14 Lower Columbia Mainstem Subbasin – Salmon Creek

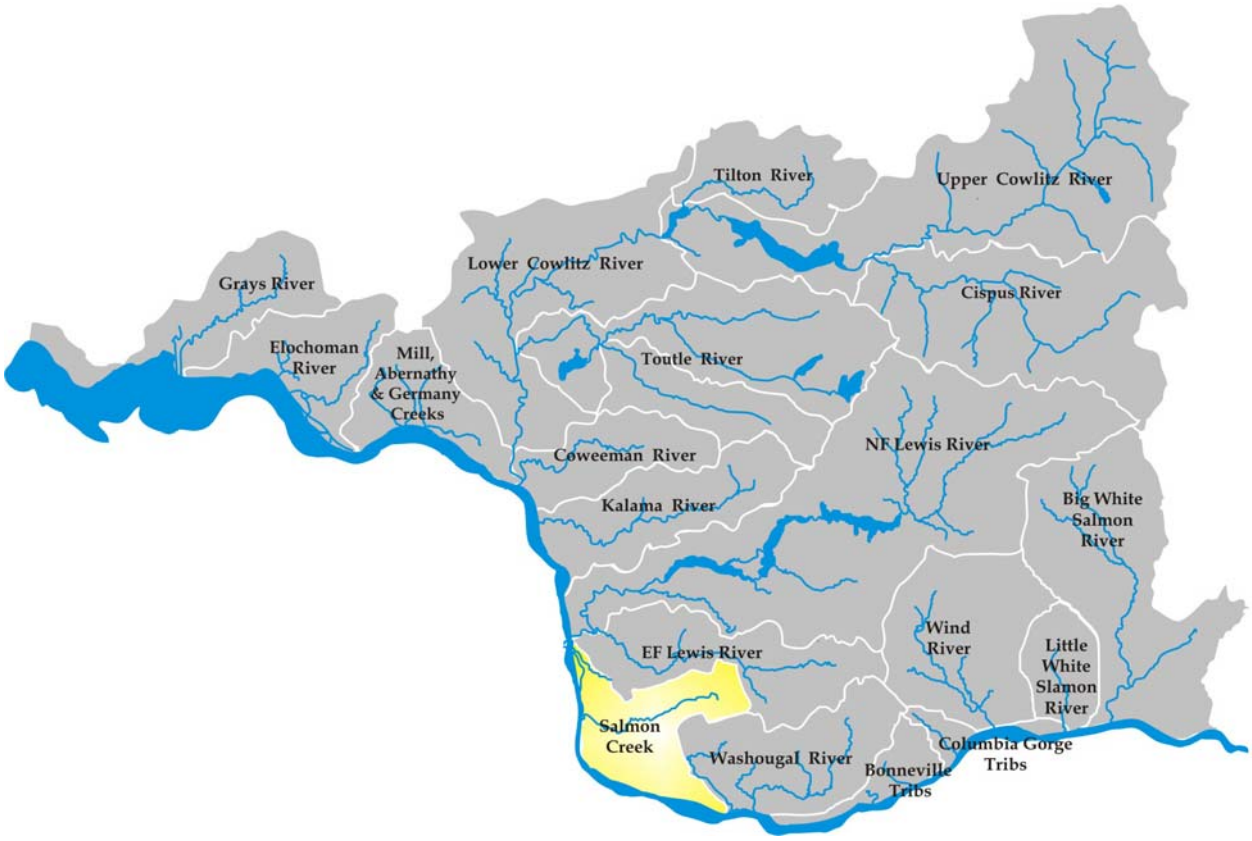


Figure 14-1. Location of the Salmon Creek Basin within the Lower Columbia River Basin.

14.1 Basin Overview

The Salmon Creek Basin comprises approximately 85 square miles in Clark County. Salmon Creek is the largest tributary to the Lake River basin. The creek enters the Columbia near Vancouver, Washington. The basin is part of WRIA 28.

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

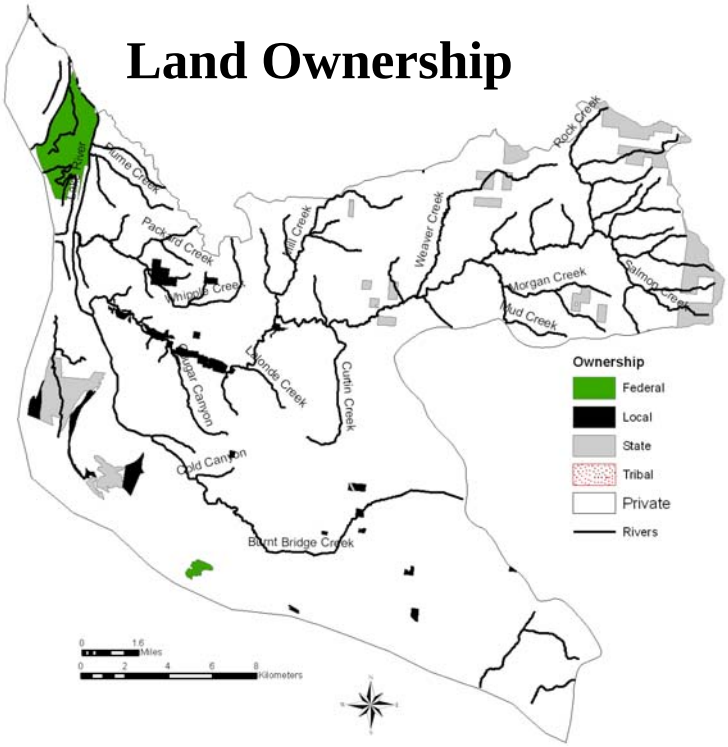
Salmon Creek salmon and steelhead are affected by a variety of in-basin and out-of basin factors including stream, Columbia River mainstem, estuary, and ocean habitat conditions; harvest; hatcheries; and ecological relationships with other species. Analysis has demonstrated that recovery cannot be achieved 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 Salmon Creek 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 Salmon Creek Subbasin.

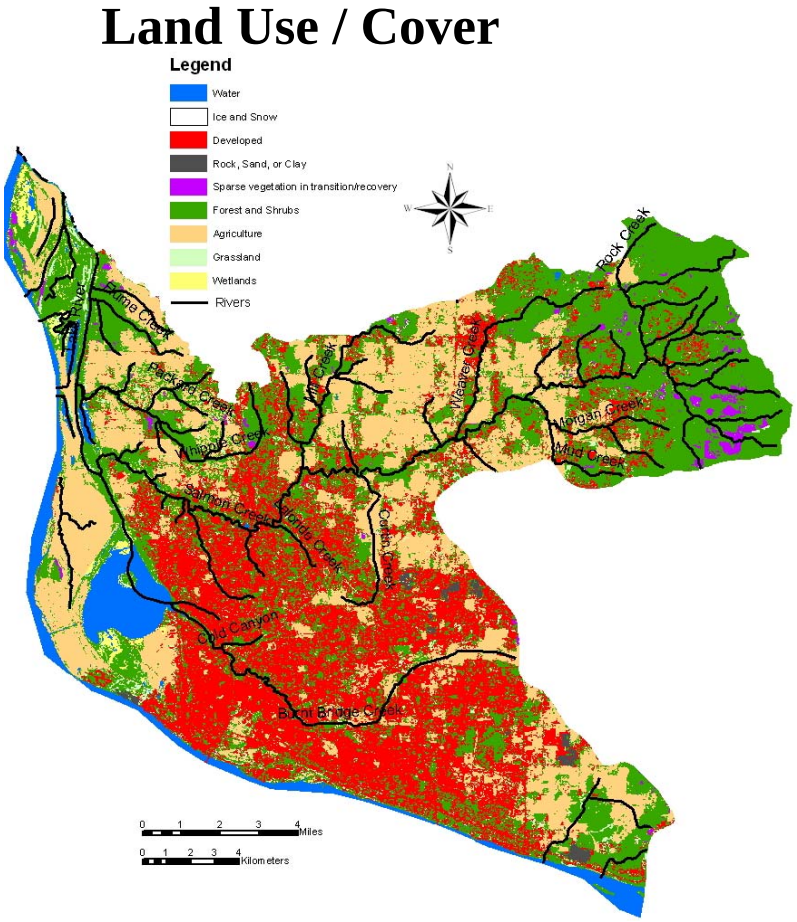
Land use in the Salmon Creek/Lake River basin is predominately urban and rural development, with nearly the entire Burnt Bridge Creek watershed lying within the Vancouver metropolitan area. Historical wetlands and floodplains have been converted to residential, commercial, industrial, and agricultural uses. The upper reaches of the Salmon Creek basin have been impacted by forestry, agriculture, and rural residential development.

Continued population growth is of primary concern in this basin. Major urban centers in the basin are Vancouver, Orchards, Salmon Creek, Battle Ground, and Ridgefield. The year 2000 population, estimated at 252,000 persons is expected to increase to 519,000 by year 2020 (LCFRB 2001). Population growth will result in the continued conversion of forestry and agricultural land uses to residential uses, with potential impacts to habitat conditions. It is important that growth management policy adequately protect critical habitats and the conditions that create and support them.

Land Ownership	
Private	89%
Federal	4%
State	4%
Other public	3%



Vegetation Composition	
Late Seral	0%
Mid Seral	6%
Early Seral	1%
Other Forest	19%
Non Forest	71%



14.2 Species of Interest

Focal salmonid species in the Salmon Creek basin include coho, winter steelhead, and chum. Fall Chinook are considered part of the East Fork Lewis population. The current health or viability is low for winter steelhead and very low for chum and coho. Focal populations need to improve to a targeted level that contributes to recovery of the species (see Volume I, Chapter 6). For Salmon Creek populations, the objective is to stabilize the populations to no less than the current viability level. The low viability level for winter steelhead provides for a 40-74% probability of persistence over 100 years, and the very low viability level for chum and coho provides for a 0-40% probability of persistence over 100 years.

Other species of interest in Salmon Creek 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 expected to benefit from habitat improvements in the estuary, Columbia River, and mainstem, and in the Salmon subbasin, although specific spawning and rearing habitat requirements for lamprey are not well known.

Table 14-1. Current viability status of Salmon populations and the biological objective status that is necessary to meet the recovery criteria for the Cascade strata and the lower Columbia ESU.

	ESA	Hatchery	Current		Objective	
Species	Status	Component	Viability	Numbers	Viability	Numbers
Winter Steelhead	Threatened	Yes	Low	<100	Low	600-1,200
Chum	Threatened	No	Very low	<100	Very low	1,100-4,200
Coho	Candidate	No	Very low	unknown	Very low	unknown

Winter Steelhead– The historical Salmon Creek adult population is estimated from 500-8,000 fish. Current natural spawning returns are less than 100 fish. Skamania Hatchery winter steelhead are released into Salmon Creek for harvest opportunity In-breeding between wild and hatchery winter steelhead is possible, but likely low because of differences in spawn timing. Spawning occurs throughout the Salmon Creek basin, the lower reaches of Gee Creek, Whipple Creek, and Burnt Bridge Creek 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 Salmon Creek.

Chum– the historical Salmon Creek adult population is estimated from 10,000-90,000 fish. Current natural spawning is estimated at less than 100 fish. Spawning occured in the lower reaches of the mainstem Salmon Creek, Gee Creek, Whipple Creek, and Burnt Bridge Creek North Fork, East Fork, and in Cedar Creek. Spawning occurs from late November through December. Juveniles rear in the lower reaches for a short period in the early spring and quickly migrate to the Columbia.

Coho– The historical Salmon Creek adult population is estimated from 6,000-35,000, with both early and late stock coho produced. Current returns are unknown, but presumed to be very low. Early stock coho spawn in early to mid-November and late stock from late November to March. There is currently no hatchery coho released into Salmon Creek. Natural spawning can occur though out the Salmon Creek basin, but principally in the upper mainstem Salmon Creek, and Morgan, Rock, Mill, and Weaver creeks. Potential for coho spawning also exists in nearby

streams, including Burnt Bridge and Whipple creeks. Juveniles rear for a full year in the Salmon Creek basin before migrating as yearlings in the spring.

Coastal Cutthroat– Coastal cutthroat abundance in Salmon Creek has not been quantified but the population is considered depressed. Both andromous and resident form of cutthroat ar present in the basin. Anadromous cutthroat enter Salmon Creek 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 Salmon Creek population. However, based on declining trends measured at Bonneville Dam and Willamette Falls it is assumed that Pacific lamprey have declined in the Salmon Creek basin also. Adult lamprey return from the ocean to spawn in the spring and summer. Juveniles rear in freshwater up to seven years before migrating to the ocean.

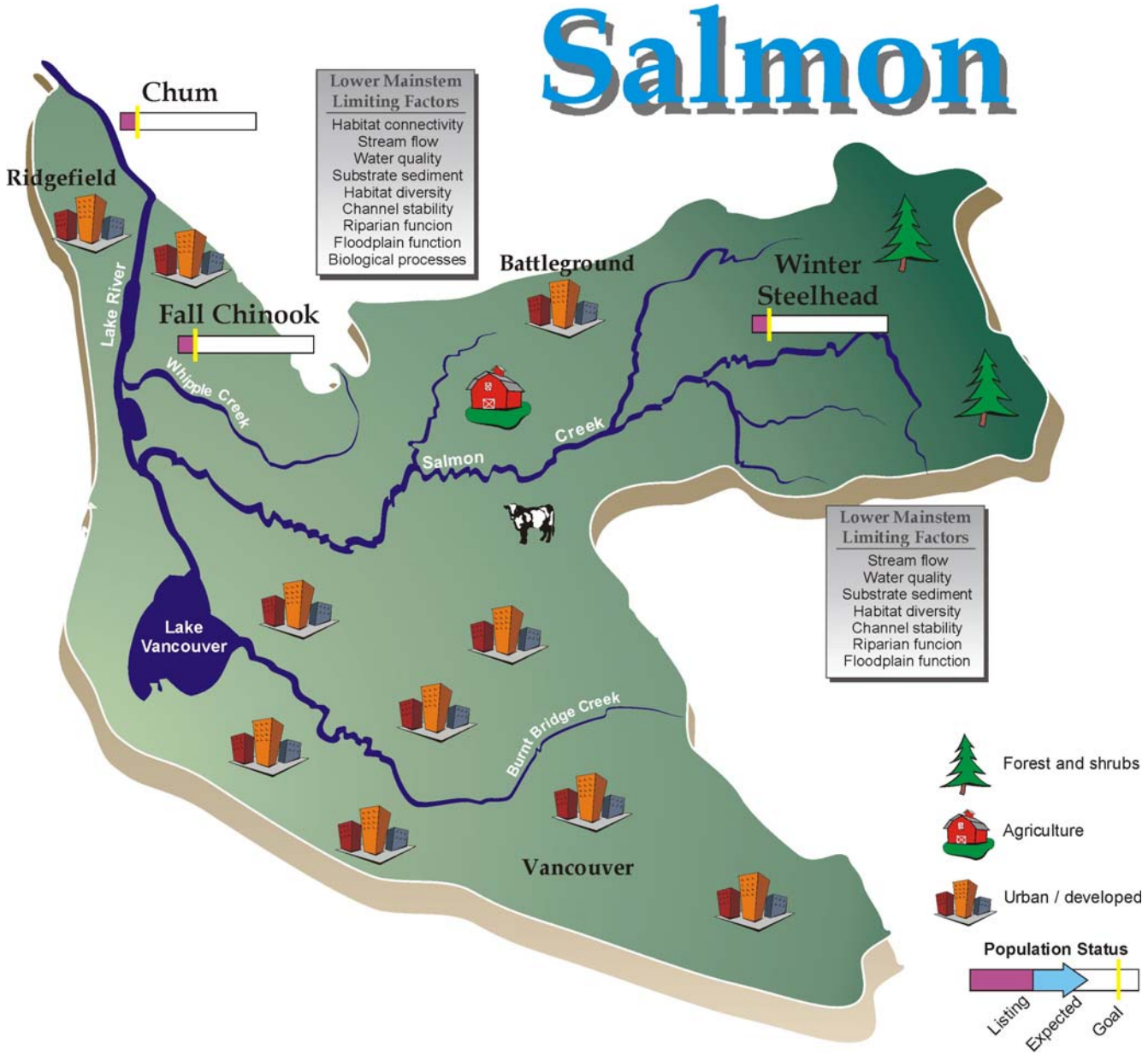


Figure 14-2. Summary of habitat limiting factors, population status, expected population improvement trend with existing programs and biological objectives depicted for the Salmon Creek Basin.

14.3 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 Salmon Creek subbasin. The pie charts below represent the relative order of magnitude of quantifiable effects for each of these factors for each focal species. The preferred recovery scenario targets an equivalent reduction in each impact factor in proportion to the magnitude of the effect. Population-specific targets are discussed in further detail in Volume I, Chapter 6.

- Loss of tributary habitat quality and quantity is an important impact for all species. Loss of estuary habitat quality and quantity is also important to chum. Harvest has a large relative impact on fall Chinook and moderate impacts on coho and winter and summer steelhead. Harvest effects on chum are minimal.

- Harvest is a significant issue for coho, but not so for both chum and winter steelhead.
- Hatchery impacts are moderate for winter steelhead and coho, but are non-existent for chum.
- Predation is moderately important to all three species.

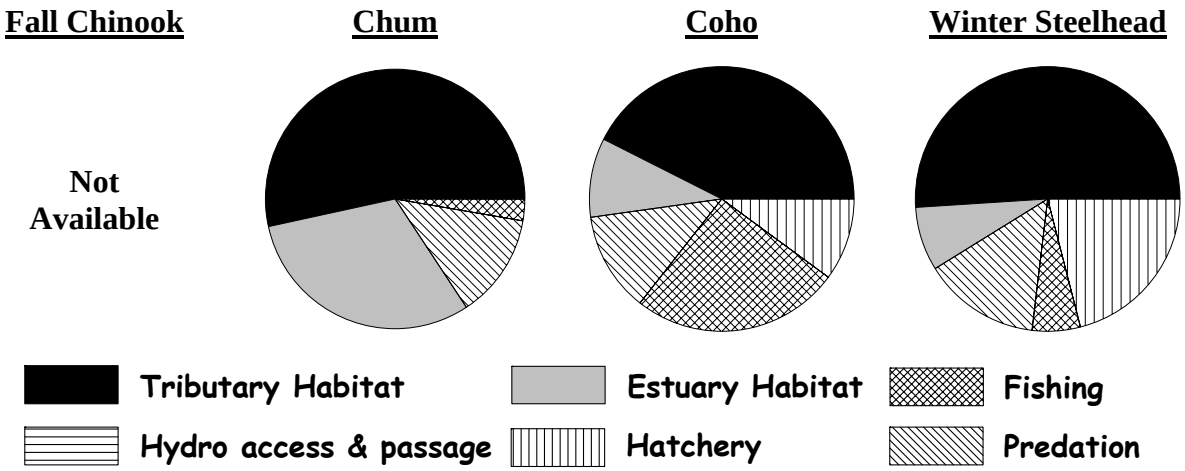


Figure 14-3. Relative contribution of potentially manageable impacts for Salmon Creek populations.

14.4 Limiting Factors, Threats, and Measures

14.4.1 Hydropower Operation and Configuration

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

14.4.2 Harvest

Most harvest of wild Salmon Creek salmon and steelhead occurs incidental to the harvest of hatchery fish and healthy wild stocks in the Columbia estuary, mainstem, and ocean. This mortality is very low for chum and steelhead, and relatively low for coho. 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 Salmon Creek sport fisheries. Some chum can be impacted incidental to fisheries directed at coho and winter steelhead. Harvest of Salmon Creek coho occurs in the ocean commercial and recreational fisheries off the Washington and Oregon coasts and Columbia River. There is no salmon directed sport fishery in Salmon Creek. Wild coho impacts are limited by fishery management to retain fin-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 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 Salmon Creek Subbasin populations are summarized in the following table:

Table 14-2. Regional harvest measures from Volume I, Chapter 7 with significant application to the Salmon Creek 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.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.

14.4.3 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 Salmon Creek Basin. Skamania Hatchery winter steelhead are released into lower Salmon Creek to provide harvest opportunity. Skamania Hatchery steelhead are a composite stock and are genetically different from the naturally produced steelhead in Salmon Creek. The main threats from hatchery steelhead are potential domestication of the naturally produced steelhead as a result of adult interactions or ecological interactions between natural juvenile salmon and hatchery released juvenile steelhead.

Table 14-3. Salmon Creek hatchery Production.

Hatchery	Release Location	Winter Steelhead
Skamanaia	Salmon Creek	20,000

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

Table 14-4. Regional hatchery measures from Volume I, Chapter 7 with specific implementation actions in the Salmon Creek 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.M34	Mark hatchery steelhead.	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.

14.4.4 Ecological Interactions

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

14.4.5 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 Salmon Creek 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 Salmon Creek 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.

14.4.6 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 Salmon River basin have the greatest impact on the health and viability of salmon and steelhead relative to the other limiting factors and threats discussed in this chapter.

Subwatersheds, reaches, and habitat attributes have been prioritized for protection and/or restoration based on the plan's biological objectives, fish distribution, critical life history stages, current habitat conditions, and potential fish population performance. Priority areas for habitat preservation and restoration are identified in Figure 14-4. A summary of the primary habitat limiting factors and threats are presented in Table 14-6. Habitat measures and related information are presented in Table 14-7. Results of IWA watershed process modeling are depicted for subwatersheds in Figure 14-5. Reach- and subwatershed-scale limiting factors generated from the technical assessment are included in Table 14-5. 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 Salmon Creek basin contains no Tier 1 or 2 reaches, which reflects that Salmon Creek salmonid populations are not expected to be recovered to a high level of viability for recovery planning purposes. It is important for recovery planning, however, that these populations do not decline further, which will be a challenging objective considering the continued intensive development of this basin. The areas with the greatest current or potential contribution to focal salmonid population health and productivity are listed below.

- Lower mainstem Salmon & tributaries – Salmon 12-16; Suds 1-2
- Upper mainstem Salmon & tributaries – Salmon 20-32; Morgan 1; Rock 1, 5, 7

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 Salmon Creek reaches with the greatest potential production are located in the vicinity of Salmon Creek County Park, near the I-5 crossing. These reaches historically provided productive habitats for fall Chinook, chum, coho, and winter steelhead. This area is heavily impacted by urban and rural development in the expanding Vancouver metropolitan area. Effective recovery measures will involve land-use planning that adequately protects habitat-forming processes in sensitive areas (wetlands, floodplains, riparian corridors). Restoration of riparian areas along these and upstream reaches will also yield important benefits.

A few potentially productive reaches for coho and winter steelhead are located on the mainstem between the Hwy 503 crossing and Salmon Falls. Rock Creek and other, smaller, tributaries (e.g., Morgan Creek) also contain potentially productive habitats for coho. These reaches are heavily impacted by agricultural uses and rural residential development. As with the lower basin, the upper basin is expected to continue to develop rapidly. In light of the continued growth, there needs to be emphasis on land-use planning that provides adequate protections to sensitive areas. In addition, riparian and floodplain restoration that targets impacts related to grazing and rural development will yield important benefits to salmonid habitat.

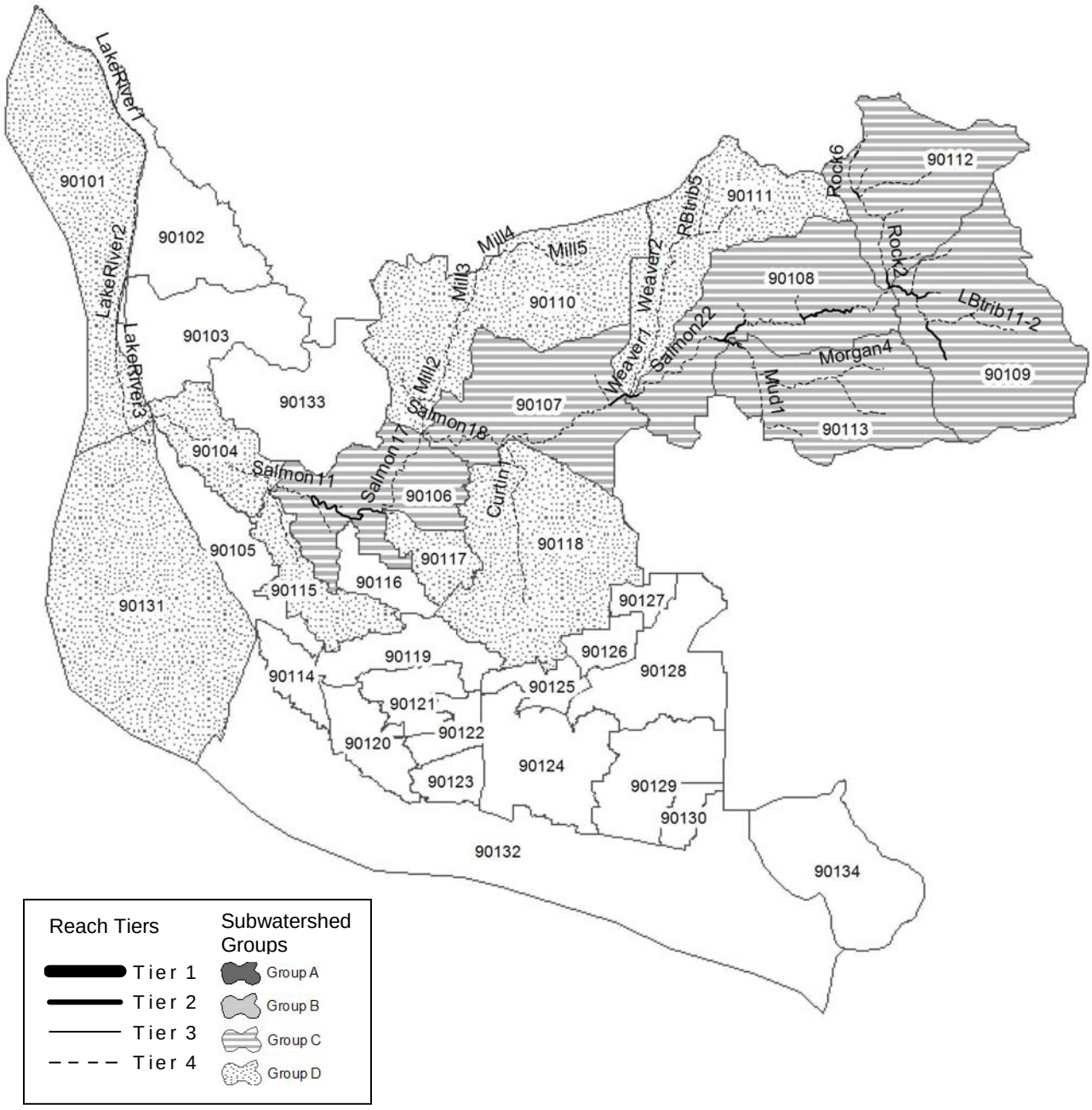


Figure 14-4. Reach tiers and subwatershed groups in the Salmon Creek Basin. Tier 1 reaches and Group A subwatersheds represent the areas where recovery actions would yield the greatest benefits with respect to species recovery objectives. The subwatershed groups are based on Reach Tiers. Priorities at 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.

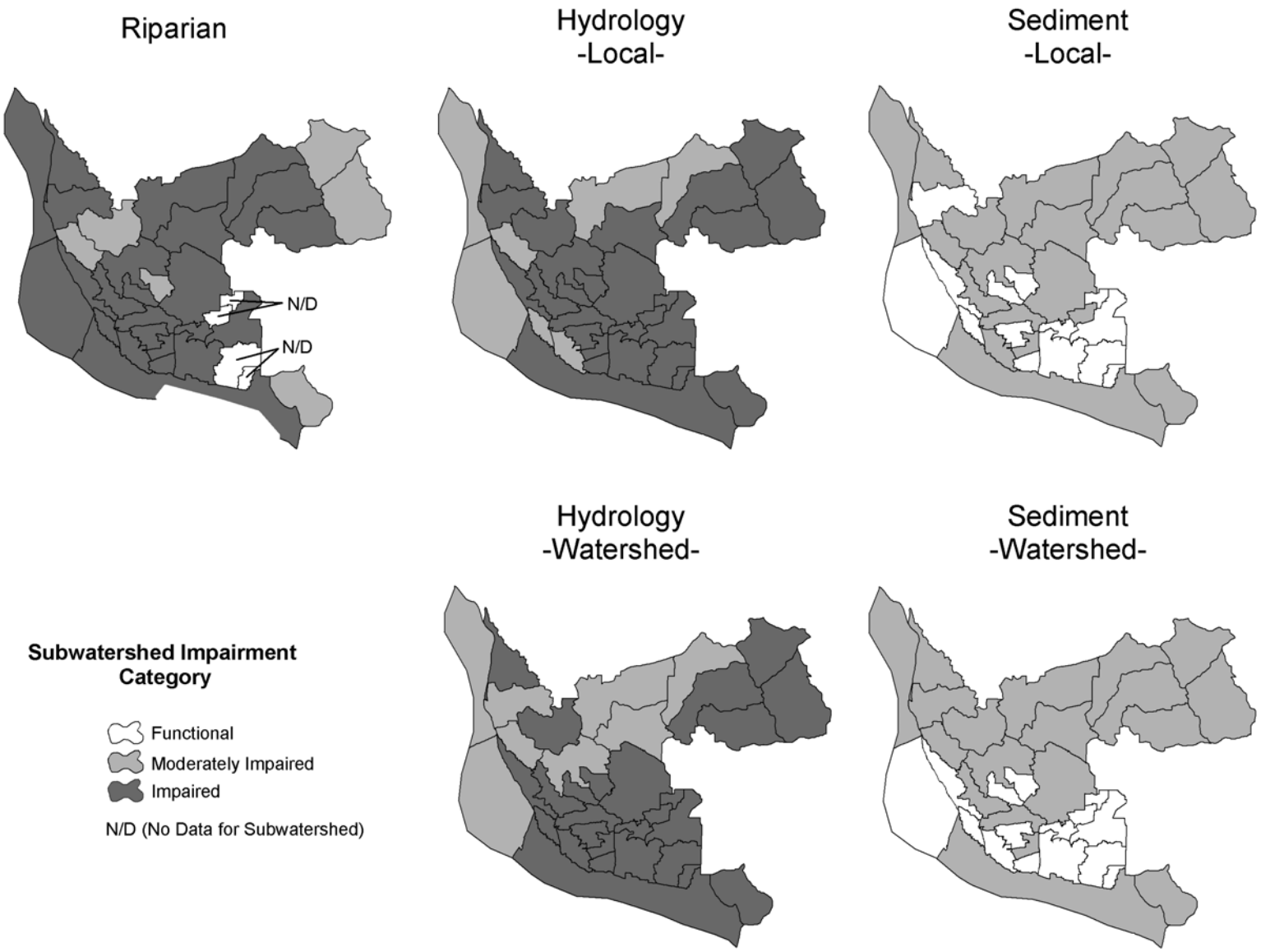


Figure 14-5. IWA subwatershed impairment ratings by category for the Salmon Creek Basin. Watershed process impairment ratings are based on landscape conditions that influence the hydrologic regime, the sediment regime, and riparian function. See Volume II and Volume V of the Recovery Plan Technical Foundation for additional information.

Table 14-5. Summary Table of reach- and subwatershed-scale limiting factors in priority areas. The table is organized by subwatershed groups, beginning with the highest priority group. Species-specific reach priorities, critical life stages, high impact habitat factors, and recovery emphasis (P=preservation, R=restoration, PR=restoration and preservation) are included. Watershed process impairments: F=functional, M=moderately impaired, I=impaired. Species abbreviations: ChS=spring Chinook, ChF=fall Chinook, StS=summer steelhead, StW=winter steelhead.

Sub-watershed Group	Sub-watershed	Reaches within subwatershed	Species Present	High priority reaches by species	Critical life stages by species	High impact habitat factors	Preservation or restoration emphasis	Watershed processes (local)			Watershed processes (watershed)	
								Hydrology	Sediment	Riparian	Hydrology	Sediment
C	90113	BakerCr1_(LBtrib3-1)	StW	none				I	M	I	I	M
		BakerCr2_(LBtrib3-2)	Coho	Morgan1	egg incubation	channel stability	R					
		BakerCr3_(LBtrib3-3)		SideChannel1	summer rearing	temperature						
		Fishway1			winter rearing	flow						
		Morgan1			adult holding	sediment						
		Morgan2				key habitat quantity						
		Morgan3_A										
		Morgan3_B										
		Morgan4										
		Mud1										
		Mud2										
		SideChannel1										
	90112	LBtrib5	StW	none				I	M	M	I	M
		LBtrib7-1	Coho	Rock1	egg incubation	channel stability	R					
		LBtrib8-1		Rock5	fry colonization	habitat diversity						
		LBtrib9		Rock7	summer rearing	flow						
		Rock1			winter rearing	sediment						
		Rock2				food						
		Rock3				key habitat quantity						
		Rock4										
		Rock5										
		Rock6										
		Rock7										
		Rock8										
		RockCulv1										
	90109	LBtrib11-1	StW	Salmon28	egg incubation	habitat diversity	PR	I	M	M	I	M
		LBtrib11-2		Salmon29	fry colonization	sediment						
		LittleSalmon1		Salmon31	summer rearing							
		RBtrib11-1		Salmon32	winter rearing							
		RBtrib11-2	Coho	LBtrib11-1	spawning	channel stability	PR					
		RBtrib11Culv1		RBtrib11-1	egg incubation	habitat diversity						
		RBtrib12-1		Salmon29	fry colonization	sediment						
		RBtrib12-2		Salmon31	summer rearing	key habitat quantity						
		Salmon28			winter rearing							
		Salmon29			juvenile migrant (age-0)							
		Salmon30										
		Salmon31										
		Salmon32										
	90108	Salmon21	StW	Salmon21	egg incubation	sediment	R	I	M	I	I	M
				Salmon23	fry colonization							
		Salmon23			summer rearing							
		Salmon24	Coho	Salmon21	egg incubation	habitat diversity	R					
		Salmon26		Salmon23	fry colonization	sediment						
		RBtrib9-1		Salmon24	summer rearing							
		Salmon25		Salmon26	winter rearing							
		Salmon27		RBtrib9-1								
		RBtrib8										
		Salmon22										
		RBtrib9-2										
		RBtrib9Dam										
	90107	Salmon20	StW	Salmon20	egg incubation	habitat diversity	R	I	M	I	M	M
					summer rearing	sediment						
					winter rearing							
		Salmon18	Coho	Salmon20	egg incubation	habitat diversity	R					
		Salmon19			summer rearing	sediment						
		RBtrib4			winter rearing							
	90106	Klineline1	ChF	Salmon14_A	spawning	channel stability	R	I	M	I	M	M
		KlinelineChannel1 (SCPC1)		Salmon14_B	egg incubation	habitat diversity						
		Lalonde1		Salmon14_C	fry colonization	sediment						
		LalondeCulv1		Salmon16	adult holding	key habitat quantity						
		Salmon11	Chum	Salmon13	spawning	habitat diversity	R					
		Salmon12		Salmon14_A	egg incubation	sediment						
		Salmon13		Salmon14_B	fry colonization	harassment						
		Salmon14_A		Salmon16	adult migrant	key habitat quantity						
		Salmon14_B			adult holding							
		Salmon14_C	StW	Salmon13	egg incubation	habitat diversity	R					
		Salmon15(falls)		Salmon14_A	fry colonization	temperature						
		Salmon16		Salmon14_B	summer rearing	predation						
		Salmon17		Salmon14_C		flow						
		Suds1		Salmon16		sediment						
		Suds2	Coho	Lalonde1	spawning	channel stability	R					
		Suds3		Salmon12	egg incubation	habitat diversity						
		Suds4		Salmon13	fry colonization	predation						
		Suds5		Salmon14_A	summer rearing	flow						
		Suds6		Salmon14_B	winter rearing	sediment						
		SudsCulv1		Salmon16	juvenile migrant (age-0)							
		SudsCulv2		Suds1	juvenile migrant (age-1)							
		SudsCulv3		Suds2								
		SudsCulv4										
		SudsCulv5										
		TenneyCr(LBtrib1)										

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
D	90131	Salmon1	All	none				M	F	I	M	F
	90118	Curtin1 Curtin2 CurtinCulv	Coho	none				I	M	I	I	M
	90117	Lalonde2	Coho	none				I	F	M	I	F
	90115	CougarCanyon1 CougarCanyon2 NW119thCulv	Coho	none				I	M	I	I	M
	90111	RBtrib5	StW	none				M	M	I	M	M
		Weaver1 Weaver2 Weaver3 WeaverCulv1	Coho	none								
	90110	Dam1	StW	none				M	M	I	M	M
		Mill1 Mill2 Mill3 Mill4 Mill5 RBtrib2-1 (MillCr) Reservoir1	Coho	none								
	90104	Salmon2 Salmon3 Salmon4 Salmon5 Salmon6 Salmon7 Salmon8 Salmon9 Salmon10	All	none				M	M	M	M	M
	90101	LakeRiver1	All	none				M	M	I	M	M
		LakeRiver2	Chum	none								
		LakeRiver3	StW	none								

Table 14-6. Salmonid habitat limiting factors and threats in priority areas. Priority areas include the lower Salmon mainstem (LM) and upper mainstem Salmon & tributaries (UM). Linkages between each threat and limiting factor are not displayed – each threat directly and indirectly affects a variety of habitat factors.

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

Threats	LM	UM
Agriculture/grazing		
Clearing of vegetation	✓	✓
Riparian grazing	✓	✓
Floodplain filling	✓	✓
Urban/suburban/rural development		
Clearing of vegetation	✓	✓
Floodplain filling	✓	✓
Increased impervious surfaces	✓	✓
Increased drainage network	✓	✓
Roads – riparian/floodplain impacts	✓	✓
Leaking septic systems	✓	✓
Channel manipulations		
Bank hardening	✓	✓
Channel straightening	✓	✓
Artificial confinement	✓	✓
Dredge and fill activities	✓	
Mining		
Clearing of vegetation	✓	
Channel and/or floodplain substrate removal	✓	
Floodplain filling	✓	
Increased water surface area	✓	
Recreation		
River recreation (harassment)	✓	

Table 14-7. 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.

Priority Location	Limiting Factors Addressed	Threats Addressed	Target Species	Time	Discussion
1. Protect and restore floodplain function and channel migration processes ***A. Set back, breach, or remove artificial channel confinement structures***					
Lower mainstem Salmon 12-16 ***Upper mainstem*** Salmon 20-32	• Bed and bank erosion • Altered habitat unit composition • Restricted channel migration • Disrupted hyporheic processes • Reduced flood flow dampening • Altered nutrient exchange processes • Channel incision	• Floodplain filling • Channel straightening • Artificial confinement	• Chum • Coho • Fall Chinook	2-15 years	Good potential benefit due to improvements in many limiting factors. This passive restoration approach can allow channels to restore naturally once confinement structures are removed. There are challenges with implementation due to private lands, existing infrastructure already in place, potential flood risk to property, and large expense. Opportunities exist in a few 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)***					
Lower mainstem Salmon 12-16 ***Upper mainstem*** Salmon 20-32	• Loss of off-channel and/or side-channel habitat • Blockages to off-channel habitats • Altered habitat unit composition	• Floodplain filling • Channel straightening • Artificial confinement	• Chum • Coho	2-15 years	Good potential benefit especially for chum, which have lost a significant portion of historically available off-channel habitat for spawning. Potential benefit is limited by moderate probability of success with creation of new habitats. There are challenges with implementation due to private lands, existing infrastructure already in place, potential flood risk to property, and large expense. Opportunities exist in a few 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***					

Priority Location	Limiting Factors Addressed	Threats Addressed	Target Species	Time	Discussion
Lower mainstem & tribs Salmon 12-16; Suds 1-2 ***Upper mainstem & tribs*** Salmon 20-32; Morgan 1; Rock 1, 5, 7	• Reduced stream canopy cover • Altered stream temperature regime • Reduced bank/soil stability • Reduced wood recruitment • Lack of stable instream woody debris • Exotic and/or noxious species • Bacteria • Reduced DO concentration	• Riparian grazing • Clearing of vegetation due to development, agriculture, and mining	• All species	20-100 years	High potential benefit due to the many limiting factors that are addressed. Riparian impairment is related to most land-uses and is a concern throughout the basin. Riparian protections on forest lands are provided for under current harvest policy. Riparian restoration projects are relatively inexpensive and are often supported by landowners. Whereas the specified stream reaches are the highest priority for riparian measures, riparian restoration and preservation should occur throughout the basin since riparian conditions affect downstream reaches. Use IWA riparian ratings to help identify restoration and preservation opportunities.
4. Restore channel and floodplain areas damaged as a result of streamside gravel mining and reduce risks of future impairment due to these activities ***A. Stabilize surface mining sites to prevent erosion*** ***B. Restore channel morphology where streams have avulsed into mining areas***					
Lower mainstem Salmon 13-14	• 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	• Channel and/or floodplain substrate removal • Floodplain filling • Increased water surface area	• Chum • Fall Chinook • Coho	10-50 years	The main area of concern is between I-5 and Highway 99, where the mainstem avulsed into streamside gravel mining ponds in 1996. An upstream migrating headcut has resulted from this avulsion. Restoration measures need to focus on restoring currently degraded channel conditions as well as reducing the risk of future degradation.
5. Protect and restore streambank stability ***A. Restore eroding streambanks***					
Lower mainstem Salmon 13-14 ***Upper mainstem & tribs*** Salmon 24, 26; Morgan 1; Rock 5	• Reduced bank/soil stability • Excessive fine sediment • Embedded substrates • Excessive turbidity	• Artificial confinement • Clearing of vegetation • Roads – riparian / floodplain impacts • Riparian grazing • Mining impacts	• All species	5-25 years	There are areas of bank instability just upstream of I-5 due to avulsion into streamside gravel pits. The upstream reaches in the mainstem, Morgan, and Rock creeks have bank instability associated with roads and riparian livestock grazing. Restoration measures should include livestock exclusion fencing and bio-engineered approaches that rely on structural as well as vegetative

Priority Location	Limiting Factors Addressed	Threats Addressed	Target Species	Time	Discussion
					measures.
6. Protect and restore natural sediment supply processes ***A. Address agricultural sources*** ***B. Address developed land sources***					
Entire basin	• Excessive fine sediment • Excessive turbidity • Embedded substrates	• Agricultural practices – impacts to sediment supply • Urban and rural development – impacts to sediment supply	• All species	5-50 years	High potential benefit due to sediment effects on egg incubation and early rearing. There are challenges with implementation on agricultural lands due to few sediment-focused regulatory requirements for agricultural lands. Use IWA impairment ratings to identify restoration and preservation opportunities.
7. Protect and restore runoff processes ***A. Limit additional watershed imperviousness*** ***B. Manage stormwater runoff***					
Entire basin	• Stream flow – altered magnitude, duration, or rate of change of flows	• Increased impervious surfaces • Increased drainage network (road ditches, storm drains) • Clearing of vegetation (development, agriculture)	• All species	5-50 years	High potential benefit due to flow effects on habitat formation, redd scour, and early rearing. There are challenges with addressing runoff issues on developed lands due to continued increase in watershed imperviousness related to development and lack of adequate mitigation. Use IWA impairment ratings to identify restoration and preservation opportunities.
8. Protect and restore instream flows ***A. Water rights closures*** ***B. Purchase or lease existing water rights*** ***C. Relinquishment of existing unused water rights*** ***D. Enforce water withdrawal regulations*** ***E. Implement water conservation, use efficiency, and water re-use measures to decrease consumption***					
Entire basin	• Stream flow – altered magnitude, duration, or rate of change of flows	• Water withdrawals	• All species	1-5 years	Instream flow management strategies for the Salmon Creek basin have been identified as part of Watershed Planning for WRIA 28 (LCFRB 2004). Strategies include water rights closures, setting of minimum flows, and drought management policies.
9. Protect and restore water quality ***A. Restore the natural stream temperature regime***					

Priority Location	Limiting Factors Addressed	Threats Addressed	Target Species	Time	Discussion
B. Reduce fecal coliform bacteria levels ***C. Reduce turbidity sources*** ***D. Restore dissolved oxygen concentrations***					
Entire basin	• Altered stream temperature regime • Bacteria • Excessive turbidity • Reduced DO concentration	• Riparian grazing • Leaking septic systems • Clearing of vegetation (development, agriculture)	• All species	1-50 years	Primary emphasis for restoration should be placed on stream segments that are listed on the 2004 303(d) list.
10. Protect and restore instream habitat complexity ***B. Place stable woody debris in streams to enhance cover, pool formation, bank stability, and sediment sorting*** ***C. Structurally modify stream channels to create suitable habitat types***					
Lower mainstem & tribs Salmon 12-16; Suds 1-2 ***Upper mainstem & tribs*** Salmon 20-32; Morgan 1; Rock 1, 5, 7	• Lack of stable instream woody debris • Altered habitat unit composition	• None (symptom-focused restoration strategy)	• coho • winter steelhead	2-10 years	Moderate potential benefit due to the high chance of failure. Failure is probable if habitat-forming processes are not also addressed. These projects are relatively expensive for the benefits accrued. Moderate to high likelihood of implementation given the lack of hardship imposed on landowners and the current level of acceptance of these type of projects.
11. Protect and restore sensitive areas through recreation management ***A. Limit intensive recreational use where there is harassment potential*** ***B. Actively rehabilitate areas damaged by intensive recreational use***					
Lower mainstem Salmon 12-16	• Harassment	• River recreation	• chum • fall Chinook	immediate	Human activity in and around the stream in the vicinity of Salmon Creek County Park has the potential to disrupt spawning, egg incubation, and early rearing of chum and fall Chinook. Outreach programs (primarily through signage) may assist in educating park goers about areas to avoid during sensitive times.
12. Protect habitat conditions and watershed functions through land-use planning that guides population growth and development ***A. Plan growth and development to avoid sensitive areas (e.g. wetlands, riparian zones, floodplains, unstable geology)*** ***B. Encourage the use of low-impact development methods and materials*** ***C. Apply mitigation measures to off-set potential impacts***					
Entire basin	***Preservation Measure*** – addresses many potential limiting factors and threats		• All species	5-50 years	This basin is experiencing rapid development. The focus should be on management of land-use conversion and managing continued development in sensitive areas (e.g.,

Priority Location	Limiting Factors Addressed	Threats Addressed	Target Species	Time	Discussion
					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.
13. Protect habitat conditions and watershed functions through land acquisition or easements where existing policy does not provide adequate protection ***A. Purchase properties outright through fee acquisition and manage for resource protection*** ***B. Purchase easements to protect critical areas and to limit potentially harmful uses*** ***C. Lease properties or rights to protect resources for a limited period***					
Entire basin	***Preservation Measure*** – addresses many potential limiting factors and threats		• All species	5-50 years	Land acquisition and conservation easements in riparian areas, floodplains, and wetlands have a high potential benefit. These programs are under-funded and have low landowner participation.

14.5 Program Gap and Sufficiency Analysis

The Salmon Creek Basin (~150 sq mi) is located entirely in Clark County:

- The Department of Natural Resources has approximately 10 square miles of public forest in the uppermost reaches of the Salmon Creek Basin;
- Small- and industrial private forests represent approximately 10 square miles of the Basin;
- The predominant land uses in the Salmon Creek Basin are urban, suburban, residential, and agriculture;
- Burnt Bridge Creek lies within urban Vancouver;
- Clark County has regulatory authority for areas outside of the Vancouver City limits;
- The City of Battleground is partially within the Salmon Creek Watershed;
- The City of Brush Prairie is within the Salmon Creek Watershed;
- Other emerging population centers within the Salmon Creek Basin include Orchards, Salmon Creek, and Ridgefield;
- The 2000 population of the Basin was 252,000 and is projected to grow to an estimated 519,000 by the year 2020.

Protection Programs

Protection programs in the Salmon Creek Basin are implemented by a variety of agencies, organizations, and private interests. Protection programs in this analysis include those programs that protect habitat conditions or watershed functions through regulatory measures, through the acquisition outright or the purchase of easements, or by applying standards to new development that protects resources by avoiding damaging impacts. Example programs implementing measures are identified below.

Federal Program

- ***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.4; M.5A; M.10B; M.10C]

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.9A; M.9C]

- 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.9A; M.9A]

➢ ***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.10B; M.10C]

- 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.4; M.5A; M.6B; M.8A; M.8B; M.8C; M.8D; M.9A; M.9B; M.9C; M.10B; M.10C; M.11A; M.11B; M.12A; M.12B; M.12C]

➢ ***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.9A; M.9B; M.9C]

- Water Resources Program/Water Rights: Department of Ecology, in consultation with the Department of Fish and Wildlife, has administrative closed selected areas within the Salmon Creek watershed to further surface and groundwater withdraws (where groundwater is in continuity with surface water). Existing administrative closures by the Department of Ecology protect surface waters from further withdrawals. Formal rule-making would strengthen the closures. The extent of unauthorized surface water withdrawals is unknown, but could exacerbate summer low flows. [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.7A; M.7B; M.8A; M.8B; M.8C; M.8D; M.9A; M.9B; M.9C; M.9D; M.12A]

➢ ***Department of Ecology and the Department of Fish and Wildlife***

- There are many administrative closures relating to surface water withdrawals in the Basin; [M.8A; M.8B; M.8C; M.8D]

➢ ***Washington Department of Transportation***

- Highway maintenance program implements best management practices for the protection of habitat. [M.7A; M.7B]

Local Government Programs

o ***Clark County***

- 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.
  - ✓ Wetland ordinance provides substantial protection. [M.12A; M.12B; M.12C]
  - ✓ Other protection programs include conservation futures and Conservation REET which provides for the acquisition of sensitive habitat areas; [M.13A; M.13B; M.13C]
- 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.7A; M.7B; M.9A; M.9C; M.9D]

- 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.7A; M.7B]

- Parks and County Facilities:

- ✓ The County has an active Conservation Futures program to acquire and protect critical habitat. [M.13A; M.13B]
- ✓ The County has not implemented a comprehensive parks and facilities management plan to protect habitat.

➢ ***Clark Conservation District and NRCS*** is active in the Salmon Creek Basin, including Salmon Creek and Burnt Bridge Creek. CCD works with agriculture interests to develop farm plans and acquires short-term easements to implement Conservation Enhancement Reserve Program [M.1A; M.2A; M.2B; M.2C; M.3A; M.3C; M.5A; M.6A; M.9A; M.9B; M.9C; M.9D]

Community Programs

Restoration Programs

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

State Programs

➢ ***Washington Department of Natural Resources***

State Forest Land Habitat Conservation Plan (HCP): The Department manages state forest lands pursuant to a Habitat Conservation Plan (HCP). The HCP road maintenance and restoration objectives require barrier upgrades and road abandonment and/or other improvements. [M.3A; M.3B; M.9A; M.9C]

- State Forest Practices Act:
  - ✓ Industrial forests within the 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.9A; M.9C]
  - ✓ 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.9A; M.9C]

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

- 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.4; M.5A; M.6B; M.8A; M.8B; M.8C; M.8D; M.9A; M.9B; M.9C; M.10B; M.10C; M.11A; M.11B; M.12A; M.12B; M.12C]

➢ ***Washington Department of Ecology***

- Water Resources Program/Watershed Planning:

The planning process for WRIA 27 is dealing with water quantity and quality, stream flows and fish habitat. Potential restoration efforts address improving summer low flows through conservation and acquisition of water rights. Once approved by counties within the WRIA, the plan will be binding on state agencies and local governments. [M.8A; M.8B; M.8C; M.8D; M.9A; M.9B; M.9C; M.9D; M.12A]

- ***Washington Department of Transportation***

  - Barriers: WSDOT has improved several blockages associated with State Route 500 in the Salmon Creek area.

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

  - Washington Salmon Recovery Act (RCW 77.85): As noted under preservation programs above, the SRFB and the LCFRB jointly administer a grant program that allocates federal Pacific Salmon Recovery Funds and State funds for habitat protection and restoration projects by state and local agencies, nonprofit organizations, and landowners. To date the SRFB has not funded projects in this basin. [M.1A; M.2A; M.2B; M.3A; M.3B; M.5A; M.9A; M.9C; M.10B; M.10C]

- ***Conservation Commission/Clark Conservation District* (CCD)**

  - The CCD is active within the basin. CCD works with agriculture interests to develop farm plans and implements the Conservation Enhancement Reserve Program. [M.1A; M.2A; M.2B; M.2C; M.3A; M.3C; M.5A; M.6A; M.9A; M.9B; M.9C; M.9D]

Local Government Programs

- ***Clark County***

  - Clark County ESA Program: The Clark County ESA program encourages and recognizes citizen efforts to conserve and restore habitat for salmon through education and outreach activities.
  - Clark County Culvert Program: The County inventories and replaces priority barriers associated with its roads.

Community Programs

- ***Clark Public Utility*** is active in the Salmon Creek Watershed; restoration projects focus on stabilizing streambanks to reduce erosion and improve water quality; Clark Public Utilities also has an extensive water quality monitoring program; [M.3A; M.5A; M.8C; M.9A; M.9C]

Gap Analysis

Forest-related Programs: In the Salmon Creek Basin, forestry programs have a relatively minor, but important role in protecting and restoring watershed functions and habitat conditions consistent with recovery goals. This is because these programs apply to only a fraction of the basin. Certainty of forestry-related protection and restoration programs is relatively high because programs are being implemented and, for the most part, fully funded.

Protection-related Programs: Clark County and the City of Vancouver land use regulatory mechanisms provide significant protections throughout the Salmon Creek Basin. The City of Battleground land use regulatory mechanisms provide some protections; however, the City's programs lack effective provisions that commonly are used to proactively direct growth, protect streams and wetlands, and manage stormwater. These protection mechanisms will be extremely important to direct population growth away from critical areas and to slow the conversion of commercial forests and agriculture to more intensive uses, such as suburban and residential uses. In addition, as in all lower Columbia subbasins, there are very limited protection mechanisms for agricultural practices relative to riparian areas and hydrologic impairment.

Restoration-related Programs: The Salmon Creek Basin has received good attention from restoration-focused programs and there is reason to believe these efforts will continue. Restoration activities are especially important in the Salmon Creek Basin because of the wholesale changes to watersheds that have occurred as a result of urban growth and development. It is a foregone conclusion that the Basin will experience additional population growth over the next 20 years. While effective regulatory programs will be fundamental to protect critical areas, they will not entirely offset impacts associated with growth. Restoration activities will be necessary to address the cumulative impacts from additional imperviousness, riparian degradation and water quality.

Table 14-8. Program Actions to Address Gaps

Action #	Lead Agency	Proposed Action
SALMON.1	Battleground, Brush Prairie, Orchards	Develop and implement stormwater discharge controls to protect water quality and quantity and reduce localized stream flow impacts detrimental to fish —including peak and base flows
SALMON.2	Battleground, Brush Prairie, Orchards	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
SALMON.3	Battleground, Brush Prairie, Orchards	Zoning and development standards to adequately protect wetlands, wetland buffers, and wetland function.
SALMON.4	Clark County, City of Vancouver, Battleground, Brush Prairie, Orchards	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
SALMON.5	Clark County, City of Vancouver, Battleground, Brush Prairie Orchards	Protect historic stream meander patterns and channel migration zones and avoid hardening stream banks and shorelines
SALMON6	Battleground, Brush Prairie, Orchards	Development and implement controls and development standards to adequately protect wetlands, wetland buffers, and wetland function
SALMON.7	State of Washington (Dept of Agriculture)	Develop and implement agricultural practices and regulations to protect riparian conditions and water quality
SALMON.8	State of Washington (DFW, Ecology)	Close tributaries to the Salmon Creek Basin to further withdrawal of surface water, including groundwater in connection with surface waters. Curtail unauthorized withdrawals.
SALMON.9	State of Washington, LCFRB, CC	Build institutional capacity for agencies and organizations to undertake protection and restoration projects
SALMON.10	LCFRB, DOE, DFW, NOAA, USFWS, ACOE, BPA	Increase available funding for projects that implement measures and addresses underlying threats, including noxious weed control
SALMON.12	Clark CD, Clark County, Vancouver.	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
SALMON.13	Clark County, Vancouver, Battleground, Brush Prairie, Orchards	Apply land use code enforcement across jurisdictions in a consistent manner, using appropriate funding levels and application
SALMON.14	FEMA	Update floodplain maps using Best Available Science