearing winter rearing	habitat diversity flow sediment	PR					
	60204	Eloch-2 Eloch-3 Longtrain-1 Nelson-1 Nelson-2 Nelson-3 Trib1233695462430-1	ChF	none				I	M	M	I	M
			Chum	Eloch-3	spawning egg incubation adult holding	sediment	PR					
			Coho	none								
			StW	none								
B	60203	Beaver-1 Beaver-2	Coho	none				M	M	M	M	M
			StW	Beaver-2	spawning egg incubation fry colonization summer rearing	habitat diversity sediment	R					
	60101	Trib1232792463272 Trib1232902463299 Trib1233036463388-1 WF Eloch-2 WF Eloch-3	Coho	none				I	M	M	I	M
			StW	WF Eloch-2	egg incubation fry colonization summer rearing winter rearing	habitat diversity flow sediment	R					
	60103	EF Eloch-1 EF Eloch-2 Otter-1 Otter-2 Trib1232156463572	Coho	none				I	M	M	I	M
			StW	none								
D	60401	Eloch-1	All	none				I	M	I	I	M

Table 4-6. Salmonid habitat limiting factors and threats in priority areas. Priority areas include the upper Skamokawa and tributaries (US), Wilson Creek (WC), lower Elochoman and tributaries (LE), and the upper Elochoman and tributaries (UE). Linkages between each threat and limiting factor are not displayed – each threat directly and indirectly affects a variety of habitat factors.

Limiting Factors	US	WC	LE	UE
Habitat connectivity				
Blockages to 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				
Lack of adequate spawning substrate				
Excessive fine sediment	✓	✓	✓	✓
Embedded substrates	✓	✓	✓	✓

Threats	US	WC	LE	UE
Agriculture / grazing				
Clearing of vegetation	✓	✓	✓	
Riparian grazing	✓	✓	✓	
Floodplain filling	✓	✓	✓	
Rural development				
Clearing of vegetation	✓	✓	✓	
Floodplain filling	✓	✓	✓	
Roads – riparian/floodplain impacts	✓	✓	✓	
Increased watershed imperviousness	✓	✓	✓	
Leaking septic systems	✓	✓	✓	
Forest practices				
Timber harvests –sediment supply impacts	✓	✓	✓	✓
Timber harvests – impacts to runoff	✓	✓	✓	✓
Riparian harvests			✓	✓
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	✓	✓	✓	

Table 4-7. 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					
Upper Skamokawa & tributaries Skamokawa 4-8; LF Skamokawa 2; Falk 1-2 ***Wilson Creek*** Wilson 1-4 ***Lower Elochoman & tributaries*** Elochoman 3-7; Duck 1-6; Clear Cr 1-3	• Loss of off-channel and/or side channel habitats • 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	• All species	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)					
Upper Skamokawa & tributaries Skamokawa 4-8; LF Skamokawa 2; Falk 1-2 ***Wilson Creek*** Wilson 1-4 ***Lower Elochoman & tributaries*** Elochoman 3-7; Duck 1-6; Clear Cr 1-3	• 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 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***					
Upper Skamokawa & tributaries Skamokawa 4-8; LF Skamokawa 2; Falk 1-2; McDonald 1,3 ***Wilson Creek*** Wilson 1-4 ***Lower Elochoman & tributaries*** Elochoman 3-7; Duck 1-6; Clear Cr 1-3 ***Upper Elochoman & tributaries*** Elochoman 8-14; WF Eloch 1-2; NF Eloch 1; EF Eloch 1	• 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 rural development & 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***					
Upper Skamokawa & tributaries Skamokawa 4-8; LF Skamokawa 2; Falk 1-2 ***Wilson Creek*** Wilson 1-4	• Reduced bank/soil stability • Excessive fine sediment • Excessive turbidity • Embedded substrates	• Artificial confinement • Clearing of vegetation (ag) • Roads – riparian / floodplain impacts • Riparian grazing	• All species	5-50 years	Most areas of bank instability are located in the agricultural middle valley of the Skamokawa and Wilson Creeks. 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 • Excessive turbidity • Embedded substrates	• Timber harvest – impacts to sediment supply • Forest roads – 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 FPRs and forest land HCPs. There are challenges with implementation on agricultural lands due to few

Location	Limiting Factors Addressed	Threats Addressed	Target Species	Time	Discussion
		• Agricultural practices – impacts to sediment supply			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 • Increased impervious surfaces • Clearing of vegetation	• 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. There are challenges associated with addressing runoff issues on developed lands due to continued increase in watershed imperviousness related to development and lack of adequate mitigation. 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 Elochoman/Skamokawa Basin have been identified as part of Watershed Planning for WRIA 25 (LCFRB 2004).
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 • Leaking septic systems	• All species	1-50 years	Primary emphasis for restoration should be placed on stream segments that are listed on the 2004 303(d) list.

Location	Limiting Factors Addressed	Threats Addressed	Target Species	Time	Discussion
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***					
Upper Skamokawa & tributaries Skamokawa 4-8; LF Skamokawa 2; Falk 1-2; McDonald 1,3 ***Wilson Creek*** Wilson 1-4 ***Lower Elochoman & tributaries*** Elochoman 3-7; Duck 1-6; Clear Cr 1-3 ***Upper Elochoman & tributaries*** Elochoman 8-14; WF Eloch 1-2; NF Eloch 1; EF Eloch 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.
10. Protect and restore fish access to channel habitats ***A. Beaver Creek Hatchery blockage*** ***B. Culvert barriers on various small tributaries***					
Lower Elochoman Beaver Creek ***Various small tribs***	• Blockages to channel habitats	• Dams, culverts, in-stream structures	• Coho • Winter steelhead	immediate	As many as 10 miles of potentially accessible habitat are blocked by culverts or other barriers (approximately eight barriers total). The blocked habitat is believed to be marginal in most cases. The water intake dam for the hatchery on Beaver Creek is believed to be a partial barrier. 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		• All species	5-50 years	The focus should be on management of land-

Location	Limiting Factors Addressed	Threats Addressed	Target Species	Time	Discussion
	limiting factors and threats				use conversion and managing continued development in sensitive areas (e.g., wetlands, stream corridors, unstable slopes). 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.

4.5 Program Gap Analysis

The Elochoman-Skamokawa Subbasin (~73 sq mi) is located primarily in Wahkiakum County; however, the uppermost headwaters of the Elochoman are in Pacific and Cowlitz County. The Elochoman-Skamokawa Basins can be characterized as nearly exclusively forested, with agricultural land uses occurring in the broad mainstem river valleys of the lower Skamokawa and Elochoman basins.

- Approximately 41 square miles of the Elochoman-Skamokawa Basin are owned and managed by large industrial timber companies; a small fraction of those acres are small-commercial forest lands;
- There is only minor federal land ownership in the Elochoman-Skamokawa Basin; the Julia Butler Hansen Refuge (1.46 sq mi) is managed by the US Fish and Wildlife Service;
- Washington Department of Natural Resources manages approximately 15 square miles of forestlands in the Elochoman-Skamokawa Basins;
- Functionally, all of the Elochoman-Skamokawa Basins are located in Wahkiakum County;

Protection Programs

Protection programs in the Elochoman-Skamokawa Basin are implemented by private forest owners pursuant to the state forest practice rules, Wahkiakum County land use regulations, the Department of Natural Resources HCP and other regulatory agencies. Protection programs in this analysis include those programs that protect habitat conditions or watershed functions through management policies and programs, regulatory measures, incentives, and acquisition of sensitive habitats or protective easements. Major programs implementing protection measures are identified below.

Federal 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 fish; [M.1A; M.2A; M.2B; M.4A; M.9A; M.9B]

State 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.4A; M.5A; M.5B; M.6A; M.6B; M.8A]

  - 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 that manage stormwater, sedimentation and slope failure potential. [M.3A; M.3B; M.4A; M.5A; M.5B; M.6A; M.6B; M.8A]

- ***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.2C; M.3A; M.4A; M.8A; M.8B; M.9A; M.9B; M.10A; M.10B; M.11A; M.11B; M.11C]

- ***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 lower Cowlitz 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) 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.7A; M.7B; M.7C; M.7D; M.7E; M.8A; M.8B]

- ***Washington 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. [M.5C; M.8C]

- ***Conservation Commission/ Wahkiakum Conservation District*** 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 Elochoman and Skamokawa watersheds. These programs could help address measure M.3A; M.3C; M.4A; M.5C; M.8A; M.8B; M.9A; M.9B]

Local Government Programs

- ***Wahkiakum County***

  - Comprehensive Planning and Land Use Zoning: [M.11A; M.11B; M.11C]
    - ✓ 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.

  - Public Works Program: The County is proceeding with the replacement or repair of blocking culverts on County roads. [M.10B]

Community Programs

- No active programs.

Restoration Programs

Restoration programs in the Elochoman-Skamokawa 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

- ***Washington 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. This program addresses measures M.3A; M.3B; M.5A, M.5B; M.6A; M.6B; M.8A; and M.10B.

  - State Forest Practices Act:
    - ✓ Industrial forests within the lower NF Lewis 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.5A, M.5B; M.6A; M.6B; M.8A; and M.10B].

➢ ***Washington 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.2C; M.3A; M.4A; M.8A; M.8B; M.9A; M.9B; M.10A; M.10B; M.11A; M.11B; M.11C]

➢ ***Washington Department of Ecology***

- Water Quality Program: Ecology has listed both the Elochoman and Skamokawa on the state's impaired water bodies 303(d) list**.** [M.8A; M.8B]
- Water Resources Program/Watershed Planning:
  The planning process for WRIA 26 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.7E; M.8A; M.8B]

➢ ***Washington Department of Transportation***

- Barrier Removal Program:
  WSDOT is working to improve blockages associated with SR-4. [M.5D; M.8C; M.10A]

➢ ***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. Both Conservation Districts have undertaken restoration projects in the Elochoman and Skamokawa watersheds. [M.3A; M.3C; M.4A; M.5C; M.8A; M.8B; M.9A; M.9B].

Local Government Programs

➢ ***Wahkiakum County***

- Public Works Program replaces and/or upgrades barriers associated with roads. [M.10B]

➢ ***Wahkiakum County Noxious Weed Control Board***

- The Board has three primary programs that address weed control in the Elochoman--Skamokawa 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

Community Restoration 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 Elochoman and Skamokawa watersheds. [M.3A; M.4A; M.8A; M.9A; M.9B; M.10B]

- ***Columbia Land Trust*** is a nonprofit organization whose mission is to preserve and restore unique landscapes, natural areas, and sensitive habitats. The organization has been involved in restoration projects in the Elochoman and Skamokawa watersheds. [M.12A; M.12B; M.12C]

Analysis

***Forest-related Programs*:** Forestlands comprise 75 percent of the Elochoman-Skamokawa Basin. 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 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: Watershed processes and stream habitat in the Elochoman-Skamokawa Basin have limited protection through Wahkiakum County's land use regulations. Pacific and Cowlitz County land use regulations make a limited contribution to the protection of watershed processes and stream habitat in the Basin, since they apply to only a small area of the basin. Effective county land use programs are important, especially in the rural residential and agricultural areas in the Skamokawa (the broad agricultural valley extending up the mainstem, West Fork and Wilson tributaries); and the Elochoman (areas extending up the mainstem). Wahkiakum County's Critical Areas Ordinances could be improved by updating for Best Available Science and buffer improvements to the Shoreline Master Program. Other areas of concern include limited agricultural protections within the Elochoman-Skamokawa Basin.

Restoration-related Programs: Over a long period of time, improvements to the Elochoman-Skamokawa will occur as a result of improved forest management practices that are already in place. To the degree possible, restoration programs should focus on restoring floodplain function and channel migration, as well as restoring off- and side-channel habitats. Program areas of concern include the overall level of effort in terms of restoration activities. Attention to the Department of Fish and Wildlife's Beaver Creek Hatchery should be directed toward providing access to upstream habitats. \

Table 4-8. Program Actions to Address Gaps

Action #	Lead Agency	Proposed Action
ELOCH.1	Wahkiakum County	Develop and implement controls to adequately protect riparian areas to maintain currently functional and restored habitat around rivers, estuaries, streams, lakes, deepwater habitats, and intermittent streams. Require mitigation, where necessary, to offset unavoidable damage to habitat conditions in riparian management areas
ELOCH.2	Wahkiakum County	Development and implement controls to protect historic stream meander patterns and channel migration zones and avoid hardening stream banks and shorelines
ELOCH.3	Wahkiakum County	Development and implement controls and development standards to adequately protect wetlands, wetland buffers, and wetland function.
ELOCH.4	Wahkiakum 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
ELOCH.5	Wahkiakum County	Apply land use and resource protection code enforcement across jurisdictions in a consistent manner, using appropriate funding levels and application
ELOCH.6	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
ELOCH.7	LCFRB, USFS, WDNR. WSDOT, Counties, private property owners.	Develop and implement a coordinated and strategic barrier removal program based on watershed fish priorities and ensuring an effective and efficient sequencing of barrier removal work.
ELOCH.8	Wahkiakum County	Utilize a combination of public outreach/education and, incentives, and to promote (1) stewardship practices for protecting habitat and water quality and (2) landowner support of and participation in habitat restoration efforts.
ELOCH.9	State of Washington (DOE, DFW)	Close the Elochoman-Skamokawa Basin to further surface water withdrawals, including groundwater in connectivity with surface waters; curtail unauthorized withdrawals
ELOCH.10	LCFRB, WDFW, Wahkiakum County, Wahkiakum CD, LCFEG	Build capacity (e.g. technical and administrative skills, personnel and fiscal resources) needed to allow agencies and organizations to undertake protection and restoration projects, including noxious weed control in a reasonable period time.
ELOCH.11	SRFB, BPA, NOAA, USFWS, DOE, ACOE	Increase available funding for projects that implement measures and address underlying threats
ELOCH.12	State of Washington (Dept of Agriculture, and Department of Ecology)	Develop and implement agricultural practices and regulations to protect riparian conditions and water quality
ELOCH.13	Wahkiakum Conservation District	Expand landowner incentive (e.g. CREP) and education plans to promote further habitat protection and restoration.
ELOCH.14	LCFRB, Wahkiakum CD, Wahkiakum County,	Address threats proactively by building agreement on priorities among the various program implementers
ELOCH.15	DFW	Improve fish passage at the Beaver Creek Hatchery
ELOCH.16	FEMA	Update floodplain maps using Best Available Science