

13 Lewis Subbasin – East Fork Lewis

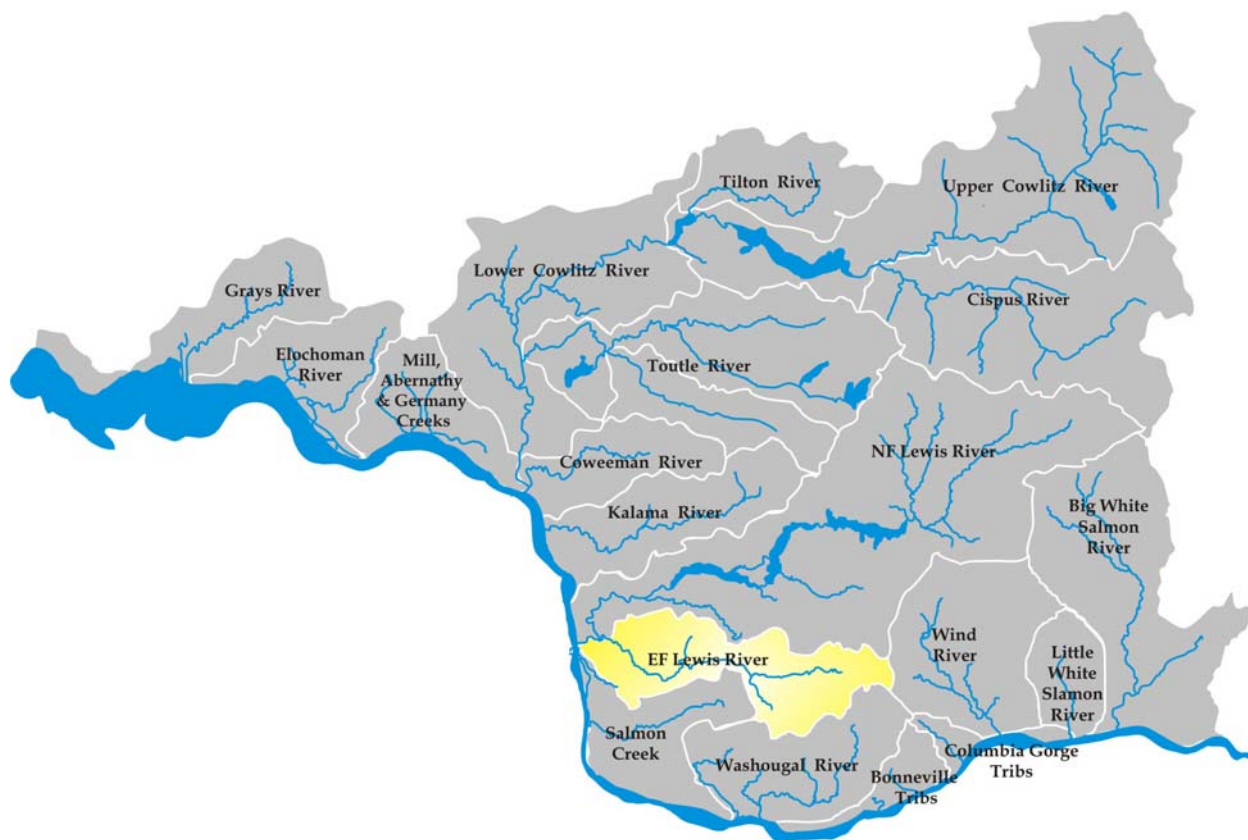


Figure 13-1. Location of the East Fork Lewis River Basin within the Lower Columbia River Basin.

13.1 Basin Overview

The East Fork Lewis River Basin comprises approximately 235 square miles, primarily in Clark County with the upper portion in Skamania County. The East Fork Lewis enters the North Fork Lewis at RM 3.5. The subbasin is part of WRIA 27.

The East Fork Lewis Basin will play a key role in the recovery of salmon and steelhead. The basin has historically supported populations of fall Chinook, summer and 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.

East 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 East Fork Lewis fish. 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 East Fork Lewis Subbasin.

The bulk of the land is forested and a large percentage is managed as commercial forest. Agricultural and residential activities are found in valley bottom areas. Recreation uses and residential development have increased in recent years. Most of the land is private (63%), with about 20% of the basin area lying within the Gifford Pinchot National Forest. 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 fires was the Yacolt Burn in 1902. Subsequent fires followed in 1927 and 1929.

The East Fork Lewis has a high degree of watershed process impairment (sediment, flow) in the lower half of the basin. This portion suffers from a variety of land uses including agriculture, grazing, mining, rural residential development, and some timber harvest. The upper portion of the basin, much of which lies within the Gifford Pinchot National Forest is more intact. Past fires and forest harvest have degraded watershed processes and riparian areas in many subwatersheds, however, healthy conditions exist in headwater areas.

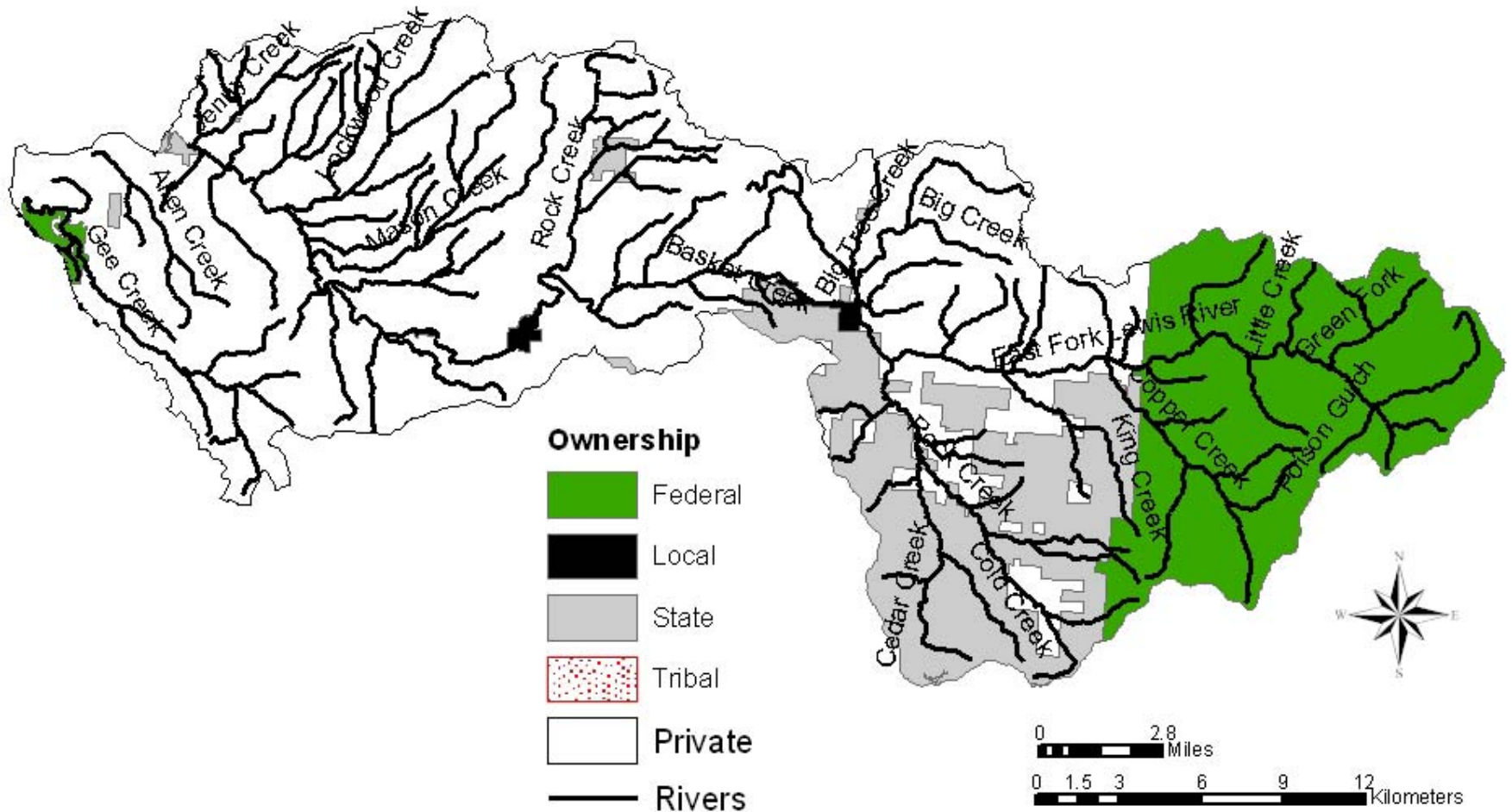
The most important areas in the basin from an aquatic habitat perspective are the mainstem reaches and the lower mainstem tributaries. The upper mainstem is critical for summer steelhead production. These spawning and rearing reaches currently support good numbers of naturally-produced steelhead, though much higher production could be achieved with recovery of impaired conditions. Upper basin timber harvest and road building have the greatest impact here. The middle mainstem provides the best potential for winter steelhead. This stock would also benefit from restoration measures focused on recovering watershed process impairments related to forest harvest.

The lower mainstem and lower mainstem tributaries represent important spawning and rearing sites for fall Chinook, chum, and coho. These areas currently suffer from loss of key habitat, low habitat diversity, and channel instability. These conditions are partly due to recent avulsions of the mainstem into stream-adjacent gravel pits. This area also suffers from artificial confinement projects and degraded riparian zones.

Rural residential development is widespread in the lower portion of the basin and is expected to increase. The population in the basin was approximately 24,400 persons in 2000 (LCFRB 2001). The population of the basin is expected to more than double by 2020. Population growth will result in conversion of forestry and agricultural land uses to residential uses, with potential impacts to habitat conditions. It is important that growth management policy adequately protect sensitive habitats and the conditions that create and support them.

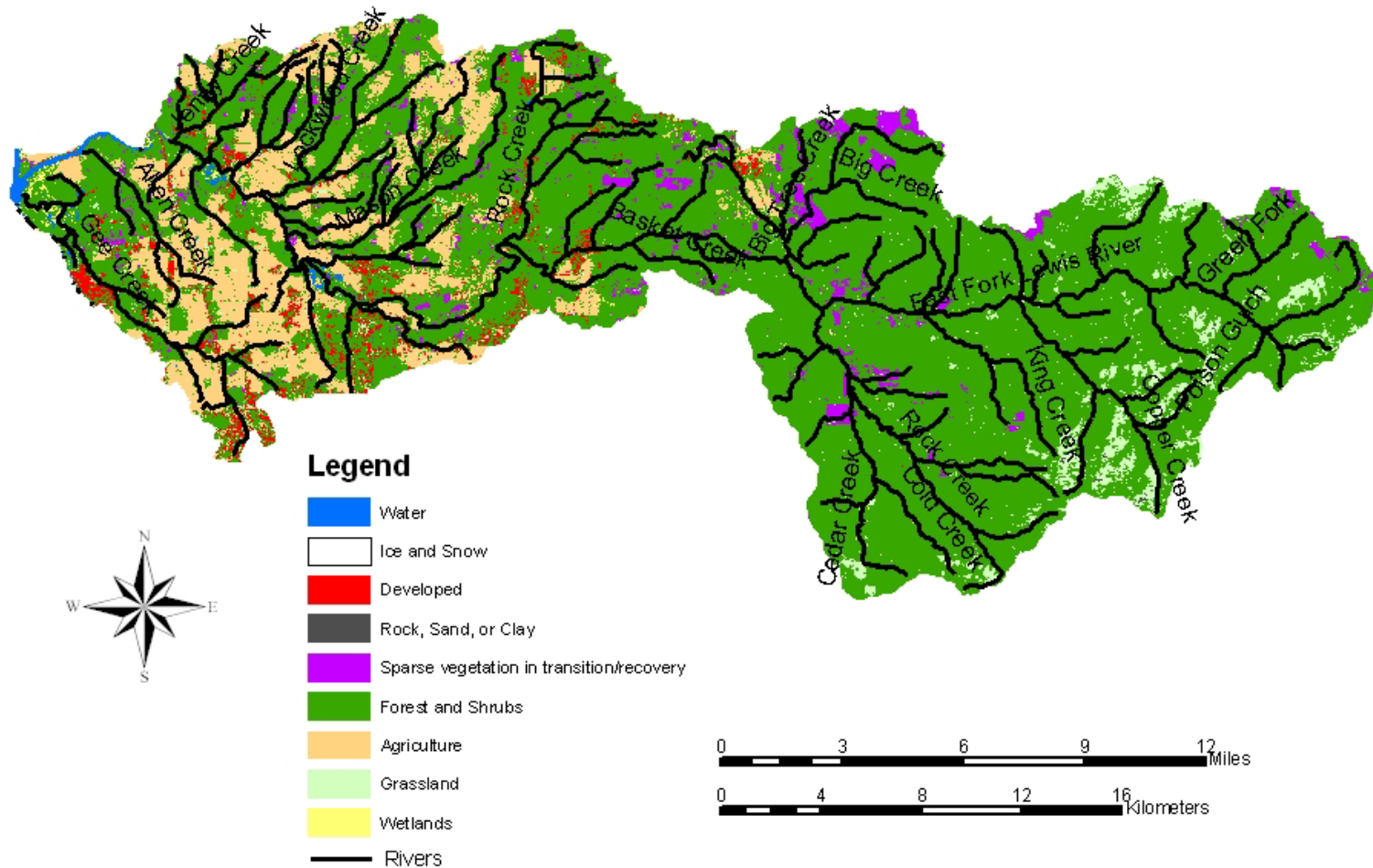
Land Ownership	
Private	63%
Federal	20%
State	16%
Other public	1%

Land Ownership



Vegetation Composition	
Late Seral	7%
Mid Seral	28%
Early Seral	3%
Other Forest	37%
Non Forest	25%

Land Use / Cover



13.2 Species of Interest

Focal salmonid species in the East Fork Lewis include fall Chinook, winter steelhead, summer steelhead, chum, and coho. The health or viability of these populations range from very low (chum) to medium (fall Chinook), except for coho, which is very low. 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 five populations to a high or very high viability level. This level will provide for a 95% or better probability of population survival over 100 years.

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

Table 13-1. Current viability status of East 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
Fall Chinook	Threatened	No	Medium	100-700	High+	1,900-3,900
Winter Steelhead	Threatened	Yes	Low-Med	100-300	High	600-1,300
Summer Steelhead	Threatened	Yes	Low-Med	100	High	200-400
Chum	Threatened	No	Very low	<100	High	1,100-71,000
Coho	Candidate	No	Low	Unknown	High	unknown

Fall Chinook– The historical East Fork Lewis River adult population is estimated from 4,000-30,000 fish. The current natural spawning number for tule fall Chinook ranges from 100-700 fish. There is no hatchery fall Chinook production. Natural spawning occurs primarily in six miles of the mainstem from Lewisville Park downstream to Daybreak Park. Spawning occurs primarily in October for the tule population, a later timed fall Chinook run spawns in November to January. Juvenile rearing occurs near and downstream of the spawning areas. Juveniles migrate from the East Fork Lewis in the spring and early summer of their first year.

Winter Steelhead– The historical East Fork Lewis adult population is estimated from 3,000-10,000 fish. Current natural spawning returns range from 100-300. In-breeding with Skamania Hatchery produced steelhead is possible, but likely low because of differences in spawn timing. Spawning occurs in the mainstem East Fork Lewis and tributaries. Access upstream of Sunset Falls was blocked until 1982 when the falls were “notched”. Spawning time is generally from early 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 East Fork Lewis.

Summer Steelhead– The historical East Fork Lewis adult population is estimated from 1,000-9,000 fish. Current natural spawning returns average about 100 fish. In-breeding with Skamania Hatchery produced steelhead is thought to be low because of differences in spawn timing and distribution. Spawning occurs throughout the basin, extending to the mainstem East Fork Lewis and tributaries upstream of Moulton Falls. Juvenile rearing occurs both downstream

and upstream of the spawning areas. Juveniles rear for a full year or more before migrating from the Lewis.

Chum– Historical adult populations produced from the Lewis Basin (including the mainstem, North, and East Lewis) are estimated from 120,000-300,000. Current natural spawning is estimated at less than 100 fish. Spawning occurs in the lower reaches of the mainstem, North Fork, East Fork, and in Cedar Creek. Natural spawning chum in the Lewis Basin are all naturally produced as no hatchery chum are released in the area. Juveniles rear in the lower reaches for a short period in the early spring and quickly migrate to the Columbia.

Coho– The historical East Fork Lewis adult population is estimated from 5,000-40,000, with the majority of returns late stock which spawn from late November to March. Some early stock coho were also historically present with spawning occurring primarily in early to mid-November. Current returns are unknown but assumed to be low. There is currently no hatchery coho released into the East Fork Lewis. Natural spawning occurs downstream of Lucia Falls (RM 21), particularly in Lockwood, Mason, and Rock creeks. Juveniles rear for a full year in the Lewis Basin before migrating as yearlings in the spring.

Coastal cutthroat– Coastal cutthroat abundance in the East Fork Lewis has not been quantified but the population is considered depressed. Anadromous cutthroat enter the East Fork Lewis from July-December and spawn from December through June. Most juveniles rear 2-4 years before migrating from their natal stream.

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

East Fork Lewis

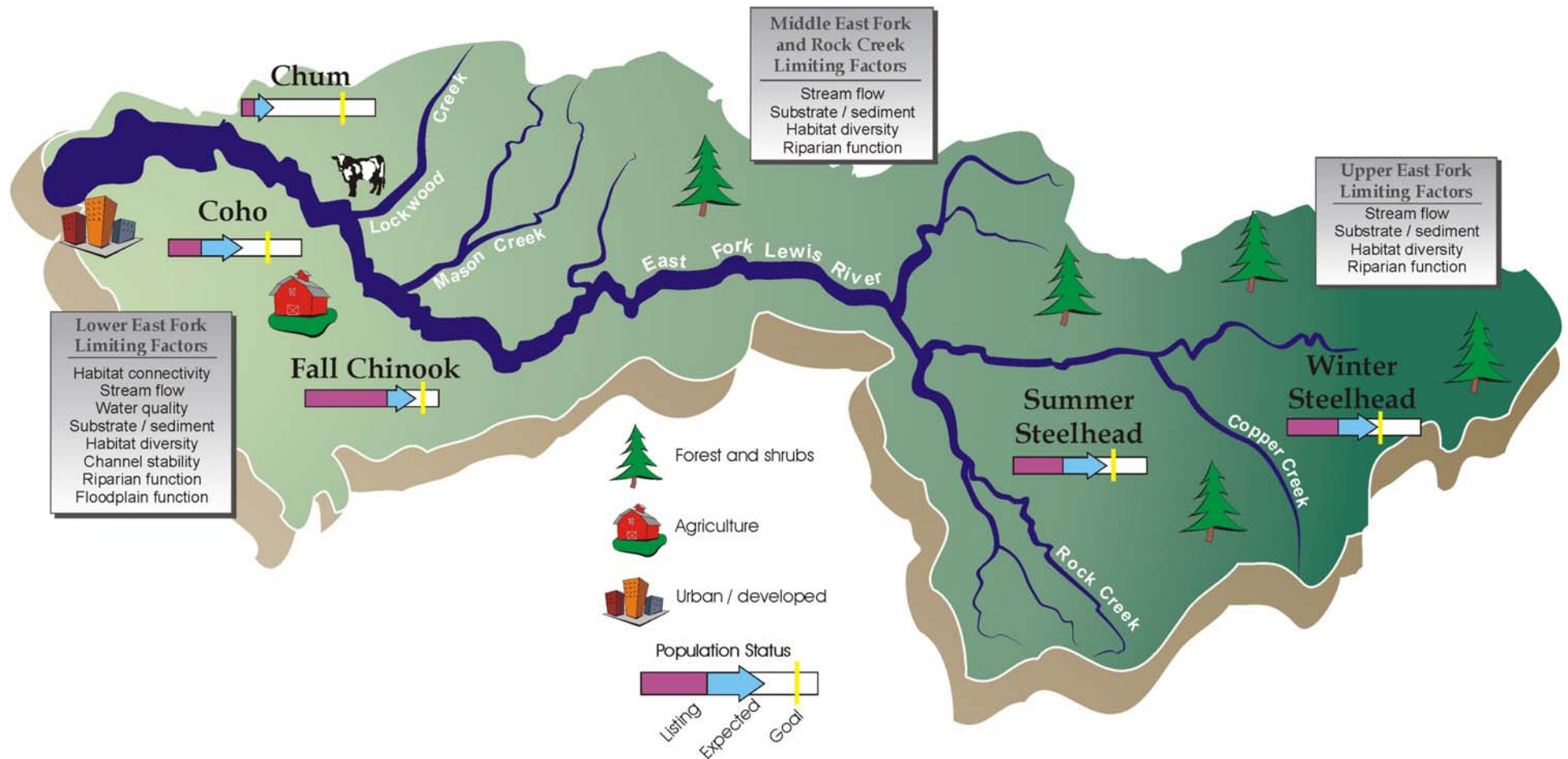


Figure 13-2. Summary of habitat limiting factors, population status, expected population improvement trend with existing programs and biological objectives depicted for the East Fork Lewis Basin.

13.3 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 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.

- Loss of habitat quantity and quality has the highest relative impact on populations in the EF Lewis.
- Loss of estuary habitat quantity and quality has high relative impacts on chum and moderate impacts on fall Chinook and winter steelhead. Impacts to summer steelhead are minor.
- Harvest has relatively high impacts on fall Chinook, but impacts to chum, steelhead, and coho are relatively minor.
- Hatchery impacts are high to moderate for summer steelhead and coho, but are low for chum, fall Chinook, and winter steelhead.
- Impacts of predation are moderately important to winter and summer steelhead, coho and chum, but are relatively minor for fall Chinook.

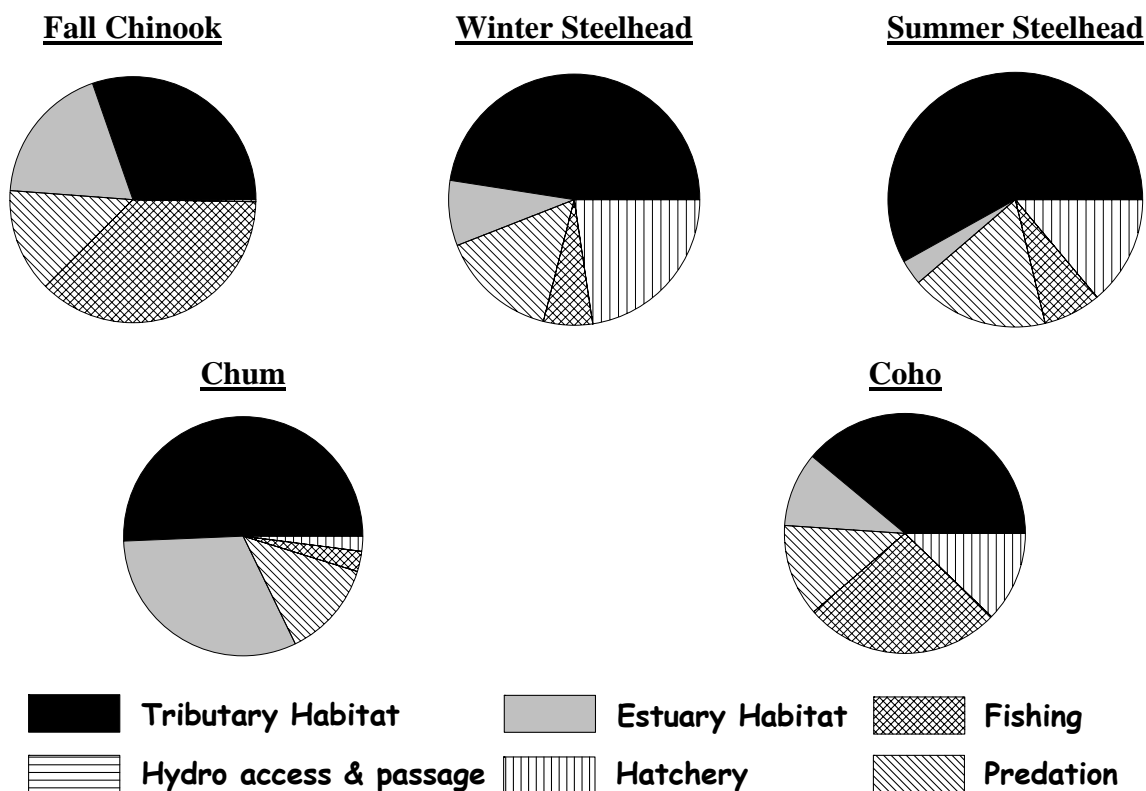


Figure 13-3. Relative contribution of potentially manageable impacts for East Fork Lewis populations.

13.4 Limiting Factors, Threats, and Measures

13.4.1 Hydropower Operation and Configuration

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

13.4.2 Harvest

Most harvest of wild East Fork Lewis salmon and steelhead is incidental to the harvest of hatchery fish and healthy wild stocks in the Columbia estuary, mainstem, and ocean. This mortality is very low for chum and steelhead, but can be significant for fall Chinook. East Fork Lewis fall Chinook are harvested in ocean and Columbia River commercial and sport fisheries as well as in-basin sport fisheries. Regional harvest is controlled by an ESA harvest limit associated with Coweeman natural fall Chinook. Retention of fall Chinook is prohibited in the East Fork Lewis sport fisheries. No harvest of chum occurs in ocean fisheries, there is no chum directed Columbia River commercial fisheries and retention of chum is prohibited in Columbia River and Lewis basin sport fisheries. Chum are impacted incidental to fisheries directed at coho and winter steelhead. Harvest of East Fork Lewis coho occurs in the ocean commercial and recreational fisheries off the Washington and Oregon coasts and Columbia River. There is no directed hatchery coho sport fishery in the East Fork Lewis. 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 marked hatchery fish and commercial fisheries cannot retain hatchery or wild steelhead.

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

Table 13-2. Regional harvest measures from Volume I, Chapter 7 with significant application to the East Fork Lewis Subbasin populations.

Measure	Description	Comments
F.M17	Monitor chum handle rate in tributary winter steelhead.	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 harvest management and for naturally-spawning escapement monitoring.	A regional marking program for tule fall Chinook would provide regional selective fishing options. This program would not affect sport harvest in the East Fork Lewis as there is no hatchery production in the basin.
F.M18	Monitor and evaluate commercial and sport impacts to naturally-spawning steelhead in salmon and hatchery steelhead target fisheries.	Includes monitoring of naturally-spawning steelhead encounter rates in fisheries and refinement of long-term catch and release handling mortality estimates. Would include assessment of the current monitoring programs and determine their adequacy in formulating naturally-spawning steelhead incidental mortality estimates.
F.M19	Continue to improve gear and regulations to minimize incidental impacts to naturally-spawning steelhead.	Regulatory agencies should continue to refine gear, handle and release methods, and seasonal options to minimize mortality of naturally-spawning steelhead in commercial and sport fisheries.
F.M24	Maintain selective sport fisheries in ocean, Columbia River, and tributaries and monitor naturally-spawning stock impacts.	Mass marking of lower Columbia River coho and steelhead has enabled successful ocean and freshwater selective fisheries to be implemented since 1998. Marking programs should be continued and fisheries monitored to provide improved estimates of naturally-spawning salmon and steelhead release mortality.

13.4.3 Hatcheries

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

There are no hatcheries operating in the East Fork Lewis Basin. Skamania Hatchery winter and summer steelhead are released into the East Fork Lewis to provide harvest opportunity. Skamania Hatchery steelhead are a composite stock and are genetically different from the naturally-produced steelhead in the East Fork Lewis 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 13-3. East Fork Lewis Hatchery Production.

Hatchery	Release Location	Winter Steelhead	Summer Steelhead
Skamania	East Fork Lewis	90,000	30,000

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

Table 13-4. Regional hatchery measures from Volume I, Chapter 7 with specific implementation actions in the East Fork Lewis Subbasin.

Measure	Description	Comments
H.M32	Juvenile release strategies to minimize interactions with naturally spawning fish.	Release strategies are aimed at reducing or avoiding interactions with wild steelhead, fall Chinook, coho by release timing and release location strategies.
H.M17,34,41	Mark hatchery steelhead, coho, fall Chinook with an adipose fin-clip for identification and selective harvest	Marking hatchery fish allows for identification of hatchery fish in the natural spawning grounds and at collection facilities which enables accurate accounting of wild fish. Marking also enables selective fisheries to retain hatchery fish and release wild fish.
H.M 24,36	Hatchery program utilized for supplementation and enhancement of wild chum and coho populations.	The Washougal hatchery is currently used for supplementation and risk management of lower gorge chum populations. This type of program could be considered to include more hatcheries and populations, including Lewis chum. Supplementation programs for East Fork Lewis natural coho could be developed with appropriate brood stock.
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.

13.4.4 Ecological Interactions

Ecological interactions focus on how salmon and steelhead, other fish species, and wildlife interact with each other and the subbasin ecosystem. East 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 East Fork Lewis populations to those of most other subbasin salmonid populations. Ecological Interactions are addressed by regional strategies and measures identified in Volume I.

13.4.5 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 East 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 East 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.

13.4.6 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 East Fork

Lewis 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 13-4. A summary of the primary habitat limiting factors and threats are presented in Table 13-6. Habitat measures and related information are presented in Table 13-7. Results of IWA watershed process modeling are depicted for subwatersheds in Figure 13-5. Reach- and subwatershed-scale limiting factors generated from the technical assessment are included in Table 13-5. 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 East Fork Lewis Basin include the following:

- Lower mainstem – EF Lewis 4-10
- Middle mainstem & Rock Creek – EF Lewis 12-13; Rock Creek 1-4
- Upper mainstem – EF Lewis 15-19C

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

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

The lower mainstem EF Lewis (EF Lewis 4-10) contains important spawning and rearing habitats for fall Chinook, chum, and coho. This mixed use area is heavily impacted by agriculture, rural residential development, and gravel mining. The recovery emphasis is for restoration and preservation measures. Effective restoration measures will involve riparian restoration, reductions in streambank erosion, re-connection of floodplains, and restoration of mining related impairments and future avulsion risks. Land-use planning/growth management is

critical to make sure that expanding development and land-use conversions do not continue to impair habitat conditions or habitat-forming processes.

The middle mainstem EF Lewis (reach EF Lewis 12-13) and Rock Creek (Rock Creek 1-4) are most important for winter steelhead, although summer steelhead also utilize these reaches to some degree. There are agricultural and rural residential uses along these reaches but forestry impacts dominate. The recovery emphasis is for restoration and preservation. Effective restoration measures will include riparian restoration and restoration of watershed processes related to forest practices (i.e., forest road and timber harvest impacts). Emphasis should be placed on preserving functional sediment supply conditions in the Rock Creek basin.

Summer steelhead use the greatest proportion of upper EF Lewis reaches. Winter steelhead may utilize some of these reaches but they rarely make significant use of reaches above Sunset Falls (upstream end of reach EF Lewis 17). Nearly the entire upper basin is within the Gifford Pinchot National Forest and forestry impacts dominate. Past wildfires have had a lasting impact on channels. The recovery emphasis is for preservation and restoration. Effective restoration measures will include riparian restoration and watershed process restoration related to forest practices.

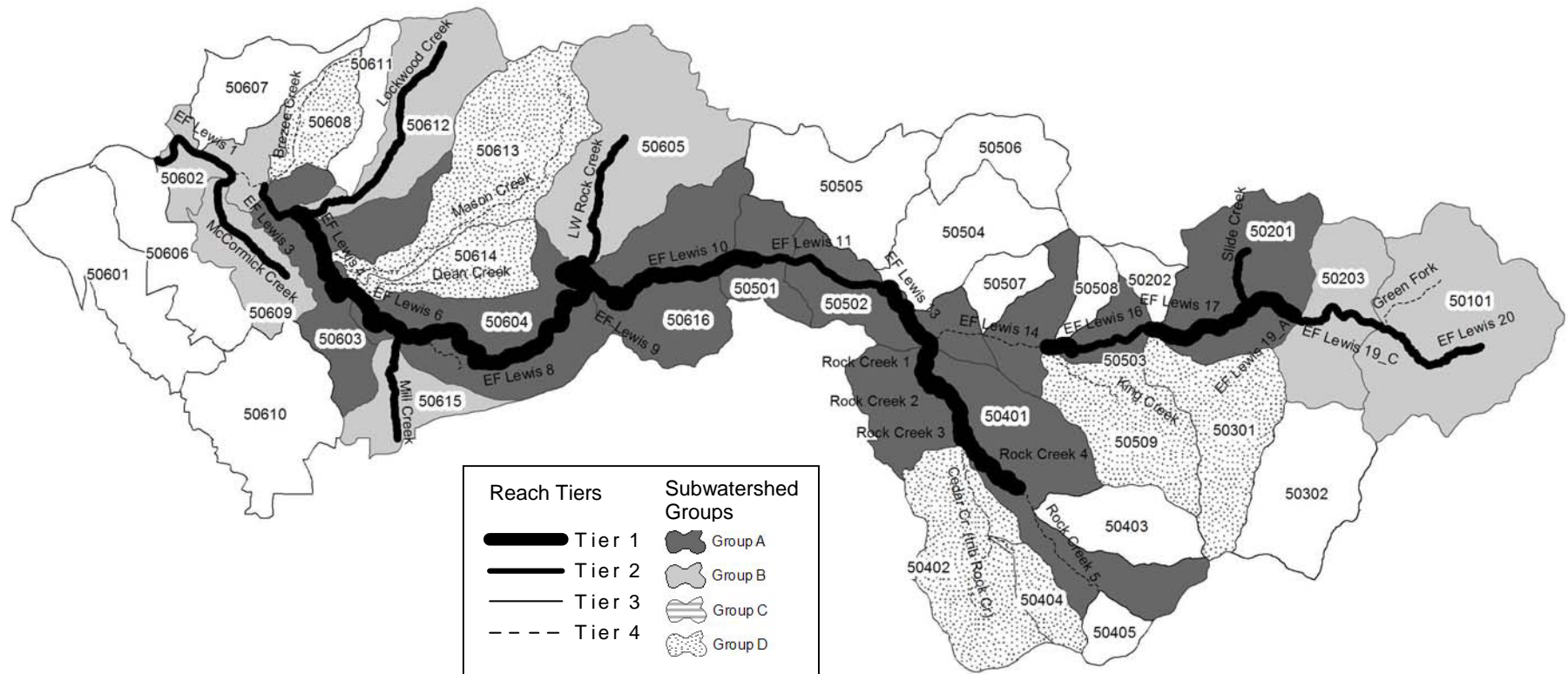


Figure 13-4. Reach tiers and subwatershed groups in the EF Lewis Basin. Tier 1 reaches and Group A subwatersheds represent the areas where recovery actions would yield the greatest benefits with respect to species recovery objectives. The subwatershed groups are based on Reach Tiers. Priorities at the 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.

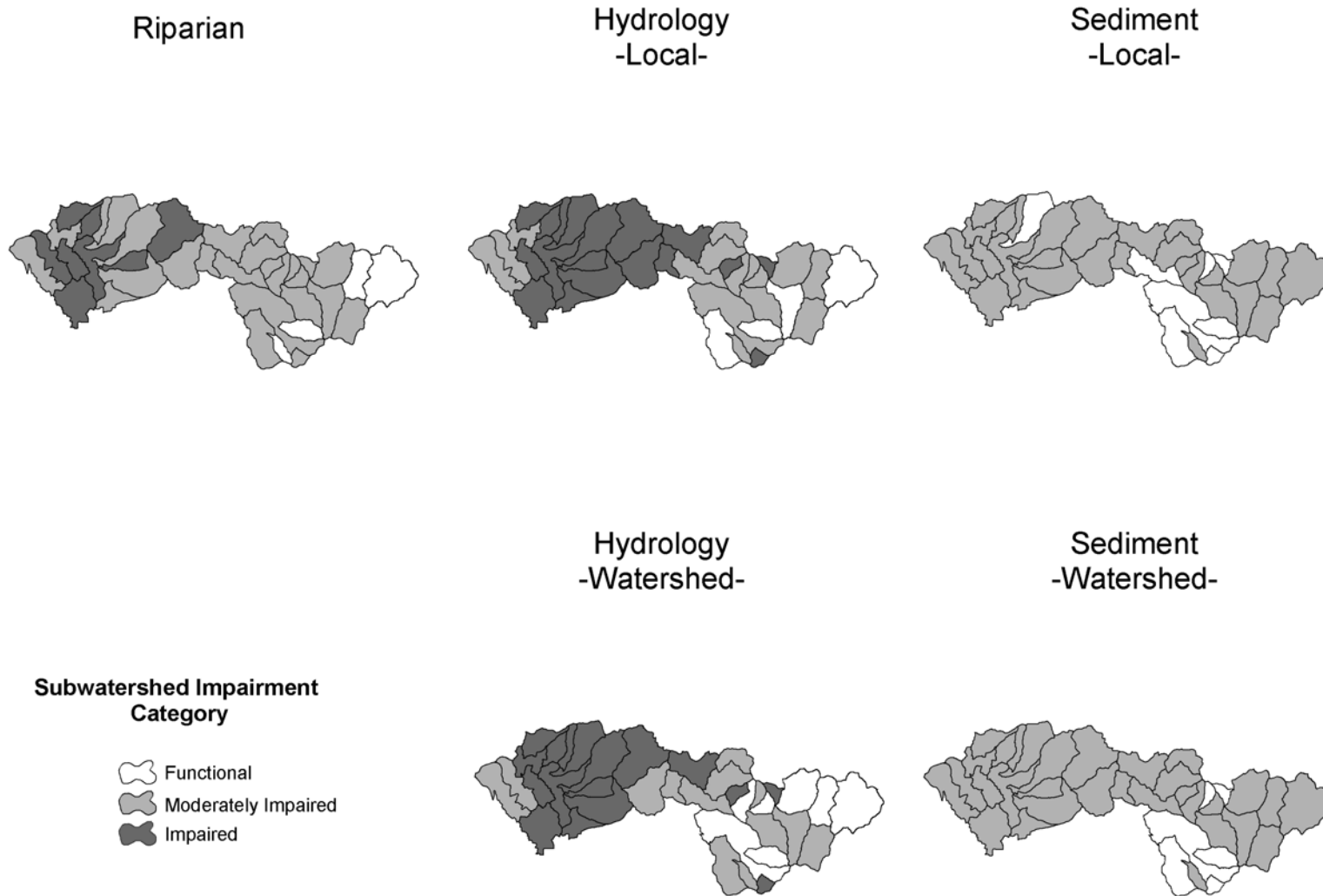


Figure 13-5. IWA subwatershed impairment ratings by category for the EF Lewis basin. Watershed process impairment ratings are based on landscape conditions that influence the hydrologic regime, the sediment regime, and riparian function. See Volume II and Volume V of the Recovery Plan Technical Foundation for additional information.

Table 13-5. 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.

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	50616	EF Lewis 10 EF Lewis 9 LW Rock Creek	ChF	EF Lewis 9	Spawning Egg incubation Fry colonization Prespawning holding	none	P							
			StW	none										
			StS	none										
				Coho	EF Lewis 10	Spawning Egg incubation Fry colonization 0-age active rearing 0-age migrant 0-age inactive 1-age active rearing	habitat diversity key habitat quantity	R	I	M	M	M	M	
	50604	EF Lewis 5 EF Lewis 6 EF Lewis 7 EF Lewis 8 Manley Creek	ChF	EF Lewis 5 EF Lewis 6 EF Lewis 7	Egg incubation Fry colonization 0-age active rearing	temperature sediment key habitat quantity	PR							
			Chum	EF Lewis 5 EF Lewis 6 EF Lewis 7 EF Lewis 8	Spawning Egg incubation Fry colonization Prespawning migrant Prespawning holding	habitat diversity sediment key habitat quantity	PR							
			StW	none						I	M	M	I	M
			StS	none										
				Coho	EF Lewis 5 EF Lewis 6 EF Lewis 7 EF Lewis 8	Spawning Egg incubation Fry colonization 0-age active rearing 0-age inactive 1-age active rearing Prespawning migrant	channel stability habitat diversity sediment key habitat quantity	R						
	50603	EF Lewis 2 EF Lewis 3 EF Lewis 4 EF Lewis 5	ChF	EF Lewis 5	Spawning Egg incubation 0-age active rearing	temperature sediment key habitat quantity	PR							
			Chum	EF Lewis 4 EF Lewis 5	Egg incubation Fry colonization Prespawning migrant Prespawning holding	habitat diversity sediment key habitat quantity	PR							
			StW	none										
			StS	none										
				Coho	EF Lewis 5	Egg incubation 0-age active rearing 0-age inactive	key habitat quantity	R						
	50503	EF Lewis 14 EF Lewis 15 EF Lewis 16 Horseshoe Falls	StW	none										
			StS	EF Lewis 15	0-age active rearing 0,1-age inactive 1-age active rearing	habitat diversity flow	P	M	M	M	F	M		
	50502	EF Lewis 11 EF Lewis 12 EF Lewis 13 EF Lewis 14 Moulton Falls Rock Creek 1	StW	EF Lewis 12 EF Lewis 13 Rock Creek 1	Egg incubation 0-age active rearing 0,1-age inactive 1-age active rearing	habitat diversity flow sediment	P	M	F	M	M	M	M	
			StS	none										
50501	EF Lewis 10 EF Lewis 11 Lucia Falls	ChF	none											
		StW	none											
		StS	none											
			Coho	EF Lewis 10	Spawning Egg incubation Fry colonization 0-age active rearing 0-age migrant 0-age inactive 1-age active rearing	habitat diversity key habitat quantity	R	I	M	M	M	M		
50401	Rock Creek 1 Rock Creek 2 Rock Creek 3 Rock Creek 4 Rock Creek 5	StW	Rock Creek 1 Rock Creek 2 Rock Creek 3 Rock Creek 4	Spawning Egg incubation Fry colonization 0-age active rearing 0,1-age inactive 1-age active rearing Prespawning holding	habitat diversity flow sediment key habitat quantity	PR	M	F	M	F	F			
50201	EF Lewis 17 EF Lewis 18 EF Lewis 19_A Slide Creek Sunset Falls	StS	EF Lewis 17 EF Lewis 18 EF Lewis 19_A	Egg incubation Fry colonization 0-age active rearing 0,1-age inactive 1-age active rearing	habitat diversity flow	PR	M	M	M	F	M			

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
B	50612	Lockwood Creek	Chum	none				I	F	M	I	M
			StW	none								
			Coho	none								
	50615	Mill Creek	Chum	none				I	M	M	I	M
			Coho	none								
	50609	McCormick Creek	Chum	none				I	M	I	I	M
			StW	none								
			Coho	none								
	50605	LW Rock Creek	StW	none				I	M	I	I	M
			Coho	none								
50602	EF Lewis 1 EF Lewis 2	ChF	none				M	M	M	I	M	
		Chum	none									
		StW	none									
		StS	none									
50203	EF Lewis 19_B EF Lewis 19_C	StS	none				M	M	F	F	M	
		Coho	none									
50101	EF Lewis 20 Green Fork	StS	none				F	M	F	F	M	
D	50614	Dean Creek	Chum	none				I	M	I	I	M
			StW	none								
			Coho	none								
	50613	Mason Creek	Chum	none				I	M	M	I	M
			StW	none								
			Coho	none								
	50608	Brezee Creek	Chum	none				I	M	I	I	M
			StW	none								
			Coho	none								
	50509	King Creek	StW	none				M	M	M	M	M
50404	Cold Creek	StW	none				M	M	F	M	M	
50402	Cedar Cr. (trib Rock Cr)	StW	none				F	F	M	M	F	
50301	Copper Creek	StS	none				F	M	M	M	M	

Table 13-7. 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					
<i>Lower mainstem</i> EF Lewis 4 – EF Lewis 10	<ul style="list-style-type: none"> • Bed and bank erosion • Altered habitat unit composition • Restricted channel migration • Disrupted hyporheic processes • Reduced flood flow dampening • Altered nutrient exchange processes 	<ul style="list-style-type: none"> • Floodplain filling • Channel straightening • Artificial confinement 	<ul style="list-style-type: none"> • Chum • Coho • Fall Chinook 	2-15 years	Great potential benefit due to improvements in many limiting factors. This passive restoration approach can allow channels to restore naturally once confinement structures are removed. There are challenges with implementation on private lands due to existing infrastructure already in place, potential flood risk to property, and large expense. Opportunities exist in areas of public ownership in these reaches.
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)					
<i>Lower mainstem</i> EF Lewis 4 – EF Lewis 10	<ul style="list-style-type: none"> • Loss of off-channel and/or side-channel habitat • Blockages to off-channel habitats • Altered habitat unit composition 	<ul style="list-style-type: none"> • Floodplain filling • Channel straightening • Artificial confinement 	<ul style="list-style-type: none"> • 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 on private lands due to existing infrastructure already in place, potential flood risk to property, and large expense. Opportunities exist in areas of public ownership in these reaches.
3. Protect and restore riparian function					
A. Reforest riparian zones					
B. Allow for the passive restoration of riparian vegetation					
C. Livestock exclusion fencing					
D. Invasive species eradication					
E. Hardwood-to-conifer conversion					
<i>Lower mainstem</i>	<ul style="list-style-type: none"> • Reduced stream canopy 	<ul style="list-style-type: none"> • Timber harvest – 	<ul style="list-style-type: none"> • All 	20-100	High potential benefit due to the many

Location	Limiting Factors Addressed	Threats Addressed	Target Species	Time	Discussion
EF Lewis 4 – EF Lewis 10 <i>Middle mainstem</i> EF Lewis 12-13 <i>Rock Creek</i> Rock Creek 1-4 <i>Upper mainstem</i> EF Lewis 15-19	cover <ul style="list-style-type: none"> • Altered stream temperature regime • Reduced bank/soil stability • Reduced wood recruitment • Lack of stable instream woody debris • Exotic and/or noxious species 	riparian harvests <ul style="list-style-type: none"> • Riparian grazing • Clearing of vegetation due to rural/suburban development, agriculture, and mining 	species	years	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. Significant riparian restoration efforts are currently underway by Clark County along the lower mainstem.
<p>4. Restore channel and floodplain areas damaged as a result of streamside gravel mining and reduce risks of future impairment due to these activities</p> <p><i>A. Prevent high temperature water and turbidity from entering streams</i></p> <p><i>B. Prevent fish stranding in processing areas</i></p> <p><i>C. Stabilize surface mining sites to prevent erosion</i></p> <p><i>D. Reduce the risk of gravel pond capture, while providing for natural channel migration processes</i></p> <p><i>E. Restore channel morphology where streams have avulsed into mining areas</i></p>					
<i>Lower mainstem</i> EF Lewis 4 – 6	<ul style="list-style-type: none"> • Loss of off-channel and/or side channel habitats • Altered habitat unit composition • Bed and bank erosion • Channel down-cutting (incision) • Altered stream temperature regime • Excessive turbidity • Restricted channel migration 	<ul style="list-style-type: none"> • Channel and/or floodplain substrate removal • Floodplain filling • Increased water surface area 	<ul style="list-style-type: none"> • Chum • Dall Chinook • Coho 	10-50 years	The two main areas of concern are the Ridgefield Pits (RM 8), which the mainstem avulsed into in 1996, and the Stordahl & Sons ponds (near Dean Creek confluence), which create a risk of future channel avulsion and temperature concerns. Restoration measures need to focus on restoring currently degraded channel conditions as well as reducing the risk of future degradation.
<p>5. Protect and restore streambank stability</p> <p><i>A. Restore eroding streambanks</i></p>					
<i>Lower mainstem</i> EF Lewis 4 - 10	<ul style="list-style-type: none"> • Reduced bank/soil stability • Excessive fine sediment • Excessive turbidity • Embedded substrates 	<ul style="list-style-type: none"> • Artificial confinement • Clearing of vegetation 	<ul style="list-style-type: none"> • Chum • Dall Chinook • Coho 	5-50 years	Most areas of bank instability are located between river mile 7 and 12. Bio-engineered approaches that rely on structural as well as vegetative measures are the most appropriate.

Location	Limiting Factors Addressed	Threats Addressed	Target Species	Time	Discussion
		<ul style="list-style-type: none"> • Roads – riparian / floodplain impacts • Riparian grazing 			<p>These projects have a high risk of failure if causative factors are not adequately addressed.</p>
<p>6. Protect and restore natural sediment supply processes</p> <p><i>A. Address forest road related sources</i></p> <p><i>B. Address timber harvest related sources</i></p> <p><i>C. Address agricultural sources</i></p>					
<p><i>Entire basin</i></p>	<ul style="list-style-type: none"> • Excessive fine sediment • Excessive turbidity • Embedded substrates 	<ul style="list-style-type: none"> • Agricultural practices – impacts to sediment supply • Forest roads – impacts to sediment supply • Timber harvest – impacts to sediment supply 	<ul style="list-style-type: none"> • All species 	<p>5-50 years</p>	<p>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. Likelihood is moderate on agricultural lands due to incentive programs and outreach to landowners, but few sediment-focused regulatory requirements. Use IWA impairment ratings to identify restoration and preservation opportunities.</p>
<p>7. Protect and restore runoff processes</p> <p><i>A. Address forest road impacts</i></p> <p><i>B. Address timber harvest impacts</i></p> <p><i>C. Limit additional watershed imperviousness</i></p> <p><i>D. Manage stormwater runoff</i></p>					
<p><i>Entire basin</i></p>	<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 • Increased impervious surfaces • Increased drainage network (road ditches, storm drains) • Clearing of vegetation (development, agriculture) 	<ul style="list-style-type: none"> • All species 	<p>5-50 years</p>	<p>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 FPRs, the USFS Northwest Forest Plan, and forest land HCPs. There are challenges with implementation on developed lands due to continued increase in watershed imperviousness related to rural and suburban residential development. Use IWA impairment ratings to identify restoration and preservation opportunities.</p>

Location	Limiting Factors Addressed	Threats Addressed	Target Species	Time	Discussion
<p>8. Protect and restore instream flows</p> <p><i>A. Water rights closures</i></p> <p><i>B. Purchase or lease existing water rights</i></p> <p><i>C. Relinquishment of existing unused water rights</i></p> <p><i>D. Enforce water withdrawal regulations</i></p> <p><i>E. Implement water conservation, use efficiency, and water re-use measures to decrease consumption</i></p>					
<p><i>Entire basin</i></p>	<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 	<p>1-5 years</p>	<p>Instream flow management strategies for the EF Lewis Basin have been identified as part of Watershed Planning for WRIA 27 (LCFRB 2004). Strategies include water rights closures, setting of minimum flows, and drought management policies.</p>
<p>9. Protect and restore instream habitat complexity</p> <p><i>A. Place stable woody debris in streams to enhance cover, pool formation, bank stability, and sediment sorting</i></p> <p><i>B. Structurally modify stream channels to create suitable habitat types</i></p>					
<p><i>Middle mainstem</i> EF Lewis 12-13</p> <p><i>Rock Creek</i> Rock Creek 1-4</p> <p><i>Upper mainstem</i> EF Lewis 15-19</p>	<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"> Coho Winter steelhead Summer steelhead 	<p>2-10 years</p>	<p>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.</p>
<p>10. Protect and restore water quality</p> <p><i>A. Restore the natural stream temperature regime</i></p> <p><i>B. Reduce fecal coliform bacteria levels</i></p> <p><i>C. Reduce delivery of chemical contaminants to streams</i></p>					
<p><i>Entire basin</i></p>	<ul style="list-style-type: none"> Altered stream temperature regime Bacteria Chemical contaminants (potential) 	<ul style="list-style-type: none"> Riparian harvests Riparian grazing Leaking septic systems Application of pesticides, herbicides, and fertilizers 	<ul style="list-style-type: none"> All species 	<p>1-50 years</p>	<p>Primary emphasis for restoration should be placed on stream segments that are listed on the 2004 303(d) list.</p>
<p>11. Protect and restore fish access to channel habitats</p> <p><i>A. Culvert, dam, and various other barriers on tributary streams</i></p>					
<p><i>McCormick Creek</i> <i>Breeze Creek & tribs</i></p>	<ul style="list-style-type: none"> Blockages to channel habitats 	<ul style="list-style-type: none"> Dams, culverts, in-stream structures 	<ul style="list-style-type: none"> Coho Winter 	<p>Immediate</p>	<p>As many as 30 miles of potentially accessible habitat are blocked by culverts or other</p>

Location	Limiting Factors Addressed	Threats Addressed	Target Species	Time	Discussion
<p><i>Lockwood Creek & tribs</i> <i>Mason Creek</i> <i>Basket Creek</i> <i>Other small tribs</i></p>			<p>Steelhead</p> <ul style="list-style-type: none"> • Summer steelhead 		<p>barriers. The blocked habitat is believed to be marginal in the majority of cases and no individual barriers in themselves account for a significant portion of blocked miles (there are 23 barriers total). Passage restoration projects should focus only on cases where it can be demonstrated that there is good potential benefit and reasonable project costs.</p>
<p>12. 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><i>Preservation Measure</i> – addresses many potential limiting factors and threats</p>	<ul style="list-style-type: none"> • All species 	<p>5-50 years</p>	<p>The lower portion of the basin is growing rapidly. 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>13. 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><i>Preservation Measure</i> – 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>	

13.5 Program Gap Analysis

The East Fork Lewis Basin (~235 sq mi) is located in Skamania and Clark Counties. The EF Lewis headwaters are in the Gifford Pinchot NF, it flows through Department of Natural Resources forest lands, through small- and industrial forest lands, through agricultural and rural residential lands and, finally through the cities of LaCenter and Ridgefield prior to meeting the North Fork Lewis at River Mile 3.5.

- The EF Lewis has approximately 43 square miles within the Gifford Pinchot National Forest.
- Department of Natural Resources forest lands comprise approximately 35 square miles.
- Small- and industrial forest lands include approximately 23 square miles.
- The Skamania County area within the East Fork Lewis watershed fall within the Gifford Pinchot National Forest. The remainder of the basin lies in Clark County
- Agriculture and rural residential uses occur on the valley floor in lower basin.
- The 2000 population in the EF Lewis was 24,400, it is expected to more than double by the year 2020.

Protection Programs

In the East Fork Lewis basin, protection programs center primarily on forest management and forest practice rules in the upper reaches and on local land use controls in the lower reaches. Protection programs in this analysis include those programs that protect habitat conditions or watershed functions through regulatory measures, acquisition sensitive habitat or protective easements, incentives 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 EF Lewis observe the forest-wide 'no clear cut' policy.
 - ✓ Some EF 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 EF Lewis are 'no touch' areas.
 - ✓ Upper portions of the watershed lands are located within Wilderness Areas allow little human activity.
 - ✓ Addresses measures: [M.3A; M.3B; M.6A; M.6B; M.7A; M.7B; M.10A]

➤ *NOAA Fisheries*

- Habitat Conservation Plan (HCP): Under Section 10 of the ESA, NOAA Fisheries has approved an HCP to minimize and mitigate the impact of gravel mining operations by Storedahl in the lower EF Lewis. The plan specifies restoration actions, schedules, funding and monitoring that would trigger adaptive management as need. Specific conservation measures address water quality (turbidity and temperature); water quantity (donation of water rights to the state trust), avulsion potential; riparian, wetland and valley-bottom revegetation; and ultimate inclusion in the EF Lewis River greenbelt with a conservation easement and endorsement to ensure its management as fish and wildlife habitat in perpetuity. [M.1A; M.3A; M.3D; M.4; M.5A; M.8B; M.10A; M.13.B]

➤ *U.S. Army Corps of Engineers*

- Regulatory Programs: U.S. Army Corps of Engineers administers the Section 10 (Rivers and Harbor Act) and Section 404 (Clean Water Act) permit processes. Section 10 requires approval of any activity in, above, or below a navigable river, which affects course, location, condition, or capacity of navigable waters. Section 404 requires prior approval of dredging, filling, grading, clearing, and bank hardening. In waters used by listed fish species, the permits are subject to ESA Section 7 consultation with NOAA Fisheries to ensure that any approved action is adequately protective of the ESA listed fish. [M.1A; M.2A; M.2B; M.2C; M.5A; M.9A; M.9B]

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.3A; M.3B; M.6A; M.6B; M.7A; M.7B]
- 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.3A; M.3B; M.6A; M.6B; M.7A; M.7B]

➤ *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.2A; M.2B; M.2C; M.5A; M.9A; M.9B]

- Habitat Program: The Department provides advice to local governments and landowners interested in measures to protect habitat values on their property. [M.1A; M.2A; M.2B; M.3A; M.5A; M.7C; M.7D; M.9A; M.9B; M.10A; M.11A; M.12A; M.12B; M.12C]

➤ *Washington Department of Ecology*

- 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 may have the potential to adversely impact low summer stream flows. Currently, there are approximately 58 cfs of water rights in the EF Lewis. It is unknown how much of this volume is being utilized for beneficial uses. This compares to an average August low flow of 83 cfs. [M.8A; M.8B; M.8C; M.8D]
- 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.7C; M.7D; M.8A; M.8B; M.8C; M.8D; M.10A; M.10B; M.10C]

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 plan 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 [M.12] 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. [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.7C; M.7D; M.11A]
 - Stormwater Management:
The County stormwater program, based on Best Available Science, is implementing an NPDES permit, including measures to protect water quality and reduce impacts on stream flows. [M.7C; M.7D; M.10C]
 - Parks and County Facilities:
The County has an active Conservation Futures program to acquire and protect critical habitat. The Clark-Vancouver Parks program has acquired 1200 acres of wetlands near LaCenter. [M.13A]
- *Skamania County*
- Comprehensive Planning and Zoning: Since all basin lands within Skamania County are federal, County land use programs do not apply.
- *Cities*
- Comprehensive Planning and Land Use Zoning: Cities within the East Fork Lewis Basin have adopted comprehensive plans and zoning ordinances that afford limited protection of watershed processes and habitat conditions. These programs relate minimally to measures M.12A, M.12B, and M.12C. Specifically:
 - ✓ The City of Battleground has a comprehensive plan with a critical areas ordinance and zoning. Battleground's ordinances lack wetland/stream protections.
 - ✓ Yacolt has critical areas designated on their zoning ordinance. Yacolt's ordinances lack wetland/stream protections.
 - ✓ LaCenter has a comprehensive plan with a critical areas ordinance and zoning.

Community Programs

No community actions at this time.

Restoration Programs

Restoration programs in the East Fork 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 East Fork 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. [M.3A; M.3B; M.6A; M.6B; M.7A; M.7B; M.11A]

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.3A; M.3B; M.6A; M.6B; M.7A; M.7B; M.11A]
- **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.3A; M.3B; M.6A; M.6B; M.7A; M.7B; M.11A]
 - ✓ 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.6A; M.6B; M.7A; M.7B; M.11A]

➤ ***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.2A; M.2B; M.3A; M.5A; M.7C; M.7D; M.9A; M.9B; M.10A; M.11A; M.12A; M.12B; M.12C]

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

- **Washington Salmon Recovery Act (RCW 77.85):** The SRFB and the LCFRB jointly administer a habitat restoration grant program that allocates federal Pacific Salmon Recovery Funds and State dollars for habitat protection and restoration projects by state

and local agencies, nonprofit organizations, and landowners. To date the program has funded six projects in the EF Lewis totaling more than \$600,000.

- ✓ Vancouver Clark Parks restored lands in the EF Lewis Basin. One project on Lockwood Creek includes restoration of 4,000' of the EF Lewis and replacing four undersized culverts. [M.3A; M.3D; M.5A; M.9A; M.9B; M.11A]
- ✓ Fish and Wildlife and Vancouver-Clark Parks sponsored restoration of approximately 22 acres of floodplain wetlands; [M.1A; M.2A; M.2B]

Local Government Programs

- **Clark Conservation District Program** works directly with agriculture interests in the EF Lewis in their Farm Plan Program and Conservation Reserve Enhancement Program. Clark Conservation District is active in the EF Lewis; [M.3A; M.3B; M.3C; M.5A; M.6C; M.10A; M.10B]

Community Programs

- **Friends of East Fork** is a non-profit entity that is developing a strategic plan for the EF Lewis. The reach-level assessment will identify and evaluate the feasibility of potential restoration projects. [M.3A; M.5A; M.9A; M.9B]
- **Fish First** is a non-profit entity that initiates restoration projects primarily in the NF Lewis Basin. Fish First participated in EF Lewis restoration as demonstrated by two projects, Price Dairy restoration and the Lockwood Creek Culvert Removal projects. [M.3A; M.5A; M.9A; M.9B]

Gap Analysis

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

Agricultural-related Programs: Best Management Practices, incentives, and regulations for agricultural practices need to be developed to ensure protection of watershed processes and habitat conditions.

Protection-related Programs: Protection programs in the mid- to lower- areas of the EF Lewis are fundamental to achieving recovery goals. Population growth in Southwest Washington will exert tremendous pressures in these areas over the next 20 to 50 years. In general, county land use protections are likely to become sufficient over the next couple of years. Cities will need to update their critical area ordinances and use Best Available Science to ensure adequate protection of habitat and watershed processes. Regulations pertaining to resource use or processing should be enhanced to protect habitat and watershed processes. Outright purchase

of habitat lands in the EF Lewis is occurring. Clark Vancouver Parks and others have acquired significant properties. Protection of instream flows should receive greater attention within the next year as WRIA 27/28 Planning Units make their recommendations to DOE for new protections. Program areas of concern include consistent land use protections across agencies, conversion of rural or resource lands to more intensive uses, unregulated activities, and the protection of instream flows.

Restoration-related Programs: The EF Lewis has received significant attention from restoration-focused programs and there is reason to believe these efforts will continue. In general, the various restoration efforts have addressed all measures at some level. Program areas of concern include magnitude of efforts and corresponding funding to support those efforts at a level necessary to achieve recovery goals. Relative to other program categories, restoration is likely to have the most significant resource needs because of impacts that haven't been fully addressed, new threats that protection mechanisms may not address, and the cumulative impacts caused by population growth over time.

Table 13-8. Actions to Address Gaps

Action #	Lead Agency	Proposed Action
EF.1	Battleground, Yacolt, LaCenter	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
EF.2	Battleground, Yacolt, LaCenter	Zoning and development standards to adequately protect wetlands, wetland buffers, and wetland function.
EF.3	Battleground, Yacolt, LaCenter, Clark 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
EF.4	State of Washington	Provide state funding for small forest owners in the EF 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
EF.5	Forest Managers LCFRB, and DFW	Identify early action forest-wide restoration projects that analysis indicates could provide significant benefits. In these cases, it may be appropriate to identify outside funding to initiate these early actions
EF.6	Restoration Agencies and Organizations	Coordinate barrier removal projects to ensure they are conducted in a logical sequence that will generate maximum benefits for fish in the highest priority subbasins
EF.7	Clark County, Cities, and State Agencies	Utilize a combination of public outreach/education, incentives, and authority to positively influence landowner behaviors toward land stewardship
EF.8	NOAA Fisheries, USFWS	Ensure implementation of the Stordahl Mine HCP, as approved or amended, including all conservation measures and adaptive management requirements
EF.9	Clark County, Cities, State of Washington	Apply land use code enforcement across jurisdictions in a consistent manner, using appropriate funding levels and application
EF.10	WRIA 27/28 PU, DOE, and DFW	Close the EF Lewis to further surface water withdrawals, including groundwater in connectivity with surface waters
EF.11	Clark County, Cities, DOE, DFW, CLT	Increase summer low-flow conditions in the EF Lewis through the purchase of existing water rights and land use actions (e.g., wetland restoration and re-connecting side-channels) and enforcement against illegal withdrawals
EF.12	Clark County, Cities, DOE, DFW, CLT	Decrease the frequency and duration of peak-flow events on the EF Lewis by reducing impervious surfaces, controlling stormwater and re-connecting riparian wetlands
EF.13	Clark County, Cities, CCD, Friends of EF, Fish First, and LCFRB	Build support for the acquisition of conservation easements, long-term leases, and fee-simple purchase through outreach and increased project funding for non-profit organizations like the Columbia Land Trust or the Nature Conservancy
EF.14	State of Washington, LCFRB, CC	Build institutional capacity for agencies and organizations to undertake protection and restoration projects
EF.15	LCFRB, DOE, DFW, NOAA, USFWS, ACOE, SRFB	Increase available funding for projects that implement measures and addresses underlying threats.
EF.16	LCFRB	Address threats proactively by building agreement on priorities among the various program implementers
EF.17	CC	Increase capacity of agencies like Clark Conservation District to perform outreach and design/implement farm plans, restoration projects, education, compliance, etc.
EF.18	CC, WDA, GSRO	Develop agricultural practices that protect watershed processes and habitat conditions.
EF.19	FEMA	Update Floodplain Maps

