

12 Lewis Subbasin – Upper North Fork Lewis

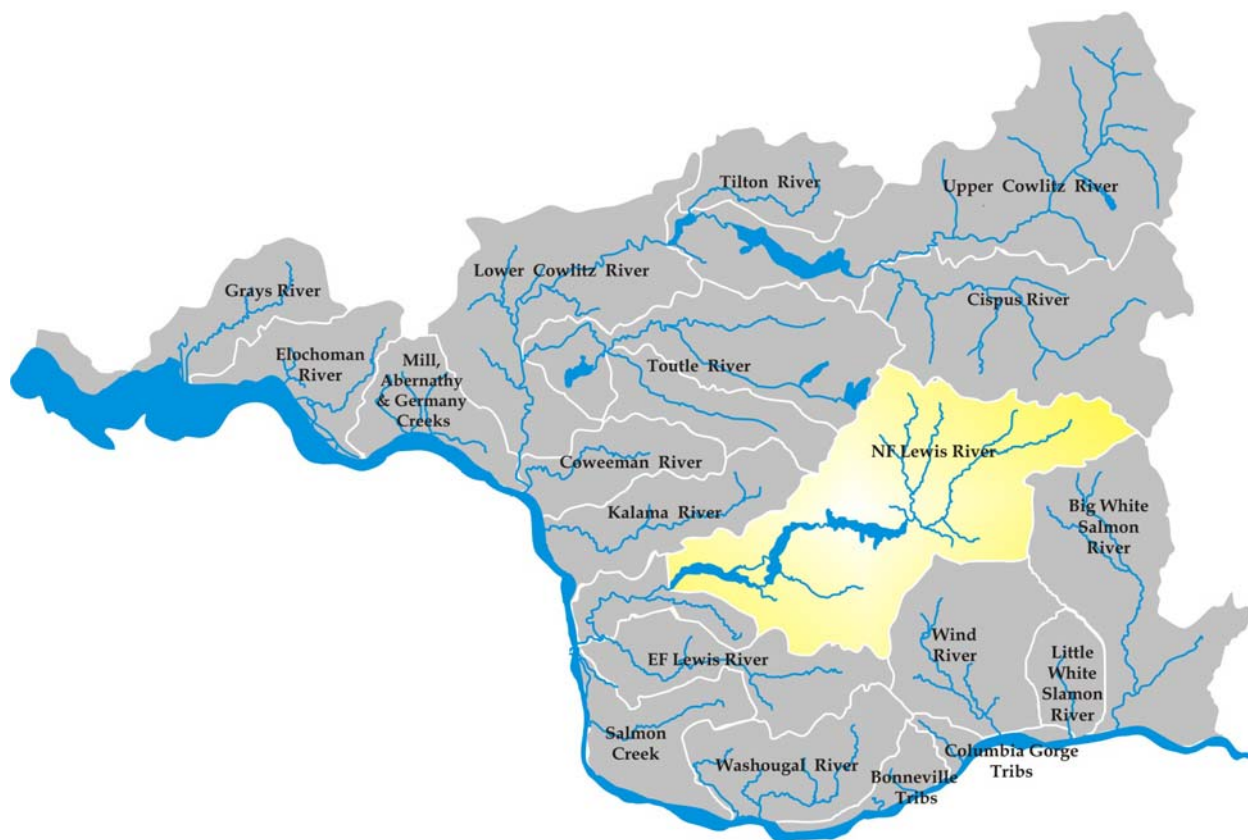


Figure 12-1. Location of the Upper North Fork Lewis River Basin within the Lower Columbia River Basin.

12.1 Basin Overview

The upper North Fork Lewis River basin comprises approximately 731 square miles, primarily in Skamania County. The lower portion of the basin including Merwin and Yale Reservoirs is in Clark and Cowlitz counties. The basin begins within the mainstem Lewis above Merwin Dam (RM 19.5). The basin contains three major reservoirs (Merwin, Yale, and Swift), and major tributaries include Pine Creek and the Muddy River. The basin is part of WRIA 27.

The upper North Fork Lewis Basin will play a key role in the recovery of salmon and steelhead. The basin has historically supported populations of spring 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.

Upper North Fork Lewis 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

Lewis fish. Speelyai and Merwin hatcheries operate within the basin with the potential to both adversely affect wild salmon and steelhead populations and to assist in recovery efforts. Key ecological interactions of concern include effects of 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 Upper North Fork Lewis Subbasin.

The bulk of the land lies within the Gifford Pinchot National Forest. Approximately 70% of the basin is national forest or national monument land, 11% is state land, and the remainder is private, most of it in private industrial forestland ownership. Recreation uses and residential development have increased in recent years. The majority of the basin is heavily forested, except for an area of approximately 30 square miles in the north part of the upper basin that was denuded by the 1980 eruption of Mount St. Helens. Stand replacement fires, which burned large portions of the basin between 1902 and 1952, have had lasting effects on basin hydrology, sediment transport, soil conditions, and riparian function. The largest of these was the Yacolt Burn in 1902. Subsequent fires followed in 1927 and 1929.

The three mainstem reservoirs inundate nearly 40 miles of historically productive habitat and block all anadromous access to the upper basin. Currently, tributaries to the reservoirs and the upper mainstem and its tributaries provide habitat for bull trout and potential habitat for anadromous fish, although these streams have been impacted by years of timber harvest activities.

Restoration of the reservoir reaches to historical conditions provides the greatest benefit to anadromous fish, however, the feasibility of such an effort is low. With the anticipated re-introduction of anadromous fish, attention should be focused on the most potentially productive habitats to which the fish will have access. The most important area is the Lewis mainstem upstream of Swift Reservoir. These reaches provide abundant potential spawning and rearing habitats. They are impacted most by past upper basin timber harvest and road building.

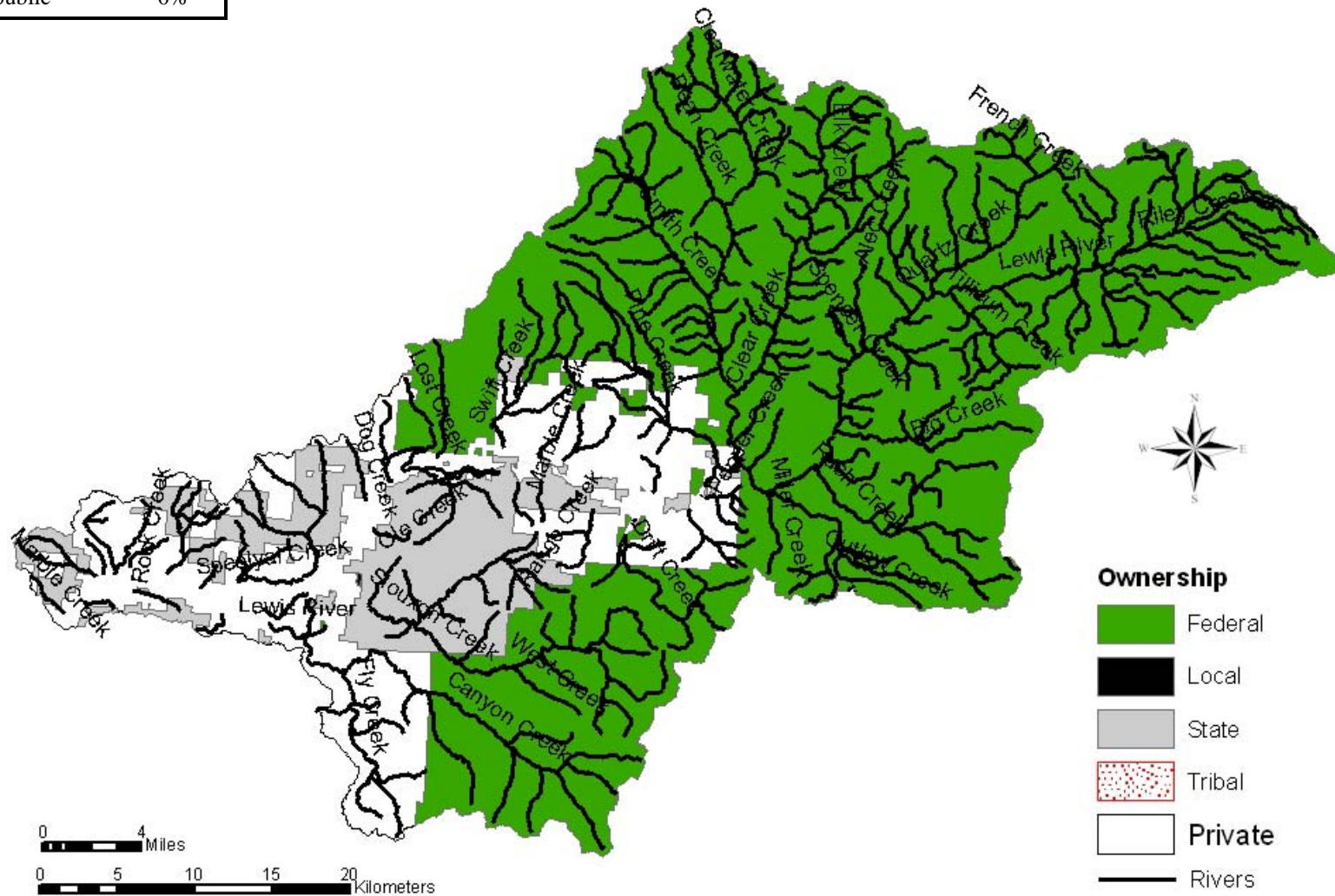
The next most important areas are the Muddy River system (including Clearwater Creek) and the Clear Creek system (tributary to lower Muddy Creek). Protecting existing production potential and restoring habitats in these areas would provide important benefits to anadromous populations. These streams have been impacted by timber harvests and road building as well as by mud and debris flows during the 1980 Mount St. Helens eruption.

The Pine Creek and Rush Creek basins currently support bull trout and also provide potential habitat for anadromous species. Improving conditions in these basins would yield important fish benefits, especially to the bull trout population. As with the Muddy Creek system, the Pine Creek basin was impacted by eruption impacts followed by intensive timber harvest. The upper Rush Creek basin has experienced intensive timber harvest and road building within the past two decades.

The population of the basin is small, with only small rural communities. There is very little development in the basin as most of the basin lies within the Gifford Pinchot National Forest. Only the areas surrounding the small communities of Yale, Woodland Park, and Cougar have any residential development or agriculture. The impact from these activities on aquatic and terrestrial habitats is relatively insignificant. The year 2000 population of the entire NF basin (including the lower NF Lewis) was approximately 14,300 persons (LCFRB 2001).

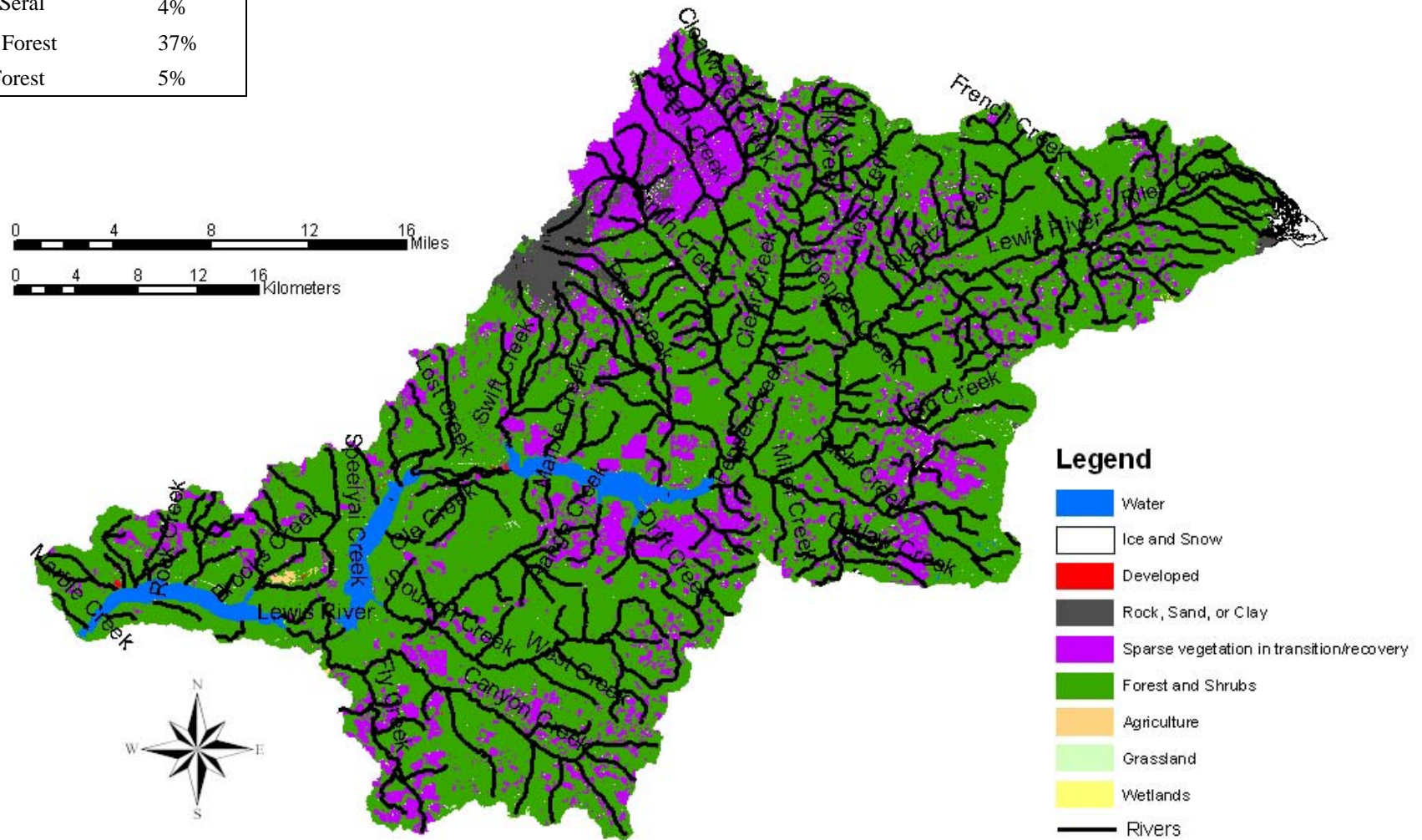
Land Ownership	
Federal	69%
Private	20%
State	11%
Other public	0%

Land Ownership



Vegetation Composition	
Late Seral	34%
Mid Seral	21%
Early Seral	4%
Other Forest	37%
Non Forest	5%

Land Use / Cover



12.2 Species of Interest

Focal salmonid species in the upper North Lewis River include spring Chinook, winter steelhead and coho. The current health or viability of the focal populations is very low for all, except low for winter steelhead. Focal populations need to improve to a targeted level that contributes to recovery of the species (see Volume I, Chapter 6). Recovery goals call for restoring all winter steelhead and coho to a medium viability level, providing for a 75-95% chance of persistence over the next 100 years. Spring Chinook recovery goals call for a high level of viability. This level will provide for a 95% probability of population survival over 100 years.

Other species of interest in the upper Lewis 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 upper North Fork Lewis subbasin although specific spawning and rearing habitat requirements of lamprey are not well known.

Table 12-1. Current viability status of upper North Fork Lewis populations and the biological objective status that is necessary to meet the recovery criteria for the Cascade strata and the lower Columbia ESU.

Species	ESA Status	Hatchery Component	Current		Objective	
			Viability	Numbers	Viability	Numbers
Spring Chinook	Threatened	Yes	Very Low	200-1,000	High	1,400-3,900
Winter steelhead	Threatened	Yes	Low	unknown	Medium	600-3,400
Coho	Candidate	Yes	Very Low	unknown	Medium	unkown

Spring Chinook- The historical North Lewis River adult population estimate is from 10,000-50,000 fish. Current natural spawning returns range from 200-1,000 and are almost entirely hatchery produced fish. Historical spawning was almost entirely in the upper Lewis basin which was blocked by Merwin Dam in 1931. Spring Chinook are expected to be reintroduced above the hydrosystem in the near future. The majority of upper Lewis spawning habitat is above Swift Reservoir in the main North Lewis, the Muddy River, Clearwater Creek, and Clear Creek. Spawning in the lower North Lewis occurs in the first 2 miles below Merwin dam and in Cedar Creek. Spawning occurs in late August and September. Juveniles rear in the Lewis basin for a full year before migrating to the Columbia in the spring.

Winter Steelhead – The historical North Lewis River adult population is estimated from 6,000-24,000 fish. Current natural spawning returns are presumed to be very low and are limited to habitat below Merwin Dam. Winter steelhead are expected be reintroduced to habitats upstream of the Lewis River hydrosystem in the near future, where the majority of winter steelhead habitat is available. The preferred stock for reintroduction is late-timed wild winter returning to the North Lewis and trapped at Merwin Dam. The majority of habitat in the upper Lewis is in the main North Lewis and tributaries upstream of Swift Dam. 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 from the Lewis Basin.

Coho – The historical North Lewis River adult population is estimated from 7,500-85,000 fish. Both early and late stocks were present historically, with early stock primarily spawning in the upper Lewis. Current returns are unknown but assumed be low and limited to the habitat

downstream of Merwin Dam. Early coho are expected to be reintroduced to the habitat upstream of the hydrosystem in the near future. Coho spawning habitat in the upper Lewis is primarily above Swift Reservoir but is also present in tributaries to Yale and Merwin reservoirs. Early stock coho spawn from late October into November and late stock spawn from late November to March. Juvenile rearing occurs upstream and downstream of spawning areas. Reintroduced juvenile coho are expected to utilize the reservoir habitat to some extent during their freshwater rearing time. Juveniles rear for a full year in the Lewis basin before migrating as yearlings in the spring.

Bull Trout – There may have been both fluvial and resident bull trout populations in the North Lewis River historically. The current bull trout populations in Swift and Yale reservoirs are isolated because there is no upstream passage at the dams. Genetic samples show significant differences between these populations indicating there may have been biological separation prior to construction of Swift Dam in 1958. Current peak counts of spawners in Cougar Creek range from 0-40 fish, and Swift Reservoir spawning population estimates range from 100-900 fish. Spawning occurs primarily in Cougar Creek (Yale population), and in Pine and Rush creeks (Swift population).

Coastal Cutthroat – Coastal cutthroat abundance in the North Lewis River has not been quantified but the population is considered depressed. Anadromous cutthroat trout are present in the North Fork Lewis and tributaries upstream to Merwin Dam, resident forms are present throughout the basin, and adfluvial forms are present in the reservoirs.

Pacific lamprey – Information on lamprey abundance is limited and does not exist for the North Lewis River population. Lamprey passage is blocked to the upper Lewis Basin.

Upper North Fork Lewis

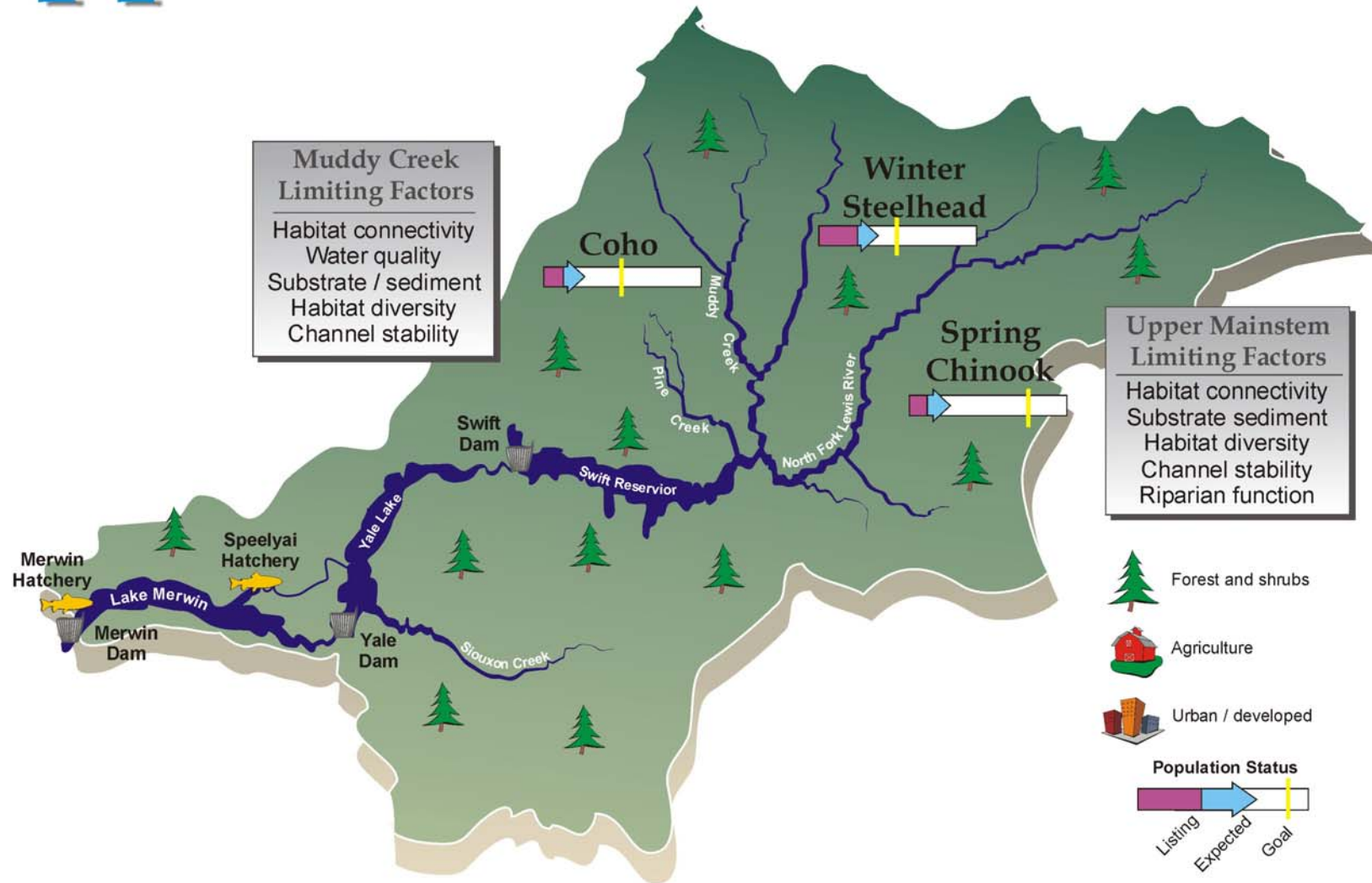


Figure 12-2. Summary of habitat limiting factors, population status, expected population improvement trend with existing programs, and biological objectives depicted for the upper North Fork Lewis Basin.

12.3 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 upper North Fork Lewis 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.

- Hydrosystem access and passage impacts are the most influential factor for each of the three upper North Fork Lewis populations. These populations are influenced by the impacts of Merwin, Yale, and Swift dams and reservoirs in the mainstem Lewis.
- Loss of tributary habitat quality and quantity is an important impact for all species, particularly for spring Chinook and winter steelhead.
- Harvest has moderate impacts on spring Chinook and coho, but its effects on winter steelhead are minor.
- Hatchery impacts include domestication of natural populations (most applicable to Chinook and coho) and ecological interactions which can impact all species to variable degrees. Hatcheries moderately impact all three species in the upper North Fork Lewis.
- Predation impacts of northern pikeminnow, Caspian terns, and marine mammals in the mainstem and estuary are moderate for winter and summer steelhead, but appear to be less important for coho, chum, and fall Chinook.

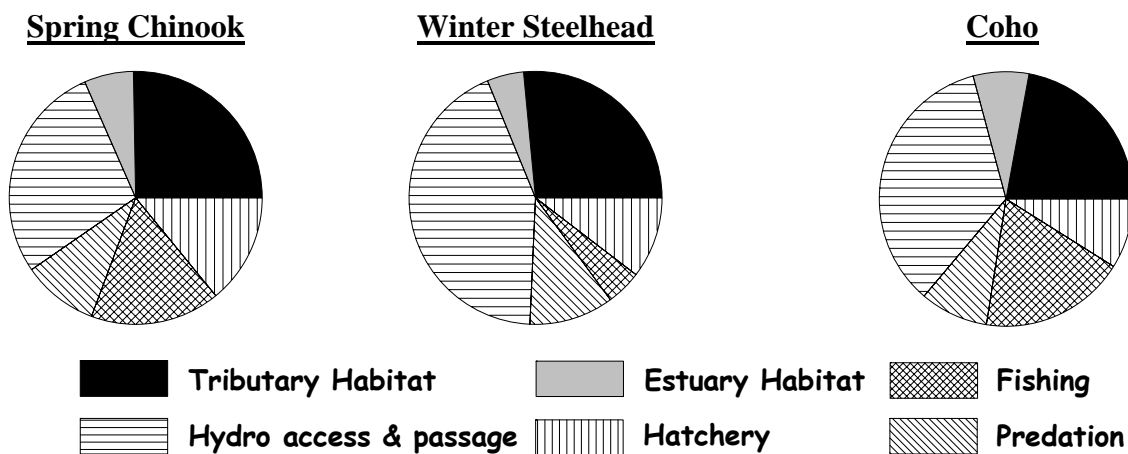


Figure 12-3. Relative contribution of potentially manageable impacts for upper North Fork Lewis populations.

12.4 Limiting Factors, Threats, and Measures

12.4.1 Hydropower Operation and Configuration

Merwin Dam (RM 20), built in 1931, blocks anadromous passage to the upper North Lewis watershed. Merwin Dam, along with Yale Dam (RM 35) and Swift 1 Dam (RM 45) form 39 miles of reservoir in the impounded upper Lewis Basin. Another small dam, Swift 2 diverts water from Swift 1 through a canal to a power generating facility. A program to reintroduce spring Chinook, coho and winter steelhead to the habitats of the upper North Lewis and provide passage for bull trout from Yale Reservoir to Swift Reservoir is likely to occur as part of an agreement for relicensing of the Lewis River hydrosystem. Successful reintroduction of Lewis spring Chinook is especially important for lower Columbia spring Chinook ESU recovery. A significant amount of habitat for North Lewis winter steelhead and coho is also located in the upper North Lewis watershed. The keys to successful reintroduction will be adequate passage of juveniles and adults to and from the upper watershed, hatchery supplementation, and habitat improvements. In addition, Upper Lewis anadromous species are affected by mainstem Columbia hydro operations and flow regimes which affect habitat in migration corridors and in the estuary. These factors are described in further detail in Volume I, Chapter 4. Mainstem hydro factors and threats are addressed by regional strategies and measures identified in Volume I, Chapter 7. Key regional strategies and measures applying to the upper North Lewis populations include:

Table 12-2. Regional hydropower measures from Volume I, Chapter 7 with significant application to the upper North Lewis Subbasin populations.

Measure	Description	Comments
D.S1	Restore access of key populations to blocked habitats in historically accessible subbasins or portions of subbasins where necessary to support region wide recovery.	Access to and from the habitats in the Upper North Fork Lewis River system is essential to meet biological objectives for spring Chinook, coho and winter steelhead. Adequate passage is a key element to achieving recovery objectives.
D.M1	Evaluate and actively implement anadromous fish reintroduction upstream of Cowlitz, Lewis, and White Salmon dams and facilities as part of dam relicensing processes.	Monitoring and evaluation of juvenile collection efficiency at Swift Dam will be necessary to meet recovery objectives. Fish management plans should clearly link adaptive management plans to needed juvenile passage efficiencies to meet population goals..

12.4.2 Harvest

Most harvest of wild North Lewis salmon and steelhead occurs incidental to the harvest of hatchery fish and healthy wild stocks in the Columbia estuary, mainstem, and ocean. Mortality is very low for steelhead. North Lewis spring Chinook are harvested in ocean and Columbia River commercial and sport fisheries as well as in-basin sport fisheries. Wild spring Chinook impacts are limited by Columbia River and Lewis River fishery management provisions to retain marked hatchery fish and release unmarked wild fish. Harvest of North Lewis 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 Lewis Basin. Wild coho impacts are limited by fishery management provisions 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 that have significant application to the upper Lewis subbasin populations are summarized in the following table:

Table 12-3. Regional harvest measures from Volume I, Chapter 7 with significant application to the upper North Lewis Subbasin populations.

Measure	Description	Comments
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 spring Chinook, 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.
F.M30	Develop a harvest plan for wild spring Chinook as populations are reestablished.	Adaptively manage harvest to respond to biological objectives for reintroduced Lewis River spring Chinook as they become reestablished in the upper watershed.

12.4.3 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 three hatcheries operating in the North Lewis Basin. The Lewis River Hatchery (since 1932) produces spring Chinook and coho for harvest as well as a sorting facility for all species trapped at Merwin Dam. The Lewis River Hatchery provides late coho eggs for the Klickitat coho program and in some years spring Chinook pre-smolts for the Deep River program. The Lewis River Hatchery also provides spring Chinook and coho for the Fish First organization's net pen program. Speelyai Hatchery (since 1958) is located in Merwin Reservoir and is used for incubation and early rearing of spring Chinook, coho, and steelhead. Speelyai Hatchery also produces kokanee and rainbow trout for reservoir recreational fisheries. Merwin Hatchery (since 1983) produces early-timed winter and summer steelhead and rainbow trout. Merwin Hatchery also provides summer steelhead for the Elochoman program. These hatchery

facilities and programs will be used in the near future to facilitate the reintroduction of spring Chinook, coho, and winter steelhead to the habitats in the upper Lewis basin

The Lewis River Hatchery spring Chinook and late coho programs are primarily derived from Cowlitz stocks, and the early coho program from Toutle stock. The early winter steelhead produced at Merwin Hatchery is a composite Elochoman, Chambers Creek, and Cowlitz steelhead, and the summer steelhead are Skamania stock. The main threats from hatchery released salmon are domestication of wild fish and ecological interactions between hatchery smolts and wild fall Chinook, chum, and coho in the lower river. 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 12-4. Lewis Basin hatchery production.

Hatchery	Release Location	Spring Chinook	Late Coho	Early Coho	Winter Steelhead	Summer Steelhead	Kokanee	Rainbow
Lewis R. Speelyai	Lower Lewis Yale Res. Swift Res.	1,050,000	815,000	880,000			93,000	400,000
Merwin	Lower Lewis Elochoman Swift Res.				100,000	175,000 35,000		400,000

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 Lewis 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 upper North Fork Lewis subbasin are summarized in Table 12-5.

Table 12-5. Regional hatchery measures from Volume I, Chapter 7 with potential implementation actions in the Upper North Fork Lewis Subbasin.

Measure	Description	Comments
H.M5,36	Integrated hatchery and wild program for reintroduced spring Chinook and early coho.	Assures fitness of the natural produced fish which will improve population productivity. Integrated programs would be developed specific to the Lewis populations in the BRAP procedure.
H.M30.	Develop a late-timed winter steelhead broodstock to enhance the winter steelhead reintroduction program.	Late-timed wild winter steelhead are the preferred stock to reintroduce above the Lewis River dams. The brood stock would be developed from wild winter steelhead entering the Merwin Trap.
H.M15, 22,32, 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, and chum by release timing and release location strategies.
H.M32, 34,41	Mark hatchery steelhead, coho, and spring 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 and sorting for the reintroduction program. 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.
H.M2	Evaluate the Lewis Salmon and Trout Hatcheries facility operations.	Both facilities would be evaluated in the BRAP process for potential hazards associated with barriers to fish passage and adequacy of screens.
H.M19, 29, 37	Hatcheries utilized for reintroduction of coho, spring Chinook, and winter steelhead into the upper Cowlitz Basin.	Hatchery facilities and operations to accommodate the reintroduction effort; including rearing, collection, transport, marking, sorting, brood stock development, and M&E.

12.4.4 Ecological Interactions

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

12.4.5 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 upper North Fork Lewis 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 upper North Fork Lewis 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.

12.4.6 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. Currently, there is no access to upper Lewis habitats and much of the habitat has been lost under the three mainstem reservoirs. Potentially productive habitats exist upstream of the reservoirs and in reservoir tributaries. Assuming fish passage is provided to upper basin reaches, the condition of stream habitat will have a large impact on the health and viability of salmon and steelhead.

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 12-4. A summary of the primary habitat limiting factors and threats are presented in Table 12-7. Habitat measures and related information are presented in Table 12-8. Results of IWA watershed process modeling are depicted for subwatersheds in Figure 12-5. Reach- and subwatershed-scale limiting factors generated from the technical assessment are included in Table 12-6. 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 upper North Fork Lewis basin include the following:

- Upper mainstem – Lewis 18-26
- Muddy Creek basin – Muddy R 1A; Clear Creek lower; Clear Creek; Clearwater Creek)
- Pine Creek – Pine Creek 1-6

The areas with the greatest current or potential production of bull trout in the upper North Fork Lewis Basin are the following:

- Pine Creek
- Rush Creek
- Cougar Creek (Yale Lake tributary)

The following paragraphs provide a brief overview of each of these priority areas, including species potentially affected, land-use threats, and the general type of measures that will be most effective. 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.

Most of the potentially productive habitat in the upper Lewis is in the upper mainstem above Swift Reservoir. The contributing basin is almost entirely within the Gifford Pinchot National Forest. The major impacts stem from the effects of forest practices on watershed processes. These reaches have high restoration and preservation value. The most effective recovery measures will be preservation of existing functional conditions and targeted restoration of road impacts and riparian areas.

The Muddy Creek system includes the large tributaries Clear Creek and Clearwater Creek. This system, particularly the mainstem Muddy and Smith Creek, were heavily impacted by the 1980 Mount St. Helens eruption. Intensive post-eruption timber harvests and road building further impacted these streams. Historically, these reaches were most important for coho but also provided productive winter steelhead and spring chinook habitat.

The recovery emphasis in the Pine Creek system is preservation; therefore no limiting factors and threats are specified. Pine Creek is believed to have historically provided habitat primarily for winter steelhead. This system was impacted by the 1980 Mount St. Helens eruption but has recovered rapidly. Although there has been considerable timber harvest and roading in this system, including some riparian timber harvests, stream conditions are currently good for winter steelhead.

Bull trout will benefit from many of the same recovery measures identified for anadromous species, especially restoration and preservation of watershed processes on forested lands. Targeted riparian and stream channel restoration may benefit bull trout in reaches of Cougar, Pine, and Rush creeks.

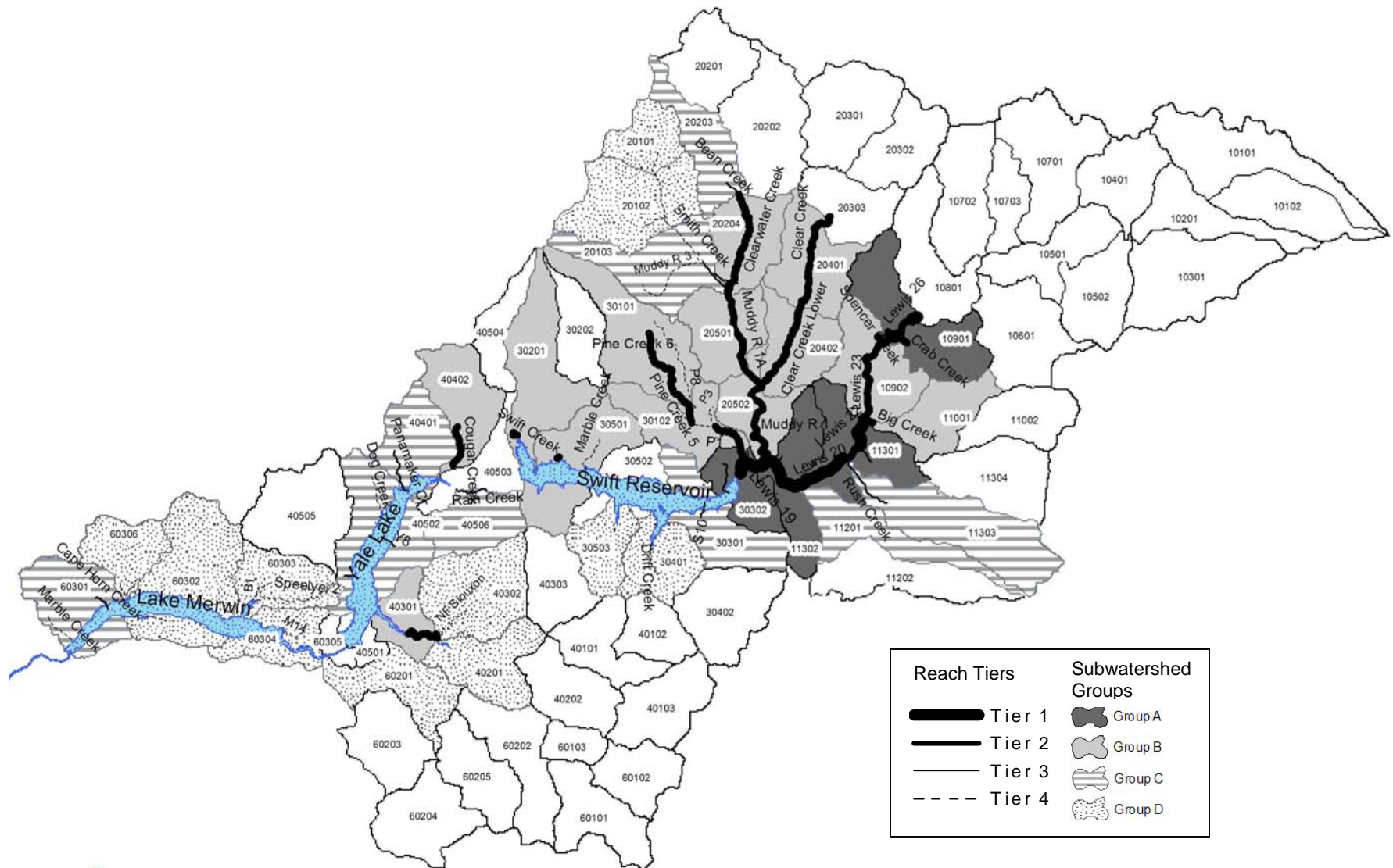


Figure 12-4. Reach tiers and subwatershed groups in the upper NF Lewis Basin. Tier 1 reaches and Group A subwatersheds represent the areas where recovery actions would yield the greatest benefits with respect to species recovery objectives. The subwatershed groups are based on Reach Tiers. Priorities 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 12-5. IWA subwatershed impairment ratings by category for the Upper NF Lewis 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 12-6. 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 subwatershed	Species present	High priority reaches by species	Critical life stages	High impact habitat factors	Restoration or preservation emphasis	Watershed processes (local)			Watershed processes (watershed)	
								Hydrology	Sediment	Riparian	Hydrology	Sediment
A	10901	Chickoom Creek Crab Creek Cussed Hollow Lewis 24 Lewis 25 Lewis 26 Lewis 27	ChS	Lewis 25 Lewis 27	spawning egg incubation fry colonization summer rearing winter rearing adult holding	channel stability habitat diversity sediment key habitat quantity	PR	F	M	F	F	M
			Coho									
			StW	Crab Creek Lewis 24 Lewis 25 Lewis 26 Lewis 27 Cussed Hollow	spawning egg incubation fry colonization summer rearing	habitat diversity predation sediment food key habitat quantity	PR					
	11301	Lewis 20 Lewis 21 Lewis 22 Little Creek	ChS	Lewis 22	egg incubation fry colonization summer rearing	sediment	PR	F	M	F	F	F
			Coho									
			StW	Lewis 21 Lewis 22	egg incubation summer rearing	sediment	P					
	11302	Lewis 20 Pepper Creek	ChS	Lewis 20	egg incubation fry colonization summer rearing	sediment	PR	F	F	F	F	F
			Coho									
			StW									
	30302	Lewis 18 Lewis 19 Swift Campground Cr	ChS	Lewis 18 Lewis 19	egg incubation fry colonization summer rearing	habitat diversity predation competition (hatchery fish) sediment food key habitat quantity	PR	F	M	M	F	F
			Coho	Lewis 18	egg incubation summer rearing winter rearing	habitat diversity predation competition (hatchery fish) sediment food key habitat quantity	R					
			StW	Lewis 18 Lewis 19	summer rearing winter rearing	habitat diversity predation competition (hatchery fish) sediment food	PR					

Sub-watershed Group	Sub-watersheds	Reaches within subwatershed	Species present	High priority reaches by species	Critical life stages	High impact habitat factors	Restoration or preservation emphasis	Watershed processes (local)			Watershed processes (watershed)	
								Hydrology	Sediment	Riparian	Hydrology	Sediment
B	10902	Spencer Creek Lewis 23	ChS					F	F	F	F	F
			Coho	Lewis 23	spawning	habitat diversity	P					
			StW	Spencer Creek	fry colonization egg incubation summer rearing	sediment						
	11001	Big Creek Mid	Coho					F	M	F	F	F
			StW	Big Creek Mid	spawning egg incubation fry colonization summer rearing winter rearing	habitat diversity sediment key habitat quantity	P					
	20204	Clearwater Creek Clearwater Tribs	ChS					F	F	M	F	M
			Coho	Clearwater Creek	egg incubation fry colonization summer rearing winter rearing	habitat diversity temperature sediment food	R					
			StW									
	20401	Clear Creek Clear Creek Small Tribs	ChS					F	F	F	F	F
			Coho	Clear Creek Small Tribs	egg incubation fry colonization summer rearing winter rearing adult holding	sediment key habitat quantity	PR					
			StW									
	20402	Clear Creek Lower Clear Creek Small Tribs	ChS					F	F	F	F	F
			Coho	Clear Creek Lower	egg incubation summer rearing winter rearing	habitat diversity sediment food key habitat quantity	PR					
			StW									
	20501	Muddy R 1A	ChS					F	M	M	F	M
			Coho	Muddy R 1A	egg incubation summer rearing winter rearing	habitat diversity sediment	R					
			StW									
	20502	Muddy R 1 Muddy R 1A	ChS					F	F	M	F	F
			Coho	Muddy R 1 Muddy R 1A	egg incubation summer rearing winter rearing	habitat diversity temperature competition (hatchery fish) sediment food	R					
			StW									
30101	P10 P8 Pine Creek 5 Pine Creek 6	ChS					F	F	M	F	F	
		Coho										
		StW	Pine Creek 5 Pine Creek 6	spawning egg incubation fry colonization summer rearing winter rearing adult holding		P						
30102	P1 P3 P7 Pine Creek 1 Pine Creek 2 Pine Creek 3 Pine Creek 4	ChS					F	M	M	F	M	
		Coho										
		StW	Pine Creek 1 Pine Creek 2 Pine Creek 4	egg incubation fry colonization summer rearing winter rearing		P						
30201	Swift Creek	ChS Coho StW					F	M	F	F	M	
30401	Drift Creek	All					F	M	M	F	M	
30501	Diamond Creek Diamond Creek Template Marble Creek	Coho	Diamond Creek	spawning egg incubation fry colonization summer rearing winter rearing adult holding	habitat diversity sediment	P	F	F	M	F	M	
		StW										
40301	Siouxon 1	All					F	M	M	F	M	
40402	Cougar Creek	All					F	M	F	F	M	

Sub-watershed Group	Sub-watersheds	Reaches within subwatershed	Species present	High priority reaches by species	Critical life stages	High impact habitat factors	Restoration or preservation emphasis	Watershed processes (local)			Watershed processes (watershed)		
								Hydrology	Sediment	Riparian	Hydrology	Sediment	
C	11201	Curly Creek	Coho StW					F	F	F	F	F	
	11303	Rush Creek	All					F	F	M	F	F	
	20103	Muddy R 2 Muddy R 3 Smith Creek	All					F	M	M	F	F	
	20203	Bean Creek	Coho StW					F	F	M	F	F	
	30301	S10	Coho					F	I	M	F	F	
	40401	Panamaker Cr	Coho StW					M	M	M	M	M	
	40502	Dog Creek Dog Creek Template Y8	Coho StW					F	M	M	M		
40506	Ole Creek Rain Creek	Coho StW					F	F	F	F	F		
60301	Cape Horn Creek Marble Creek Marble Creek Templa	Coho StW						I	M	M	M	M	
D	20101	Upper Smith Creek	All					F	F	M	F	F	
	20102	Ape Canyon Creek Upper Smith Creek	All					F	F	M	F	F	
	30401	Drift Creek	All					F	M	M	F	M	
	30503	Range Creek Range Creek Templat	All					F	M	M	F	M	
	40201	Siouxon 2	StW					F	M	M	F	M	
	40302	NF Siouxon	Coho StW					F	M	F	F	M	
	60201	Canyon Creek	All					I	I	M	I	M	
	60302	Buncombe Hollow Creek	Coho StW					F	F	M	M	M	
	60303	B1 Brooks Creek Speelyei 1 Speelyei 1 Template Speelyei 2	Coho StW					M	M	M	M	M	
	60304	M14 M14 Template	Coho StW					M	M	M	M	M	
	60306	Indian George Creek Jim Creek	Coho StW						I	F	M	I	F
	60501	Lewis 1 tidal Lewis 2 tidal	All						I	M	I	M	M
	60502	Lewis 3 Lewis 4	All						I	M	M	M	M
	60503	Lewis 5 Lewis 6	All						I	M	M	M	M
60504	Lewis 7	All						I	M	M	M	M	

Table 12-7. Salmonid habitat limiting factors and threats in priority areas. Priority areas include the upper mainstem (UM) and Muddy Creek and tributaries (MC). Linkages between each threat and limiting factor are not displayed – each threat directly and indirectly affects a variety of habitat factors.

Limiting Factors	Threats	
	UM	MC
<i>Habitat connectivity</i>		
Blockages to stream habitats due to structures	✓	✓
<i>Habitat diversity</i>		
Lack of stable instream woody debris	✓	✓
Altered habitat unit composition		✓
<i>Channel stability</i>		
Bed and bank erosion	✓	✓
Mass wasting		✓
<i>Riparian function</i>		
Reduced bank/soil stability	✓	
Reduced wood recruitment	✓	
<i>Water quality</i>		
Altered stream temperature regime		✓
Excessive turbidity		✓
<i>Substrate and sediment</i>		
Excessive fine sediment	✓	✓

Table 12-8. 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
<p>1. Protect and restore riparian function A. Reforest riparian zones B. Allow for the passive restoration of riparian vegetation</p>					
<p><i>Upper mainstem Lewis</i> Lewis 18-26 <i>Muddy Creek & tribs</i> Muddy Creek 1-1A, Clear Creek lower, Clear Creek, Clearwater Creek</p>	<ul style="list-style-type: none"> • Reduced stream canopy cover • Altered stream temperature regime • Reduced bank/soil stability • Reduced wood recruitment • Lack of stable instream woody debris 	<ul style="list-style-type: none"> • Timber harvest – riparian harvests 	<ul style="list-style-type: none"> • Winter steelhead • Coho • Spring Chinook 	20-80 years	High potential benefit due to the many limiting factors that are addressed. Riparian impairment is related to the 1980 Mt. Saint Helens eruption and subsequent timber harvests. Recovery of riparian forests is occurring naturally. Riparian protections on forest lands are provided for under current harvest policy. Active reforestation should be considered low priority unless the benefit can be clearly demonstrated. 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.
<p>2. Protect and restore natural sediment supply processes A. Address forest road related sources B. Address timber harvest related sources</p>					
<p><i>Entire basin</i></p>	<ul style="list-style-type: none"> • Excessive fine sediment • Excessive turbidity 	<ul style="list-style-type: none"> • Timber harvest – impacts to sediment supply • Forest roads – impacts to sediment supply 	<ul style="list-style-type: none"> • Winter steelhead • Coho • Spring Chinook • Bull trout 	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, the USFS Northwest Forest Plan, and forest land HCPs. Use IWA impairment ratings to identify restoration and preservation opportunities.

Location	Limiting Factors Addressed	Threats Addressed	Target Species	Time	Discussion
3. Protect and restore runoff processes A. Address forest road impacts B. Address timber harvest impacts					
<i>Entire basin</i>	<ul style="list-style-type: none"> Stream flow – altered magnitude, duration, or rate of change of flows 	<ul style="list-style-type: none"> Timber harvest – impacts to runoff Forest roads – impacts to runoff 	<ul style="list-style-type: none"> Winter steelhead Coho Spring Chinook Bull trout 	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, the USFS Northwest Forest Plan, and forest land HCPs.
4. 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					
<i>Upper mainstem Lewis</i> Lewis 18-26 <i>Muddy Creek & tribs</i> Muddy Creek 1-1A, Clear Creek lower, Clear Creek, Clearwater Creek	<ul style="list-style-type: none"> Lack of stable instream woody debris Altered habitat unit composition 	<ul style="list-style-type: none"> None (symptom-focused restoration strategy) 	<ul style="list-style-type: none"> winter steelhead coho spring Chinook 	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. High likelihood of implementation given the USFS focus on stream restoration.
5. Protect and restore water quality A. Restore the natural stream temperature regime					
<i>Entire basin</i>	<ul style="list-style-type: none"> Altered stream temperature regime 	<ul style="list-style-type: none"> Riparian harvests 	<ul style="list-style-type: none"> All species 	20-50 years	Primary emphasis for restoration should be placed on stream segments that are on the 2004 303(d) list.
6. 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					
<i>Entire basin</i>	<ul style="list-style-type: none"> Stream flow – altered magnitude, duration, or rate of change of flows 	<ul style="list-style-type: none"> Water withdrawals 	<ul style="list-style-type: none"> All species 	1-5 years	Instream flow management strategies for the Upper Lewis Basin have been identified as part of Watershed Planning for WRIA 27 (LCFRB 2004).

Location	Limiting Factors Addressed	Threats Addressed	Target Species	Time	Discussion
<p>7. Protect habitat conditions and watershed functions through land-use planning that guides population growth and development</p> <p><i>A. Plan growth and development to avoid sensitive areas (e.g., wetlands, riparian zones, floodplains, unstable geology)</i></p> <p><i>B. Encourage the use of low-impact development methods and materials</i></p> <p><i>C. Apply mitigation measures to off-set potential impacts</i></p>					
<p><i>Privately owned portions of the basin</i></p>	<p>Preservation Measure – addresses many potential limiting factors and threats</p>		<ul style="list-style-type: none"> • All species 	<p>5-50 years</p>	<p>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.</p>
<p>8. Protect habitat conditions and watershed functions through land acquisition or easements where existing policy does not provide adequate protection</p> <p><i>A. Purchase properties outright through fee acquisition and manage for resource protection</i></p> <p><i>B. Purchase easements to protect critical areas and to limit potentially harmful uses</i></p> <p><i>C. Lease properties or rights to protect resources for a limited period</i></p>					
<p><i>Privately owned portions of the basin</i></p>	<p>Preservation Measure – addresses many potential limiting factors and threats</p>		<ul style="list-style-type: none"> • All species 	<p>5-50 years</p>	<p>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.</p>

12.5 Program Gap Analysis

The upper North Fork Lewis Basin (~731 square miles) is predominantly forest lands; its headwaters begin in the Gifford Pinchot National Forest before entering three hydroelectric reservoirs managed by PacifiCorp. The three reservoirs are Swift, Yale, and Merwin.

- Approximately 500 square miles of the basin lie within the Gifford Pinchot NF and divided into multiple management areas. These include the Mount St Helens Monument and Ranger District, Mt Adams Ranger District, Indian Heaven Wilderness, and the Mt Adams Wilderness.
- Lands surrounding Swift Reservoir are predominantly private industrial forest lands with some Department of Natural Resources managed state forests.
- Lands surrounding the Yale Reservoir are predominantly Department of Natural Resources managed state lands (~80 square miles), Mt St Helens National Monument, private small landowner and industrial forest lands, and private lands.
- Lands surrounding the Merwin Reservoir are a balanced mix of Department of Natural Resources lands, private small and industrial forest lands, and private lands that can be characterized as rural and residential;
- The portion of the upper North Fork Lewis basin above Yale Reservoir lies in Skamania County. Below this point, lands north of the river lie in Cowlitz County and lands south of the river lie in Clark County.
- PacifiCorp and Cowlitz PUD management of the three reservoirs is governed by a license issued by the Federal Energy Regulatory Commission. Programs implemented under the current license include flow, habitat, hatcheries, and water quality.

Protection Programs

In the upper North Fork Lewis basin, protection programs center forest management and the existing hydroelectric project. Habitat protection on the very small remaining area of private is provided through county land use programs. Protection programs in this analysis include those programs that protect habitat conditions or watershed functions through regulatory measures, acquisition sensitive habitat or protective easements, or by applying standards to new development that protects resources by avoiding damaging impacts. Key programs implementing protection measures are identified below.

Federal Programs

➤ ***U.S. Forest Service Gifford Pinchot National Forest***

- **Forest Plan:** The Gifford Pinchot NF Forest Plan provides high levels of protection for riparian areas and forest stands within the upper NF Lewis Basin. Protection efforts are subject to NOAA Fisheries and U.S. Fish and Wildlife Service ESA Section 7.
 - ✓ Riparian buffers in all areas of the Gifford Pinchot NF include at least 300' setbacks.
 - ✓ Designated matrix lands in the NF Lewis observe the forest-wide 'no clear cut' policy.
 - ✓ Some NF Lewis Gifford Pinchot lands fall in the Late Successional Reserves Program. Thinning occurs in the riparian areas to support healthier late successional stands.

- ✓ Congressional Reserve Areas (Mt St Helens National Volcanic Monument) in the NF Lewis are ‘no touch’ areas. This includes portions of the Muddy Fork watershed.
 - ✓ Upper NF Lewis lands located within Wilderness Areas (Indian Heaven and Mt Adams) allow little human activity.
 - ✓ Addresses measures: M.1B; M.2A; M.2B; M.3A; M.3B; M.5A
- ***Federal Energy Regulatory Commission (FERC)***
- Licensing of Hydroelectric Projects: PacifiCorp and the Cowlitz PUD operate hydroelectric facilities on the North Fork Lewis. Existing FERC licenses for these projects include habitat protection provisions. The projects are currently undergoing relicensing pursuant to the federal Power Act using FERC’s alternative licensing approach. Under this approach the utilities are working with federal agencies, local governments, tribes, community interests, and environmental organizations to develop a settlement agreement defining terms for a license. Aquatic and terrestrial habitat protection is an issue under consideration in the relicensing discussions.
- ***NOAA Fisheries***
- Hydroelectric Project Relicensing: Under the federal Power Act, NOAA Fisheries has substantive authority over FERC license provisions relating to listed salmonids. The agency is actively engaged in the relicensing efforts for the Lewis hydroelectric projects. With regard to the upper North Fork Lewis, habitat protection is a key issues of interest to NOAA fisheries.
- ***U.S. Fish and Wildlife Service***
- Hydroelectric Project Relicensing: Under the federal Power Act, the U.S, Fish and Wildlife Service (USFWS) has substantive authority over FERC license provisions relating to bull trout in the upper North Fork Lewis. The agency is actively engaged in the relicensing efforts for the Lewis hydroelectric projects. With regard to the upper North Fork Lewis, key protection issue of interest to USFWS is bull trout habitat protection.
- ***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.4A; M.4B]

State Programs

- ***Department of Natural Resources***
- State Forest Land HCP: State forest lands are managed under the provisions of a Habitat Conservation Plan (HCP). The Habitat Conservation Plan has 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.1B; M.2A; M.2B; M.3A; M.3B; M.5A]

- **State Forest Practices:** 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.1B; M.2A; M.2B; M.3A, M.3B, M.5A]

➤ ***Washington 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.4A; M.4B]
- **Habitat Program:** The Department provides advice to local governments and landowners interested in measures to protect habitat values on their property. [M.1A; M.4A; M.4B; M.5A; M.7A; M.7B; M.7C]
- **Hydro Facility Relicensing:** The Department is an active participant in the FERC relicensing of the PacifiCorp and Cowlitz PUD hydro facilities on the North Fork Lewis. Protection of aquatic and terrestrial habitat in the upper North Fork Lewis is a topic of interest to WDFW.

➤ ***Washington Department of Ecology***

- **Water Quality Program/Clean Water Act – Section 401 Certification**
FERC relicensing of the Lewis hydro projects requires the Department to issue a CWA Section 401 water quality certification. The Department of Ecology review and, where necessary, revise flow requirements for the protection of fish and their habitat. [M.3A; M.3B; M.5A]
- **Water Resources Program/Water Rights:** Department of Ecology, in consultation with the Department of Fish and Wildlife, has administratively closed selected areas within the North Fork Lewis watershed to further surface and groundwater withdrawals (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 given the low intensity of land uses is not expected to adverse impact stream flows. [M.6A; M.6B; M.6C; M.6D]
- **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) 27 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.5A; M.6A; M.6B; M.6C; M.6D; M.7A]

Local Government Programs

➤ *Clark County* (Lands south of the NF Lewis)

- ESA Program: The County has established an Endangered Species Program to address ESA requirements and develop a comprehensive county strategy for salmon recovery. An ESA committee with representatives from federal and state agencies, tribes, citizens, the business community and environmental groups has been established to advise the county as it works to bring its ordinances and programs into compliance with ESA requirements.
- Land Use:
 - ✓ The County is actively engaged in a comprehensive review and revision of its programs to better protect watershed processes and habitat and to secure ESA Section 4d assurances from NOAA Fisheries.
 - ✓ The County comprehensive sets policies calling for the protection of habitat for ESA listed salmon and other aquatic and terrestrial species.
 - ✓ Zoning that directs growth throughout the County and maintains low-density development in rural areas. The County has a designated Urban Growth Area pursuant to the Washington Growth Management Act (GMA). The UGA helps protect rural lands by directing high intensity uses to developed areas.
 - ✓ A Habitat Conservation Ordinance provides stream buffers and measures for the protection of important habitat, including ESA listed salmonids.
 - ✓ Addresses measures: [M.7A; M.7B; M.7C]
- Road Maintenance:
Clark County Road Program utilizes Best Management Practices to guide their operations and is actively seeking programmatic ESA Section 4d assurances from NOAA Fisheries that these measures provide adequate protection for fish. [M.5A]

➤ *Cowlitz County* (Lands north of the NF Lewis)

- Land Use:
 - ✓ The comprehensive plan that applies to the non-federal lands, but contains no significant policies for the protection of watershed processes and stream habitat.
 - ✓ Zoning along State Highway 503 provides for one dwelling per 2 acres and one dwelling per 5 acres along non-county roads.
 - ✓ Cowlitz County has not adopted protective stream buffers.
 - ✓ Wetland buffers vary from 25' to 200' and are based upon soil type and wildlife utilization.
 - ✓ The County has not developed comprehensive ordinances for the protection of watershed processes or stream habitat conditions. [M.7A; M.7B; M.7C]
- Road Maintenance

The County has not developed or implemented a road maintenance program to protect habitat. [M.5A]

Community Programs

No active programs

Restoration Programs

Restoration programs in the upper NF Lewis Basin are conducted primarily by the U.S. Forest Service Gifford Pinchot National Forest, the Washington Department of Natural Resources on state forest lands and industrial and small forest land owners pursuant to the state forest practice rules. Restoration programs are generally organized around agencies, organizations, and private interests that assess threats, develop solutions, and implement projects that are intended to improve habitat conditions or watershed functions. Key programs implementing restoration measures are identified below:

Federal Programs

- ***U.S. Forest Service Gifford Pinchot National Forest:*** Restoration activities within the upper NF Lewis Basin are a high priority on the Gifford Pinchot NF. These efforts include placement of large wood, riparian thinning to improve stands, and road stabilization and decommissioning. The Muddy Fork and Pine Creek receive provide important bull trout habitat receive high priority for restoration. [M.1A; M.1B; M.2A; M.2B; M.3A; M.3B; M.5A]
- ***Federal Energy Regulatory Commission (FERC)***
 - **Hydro Project Licensing:** Current FERC licenses for the hydroelectric projects operated by PacifiCorp and Cowlitz PUD contain habitat restoration provisions. Relicensing negotiations underway included the following habitat restoration topics:
 - ✓ Adult and juvenile passage for salmonids;
 - ✓ Reintroduction of spring Chinook, coho, and steelhead;
 - ✓ Habitat protection and improvement for salmon, steelhead, and bull trout; and
 - ✓ Flows in the bypass reach (former North Fork Lewis channel).

Reintroduction and passage of spring chinook are essential for the recovery of the species in the lower Columbia ESU.

➤ ***NOAA Fisheries***

- **Hydroelectric Project Relicensing:** Under the federal Power Act, NOAA Fisheries has substantive authority over FERC license provisions relating to listed salmonids. The agency is actively engaged in the relicensing efforts for the Lewis hydroelectric projects. With regard to the upper North Fork Lewis, restoration of primary concern are:
 - ✓ Adult and juvenile passage for salmonids;
 - ✓ Reintroduction of spring Chinook, coho, and steelhead; and
 - ✓ Habitat protection and improvement.

➤ ***U.S. Fish and Wildlife Service***

- Hydroelectric Project Relicensing: Under the federal Power Act, the U.S. Fish and Wildlife Service (USFWS) has substantive authority over FERC license provisions relating to bull trout in the upper North Fork Lewis. The agency is actively engaged in the relicensing efforts for the Lewis hydroelectric projects. With regard to the upper North Fork Lewis, key restoration issues for USFWS are protection.
 - ✓ Bull trout passage; and
 - ✓ Restoration of bull trout habitat.

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 require barrier upgrades and road abandonment and/or other improvements. [M.1B; M.2A; M.2B; M.3A; M.3B; M.5A]
- 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 [M.1B; M.2A; M.2B; M.3A; M.3B; M.5A]
 - 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.1B; M.2A; M.2B; M.3A; M.3B; M.5A]

➤ ***Department of Fish and Wildlife***

- Habitat Program: The Department provides advice and assistance to local governments and landowners interested in measures to restore habitat. [M.1A; M.4A; M.4B; M.5A; M.7A; M.7B; M.7C]
- Hydro Facility Relicensing: The Department is an active participant in the FERC relicensing of the PacifiCorp and Cowlitz PUD hydro facilities on the North Fork Lewis. Upper North Fork restoration issues of interest to WDFW include:
 - ✓ Adult and juvenile passage for salmonids;
 - ✓ Reintroduction of spring Chinook, coho, and steelhead;
 - ✓ Habitat protection and improvement for salmon, steelhead, bull trout and other aquatic species;
 - ✓ Flows in the bypass reach (former North Fork Lewis channel); and
 - ✓ Restoration of habitat for terrestrial species.

➤ ***Department of Transportation***

- **Barrier Removal Program:**
WSDOT has improved several blockages associated with State Route 503 project.
- **Road Maintenance Program**
WSDOT has an ESA Section 4(d) Road Maintenance Program. The Maintenance Program uses trained crews to primarily manage road-side vegetation, litter control, and maintenance of safety rest areas. [M.5A]

Gap Analysis

Forest-related Programs: Approximately 70% of the upper NF Lewis Basin is in the Gifford Pinchot NF. Forest Service management will provide a high level of watershed and habitat protection and restoration on these lands. Forestry programs and regulations applicable to state and private forest lands will play a substantial role in protecting and restoring watershed functions and habitat conditions at levels supporting recovery goals. Certainty of forestry-related protection and restoration programs is relatively high because programs are being implemented and, for the most part, fully funded. Program areas of concern include state funding for small commercial forest landowners and the continued potential for hydrologic impacts caused by past harvest practices. Monitoring of watershed processes and habitat conditions will be required to confirm the effectiveness of these measures.

Protection-related Programs: Clark, Skamania, and Cowlitz Counties' land use regulatory mechanisms provide varied protections throughout the upper NF Lewis Basin. Cowlitz County land use regulatory mechanisms provide some protections. However, Cowlitz County programs lack effective provisions that commonly are used to proactively direct growth, protect streams and wetlands, and manage stormwater. In addition, there are very limited protection mechanisms for agricultural practices relative to riparian areas and hydrologic impairment.

Restoration-related Programs: Relative to the hydroelectric facilities, upstream and downstream passage for coho, steelhead, and spring chinook are fundamental to access high-quality habitats upstream of the reservoirs. Recovery of Spring Chinook, in particular, hinges upon success of the PacifiCorp and Cowlitz PUD passage program. New FERC licenses will likely provide for additional habitat restoration.

Table 12-9. Program Actions to Address Gaps

Action #	Lead Agency	Proposed Action
U-NFL.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
U-NFL.2	Cowlitz County, Skamania County	Zoning and development standards to adequately protect wetlands, wetland buffers, and wetland function.
U-NFL.3	Cowlitz County, Skamania 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
U-NFL.4	State of Washington (DNR)	Provide state funding for small forest owners in the upper NF Lewis 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
U-NFL.5	State of Washington (DFW, Ecology)	Close tributaries to the upper NF Lewis to further withdrawal of surface water, including groundwater in connection with surface waters. Curtail unauthorized withdrawals.
U-NFL.6	Forest Managers LCFRB, and DFW	Identify and sequence early action forest 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
U-NFL.7	State of Washington, LCFRB, CC	Build institutional capacity for agencies and organizations to undertake protection and restoration projects
U-NFL.8	LCFRB, DOE, DFW, NOAA, USFWS, ACOE, BPA	Increase available funding for projects that implement measures and addresses underlying threats
U-NFL.9	PacifiCorp and Cowlitz PUD	Provide passage and collection facilities for adult and juvenile coho, steelhead, spring chinook populations to make use of habitats above Swift Reservoir. Monitor and mitigate LWD and sediment (gravel) transport impacts below Merwin Dam.
U-NFL.10	PacifiCorp and Cowlitz PUD	Increase fish and wildlife habitat mitigation measures (upstream and downstream) commensurate with recovery goals for populations affected by hydrosystem impacts
U-NFL.11	Clark CD, Clark County, Cowlitz County, Skamania County, non profit fish recovery organizations.	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
U-NFL.12	Clark County, Cowlitz County, Skamania County	Apply land use code enforcement across jurisdictions in a consistent manner, using appropriate funding levels and application
U-NFL.13	WRIA 27/28 PU, DOE, DFW	Close the upper NF Lewis River to further surface water withdrawals,
U-NFL.14	LCFRB, Clark County, Cowlitz County, Skamania County, DFW	Build institutional capacity for agencies and organizations to undertake additional protection and restoration projects, including noxious weed control
U-NFL.15	LCFRB, , WDFW, PacifiCorp	Address threats proactively by building agreement on priorities among the various program implementers
U-NFL.16	FEMA	Update Floodplain maps using Best Available Science