# 10 Kalama River Subbasin

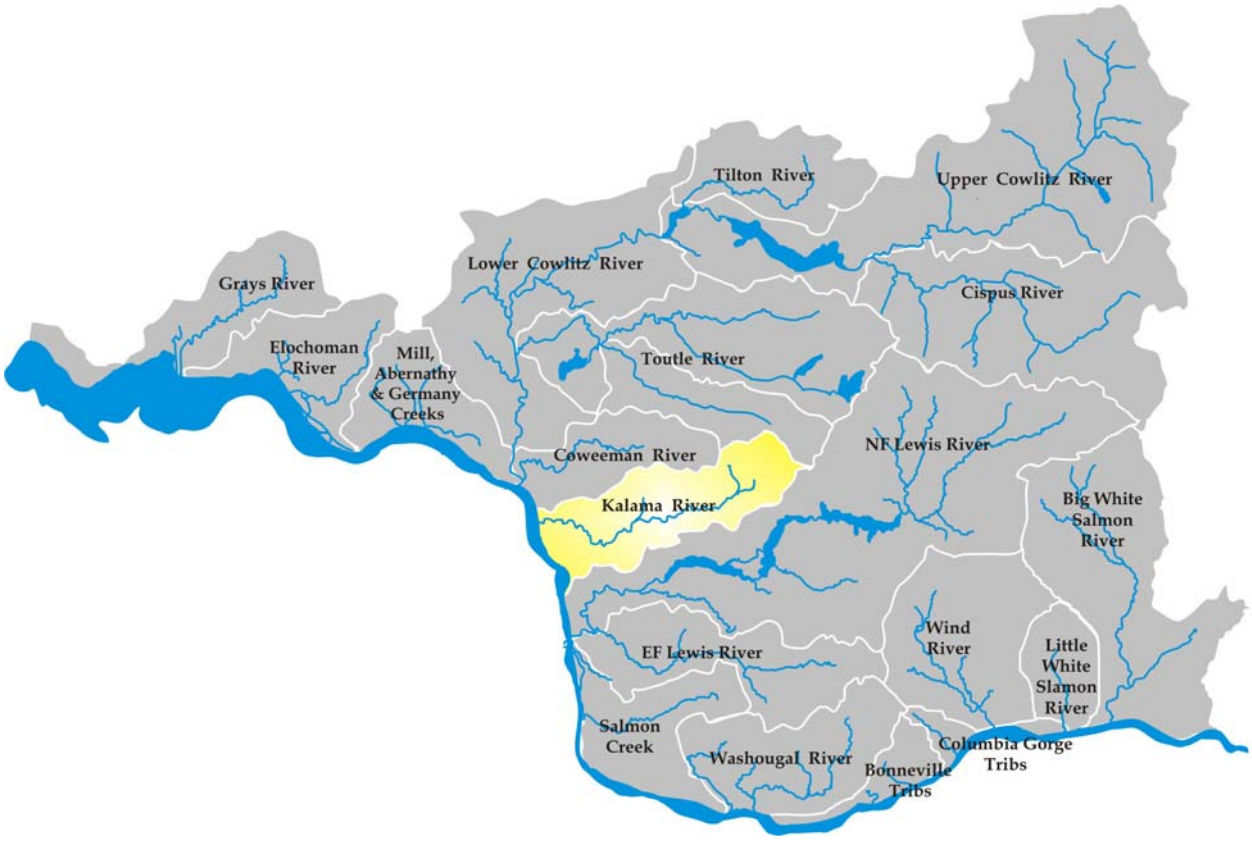



**Figure 10-1. Location of the Kalama River Subbasin within the Lower Columbia River Basin.**

## 10.1 Basin Overview

The Kalama River Subbasin comprises approximately 205 square miles in Cowlitz County. The river enters the Columbia at RM 73, approximately 8 miles upstream of Longview, Washington. The principle tributary to the Kalama is Gobar Creek. The subbasin is part of WRIA 27.

The Kalama Subbasin will play a key role in the recovery of salmon and steelhead. The subbasin has historically supported populations of fall and spring Chinook, winter and summer 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.

Kalama 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 Kalama fish. Kalama Falls and Fallert Creek hatcheries operate within the basin with the potential to both adversely affect

wild salmon and steelhead populations and to assist in recovery efforts. Key ecological interactions of concern include effects of non-native species; nutrient inputs from salmon carcasses; and predation by species affected by development including Caspian terns, northern pikeminnow, seals, and sea lions. Discussions of out-of-basin factors, strategies, and measures common to all subbasins may be found in Volume I, Chapters 4 and 7. This subbasin chapter focuses on habitat and other factors of concern specific to the Kalama Subbasin.

Most of the basin is forested and nearly the entire basin is managed for commercial timber production (96%). Only 1.3% is non-commercial forest and 1.5% is cropland. Areas along the lower river have experienced industrial and residential development, resulting in channelization of the lower river. A portion of the upper basin is located within the Mount St. Helens National Volcanic Monument. National Monument land is managed primarily for natural resource protection and tourism.

The Kalama mainstem provides most of the available spawning and rearing habitat in the subbasin, except for a few tributaries that support steelhead and spring Chinook. The mainstem has been severely impacted by logging and road building throughout the subbasin and to some extent by agricultural, rural residential development, and commercial development along the lower river.

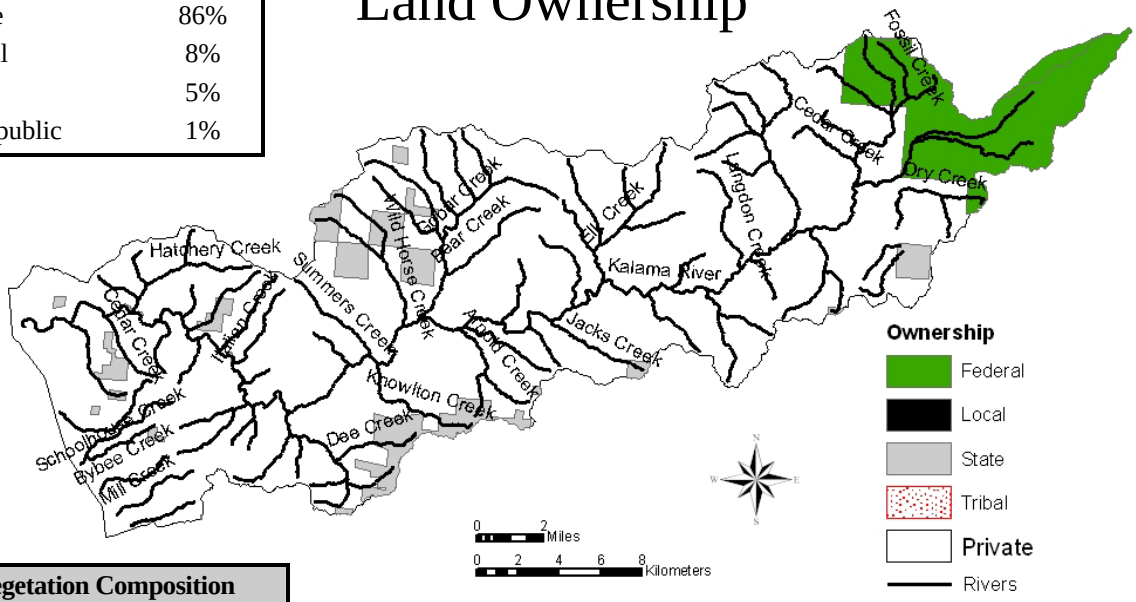
The important reaches for steelhead and spring Chinook are in the middle and upper mainstem and in the lower reaches of a few tributaries (NF Kalama, Gobar Creek, Wildhorse Creek, Little Kalama River). These habitats currently support healthy runs of steelhead. Further degradation of these reaches would jeopardize populations. Of particular importance are the mainstem canyon reaches, which are critical for parr rearing.

The lower mainstem reaches are the most important for chum, fall Chinook, and coho. These reaches suffer from impaired channel stability and habitat diversity, which are related to riparian and floodplain impacts from rural residential development, commercial development, agriculture, and transportation corridors. Sedimentation of these reaches is related to basin-wide forestry practices. Further degradation of these reaches would severely impact chum and fall Chinook. Restoration would yield substantial benefits.

Population density and development in the watershed are low. The year 2000 population was approximately 5,300 persons (LCFRB 2001). The town of Kalama, located near the mouth, is the only urban area in the basin.

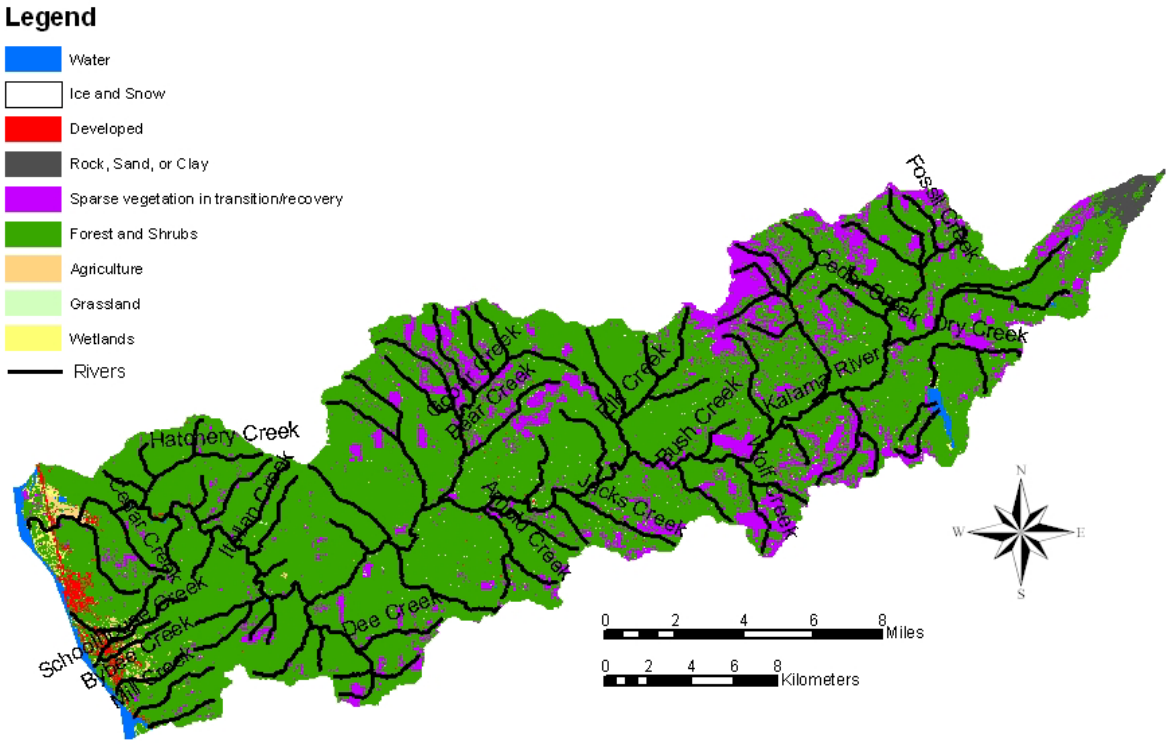
| Land Ownership | |
|---|---|
| Private | 86% |
| Federal | 8% |
| State | 5% |
| Other public | 1% |

# Land Ownership




| Vegetation Composition | |
|---|---|
| Late Seral | 4% |
| Mid Seral | 23% |
| Early Seral | 9% |
| Other Forest | 55% |
| Non Forest | 9% |

# Land Use / Cover



## 10.2 Species of Interest

Focal salmonid species in the Kalama basin include fall Chinook, spring Chinook, winter steelhead, summer steelhead, chum, and coho. The health or viability of these populations ranges from very low (chum and spring Chinook) to above medium (winter steelhead). Focal populations need to improve to a targeted level that contributes to recovery of the species (see Volume I, Chapter 6). Recovery goals call for restoring Chinook and steelhead 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. Chum recovery goals call for medium viability levels providing a 75-95% probability of persistence over 100 years. Recovery goals for coho are low, providing for a 40-75% chance of survival over 100 years.

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

**Table 10-1. Current viability status of Kalama populations and the biological objective status that is necessary to meet the recovery criteria for the Cascade strata and the lower Columbia ESU.**

| | ESA | Hatchery | Current | | Objective | |
|---|---|---|---|---|---|---|
| Species | Status | Component | Viability | Numbers | Viability | Numbers |
| Fall Chinook | Threatened | Yes | Low+ | 3,800-20,000 | High | 1,300-3,200 |
| Spring Chinook | Threatened | Yes | Very Low | 50-600 | High | 900-1,400 |
| Winter Steelhead | Threatened | Yes | Med+ | 500-2,300 | High+ | 600-700 |
| Summer Steelhead | Threatened | Yes | Low+ | 200-2,300 | High | 700-1,000 |
| Chum | Threatened | No | Very Low | <50 | Low | 1,100-12,200 |
| Coho | Candidate | Yes | Low | Unknown | Medium | unknown |

*Fall Chinook*– The historical Kalama adult population is estimated from 3,800-20,000 fish. The current natural spawning numbers are similar, but the majority of the returns are hatchery fall Chinook released as juveniles from the Kalama hatchery facilities. Natural spawning occurs from late September through October in eleven miles of the mainstem Kalama from Kalama Falls Hatchery downstream to just above the I-5 Bridge. Juvenile rearing occurs near and downstream of the spawning areas. Juveniles migrate from the Kalama in the spring and early summer of their first year.

*Spring Chinook*–The historical Kalama adult population is estimated from 6,000-15,000 fish, although these estimates may be high. The majority of the habitat for spring Chinook production is upstream of the lower Kalama Falls which was an historical passage block for Chinook. Current natural spawning numbers range from less than 50 to 600, with the majority of the natural spawners originating from the Kalama hatcheries. Natural spawning occurs in the mainstem above the lower Kalama Falls, when fish are passed above Kalama Falls Hatchery, and in the mainstem in the first few miles downstream of the Kalama Falls Hatchery. Juveniles rear for a full year before migrating from the Kalama in the spring.

*Winter Steelhead*– The historical Kalama adult population is estimated from 1,000-8,000 fish. Current natural spawning returns range from 500-2,300. In-breeding with Skamania Hatchery produced steelhead is thought to be low because of differences in spawn timing. Spawning occurs primarily in the mainstem and tributaries upstream of Kalama Falls Hatchery. Spawning generally occurs 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 Kalama.

*Summer Steelhead*– The historical Kalama adult population is estimated from 1,300-7,000 fish. Current natural spawning returns range from 200-2,300 fish. In-breeding with Skamania Hatchery produced steelhead is thought to be low because of differences in spawn timing. Spawning occurs primarily in the mainstem and tributaries upstream of Kalama Falls Hatchery. Spawn timing is generally from February to April. Juvenile rearing occurs both downstream and upstream of the spawning areas. Juveniles rear for a full year or more before migrating from the Kalama.

*Chum*– The historical Kalama adult population is estimated from 15,000-40,000. Current natural spawning estimate is less than 50 fish in the Kalama. Spawning occurs in the lower reaches of the mainstem Kalama between Modrow Bridge and lower Kalama Falls. Spawn timing is mid November-December. Natural spawning chum in the Kalama 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 Kalama adult population is estimated from 2,000-26,000, with both early and late stock present. Early coho spawn primarily in November while late stock spawning is spread from late November to March. Current returns are unknown but assumed to be very low. A number of hatchery produced fish spawn naturally. Natural spawning occurs in the mainstem and tributaries downstream of lower Kalama Falls. Juveniles rear for a full year in the Kalama Basin before migrating as yearlings in the spring.

*Coastal Cutthroat*– Coastal cutthroat abundance in the Kalama has not been quantified but the population is considered depressed. Both anadromous and resident forms of cutthroat trout are found in the basin. Counts of adult cutthroat trout at the Kalama Falls fishway and smolt production estimates indicate a declining trend in abundance. Anadromous cutthroat enter the Kalama from July-December and spawn from December through June. Most juveniles rear 2-4 years before migrating from their natal stream. A hatchery cutthroat program was discontinued in 1999.

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

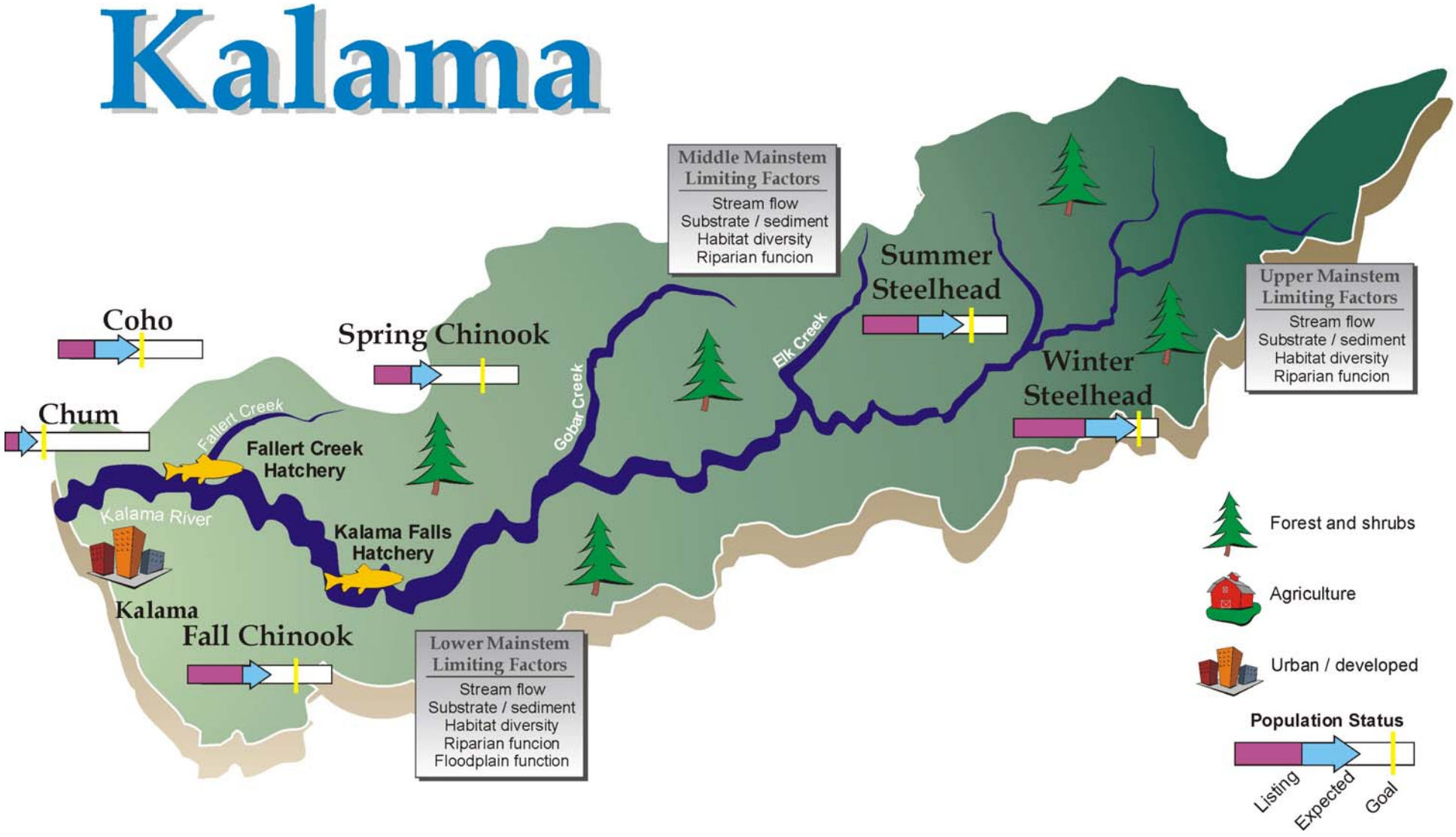



**Figure 10-2. Summary of habitat limiting factors, population status, expected population improvement trend with existing programs, and biological objectives depicted for the Kalama Subbasin.**

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

- Loss of tributary habitat quality and quantity is an important impact for all species, particularly for chum. Loss of estuary habitat quality and quantity is also important, particularly for chum and winter steelhead. The combination of tributary and estuary habitat factors account for 82% and 63% of the relative impact to chum and winter steelhead, respectively.
- Harvest has a large relative impact on fall and spring Chinook and coho and moderate impact on winter and summer steelhead. Harvest effects on chum are minimal.
- Hatchery impacts are substantial for coho and fall and spring Chinook, and are minimal for steelhead and chum.
- Predation impacts are moderate for winter and summer steelhead, but appear less important for coho, chum, and fall and spring Chinook.
- Hydrosystem access and passage impacts appear to be relatively minor for all species.

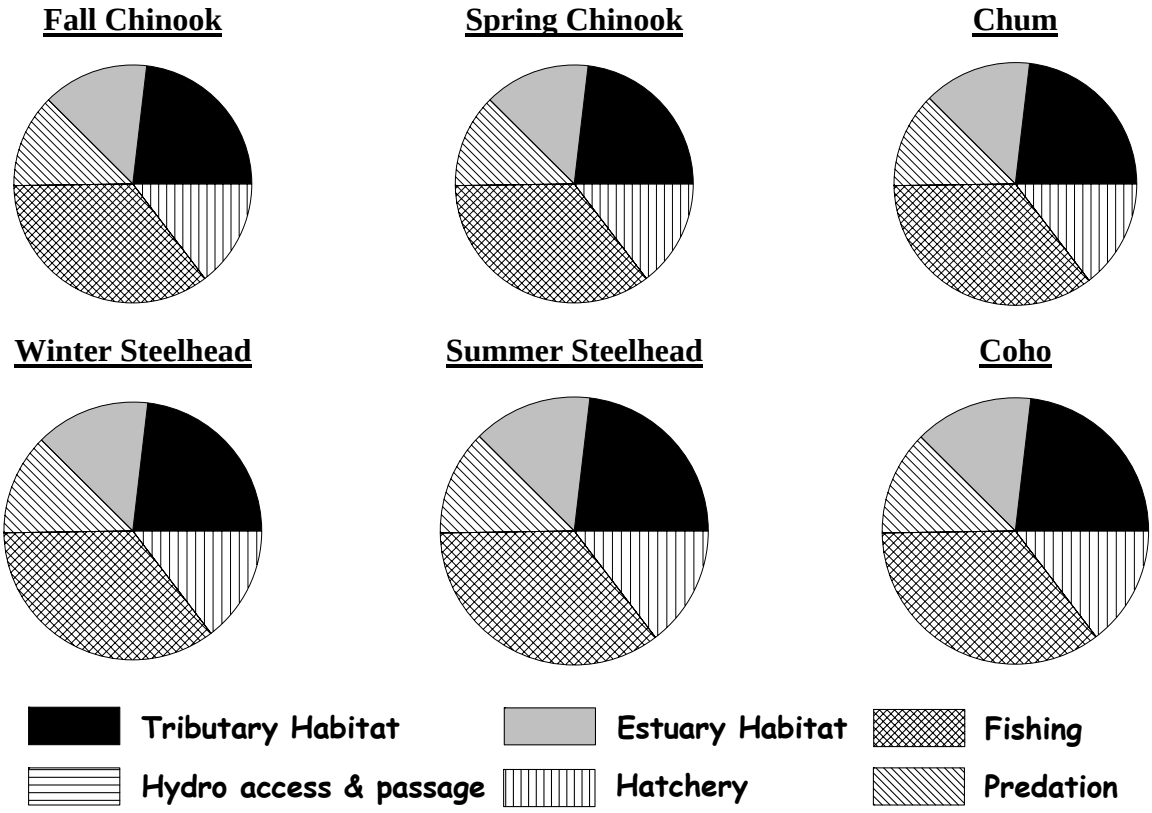



**Figure 10-3. Relative contribution of potentially manageable impacts for Kalama populations.**

## 10.4 Limiting Factors, Threats, and Measures

### 10.4.1 Hydropower Operation and Configuration

There are no hydro-electric dams in the Kalama River Basin. However, Kalama 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, Chapter 7.

### 10.4.2 Harvest

Most harvest of wild Kalama 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 is more significant for fall Chinook. Kalama fall Chinook are harvested in ocean and Columbia River commercial and sport fisheries as well as in-basin sport fisheries. Harvest is controlled by an ESA harvest limit associated with Coweeman natural fall Chinook. No harvest of chum occurs in ocean fisheries, there is no directed Columbia River or Kalama Basin chum fisheries and retention of chum is prohibited in Columbia River and Kalama sport fisheries. Chum are impacted incidental to fisheries directed at coho and winter steelhead. Harvest of Kalama coho occurs in the ocean commercial and recreational fisheries off the Washington and Oregon coasts and Columbia River as well as recreational fisheries in the Kalama Basin. 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 steelhead and commercial fisheries cannot retain hatchery or wild steelhead.

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

**Table 10-2. Regional harvest measures from Volume I, Chapter 7 with significant application to the Kalama Subbasin populations.**

| Measure | Description | Comments |
|---|---|---|
| F.M17 | Monitor chum handle rate in winter steelhead and late coho tributary sport fisheries. | State agencies would include chum incidental handle assessments as part of their annual tributary sport fishery sampling plan. |
| F.M13 | Develop a mass marking plan for hatchery tule Chinook for tributary harvest management and for naturally-spawning escapement monitoring. | Provides the opportunity to implement selective tributary sport fishing regulations in the Kalama watershed. Recent legislation passed by Congress mandates marking of all Chinook, coho, and steelhead produced in federally funded hatcheries that are intended for harvest. Details for implementation are currently under development by WDFW, ODFW, treaty Indian tribes, and federal agencies. |
| F.M18 | Monitor and evaluate commercial and sport impacts to naturally-spawning steelhead in salmon and hatchery steelhead target fisheries. | Includes monitoring of naturally-spawning steelhead encounter rates in fisheries and refinement of long-term catch and release handling mortality estimates. Would include assessment of the current monitoring programs and determine their adequacy in formulating naturally-spawning steelhead incidental mortality estimates. |
| F.M19 | Continue to improve gear and regulations to minimize incidental impacts to naturally-spawning steelhead. | Regulatory agencies should continue to refine gear, handle and release methods, and seasonal options to minimize mortality of naturally-spawning steelhead in commercial and sport fisheries. |
| 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. |

### 10.4.3 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 two hatcheries operating in the Kalama basin. Fallert Creek Hatchery (since 1895) operates in conjunction with Kalama Falls Hatchery (since 1959) to produces winter and summer steelhead, fall Chinook, spring Chinook, and coho for harvest opportunity. Gobar Pond (RM 19) is used to acclimate steelhead and spring Chinook smolts prior to release. Hatchery produced steelhead include Skamania summer, Cowlitz and Beaver Creek winters, as well as steelhead originating from Kalama wild summer and winter brood stock. Skamania and Beaver Creek hatchery steelhead are a composite stock and are genetically different from the naturally produced steelhead in the Kalama. 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. Fall Chinook are derived from Kalama stock and there have been few transfers of outside fall Chinook stock into Kalama Basin hatcheries. Spring Chinook are primarily Kalama origin with some history of transfers from Cowlitz Hatchery. Both early and late coho are produced from the

Kalama hatcheries. The main threats from the salmon hatchery programs are domestication of natural fall Chinook and coho and potential ecological interactions between the hatchery and natural juvenile salmon.

**Table 10-3. Kalama Basin hatchery production.**

| Hatchery | Release Location | Fall Chinook | Early Coho | Late coho | Winter Steelhead | Summer Steelhead |
|---|---|---|---|---|---|---|
| Fallert Creek | Kalama | 2,500,000 | 350,000 | | | 30,000 |
| Kalama Falls | Kalama | 2,500,000 | | 350,000 | 45,000<br>45,000(wild) | <br>60,000(wild) |

Regional hatchery strategies and measures are focused on evaluating and reducing biological risks and reducing the risks to natural populations. Artificial production programs within the Kalama facilities will be evaluated in detail through the WDFW Benefit-Risk Assessment Procedure (BRAP) relative to risks to natural populations. The resulting program specific actions will be developed, evaluated, and documented through the Hatchery and Genetic Management Plan for public review and consideration by NOAA Fisheries (details in programs Volume I, Chapter 8). Regional hatchery measures identified in Volume I, Chapter 7 with potential applications at facilities within the Kalama Subbasin are summarized in Table 10-4.

**Table 10-4. Regional hatchery measures from Volume I, Chapter 7 with potential implementation actions in the Kalama Subbasin.**

| Measure | Description | Comments |
|---|---|---|
| H.M2,5,13,38 | Integrated hatchery and wild program for fall Chinook. Evaluate potential for integration of hatchery and wild coho. | Assures fitness of the natural produced fish which will improve population productivity. Integrated programs would be developed specific to the Kalama populations in the BRAP procedure. |
| H.M14 | Use only local brood stock in the fall Chinook hatchery program. | This measure will preclude transfer of outside basin stock into the Kalama hatchery program. This will enable a hatchery and wild integrated program to be developed with fall Chinook that are ecologically adapted to the Kalamal Basin. |
| H.M15,22,32,40 | Juvenile release strategies to minimize interactions with naturally spawning fish. | Release strategies are aimed at reducing or avoiding interactions with wild steelhead, fall Chinook, coho by release timing and release location strategies. |
| H.M17,32,34,41 | Mark hatchery steelhead, coho, fall Chinook, and spring Chinook with an adipose fin-clip for identification and selective harvest. | Marking hatchery fish allows for identification of hatchery fish in the natural spawning grounds and at collection facilities which enables accurate accounting of wild fish. Marking also enables selective fisheries to retain hatchery fish and release wild fish. |
| H.M1,36 | Hatchery program utilized for supplementation and enhancement of wild coho populations. | . Supplementation programs for Kalama natural coho could be developed with appropriate brood stock in the Kalama hatcheries. |
| H.M8 | Adaptively manage hatchery programs to further protect and enhance natural populations and improve operational efficiencies. | Appropriate research, monitoring, and evaluation programs along with guidance from regional hatchery evaluations will be utilized to improve the survival and contribution of hatchery fish, reduce impacts to natural fish, and increase benefits to natural fish. |
| H.M6 | Evaluate Fallert Creek and Kalama Falls hatcheries facility operations. | Both facilities would be evaluated in the BRAP process for potential hazards associated with barriers to fish passage and adequacy of screens |

### 10.4.4 Ecological Interactions

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

### 10.4.5 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 Kalama 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 Kalama 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.

### 10.4.6 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 Kalama subbasin 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 protection and restoration are shown in Figure 10-4. A summary of the primary habitat limiting factors and threats are presented in Table 10-6. Habitat measures and related information are presented in Table 10-7. Results of IWA watershed process modeling are depicted for subwatersheds in Figure 10-5. Reach- and subwatershed-scale limiting factors generated from the technical assessment are included in Table 10-5. 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 Kalama basin include the following:

- Lower Kalama mainstem – Kalama 2-6
- Middle Kalama mainstem & tributaries – Kalama 8-12; Gobar Creek
- Upper Kalama mainstem & tributaries – Kalama 15-21; NF Kalama River

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 Kalama mainstem from the mouth to Dee Creek contains productive habitat for fall Chinook, chum, and coho. These reaches are primarily impacted by forest practices, though agriculture and rural development affect riparian areas and floodplains in the lower 2 reaches. The most effective recovery measures will involve riparian and floodplain restoration in reach Kalama 2 and 3, as well as addressing basin-wide forest and road conditions.

The middle mainstem Kalama and major tributaries (i.e., Gobar Creek) contain productive habitats for steelhead and spring Chinook. Coho, fall Chinook, and chum do not typically ascend lower Kalama Falls to access these habitats. Forestry is the dominant land use surrounding these reaches. Stream-adjacent roadways impact riparian function. The most effective recovery measures will include preservation and restoration of riparian and upland forest and road conditions.

The upper Kalama mainstem and tributaries (i.e., NF Kalama) are used primarily by summer steelhead. These reaches are heavily impacted by forest practices. The most effective recovery measures will include preservation and restoration of riparian and upland forest and road conditions.

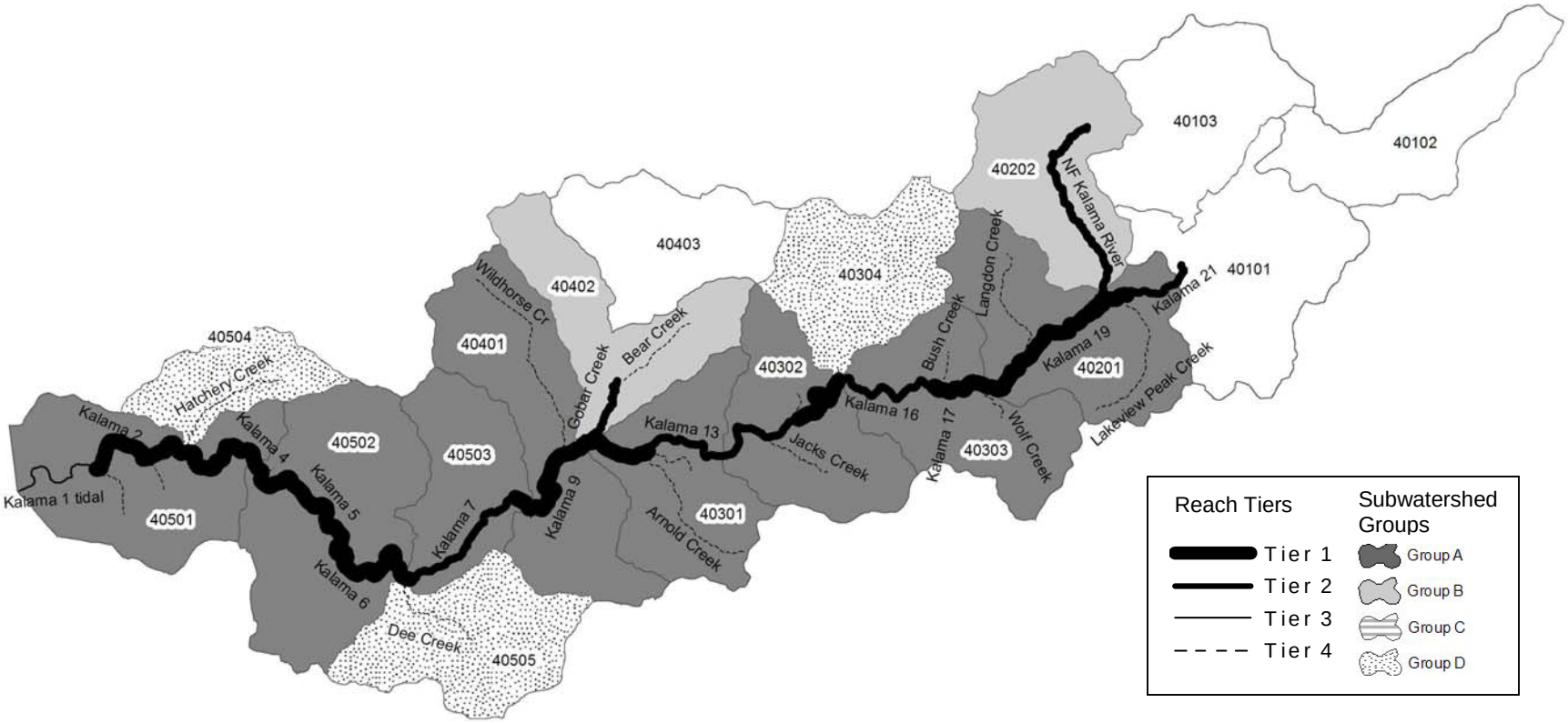



**Figure 10-4. Reach tiers and subwatershed groups in the Kalama Basin. Tier 1 reaches and Group A subwatersheds represent the areas where recovery actions would yield the greatest benefits with respect to species recovery objectives. The subwatershed groups are based on Reach Tiers. Priorities at the 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.**

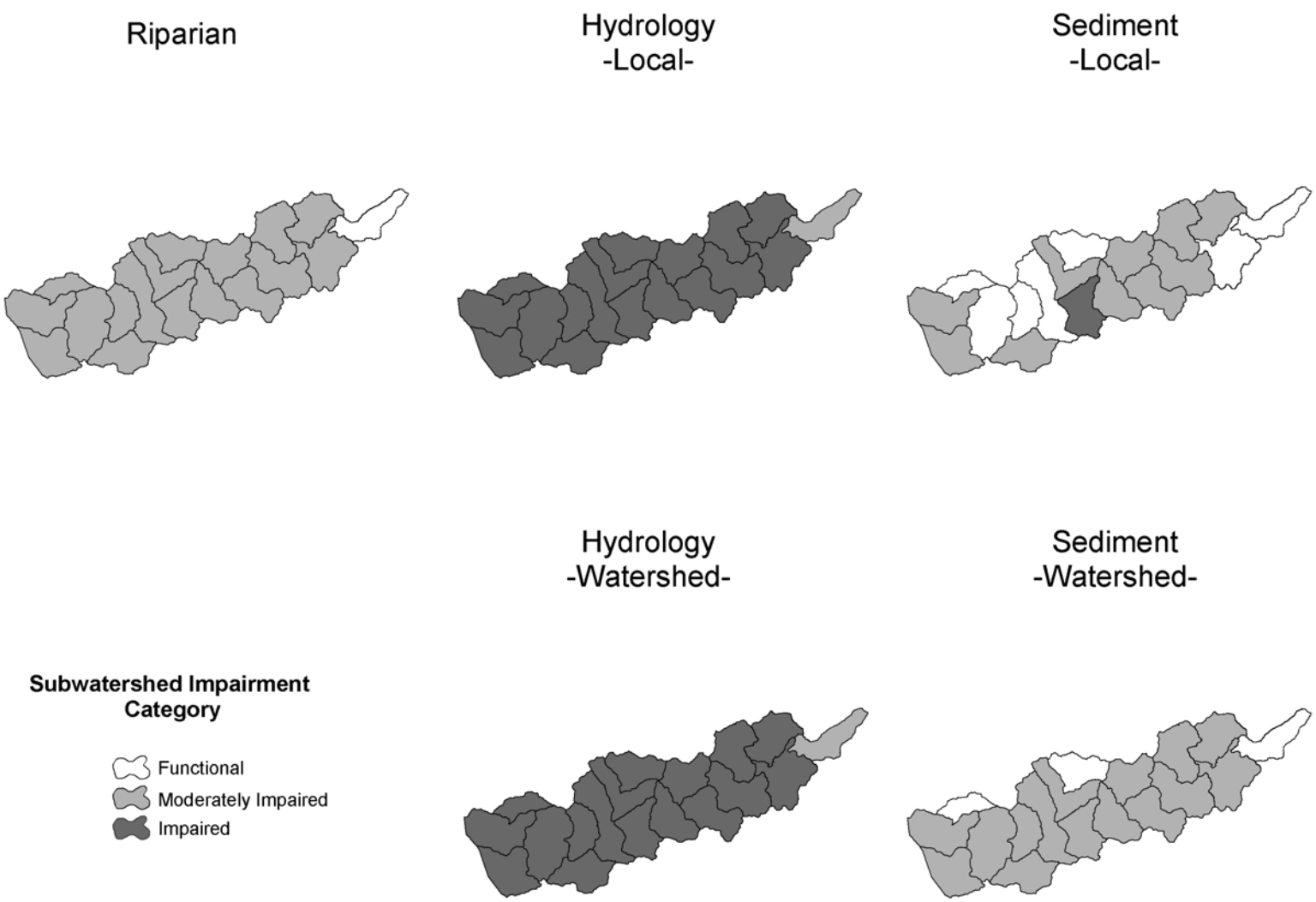



**Figure 10-5. IWA subwatershed impairment ratings by category for the Kalama Basin. Watershed process impairment ratings are based on landscape conditions that influence the hydrologic regime, the sediment regime, and riparian function. See Volume II and Volume V of the Recovery Plan Technical Foundation for additional information.**

**Table 10-5. 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 | Subwatershed | Reaches within subwatershed | Species Present | High priority reaches by species | Critical life stages by species | High impact habitat factors | Restoration or preservation emphasis | Watershed processes (local) | | | Watershed processes (watershed) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Hydrology | Sediment | Riparian | Hydrology | Sediment |
| A | 40503 | Kalama 7 | StS | none | | | | I | F | M | I | M |
| | | Kalama 8<br>Summers Creek | StW | Kalama 8 | egg incubation<br>summer rearing<br>winter rearing | habitat diversity<br>sediment | PR | | | | | |
| | | | ChS | Kalama 8 | spawning<br>egg incubation<br>fry colonization | sediment | PR | | | | | |
| | 40502 | Kalama 5<br>Kalama 6<br>Lower Falls<br>Indian Creek | StS | Kalama 6 | summer rearing<br>winter rearing<br>adult holding | none | P | | | | | |
| | | | StW | Kalama 5<br>Kalama 6 | egg incubation<br>fry colonization<br>summer rearing<br>winter rearing | none | R | | | | | |
| | | | ChS | Kalama 6 | spawning<br>egg incubation<br>fry colonization | sediment | P | | | | | |
| | | | ChF | none | | | | | | | | |
| | | | Chum | Kalama 5 | spawning<br>egg incubation<br>fry colonization<br>adult holding | none | P | | | | | |
| | | | Coho | none | | | | | | | | |
| | 40501 | Kalama 1 tidal<br>Kalama 2<br>Kalama 3<br>Kalama 4<br>Spencer Creek<br>Cedar Creek | StS | none | | | | I | M | M | I | M |
| | | | StW | Kalama 4 | spawning<br>egg incubation<br>fry colonization<br>summer rearing<br>winter rearing | habitat diversity | R | | | | | |
| | | | ChS | none | | | | | | | | |
| | | | ChF | Kalama 2<br>Kalama 3 | spawning<br>egg incubation<br>fry colonization<br>adult holding | habitat diversity<br>sediment | PR | | | | | |
| | | | Chum | Kalama 2 | spawning<br>egg incubation<br>fry colonization<br>adult holding | habitat diversity | PR | | | | | |
| | | | Coho | Kalama 2<br>Kalama 3 | spawning<br>egg incubation<br>fry colonization<br>summer rearing<br>winter rearing<br>adult migrant | habitat diversity<br>key habitat quantity | R | | | | | |
| | 40401 | Kalama 10<br>Kalama 9<br>Wildhorse Creek<br>Knowlton Creek | StS | none | | | | I | F | M | I | M |
| | | | StW | Kalama 10<br>Kalama 9 | egg incubation<br>summer rearing<br>winter rearing | habitat diversity<br>sediment | PR | | | | | |
| | | | ChS | Kalama 10<br>Kalama 9 | egg incubation<br>fry colonization<br>summer rearing | habitat diversity<br>sediment | P | | | | | |
| | 40303 | Bush Creek<br>Kalama 16<br>Kalama 17<br>Wolf Creek | StS | Kalama 17 | egg incubation<br>summer rearing<br>winter rearing | habitat diversity<br>flow<br>sediment | PR | I | M | M | I | M |
| | | | ChS | none | | | | | | | | |
| | 40302 | Jacks Creek<br>Kalama 14<br>Kalama 15<br>Lost Creek | StS | none | | | | I | M | M | I | M |
| | | | ChS | Kalama 15 | egg incubation<br>fry colonization<br>summer rearing | sediment | P | | | | | |
| | 40301 | Arnold Creek<br>Kalama 11<br>Kalama 12<br>Kalama 13<br>Unnamed Creek | StS | none | | | | I | I | M | I | M |
| | | | StW | none | | | | | | | | |
| | | | ChS | Kalama 11<br>Kalama 12 | egg incubation<br>fry colonization<br>summer rearing | habitat diversity<br>sediment | P | | | | | |
| | 40201 | Kalama 18<br>Kalama 19<br>Kalama 20<br>Kalama 21<br>Lakeview Peak Creek<br>Langdon Creek | StS | Kalama 18<br>Kalama 19<br>Kalama 20 | egg incubation<br>summer rearing<br>winter rearing<br>adult holding | habitat diversity<br>flow<br>sediment | PR | I | M | M | I | M |
| | | | ChS | none | | | | | | | | |
| B | 40402 | Bear Creek<br>Gobar Creek | StS | none | | | | I | M | M | I | M |
| | | | StW | none | | | | | | | | |
| | 40202 | North Fork Kalama River | StS | none | | | | I | M | M | I | M |
| D | 40505 | Little Kalama River | StW | none | | | | I | M | M | I | M |
| | 40504 | Hatchery Creek | ChF | none | | | | I | F | M | I | F |
| | | | Chum | none | | | | | | | | |
| | | | Coho | none | | | | | | | | |
| | 40304 | Elk Creek | StS | none | | | | I | M | M | I | M |

**Table 10-6. Salmonid habitat limiting factors and threats in priority areas. Priority areas include the lower Kalama mainstem (LM), middle Kalama mainstem & tributaries (MK), and the upper Kalama mainstem & tributaries (UK). Linkages between each threat and limiting factor are not displayed – each threat directly and indirectly affects a variety of habitat factors.**

| Limiting Factors | LM | MK | UK |
|---|---|---|---|
| ***Habitat connectivity*** | | | |
| Blockages to stream channel habitats | ✓ | ✓ | |
| ***Habitat diversity*** | | | |
| Lack of stable instream woody debris | ✓ | ✓ | ✓ |
| Altered habitat unit composition | ✓ | ✓ | ✓ |
| Loss of off-channel and/or side-channel habitats | ✓ | | |
| ***Riparian function*** | | | |
| 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 | ✓ | ✓ | ✓ |
| ***Substrate and sediment*** | | | |
| Excessive fine sediment | ✓ | ✓ | ✓ |
| Embedded substrates | ✓ | ✓ | ✓ |

| Threats | LM | MK | UK |
|---|---|---|---|
| ***Agriculture/grazing*** | | | |
| Clearing of vegetation | ✓ | | |
| Riparian grazing | ✓ | | |
| Floodplain filling | ✓ | | |
| ***Rural development*** | | | |
| Clearing of vegetation | ✓ | | |
| Floodplain filling | ✓ | | |
| Roads – riparian/floodplain impacts | ✓ | | |
| ***Forest practices*** | | | |
| Timber harvests – impacts to sediment supply | ✓ | ✓ | ✓ |
| Timber harvests – impacts to runoff | ✓ | ✓ | ✓ |
| Riparian harvests | ✓ | ✓ | ✓ |
| Forest roads – impacts to sediment supply | ✓ | ✓ | ✓ |
| Forest roads – impacts to runoff | ✓ | ✓ | ✓ |
| Forest roads – riparian / floodplain impacts | | ✓ | ✓ |

**Table 10-7. 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*** <br> ***A. Set back, breach, or remove artificial channel confinement structures*** | | | | | |
| ***Lower mainstem*** <br> Kalama 2 | • Bed and bank erosion <br> • Altered habitat unit composition <br> • Restricted channel migration <br> • Disrupted hyporheic processes <br> • Reduced flood flow dampening <br> • Altered nutrient exchange processes | • Floodplain filling <br> • Channel straightening <br> • Artificial confinement | • Chum <br> • Coho <br> • Fall chinook | 2-15 years | Great potential benefit due to improvements in many limiting factors. This passive restoration approach can allow channels to restore naturally once confinement structures are removed. There are challenges with implementation due to private lands, existing infrastructure already in place, potential flood risk to property, and large expense. |
| ***2. Protect and restore off-channel and side-channel habitats*** <br> ***A. Restore historical off-channel and side-channel habitats where they have been eliminated*** <br> ***B. Provide access to blocked off-channel habitats*** <br> ***C. Create new off-channel or side-channel habitats (i.e., spawning channels)*** | | | | | |
| ***Lower mainstem*** <br> Kalama 2 | • Loss of off-channel and/or side-channel habitat <br> • Blockages to off-channel habitats <br> • Altered habitat unit composition | • Floodplain filling <br> • Channel straightening <br> • Artificial confinement | • Chum <br> • Coho | 2-15 years | Good potential benefit especially for chum, which have lost a significant portion of historically available off-channel habitat for spawning. Potential benefit is limited by moderate probability of success with creation of new habitats. There are challenges with implementation due to private lands, existing infrastructure already in place, potential flood risk to property, and large expense. |
| ***3. Protect and restore riparian function*** <br> ***A. Reforest riparian zones*** <br> ***B. Allow for the passive restoration of riparian vegetation*** <br> ***C. Livestock exclusion fencing*** <br> ***D. Invasive species eradication*** <br> ***E. Hardwood-to-conifer conversion*** | | | | | |

| Location | Limiting Factors Addressed | Threats Addressed | Target Species | Time | Discussion |
|---|---|---|---|---|---|
| ***Lower mainstem*** Kalama 2-6 ***Middle mainstem & tributaries*** Kalama 8-12, Gobar Cr ***Upper mainstem & tributaries*** Kalama 15-20, NF Kalama | • Reduced bank/soil stability<br>• Reduced wood recruitment<br>• Lack of stable instream woody debris<br>• Exotic and/or noxious species | • Riparian harvests<br>• Riparian grazing<br>• Clearing of vegetation due to rural development & agriculture<br>• Roads – riparian/floodplain impact | • All species | 20-100 years | High potential benefit due to the many limiting factors that are addressed. Riparian impairment is related to most land-uses and is a concern throughout the basin. Riparian protections on forest lands are provided for under current harvest policy. Riparian restoration projects are relatively inexpensive and are often supported by landowners. Whereas the specified stream reaches are the highest priority for riparian measures, riparian restoration and preservation should occur throughout the basin since riparian conditions affect downstream reaches. Use IWA riparian ratings to help identify restoration and preservation opportunities. |
| ***4. Protect and restore natural sediment supply processes***<br>***A. Address forest road related sources***<br>***B. Address timber harvest related sources*** | | | | | |
| ***Entire basin*** | • Excessive fine sediment<br>• Embedded substrates | • Forest roads – impacts to sediment supply<br>• Timber harvest – impacts to sediment supply | • All species | 5-50 years | High potential benefit due to sediment effects on egg incubation and early rearing. Improvements are expected on timber lands due to requirements under the new FPRs, the USFS Northwest Forest Plan, and forest land HCPs. Use IWA impairment ratings to identify restoration and preservation opportunities |
| ***5. Protect and restore runoff processes***<br>***A. Address forest road impacts***<br>***B. Address timber harvest impacts*** | | | | | |
| ***Entire basin*** | • Stream flow – altered magnitude, duration, or rate of change of flows | • Timber harvest – impacts to runoff<br>• Forest roads – impacts to runoff | • All species | 5-50 years | High potential benefit due to flow effects on habitat formation, redd scour, and early rearing. Improvements are expected on timber lands due to requirements under the new FPRs, the USFS Northwest Forest Plan, and forest land HCPs. Use IWA impairment ratings to identify restoration and preservation opportunities. |

| Location | Limiting Factors Addressed | Threats Addressed | Target Species | Time | Discussion |
|---|---|---|---|---|---|
| ***6. Protect and restore instream flows***<br>***A. Water rights closures***<br>***B. Purchase or lease existing water rights***<br>***C. Relinquishment of existing unused water rights***<br>***D. Enforce water withdrawal regulations***<br>***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 (potential) | • All species | 1-5 years | Instream flow management strategies for the Kalama 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. |
| ***7. Protect and restore instream habitat complexity***<br>***A. Place stable woody debris in streams to enhance cover, pool formation, bank stability, and sediment sorting***<br>***B. Structurally modify stream channels to create suitable habitat types*** | | | | | |
| ***Lower mainstem***<br>Kalama 2-6<br>***Middle mainstem & tributaries***<br>Kalama 8-12, Gobar Cr<br>***Upper mainstem & tributaries***<br>Kalama 15-20, NF Kalama | • Lack of stable instream woody debris<br>• Altered habitat unit composition | • None (symptom-focused restoration strategy) | • Coho<br>• Winter steelhead<br>• Summer 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. |
| ***8. Protect and restore fish access to channel habitats***<br>***A. Culverts and other barriers on tributary streams*** | | | | | |
| ***Hatchery (Fallert) Creek***<br>***Spencer Creek***<br>***Summers Creek***<br>***Arnold Creek***<br>***Knowlton Creek***<br>***Other small tribs*** | • Blockages to channel habitats | • Dams, culverts, in-stream structures | • Coho<br>• Winter steelhead<br>• Summer steelhead | Immediate | As many as 14 miles of potentially accessible habitat are blocked by culverts or other barriers (approximately 15 barriers total). The Kalama Hatchery on Hatchery (Fallert) Creek is a potential passage barrier. The blocked habitat is believed to be marginal in most cases. Passage restoration projects should focus on cases where it can be demonstrated that there is good potential benefit and reasonable project costs. |
| ***9. Protect habitat conditions and watershed functions through land-use planning that guides population growth and development*** | | | | | |

| Location | Limiting Factors Addressed / Threats Addressed | Target Species | Time | Discussion |
|---|---|---|---|---|
| ***A. Plan growth and development to avoid sensitive areas (e.g., wetlands, riparian zones, floodplains, unstable geology)***<br>***B. Encourage the use of low-impact development methods and materials***<br>***C. Apply mitigation measures to off-set potential impacts*** | | | | |
| ***Privately owned portions of the basin*** | ***Preservation Measure*** – addresses many potential limiting factors and threats | • All species | 5-50 years | The focus should be on management of land-use conversion and managing continued development in sensitive areas (e.g., wetlands, stream corridors, unstable slopes). Many critical areas regulations do not have a mechanism for restoring existing degraded areas, only for preventing additional degradation. Legal and/or voluntary mechanisms need to be put in place to restore currently degraded habitats. |
| ***10. Protect habitat conditions and watershed functions through land acquisition or easements where existing policy does not provide adequate protection***<br>***A. Purchase properties outright through fee acquisition and manage for resource protection***<br>***B. Purchase easements to protect critical areas and to limit potentially harmful uses***<br>***C. Lease properties or rights to protect resources for a limited period*** | | | | |
| ***Privately owned portions of the 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. |

## 10.5 Program Gap Analysis

The Kalama Basin (~205 sq mi) is located in Cowlitz County:
- Sixteen square miles of the basin fall in the U.S. Forest Service-managed Mt St Helens National Volcanic Monument (NVM).
- Large industrial forest lands (~143 sq miles) are the largest land use;
- Department of Natural Resources forestlands encompass about 10 square miles.
- Small private commercial forestland acreage is estimated at 10 square miles.
- Rural residential, commercial, agriculture, and transportation corridors affect the lower mainstem reaches.

***Protection Programs***

Protection programs in this analysis include those programs that protect habitat conditions or watershed functions through management policies and programs, regulatory measures, and acquisition of sensitive habitat or protective easements.

**Federal Programs**

- ***U.S. Army Corps of Engineers***

  - Administers the Section 10 (Rivers and Harbor Act) and Section 404 (Clean Water Act) permit processes. Section 10 requires approval of any activity in, above, or below a navigable river, which affects course, location, condition, or capacity of navigable waters. Section 404 requires prior approval of dredging, filling, grading, clearing, and bank hardening. In waters used by listed fish species, the permits are subject to ESA Section 7 consultation with NOAA Fisheries to ensure that any approved action is adequately protective of the fish; [M.1A; M.2A; M.2B; M.4A; M.7A; M.7B]

- ***U.S. Forest Service***

  - Mt St Helens National Volcanic Monument: In 1982 the President and Congress created the 110,000-acre National Volcanic Monument for research, recreation, and education. Inside the Monument, the environment is left to respond naturally to the disturbance of the eruption. The Kalama Basin was not significantly impacted by the eruption of Mt St Helens and its headwaters in the Mt St Helens NVM have excellent protection. [M.3B; M.4A; M.4B; M.5A; M.5B]

**State Programs**

➢ ***Department of Natural Resources***

- State Forest Land HCP:

  State forestlands are managed under the provisions of a Habitat Conservation Plan (HCP). The Habitat Conservation Plan protects riparian areas through the use of buffers, mitigates impacts on watershed processes through harvest restrictions and new road construction standards that are more stringent than Forest Practices Rules. [M.3A; M.3B; M.4A; M.4B; M.5A; M.5B]

- State Forest Practices:

  Riparian zones and harvest restrictions represent significant protections under the State of Washington Forest Practices Rules, including the Forest and Fish Module. These rules also establish standards for new road construction for management of sediment, runoff, and the potential for slope failure. [M.3A; M.3B; M.4A; M.4B; M.5A; M.5B]

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

- Washington State Hydraulic Code

  The Washington State Hydraulic Code is administered through the Washington Department of Fish and Wildlife. The purpose of this program is to protect stream conditions and habitat. The regulations apply to such activities as stream bank protection, instream construction, culvert installation, channel changes or realignments, debris removal, and water diversion facilities. Those proposing such actions must obtain a Hydraulic Project Approval (HPA) permit; [M.1A; M.2A; M.2B; M.4A; M.7A; M.7B]

- Habitat Program: The Department provides advice to local governments and landowners interested in measures to protect habitat values on their property. [M.1A; M.2A; M.2B; M.2C; M.3A; M.7A; M.7B; M.8A; M.9A; M.9B; M.9C]

➢ ***Washington Department of Ecology***

- Water Resources Program/Water Rights: Department of Ecology, in consultation with the Department of Fish and Wildlife, has administrative closed selected areas within the Kalama basin 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, given the low intensity of development in the basin, is not expected to be significant. The City of Kalama holds the largest water right in the Kalama basin. It is low in the basin and will likely not affect stream flows in the near-term. [M.6A; M.6B; M.6C; M.6D]

- Water Resources Program/Watershed Planning: In cooperation with the Lower Columbia Fish Recovery Board, other state and federal agencies, tribes, local governments, and citizens, the Department funds and participates in a state authorized watershed planning

process for Water Resource Inventory Area (WRIA) 26 pursuant to RCW 90.82. The goal of the plan is to ensure adequate water for people and fish. The planning process is dealing with water quantity and quality, stream flows and fish habitat. Once approved by counties within the WRIA, the plan will be binding on state agencies and local governments. [M.6A; M.6B; M.6C; M.6D; M.6E; M.9A]

- ***Washington Department of Transportation***
  - Highway maintenance program implements best management practices for the protection of habitat. [M.8A]

- ***Conservation Commission/ Cowlitz Conservation District*** provides technical assistance and incentives (e.g., Conservation Reserve and Enhancement Program) to encourage agricultural landowners to protect riparian areas and stream habitat. These programs could help address measures M.1A; M.2A; M.2B; M.3A; M.3C; M.7A; M.7B; M.8A.

**Local Government Programs**

- ***Cowlitz County***
  - Land Use: [M.9A; M.9B; M.9C]
    - The comprehensive plan that applies to the non-federal lands, but contains no significant policies for the protection of watershed processes and stream habitat.
    - Zoning along county roads provides for one dwelling per 2 acres and one dwelling per 5 acres along non-county roads.
    - Cowlitz County has not adopted protective stream buffers.
    - Wetland buffers vary from 25' to 200' and are based upon soil type and wildlife utilization.
    - The County has not developed comprehensive ordinances for the protection of watershed processes or stream habitat conditions.
  - Road Maintenance

    The County has not developed or implemented a road maintenance program to protect habitat. [M.8A]

**Community Programs**

- ***Columbia Land Trust*** is a nonprofit organization whose mission is to preserve and restore unique landscapes, natural areas, and sensitive habitats. The Trust has been pursuing the acquisition of sensitive habitat within the Kalama basin. [M.10A; M.10B]

***Restoration Programs***

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

**Federal Programs**

- ***U.S. Forest Service***

  - *Mt St Helens NVM:* Restoration only occurs passively. Monitoring and evaluation of natural restoration occurs in the Kalama; [M.3B]

**State Programs**

- ***Washington Department of Natural Resources***

  - State Forest Land Habitat Conservation Plan (HCP): The Department manages state forest lands pursuant to a Habitat Conservation Plan (HCP). The HCP road maintenance and restoration objectives require barrier upgrades and road abandonment and/or other improvements. This program addresses measures M.3A, M.3B, M.4A, M.4B, M.5A, M.5B and M.8A.

  - State Forest Practices Act:
    - ✓ Industrial forests within the lower Kalama Basin are governed by Forest and Fish regulations and have rigid schedules for maintaining and improving roads and removing barriers. Industrial landowners have 15 years to bring roads and barriers into compliance with regulations.
    - ✓ Small private forest owners are governed by Forest and Fish regulations; however their road and barrier maintenance and improvement programs are tied to state funding. In the State 2003-05 Biennial Budget, 2 million dollars was allocated statewide to support small private forest owners.
    - ✓ This program addresses measures M.3A, M.3B, M.4A, M.4B, M.5A, M.5B, and M.8A.

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

  - Habitat Program: The Department provides advice to local governments and landowners interested in measures to restoring watershed processes and stream habitat. [M.1A; M.2A; M.2B; M.2C; M.3A; M.7A; M.7B; M.8A; M.9A; M.9B; M.9C]

- ***Washington Department of Ecology***

  - Water Quality Program: The Kalama River and Hatchery (Fallert) Creek are listed for temperature impairment on the WA State 303(d) list.

  - Water Resources Program/Watershed Planning:

The planning process for WRIA 26 is dealing with water quantity and quality, stream flows and fish habitat. Potential restoration efforts address improving summer low flows through conservation and acquisition of water rights. Once approved by counties within the WRIA, the plan will be binding on state agencies and local governments. [M.6A; M.6B; M.6C; M.6D; M.6E; M.9A]

- ***Conservation Commission/ Cowlitz Conservation District*** provides technical assistance and incentives (e.g., Conservation Reserve and Enhancement Program) to encourage agricultural landowners to protect riparian areas and stream habitat. These programs could help address measures M.1A; M.2A; M.2B; M.3A; M.3C; M.7A; M.7B; M.8A.

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

  - Washington Salmon Recovery Act: 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 over $700,000 has been granted for work on the Kalama on Wildhorse Creek. [M.1A; M.2A; M.2B; M.2C; M.3A; M.7A; M.7B; M.8A; M.10A]

**Local Government Restoration Program**

- ***Cowlitz County***
  - Public Works Program:
    The County inventoried culverts on county roads and is replacing and/or upgrading barrier culverts. Removal of a barrier culvert at the confluence of wildhoures Creek and the Kalama opened 10 miles of habitat to salmon and steelhead.[M.9A]

  - Cowlitz Noxious Weed Control Board: The Board has three primary programs that address weed control in the lower Cowlitz Basin; [M.3D]
    - Public education to prevent the spread of noxious weeds;
    - Survey County lands to assess emerging issues; and
    - Enforcement of noxious weed control

**Community Programs**

- ***Lower Columbia Fly Fishers*** is a non-profit organization that works with landowners and sport fisherman to preserve and restore reaches in the basin. The group sponsors a supplementation program.

## Gap Analysis

***Forest-related Programs*:** Ninety percent of the Kalama Basin is in forest use. Accordingly, forestry programs play a substantial role in protecting and restoring watershed functions and habitat conditions at levels supporting recovery goals. Certainty of forestry-related protection and restoration programs is relatively high because programs are being implemented and, for the

most part, fully funded. Program areas of concern include state funding for small commercial forest landowners and the continued potential for hydrologic impacts caused by past harvest practices. Monitoring of watershed processes and habitat conditions will be required to confirm the effectiveness of these measures.

***Protection-related Programs:*** Cowlitz County land use regulations provide limited watershed and habitat protection. County programs lack effective provisions that commonly are used to direct growth away from sensitive habitat, preserve watershed processes, protect streams and wetlands, and manage stormwater. Although agriculture is a minor use within the basin, there are no effective measures to protect riparian areas and stream habitats from its effects.

***Restoration-related Programs:*** Over a long period of time, improvements to the Kalama Basin will occur as a result of improved forest management practices that are already in place. Active restoration in the lower mainstem should focus on impaired channel stability and habitat diversity.

**Table 10-8. Program Actions to Address Gaps**

| Action # | Lead Agency | Proposed Action |
|---|---|---|
| KALAMA.1 | Cowlitz County | Develop and implement controls to adequately protect riparian areas to maintain currently functional and restored habitat around rivers, estuaries, streams, lakes, deepwater habitats, and intermittent streams. Require mitigation, where necessary, to offset unavoidable damage to habitat conditions in riparian management areas |
| KALAMA.2 | Cowlitz County | Development and implement controls to protect historic stream meander patterns and channel migration zones and avoid hardening stream banks and shorelines |
| KALAMA.3 | Cowlitz County | Development and implement controls and development standards to adequately protect wetlands, wetland buffers, and wetland function. |
| KALAMA.4 | Cowlitz County | Develop and implement controls to address erosion and sediment run-off during (and after) construction to prevent sediment and pollutant discharge to streams, wetlands and other water bodies |
| KALAMA.5 | Cowlitz County | Apply land use and resource protection code enforcement across jurisdictions in a consistent manner, using appropriate funding levels and application |
| KALAMA.6 | State of Washington | Provide state funding for small forest owners in the Kalama 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 |
| KALAMA.7 | Forest Managers LCFRB, and DFW | Identify and sequence early action forest-wide restoration projects that analysis indicates could provide significant benefits. In these cases, it may be appropriate to identify outside funding to initiate these early actions |
| KALAMA.8 | LCFRB, USFS, WDNR. WSDOT, Cowlitz County, Kalama, private property owners. | Develop and implement a coordinated and strategic barrier removal program based on watershed fish priorities and ensuring an effective and efficient sequencing of barrier removal work. |
| KALAMA.9 | Cowlitz County | Utilize a combination of public outreach/education and, incentives, and to promote (1) stewardship practices for protecting habitat and water quality and (2) landowner support of and participation in habitat restoration efforts. |
| KALAMA.10 | State of | Close the Kalama Basin to further surface water withdrawals, including |

| | | |
|---|---|---|
| | Washington (DOE, DFW) | groundwater in connectivity with surface waters; curtail unauthorized withdrawals |
| KALAMA.11 | LCFRB, WDFW, Cowlitz County, Cowlitz CD, LCFEG | Build capacity (e.g. technical and administrative skills, personnel and fiscal resources) needed to allow agencies and organizations to undertake protection and restoration projects, including noxious weed control in a reasonable period time. |
| KALAMA.12 | SRFB, BPA, NOAA, USFWS, DOE, ACOE | Increase available funding for projects that implement measures and address underlying threats |
| KALAMA.13 | State of Washington (Dept of Agriculture, and Department of Ecology) | Develop and implement agricultural practices and regulations to protect riparian conditions and water quality |
| KALAMA.14 | Cowlitz Conservation District | Expand landowner incentive (e.g. CREP) and education plans to promote further habitat protection and restoration. |
| KALAMA.15 | LCFRB, Cowlitz CD, Cowlitz County, | Address threats proactively by building agreement on priorities among the various program implementers |
| KALAMA.16 | FEMA | Update floodplain maps using Best Available Science |