Draft

Kalama River Subbasin Summary

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(Most of this summary is derived from Wade's 2000 Limiting Factors Analysis completed by Washington Conservation Commission).

DRAFT: This document has not yet been reviewed or approved by the Northwest Power Planning Council

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Table of Contents

List of Tables

Kalama River Subbasin Summary

Subbasin Description

General Description

The Kalama River begins on the southwest slope of Mt. St. Helens and flows 44.5 miles west-southwest to enter the Columbia River at river mile (RM) 73.1 (WDW 1990). While the river's headwaters arise in Skamania County, 98.9 percent of the 205 square mile drainage area is within Cowlitz County.

The topography is mountainous, averaging 1,880 feet, and climaxing near 8,000 feet on Mt. St. Helens. Much of the landscape was formed over the last 20,000 years as a result of Mt. St. Helens' volcanic activity occurring at intervals of 100 to 400 years (USFS 1996a). Lahars (mudflows) from St. Helens traveled down many of the Kalama basin's drainages, leaving unconsolidated volcanic deposits that have a tendency to erode on steep slopes (USFS 1996a). This is a concern in the upper portions of the Kalama and some of its tributaries, where steep slopes increase the possibility of mass wasting.

The gradient of the Kalama River along the lower eight miles is flat to moderate. At the mouth, a shallow bar that inhibits fish passage at low tide extends well into the Columbia River (WDF 1951). Tidal influences extend up to approximately Modrow Bridge at RM 2.8. At RM 10, the lower Kalama Falls blocked most anadromous passage other than summer steelhead until it was laddered in 1936 and then improved in the 1950s. A concrete barrier dam and fish ladder at the falls now traps most returning fish and only steelhead and excess spring chinook are passed above the lower falls by Washington Department of Fish and Wildlife (WDFW) (Wagemann 1999, personal comm.). Above RM 10 the valley closes in and continues as a narrow V-shaped drainage (WDW 1990). At RM 35 an impassable falls blocks all anadromous passage. Many of the tributaries to the Kalama have steep gradients, with only the lower portions of the streams accessible to anadromous fish.

Approximately 96 percent of the Kalama River Watershed is owned and managed by private timber companies. Most of the watershed was logged in the 1960s through the early 1980s; current timber harvest is minimal in comparison (WDFW 1998 vol. 1). An extensive road network (1,292 miles of roads) covers the forestry lands, with a road density of 5.75-miles/square mile of area (Lewis County GIS 1999). Even in the upper Kalama watershed on Forest Service property road, densities often exceed 4.0-miles/square mile (USFS 1996a). Extensive industrial development has occurred within the historic floodplains in the lower two miles of the Kalama, especially to the west of Interstate-5. Most of the lower river has been channelized and diked to facilitate this development. Residential development has increased along the lower river as well.

Mean flow in the Kalama subbasin for 1953 through 1967 was 1,219 cubic feet per second (cfs) (WDW 1990). Because much of the subbasin is below the normal snow line, peak river flows correspond to mid-winter warm rains and possible snowmelt from the foothills (see Table 1). Low flows are generally encountered in the late summer and fall (WDW 1990).

Table 1. Kalama subbasin flows (cfs) and temperatures (F).

Month	Flow (cfs)	Temp (F)	Month	Flow (cfs)	Temp (F)
January	2,152	39.7	July	409	56.5
February	1,954	39.7	August	305	56.7
March	1,702	42.1	September	306	54.3
April	1,566	46.0	October	680	50.5
May	1,063	50.5	November	1,645	45.9
June	688	54.1	December	2,157	41.9
			Average	*1,219*	*48.2*

Flows (1953-1967) and temperatures (1960-1967) measured below Italian Creek. Adapted from WDW 1990.

A 1974 survey found that land use within the Kalama subbasin is dominated by forestry (see Table 2) (USFS 1996a). Creation of the legislative and administrative Mt. St. Helens National Volcanic Monument has subsequently reduced acreage in commercial forest. With the exception of the upper headwaters and other scattered tracts, the Kalama subbasin is privately owned. The only urban area in the Kalama subbasin is the town of Kalama near the mouth of the river.

Table 2. Land use (%) in the Kalama subbasin.

Land Use	Percent
Commercial Forest	96.0
Non-commercial Forest	1.3
Cropland	1.5
Other	1.1

Prior to active state and federal regulation of forest practices, fishery habitat was damaged throughout the Kalama subbasin. Indiscriminate logging around and through streams, the use of splash dams to transport logs, poor road construction and inadequate culverts reduced or eliminated anadromous fish from many streams (WDW 1990). Most of the private timberlands were logged in the 1970s and early 1980s, leading to excessive peak flows carrying high sediment loads. The construction of Interstate-5 and development near the mouth has reduced already limited floodplain habitat within the lower river.

Fish and Wildlife Resources

Fish and Wildlife Status

The distribution of fall and spring chinook salmon, winter and summer steelhead, coho salmon, chum salmon, and bull trout/Dolly Varden was mapped within WRIA 27 at a 1:24,000 scale for the Habitat Limiting Factors Analysis Report. Maps for each of the anadromous species of interest were developed using a number of existing sources on distribution, such as SASSI, Streamnet, WDFW stream surveys, and WDFW spawning surveys (see Appendix A). Members of the Technical Advisory Group (TAG) for WRIA 27 added considerably to this existing database with professional experience on WRIA 27 stream systems. For each species, known, presumed, and potential habitat was mapped. Table 3 represents a compilation of all the fish distribution data that was collected for each stream as well as the number of miles of stream affected by physical barriers.

Table 3. WRIA 27 fish distribution and barriers.

Stream	Species Present							Miles of Use			Physical Barriers (Miles Affected)		
	SC	FC	WS	SS	CH	CO	BT	KN	PR	POT	Dikes	Culverts	Dams
Low. Lewis River*	X	X	X	X	X	X		20.4			7.4		
Gee Creek			X			X			6.0				
Allen Canyon Crk.*			X			X			0.5				
Low. E.F. Lewis*		X	X	X	X	X		21.2			6.5		
McCormick Creek			X			X			0.9	2.3		2.3	
(1) Breeze Creek			X			X		0.4		5.7		5.7	
(2) Breeze Creek			X			X						5.6	
(3) Breeze Creek			X			X						0.3	
(4) Breeze Trib.			X			X						1.8	
Lockwood Creek			X			X		2.2	4.6	2.3		1.2	
Riley Creek			X			X		2.9		0.8		0.8	
Mason Creek			X			X		6.3	2.7				
Mason Trib.								1.4	0.6			1.1	
Mason Trib.												0.47	
Dean Creek			X			X		1.6	0.7			2.2	
Dean Creek			X			X						0.8	
Manley Creek			X			X		1.0	0.8				
Mill Creek			X			X		2.0	0.5				
Rock Crk. (Lower)			X			X		4.5	1.4				
Unnamed			X			X				1.8			
Upper East Fork*			X	X				18.5	1.0				
Big Tree Creek			X	X					1.5	0.23		0.23	
Rock Creek			X	X				5.6	3.3				
Cedar Creek			X	X				4.5					
Cold Creek			X	X				0.7					
Coyote Creek			X	X				1.2					
King Creek			X	X				0.5	1.8				
Copper Creek			X	X				0.4					
Slide Creek			X	X				1.5					
Green Fork			X	X				1.6		0.3		0.3	
Robinson Creek			X	X		X		0.9					
Ross Creek			X	X		X			2.3				
Houghton Creek			X	X		X		1.6	0.6				
Johnson Creek			X	X		X		1.0					
Cedar Creek	X		X	X	X	X		20.2		1.4		1.4	
Pup Creek			X	X		X		2.0				1.4	

Stream	Species Present							Miles of Use			Physical Barriers (Miles Affected)		
	SC	FC	WS	SS	CH	CO	BT	KN	PR	POT	Dikes	Culverts	Dams
(1) Beaver Creek			X	X		X		0.1		1.4			
(2) Beaver Creek			X	X		X						0.88	
(3) Beaver Creek			X	X		X						0.73	
John Creek			X	X		X			0.3	0.8		0.8	
Brush Creek			X	X		X			0.2	0.9		0.9	
Bitter Creek			X	X		X		1.4					
Unnamed Trib.			X			X		0.1		1.5		1.5	
Chelatchie Crk.		X	X	X		X		4.8					
NF Chelatchie Cr.		X	X	X		X		1.3					
Upper NF Lewis*	X	X	X	X		X	X			53.3			53.3
Dog Creek			X	X		X	X			2.0			
Panamaker Creek			X	X		X	X			2.1			
Cougar Creek			X	X		X	X			1.4			
Swift Creek			X	X		X	X			2.8			
Marble Creek			X	X		X	X			1.4			
Range Creek			X	X		X	X			1.9			
Drift Creek			X	X		X	X			7.7			
Pine Creek			X	X		X	X			2.2			
Muddy Creek			X	X		X	X			15.9			
Clearwater Creek			X	X		X	X			3.5			
Clear Creek			X	X		X	X			8.7			
Rush Creek			X	X		X	X			2.5			
Schoolhouse Cr.						X			0.3	3.2		3.2	
Bybee Creek						X			0.4	1.0		1.0	
Low. Kalama Riv.	X	X	X	X	X	X		10.5			2.8		
Spencer Creek			X			X		1.3					
Cedar creek			X			X		0.8					
Hatchery Creek			X			X		0.2	2.7				
Indian Creek			X					0.2					
Upper. Kalama R.	X		X	X	X	X		26.3	1.1				
Little Kalama R.			X	X				3.2					
Dee Creek			X	X				0.8					
Summers Creek			X	X				0.1					
Knowlton Creek			X	X				0.3					
Wildhorse Creek			X	X				2.4	1.8	0.6		0.6	
Gobar Creek			X	X				6.0	4.1				
Bear Creek			X	X				1.8		0.3		0.3	
Arnold Creek			X	X				1.9	1.9				
Unnamed Creek			X	X					1.3				
Jacks Creek			X	X				1.7					
Lost Creek			X	X					0.7				
Elk Creek			X	X				0.4					
Bush Creek			X	X					0.9				
Wolf Creek			X	X				1					
Langdon Creek			X	X				1.6					
NF Kalama R.			X	X				3.1	5.6				
Lakeview Pk. Cr.			X	X				3.4					

SC = spring chinook　FC = fall chinook　KN = known presence　BT = bull trout
WS = winter steelhead　SS = summer steelhead　PR = presumed presence
CH = chum　CO = coho　POT = potential presence
*Low. Lewis River from mouth to Merwin Dam　*Low. East Fork from Mouth to Lucia Falls (21.3)
*Upper. EF from Lucia Falls to headwaters　*Low. Kalama from mouth to Low. Kalama Falls (RM 10)
*Upper Kalama from Low. Kalama Falls to Upper Kalama Falls (RM 36.8)
Winter steelhead distribution was used to denote miles of known, presumed and potential habitat except where coho salmon distribution was greater. The numbers were italicized where coho distribution was used.

Spring chinook (*Oncorhynchus tshawytscha*)

Spring and fall chinook are indigenous to the Kalama system. Historically, spring chinook were predominant in the Lewis River and fall chinook in the Kalama basin. By the early 1900s, Columbia River salmon populations were declining from overfishing and a combination of land use practices that proved detrimental to salmon habitat (WDFW, 1998 vol. 1).

Early attempts to save the native population through hatchery production failed, and by the 1950s spring chinook runs in the Kalama River had been reduced to only remnant populations. Hatchery programs for spring chinook were established at Kalama Falls Hatchery after its completion in 1959.

The Kalama River naturally spawning spring chinook population was considered healthy based on escapement trend (see Table 4) (WDF/WDW 1993). However, this status was determined on a mixed stock of composite production, and WDFW is not sure of the recent status of wild Kalama spring chinook populations (see Table 5) (Rawding 1999). Escapement from 1980-1991 averaged 602 with a low of zero in 1985 and a peak of 2,892 in 1982 (WDF/WDW 1993). Primary production is from hatchery releases.

Spawning occurs between the Lower Kalama Hatchery (RM 4.8) and the Kalama Falls Hatchery (RM 10). In surplus years, spawning releases are made upstream of the upper hatchery, allowing access all the way to the upper falls (RM 36) (Caldwell et al. 1999).

Table 4.Kalama River spring chinook stock status.

Stock	Screening Criteria	1992 SASSI Stock	Status (ESA Listing)
Kalama	Escapement Trend	Healthy	Federal “Threatened”

Adopted from WDFW/WDW 1993.

Table 5. Kalama River spring chinook stocks.

Stock	Stock Origin	Production Type
Kalama	Mixed	Composite

Adopted from WDFW/WDW 1993.

Fall chinook (*Oncorhynchus tshawytscha*)

Historically, fall chinook in the Kalama River system were abundant. For many years a fish trapping and canning operation existed about one mile from the river’s mouth (WDF 1951). Natural production of fall chinook in the Kalama River has declined from historic levels and has been replaced by hatchery fish (WDFW 1998 vol. 1 appendices). Run size prior to hatchery plants is difficult to determine because the Lower Kalama Salmon Hatchery began operation in 1895 when four million eggs were taken (WDF/WDW 1993). In 1951, WDF estimated spawning escapement at 20,000 fall chinook. The mainstem Kalama between Lower Kalama Falls (RM 10) and to Modrow Bridge (RM 2.4) provides the entire available spawning habitat for fall chinook populations in the Kalama basin.

The Kalama River stock status was considered healthy based on escapement trend (see Table 6) (WDF/WDW 1993). However, this status was determined on a mixed stock with composite production, and WDFW is not sure of the recent status of wild Kalama fall chinook populations (Table 7) (Rawding 1999). Natural spawn escapements from 1967-1991 averaged 6,448 with a low return of 1,259 in 1985 and a peak of 24,549 in 1988 (WDF/WDW 1993).

Table 6. Kalama River fall chinook stock status.

Stock	Screening Criteria	1992 SASSI Stock	Status (ESA Listing)
Kalama	Escapement Trend	Healthy	Federal "Threatened"

Adopted from WDF and WDW, 1993.

Table 7. Kalama River fall chinook stocks.

Stock	Stock Origin	Production Type
Kalama	Mixed	Composite

Adopted from WDF and WDW, 1993.

Coho Salmon (*Oncorhynchus kisutch*)

Coho were historically present in the Kalama basin but WDF (1951) estimated only 3,000 fish. Both early returning and late-returning fish were present, but distribution was confined to the area below Kalama Falls (RM 10.0) until a fish ladder was constructed in 1936. Coho from the Lower Kalama Hatchery have been released in the basin since at least 1942 (WDFW 1998 vol. 1).

The Kalama River coho stock status is depressed based on chronically low production (see Table 8). Natural spawning is presumed to be quite low and subsequent juvenile production is considered below stream potential. The current management policy on the Kalama River is to not pass coho through the lower Kalama Falls (RM10) (Dammers 2000, personal comm.)

Table 8. Kalama River coho stocks status.

Stock	Screening Criteria	1992 SASSI Stock	Status (ESA Listing)
Kalama	Chronically Low	Depressed	Federal "Candidate"

Summer Steelhead (*Oncorhynchus mykiss*)

The Kalama River subbasin historically had moderate numbers of summer steelhead. Run size of natural fish in the 1950's was probably less than 1,500 (WDW 1990). Distribution was throughout the watershed up to the high falls at RM 35. Summer steelhead were thought to be the only salmonids to regularly move beyond the Kalama Falls Hatchery site before the construction of the fishway in 1936 (WDW 1990). The current status of the Kalama River summer steelhead stock is depressed based upon adjusted trap count data collected by WDFW's Kalama River Research Station personnel (see Table 9 & Table 10). The escapement goal is 1,000 wild summer steelhead (See Table 11) (WDF/WDW 1993; LCSCI 1998).

Table 9. Kalama River summer steelhead status.

Stock	Screening Criteria	1992 SASSI Stock	Status (ESA Listing)
Kalama	Short-term Severe Decline	Depressed	Federal "Threatened"

Adapted from Lower Columbia Steelhead Conservation Initiative, 1998.

Table 10. Kalama River summer steelhead stocks.

Stock	Stock Origin	Prod. Type	Data Type	Escapement	Monitoring Period
Kalama	Native	Wild	Trap	Total	1977-97

Adapted from Lower Columbia Steelhead Conservation Initiative, 1998.

Table 11. Kalama River summer steelhead escapement data.

Stock	Wild Steelhead Escapement Goal	1991-1996 Avg. Wild Steelhead Escapement	Avg. % of Wild Escapement Goals	Avg. % of Hatchery Spawners
Kalama	1000	1170	117%	64%

Adapted from Lower Columbia Steelhead Conservation Initiative, 1998.

Winter Steelhead (*Oncorhynchus mykiss)*
Historically, winter steelhead were moderately abundant in the Kalama basin and were confined below Kalama Falls Hatchery site (RM 10) in most years. However, in general, the Kalama subbasin has limited natural production potential, especially for steelhead, because the relatively few tributaries are short in length and have high gradients (see Table 12) (WDW 1990). Hatchery fish were sporadically planted into the Kalama system beginning in 1938, with consistent annual plants beginning in 1955. According to the Lower Columbia Steelhead Conservation Initiative (1998), the Kalama River had the only healthy winter steelhead stock in the lower Columbia ESU in 1997 (see Table 13). WDFW estimated that 31% of the spawning fish in the Kalama were of hatchery origin (see Table 14).

Table 12. Kalama River winter steelhead stocks.

Stock	Stock Origin	Prod. Type	Data Type	Escapement	Monitoring Period
Kalama	Native	Wild	Trap	Total	1977-97

Adpated from Lower Columbia Steelhead Conservation Initiative, 1998.

Table 13. Kalama River winter steelhead stock status.

Stock	Screening Criteria	Proposed 1997 Stock Status	Status (ESA Listing)
Kalama		Healthy	Federal "Threatened"

Adapted from Lower Columbia Steelhead Conservation Initiative, 1998.

Table 14. Kalama River winter steelhead escapement.

Stock	Wild Steelhead Escapement Goal	1991-1996 Avg. Wild Steelhead Escapement	Avg. % of Wild Escapement Goals	Avg. % of Hatchery Spawners
Kalama	1000	1059	106%	31%

Chum Salmon (*Oncorhynchus keta)*
The mainstem Kalama between Lower Kalama Falls (RM 10) and to Modrow Bridge (RM 2.4) provides all spawning habitat for any chum returning to the Kalama River basin. The 1992 SASSI lists information on only the Grays River, Hardy Creek, and Hamilton Creek stocks for the lower Columbia. Chum salmon populations in the other river systems of the lower Columbia have been monitored since 1998 and populations remain extremely low (Uusitalo 2001). The Columbia River is considered the maximum southerly range of chum salmon.

Wildlife
A great number of bird species are associated with or require riparian habitats along the Columbia River and its tributaries. As a subset of this guild, the neotropical migrants (e.g., willow flycatcher, yellow warbler, yellow-breasted chat, red-eyed vireo, Vaux's swift) continually exhibit declining population trends in this region. Lewis' woodpeckers are closely associated with large cottonwoods stands. Historically, they were common in cottonwood habitats of the Columbia River but declines were noted after 1965 and they are now considered absent from Columbia River riparian habitat. The yellow-billed cuckoo is a riparian obligate species that was once found along the Columbia River but has not been confirmed breeding in Washington for more than twenty years. Other species that are marsh obligates include the Virginia rail, sora rail and marsh wren. Loss of riparian-marsh habitat for these birds resulted from the inundation and alteration of habitats in the Columbia River mainstem and tributaries (Dobler 2001, personal communication).

Wildlife: Kalama/Lewis River Watersheds (WRIA #27)
(From ILM for Fish and Wildlife 1998)

Goal: Maintain the historic statewide diversity of native wildlife species.

Objective: Develop management guidelines for game and nongame species that are endangered, threatened or sensitive (ETS).

Objective: Identify, map, and update the Priority Habitats and Species (PHS) data.

Objective: Support the PHS and ILM programs with data dissemination and management recommendations.

Maintaining diversity statewide can best be achieved by maintaining diversity in individual watersheds. The six wildlife species considered in the Lewis-Kalama River project are a diverse group of native, game and ETS species. Proper management of these species in the watershed will aide in maintaining diversity.

Goal: Determine the ecological needs and population status of wildlife species of concern.

Objective: Conduct and support research to investigate the population status, habitat requirements and the natural ecology of wildlife species of concern.

Spotted owls, bald eagles, and Larch Mountain salamanders are all species of concern statewide and in the Lewis-Kalama River watershed. Whereas the ecological needs and population status of owls and eagles have been well described, little is understood regarding Larch Mountain salamanders. Work being conducted in the watershed will increase our understanding of this species.

Goal: Develop an inventory of the current habitats of wildlife populations.

Objective: Use Geographic Information System and remote sensing to map habitats.

Mapping and inventorying wildlife habitats is the heart of the Lewis-Kalama River project. Remote sensing and GIS technologies have been used to map current conditions of critical habitat components for the 4 of 6 species and model habitat changes and their impacts on wildlife in the future.

Goal: Protect and manage for recovery of all native wildlife classified as endangered, threatened or sensitive.

Objective: Develop and implement recovery and management plans for ETS species.

Managing the Lewis-Kalama River watershed at the landscape scale will aid in protecting all native species, including ETS species. Understanding individual species habitat requirements and interactions with other will improve long-term sustainability of wildlife diversity in the watershed.

Goal: Manage game populations for sustainable natural production where feasible.

Objective: Identify and evaluate acquisition needs for important habitat of game species.

Objective: Determine abundance, distribution and composition of game populations.

Objective: Develop management plans for game species.

Elk, deer, and goose populations in the watershed are-doing well and maintaining themselves through natural production and are not imperiled at this time. However, increased human development and changes in land management practices will affect species distribution and productivity. The ILM project is designed to model for habitat changes, foresee problem areas, and initiate management strategies now to meet species objectives in the future.

Habitat Areas and Quality

(From ILM for Fish and Wildlife 1998)

Riparian Habitat. Riparian habitats cover a relatively small area yet support approximately 90 percent of Washington's fish and wildlife species. Riparian areas in Washington provide essential food, cover, and water, as well as essential breeding habitat during all times of the year. Riparian areas have moist and mild microclimates that moderate seasonal temperature extremes.

Riparian areas provide critical habitat for unique and obligate species, and provide physical features that enhance nearby upland habitats for wildlife. Riparian habitats are essential to healthy, productive aquatic systems and to native fish that inhabit them. Unlike most habitat types, intact riparian habitat can offer natural habitat connections and movement corridors, enabling wildlife to persist in fragmented landscapes.

Riparian habitats support abundant and diverse fish and wildlife populations, offer habitat connectivity across the landscape, and play a vital role in maintaining aquatic systems. To sustain the long term productivity of fish and wildlife resources, riparian habitats in good condition must be preserved and those in degraded condition must be restored to a healthy productive state. Protection efforts for riparian habitat--compared to other habitats--may yield the greatest gains for fish and wildlife.

Overwhelming evidence exists to support the retention and restricted use of riparian habitat in order to maintain healthy, productive fish and wildlife habitat. Desired future conditions (DFC's) for riparian habitat widths in the Lewis River watershed are derived from WDFW's draft PHS Management Recommendation for Riparian Habitat (March 1995). These recommendations are based on an extensive survey and synthesis of the scientific literature (over 400 citations), and present the minimum standards generally needed to retain riparian habitat, protect associated wildlife, buffer streams for fish and other aquatic life, and retain hydrological functions.

Objectives for riparian habitat in the watershed include:

- Maintain or enhance the structural and functional integrity or riparian habitat and associated aquatic systems needed to support fish and wildlife populations on both site and landscape scales.
- Cease the current trend of riparian habitat loss by protecting intact riparian areas and by restoring degraded or lost habitat. Riparian habitat presently in good condition should receive the highest priority for protection.
- Design and implementation of land-use activities in or near riparian areas should strive to retain or restore structural and functional characteristics important to fish and wildlife, and the natural processes that drive these characteristics. These characteristics include: habitat connectivity; vegetation diversity in terms of age, plant species composition, and vegetation lavers; vegetation vigor; abundance of snags and woody debris; natural rather than human induced disturbance; and an irregular shape and width that mimics natural processes. Planning for riparian areas should be done from a watershed perspective.

Because riparian areas and instream habitat are affected by upland activities, management of the entire watershed is an integral part of riparian habitat management. Although riparian areas play a major role in filtering sediments and pollutants from upland activities and in regulating stream flow, they alone cannot alleviate all upland impacts. Comprehensive planning and coordination among government agencies and land users is key to maintaining functional riparian habitat and associated fish and wildlife resources across the landscape. Land use decisions that include the needs of fish and wildlife will assist in maintaining areas for both people and wildlife. Planning will also help reduce the cost and controversy associated with listing species as threatened and endangered. See the Watershed Riparian Habitat Management Plan and the Priority Habitats and Species Riparian Habitat Management Recommendations for more information on riparian habitat.

Definition: Riparian habitat can be variously defined in terms of vegetation, topography, hydrology, or ecosystem function. Riparian habitat is defined as the area adjacent to lotic systems (aquatic systems with flowing water, e.g., rivers, perennial or intermittent streams, seeps, springs) that contains elements of both aquatic and terrestrial ecosystems which mutually influence each other.

Scope of Riparian Plan: A comprehensive data set documenting current condition of riparian habitat did not exist prior to beginning the project. Therefore, we decided that five of the eighteen Watershed Administrative Units in the Lewis-Kalama watershed would receive extensive field inventories. The watershed riparian plan covers five of the eighteen Watershed Administrative Units found in the watershed (201,597 acres, approximately 24 percent of the basin). These WAU's are; Woodland, Lake Merwin, Cougar Creek, Siouxon, and Canyon Creek. They were selected because of their diversity of land use practices and land cover type. The remaining 13 WAU's were addressed but to a lesser resolution.

Extent of Riparian Data: Extensive field work was conducted in these five WAU's to document the current condition of riparian habitat and to update the Priority Habitats and Species data layer for riparian. Information on current riparian habitat condition was collected using an assessment methodology developed by Steve Manlow and Andy Carlson, WDFW biologists. The assessment methodology involved collecting information on habitat characteristics, land uses and disturbance factors, location, and water typing for each stream reach within the survey area. These data were imported into GIS and corresponding strewn reaches were digitized. Spatially linked data incorporating habitat features were analyzed for the majority of stream reaches within the five WAU's.

Separate data forms were completed for each "stream reach" evaluated within the project area. A stream reach was defined as a discrete segment or segments of riparian habitat with similar physical and biological characteristics. Breaks between stream reaches typically occurred where natural or human-induced changes resulted in distinctly different vegetation plant communities, or where differences in disturbance factors existed. Our goal was to conduct an onsite evaluation for every stream reach within the study area. However, because of access and time limitations, this was not possible.

It was assumed that the inventoried reaches within the five WAU's contained adequate riparian habitat when the buffer width met PHS recommendations: canopy closure was greater than 70 percent, trees were greater than 60 feet tall, and there were at least three vegetative layers. Twenty-four percent of all inventoried streams met these criteria. Unfortunately, due to the data collection protocol, it is very likely that additional reaches exist in the five WAU's in which adequate riparian habitat exists but were overlooked because data collection was restricted to within the 1995 PHS recommended buffer areas. Because of this, a number of Type 3, 4, and 5 stream segments in the Siouxon WAU that are dominated by deciduous trees within the buffer area did not meet the requirement of three or more vegetation layers. These reaches would have met the criteria had sampling occurred outside of the recommended buffer width at which point conifer becomes dominant. See the Watershed Riparian Habitat Plan for more detail.

Discussion

A number of state and local laws address the protection of riparian habitat. These include he Forest Practices Act, the Shoreline Management Act, the Standards and Guidelines for Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl, the Growth Management Act, Clark County Ordinances, etc. Although a number of laws exist these laws do not provide the level of riparian habitat protection identified in the PHS Riparian Habitat Management Recommendations. Although not specifically required, some landowners are leaving riparian buffers that exceed state regulations. At this time V,'DFW is unaware of any landowner plans designed specifically to meet the PHS riparian management recommendations, therefore it is very important that WDFW and landowners work together to achieve riparian management objectives.

A total of 709 stream reaches were surveyed, spanning 966 linear miles of riparian habitat (Table 15). The GIS data identified 1,450 linear miles of riparian habitat, representing 67 percent of the riparian habitat within these five WAU'S. The 13 unsurveyed WAU's were modeled at a coarse scale with data that existed prior to the beginning of ILM, therefore, the model results outside of the five inventoried WAU's may be less accurate.

After fieldwork had been completed, the Priority Habitat and Species (PHS) division updated the recommended buffer widths for riparian habitat. Because the field inventory form had been developed for the recommended buffers before that time, and because the new recommended buffer widths cannot be extracted from the data as collected, the riparian analysis is based on the old (I993) PHS buffer width recommendations. Efforts will be made to compare results with current recommendations where possible.

Table 15. Stream miles sampled in five WAU’s, by water type.

Water Type	Total Stream Miles	Miles Sampled (%)	Stream Miles Objectives (%)
1	201	111 (55)	28.0 (3)
2	5	2 (50)	0.1 (0)
3	119	107 (90)	35.0 (4)
4	268	205 (76)	45.0 (5)
5	857	541 (63)	117.0 (12)
	1,450	966 (67)	225.0 (23)

For riparian habitat, objectives are met, or not met, under the following conditions:

- Objectives are currently met, independent of ownership, within the five surveyed WAU's where stream reaches surrounded by riparian habitat contain trees taller than 60 feet, canopy closure is greater than 70 percent, three vegetation layers (or more), and buffers along Type I waters are at least 325 feet, along Type 2, 3, and 4 waters are at least 100 feet, and along Type 5 waters are at least 50 feet. Objectives currently are unmet along all other surveyed streams. Streams within the five WAU's that did not get surveyed, as well as streams outside of the five WAU'S, are labeled "Unknown" because it is not known whether objectives currently are being met or not.
- Objectives will be met in 2014 on federal land along every stream within the entire Lewis/Kalama watershed where the Forest Service has identified Riparian Reserves (RR's) on Federal land. Objectives will be unmet elsewhere on federal land.
- Objectives will be met in 2014 in the DNR Siouxon Block where streams are found within either old growth or DNR Type A or B spotted owl habitat. These areas are not being predicted for harvest. Objectives will be unmet elsewhere as current riparian habitat related rules and regulations do not protect riparian habitat to the level recommended in the "Priority .Habitats and Species Program - Riparian Habitat Management

Recommendations". Additionally, there are no known landowner plans that will adequately protect riparian habitat

- Actions Needed: Further inventory and document current condition of riparian habitat in the remaining 13 WAU'S, identify and develop agreements that maintain healthy riparian habitat, and identify areas in need of riparian habitat restoration activities. Riparian management activities are needed in all areas of the watershed, not just the forested environment.

Watershed Assessment

A major effort to develop a cooperative management process between landowners and fish and wildlife management agencies was begun in 1996 model the watershed through time was developed by WDFW through the Integrated Land Management (ILM) process. It was an attempt to shift management from a species by species approach to that of a broader cohesive watershed approach.

Watershed management and its effects could be modeled for a twenty year period. Six wildlife species (elk, black-tailed deer, Canada goose, spotted owl, bald eagle and Larch Mountain salamander), and five fish species (bull trout, kokanee, steelhead, coho and chinook salmon served as modeled species. In 2001 the Washington Conservation Commission conducted a Limiting Factors Analysis (LFA) (Wade 2001) to determine constraints to fish production. An assessment of the habitat quality of the watershed and evaluations of fish species were presented.

Limiting Factors

Access

Information on passage problems that involved culverts and other artificial barriers was gathered from three databases for WRIA 27 (WDFW's SSHEAR database, Clark County Conservation District's recent culvert inventories, and Clark County Department of Public Works' 1996 culvert inventories by Clearwater BioStudies, Inc.). Culverts were either rated as passable or impassable; however, some "impassable culverts" may be passable by certain species and/or at different flow stages. Only culverts that potentially block anadromous habitat for steelhead, coho, or chinook were mapped. Additional assessments of these culverts should be completed before projects are funded for removal or repair. Identification of passage problems associated with potential thermal barriers and/or low-flow barriers, and small dams and other obstructions ("Other Passage Barriers") came from either published data or from personal experience of TAG members.

TAG members noted that channel alterations that have occurred within in the lower Kalama River, combined with excessive sediments from upstream sources, have increased the extent of the bar at the mouth of the river. Migrating adults and juveniles must cross this wide shallow bar with little cover where they are exposed to high levels of predation and elevated water temperatures. This bar poses a potentially serious migration barrier, especially to juveniles moving downstream and out of the system. Habitat conditions on this bar need further assessment to determine the extent of the problem encountered by salmonids of all life-history stages.

The following is a list of known access problems within the Kalama River watershed including:

- The lower Kalama River Falls has a 3.4 meter drop that has a fish ladder. Only wild steelhead and excess spring chinook are passed above the falls.

- The Lower Kalama River Hatchery presents a partial barrier to migration up Hatchery (Fallert) Creek during low flows.
- A culvert on an Unnamed tributary to Wildhorse Creek, under the 6242 Road is considered a passage barrier.
- A culvert on Wildhorse Creek under the 6240 Road is considered a passage barrier.
- A culvert on Bear Creek (tributary to Gobar Creek) under the 6317 Road is considered a passage barrier and is in need of repair or replacement.
- A log-jam at the mouth of Jacks Creek may be blocking passage.
- Large gravel deposits at the mouths of Langdon Creek, North Fork Kalama, Jacks Creek and Wold Creek create conditions where the flow may become subterranean during low flows. These gravel deposits are likely related to upstream land us activities, such as, logging and road construction that have removed riparian vegetation and increased peak flows and erosion.
- Just upstream from the Kalama, two small tributaries to the Columbia, Schoolhouse Creek and Bybee Creek, also have culverts that are considered passage barriers

One of the more significant passage problems on tributaries within the Kalama system will be addressed by the construction a bridge across Wildhorse Creek during summer of 2000 opening approximately 11 miles of steelhead habitat.

Floodplain Connectivity

Almost the entire floodplain of the lower Kalama River has been disconnected from the river by the construction of dikes and levees. The construction of Interstate-5 first cut off the lower floodplain, and then development on Port of Kalama property completed the channelization of the river. With its steep canyons and tributaries the Kalama River has always had minimal floodplain habitat. Development along the lower river further exacerbates this natural limiting factor.

Bank Stability

Other than a few isolated areas, TAG members rated overall bank stability of the lower Kalama mainstem as “good.” The main problem areas identified along the lower river were concentrated along the south bank both upstream and downstream from Spencer Creek (RM 2.2). However, sections around Spencer Creek and other areas along this section of the south bank of the lower river contain naturally unstable soils and it is possible that this is an entirely natural process that has little to do with surrounding land uses.

Much of the upper Kalama mainstem is incised in bedrock and naturally stable. However, the Watershed Recovery Inventory Project identified mass wasting problems along many of the major tributaries to the Kalama river including Hatchery Creek, Wildhorse Creek, Gobar creek, North Fork Kalama, Lakeview Peak Creek, and Langdon Creek. A major slide on the North Fork Kalama that dates from the late 1970s appears to have stabilized. A very large mass soil movement is occurring in the headwaters of the Lakeview Peak Creek. Because of its size, TAG members felt that there was little anyone could do but wait for the movement to stabilize.

Large Woody Debris (LWD)

There is a general lack of LWD throughout the Kalama Basin (WDFW 1998 vol.1 appendices). Some larger pieces can be found in the main channel, and many of these are redistributed every year during high flows. From Jacks Creek (RM 24.6) to the upper falls (RM 35), TAG members felt that there was a fair amount of LWD in the mainstem, but that it was tied up in log jams and not distributed so that it could significantly enhance habitat throughout the basin. The removal of LWD for firewood is a common occurrence in the lower river, further reducing LWD abundance. Almost all the historically productive tributaries to the Kalama now have low LWD abundance.

The potential for future recruitment of LWD is also poor almost throughout the Kalama River basin. Over 88% of the riparian habitat that was analyzed using aerial photos was rated as "poor" (Lewis County GIS) and contained mainly deciduous species (WDFW 1998 vol.1 appendices). It will be many years before these degraded riparian areas will provide adequate supplies of LWD to the streams. Under the Forest and Fish Report agreements (authors included Tribal, State, timber industry, federal and local government caucuses), future management of riparian zones for non-federal forest lands in the State of Washington should begin to protect riparian zones from additional logging impacts and eventually help provide a limited supply of LWD.

Pools

In general, pool ratios and quality does not appear to be a major limiting factor within the Kalama Basin. According to TAG members, the lower mainstem Kalama has good quality, deep pools and good pool to riffle ratios. Habitat surveys conducted on the Middle Kalama WAU (RM 13 to RM 32) also found adequate pool habitat. However, the tributaries vary from having good pool ratios to very poor pools, which may tend to crowd the majority of the rearing juveniles into areas with adequate pool habitat (WDFW 1998 vol. 1 Appendices).

Side Channels

The channel of lower Kalama River has been largely channelized, with few off-channel areas for juvenile rearing over-wintering. Very few off-channel areas were noted during 1994 surveys of the Middle Kalama WAU (RM 13 to RM 32) (WDFW 1998 vol. 1). With the lack of LWD in most stream channels and potential for increased peak flows due to the extensive logging that has occurred within the basin, winter rearing for juveniles may be a major limiting factor for salmonid production within the basin. Many of the tributaries that might normally provide refuge during high flows are also inaccessible due to gradient barriers near their mouths (WDFW 1998 vol. 1 appendices).

Substrate Fines

Field surveys undertaken during the summer of 1994 as part of the Integrated Landscape Management (ILM) project (WDFW 1998 vol. 1 appendices) on the Lewis-Kalama watershed covered most of Arnold, Wildhorse, Gobar, and Bear Creeks, and the mainstem Kalama from Gobar Creek almost to the North Fork Kalama. These surveys found large quantities of fines throughout the surveyed areas of mainstem and tributaries of the Middle Kalama WAU (RM 17 to RM 32). All segments surveyed had deposits of fines within the gravels and in pools and bars, and all prior information gathered referenced fine sediments as a problem in the basin. The quantities of accumulated fine materials noted during the field surveys indicated an ongoing and persistent supply to the system (WDFW 1998 vol. 1 appendices).

As a surrogate measure of fine sediment inputs, road densities greater than three miles/square mile with numerous valley bottom roads are considered to fall in the "poor" category. It should be recognized that only rarely can roads be built without negative impact on streams (Furniss et al. 1991). Roads modify natural drainage networks and accelerate erosion processes. These changes can alter physical processes in streams, leading to changes in streamflow regimes, sediment transport and storage, channel bank and bed configurations, substrate composition, and the stability of slopes adjacent to streams (Furniss et al. 1991). The sediment contribution per unit area from roads is often much greater than that from all other land management activities combined, including log skidding and yarding (Furniss et al. 1991). Lewis County GIS (1999) measured 1,292 miles of road in the 224.5 square miles of Kalama River watershed, revealing a road density of 5.75 miles/square mile. The Middle Kalama WAU (from approximately RM 17 to 32) has approximately 516 miles of roads with a road density of 6.4 miles/square miles (WDFW 1998 vol. 1 appendices).

Road densities on Forest Service property in the upper Kalama are also relatively high, with an average value of 4.0-miles/square mile. The upper Kalama is also the most highly fragmented watershed in the Mt. St. Helens Administrative Unit, with an average of 2.6 road crossings per stream mile (USFS 1996a). The erosion potential is also generally high for the most widespread soil type (Olympic series) in the Kalama watershed, especially once the vegetative cover has been removed or roads have been constructed (WDW 1990). Many areas within the Kalama basin are also considered naturally unstable, and past logging and road construction within the watershed have likely exacerbated this natural instability. The February 1996 flooding triggered at least 39 new slides in the Kalama River basin (USFS 1996a).

The watershed is slowly recovering from past logging impacts. TAG members noted that after a heavy rain the river carries much less sediment than after the period of extensive logging in the 1970s, and that the river clears up quickly as well. The recovery of riparian areas from past logging activities coupled with stabilizing road systems appears to be resulting in improvements in sediment delivery to stream systems. Changes in road construction and maintenance practices have also likely reduced sediment inputs from roads. However, excessive chronic inputs of fine sediments to the river can be expected to continue in areas with such high road densities (Brown and Krygier 1971; Weaver et. al. 1987). And, several studies in the western Cascade Range in Oregon showed that mass soil movements associated with roads are 30 to over 300 times greater than in undisturbed forests (Sidel et al. 1985; Furniss et al. 1991).

Data is not available for substrate conditions in the mainstem Kalama below the lower falls. However, TAG members familiar with the river felt that this reach contained patches of fair to good spawning gravels. TAG members also thought that although the floods of 1996 may have triggered a number of new slides within the watershed, they also might have benefited substrate conditions by sorting gravels and scouring fines from spawning beds in the mainstem.

Another problem that was noted by TAG members was that excessive amounts of coarse sediments have collected near the mouths of some tributaries, especially at Langdon Creek and the North Fork Kalama. This process may be the result of mass wasting and increased peak flows associated with earlier logging activities.

Riparian

Approximately 96 percent of the Kalama River Watershed is owned and managed by private timber companies. Most of the watershed was logged in the late 1960s through the early 1980s; current timber harvest is minimal in comparison (WDFW 1998 vol. 1 appendices). A majority of the riparian zones along the tributaries were harvested to the streambanks, and LWD was often removed from the streams as required by law at that time. Early successional deciduous species have proliferated within these harvested riparian areas (WDFW 1998 vol. 1 appendices).

Riparian conditions were assessed along individual stream reaches within WRIA 27 by analyzing 1996 aerial photos from Clark County GIS and 1994 aerial photos of Weyerhaeuser's St. Helens Tree Farm operations. Where riparian vegetation was clearly lacking and/or contained mostly deciduous species, the reach was mapped as "poor". This analysis does not represent a full accounting of all "poor" riparian conditions within the WRIA, just a conservative estimate of where riparian areas were clearly in "poor" condition. Of the 97.25 miles of anadromous habitat within the Kalama River basin, over 85 miles have "poor" riparian conditions (Lewis County GIS 1999). Even if sufficiently wide riparian buffers are protected from future logging under the ongoing Forests and Fish Report agreements, the existing conditions assure that it may be a hundred years or more before many streams reach "good" riparian condition. These same conditions assure that there will be minimal future potential for large wood recruitment in most of the Kalama basin for at least the next 100 years. Past logging practices in the upper Kalama on forest service lands have also reduced future recruitment of large woody debris (USFS 1996a).

Riparian conditions are slowly improving, and there are sporadic reaches along the mainstem Kalama and some of the tributaries that still contain riparian areas with mature conifers. However, the TAG noted that Wildhorse Creek, North Fork Kalama, Gobar Creek, Lakeview Peak Creek and Arnold Creek, historically the most productive steelhead streams, have particularly "poor" riparian conditions.

Water Quality

Segments of the lower ten miles of the Kalama River are considered water quality impaired (303d listed) due to excessive water temperature. Hatchery (Fallert) Creek is also on Washington State Department of Ecology's (WDOE) 303d list due to numerous excursions beyond the water temperature criteria at the inflow to the Lower Kalama Hatchery (WDOE 1999). Water temperature problems are likely exacerbated in the shallows created by the growing bar at the mouth of the Kalama, possibly presenting a thermal barrier to migrating fish during summer low flows.

Water temperatures may also be a problem in many of the stream segments where the riparian canopy has been removed. However, stream temperatures noted during 1994 summer low flow surveys of the Integrated Landscape Management process were between 55 and 58 degrees F (12.7 to 14.4 degrees C) in all measured segments of the middle Kalama WAU (WDFW 1998 vol. 1 appendices). Although the Forest Service has limited water temperature monitoring data, it indicates that water temperatures in most stream systems in the upper basin meet or exceed state standards. However, Fossil Creek is an exception, with elevated water temperatures that could impact salmonid growth and disease resistance (14-23 degrees C) (USFS 1996a). There is little data available for water quality parameters for the rest of the system. In general, TAG embers felt that water quality had improved since the 1970s and early 1980s when extensive logging and road construction were occurring throughout the basin.

Water Quantity

Similar to water quality, TAG members felt that the hydrograph (low and high flow extremes) has probably improved since the 1970s when extensive logging was occurring. However, road densities as high as 6.4-miles/square mile in the middle Kalama WAU increase the stream channel network significantly, which can increase peak flows (WDFW 1998 vol. 1 appendices). Looking at the potential impacts to hydrology in the upper basin from the number of roads/mile and vegetation removal, the USFS (1996a) found that within six of eight subbasins peak flows could increase over ten percent. Higher peak flows can accelerate erosion and sediment loading, and alter channel morphology, all of which can have negative impacts on salmon habitat (Furniss et al. 1991).

In June 1999, WDOE completed a streamflow study for the Kalama River in WRIA 27 to quantify available salmonid habitat at various stream flows. Ecology conducted this study to provide information to determine minimum stream flows in the WRIA as is required by state law. Ecology used the Instream Flow Incremental Methodology (IFIM) for the Kalama River and a description is available in Publication #99-152 available from Ecology (Caldwell et al. 1999). The IFIM estimates available habitat for various salmonid species as percentage of optimal habitat as stream discharge varies. Using the IFIM model, a weighted useable area (WUA) for fish spawning and rearing is calculated using 4 variables, depth, velocity, cover and substrate. The WUA varies by species and life stages as flow changes.

Four transects were established for the study, one transect near RM 4.2 and one transect at RM 5.2. Table 16 provides data on the percent of optimum habitat available at various flows in the Kalama River. The results show that median-flows in the Kalama range from approximately 300 cfs in early October to near 700 cfs near the end of October. The flow levels are less than optimal for coho and chinook spawning in October, but flows approach optimal levels for coho spawning in early November and optimal chinook spawning levels by mid-November (Loranger 1999). There is generally plenty of water in the river to support steelhead spawning in the spring. Optimal juvenile rearing habitat occurs at about 600 cfs for chinook salmon and 950 cfs for steelhead (see Table 16). Median flow levels in the Kalama are below 600 cfs from mid-June to mid October; consequently juvenile rearing habitat is less than optimal during this period.

There is also concern about low flow problems in some of the tributaries. TAG members identified Langdon Creek as an area of particular concern because the flow becomes subsurface at times in the coarse sediments that have accumulated near the mouth. Juveniles rearing in the stream may become stranded in warm remnant pools as the flow becomes intermittent. Similar accumulations of coarse sediments occur at the mouths of the North Fork Kalama, Jacks and Wold Creeks (WDFW 1998 vol. 1 appendices). Water withdrawals are not considered a major concern within the Kalama basin today; however,
extensive development is occurring within the lower basin and water withdrawals could become a problem in the near future.

Biological Processes

The Washington Conservation Commission is using the number of stocks meeting escapement goals as a surrogate measurement of nutrient levels within stream systems. Actual data on nutrient levels and cycling would provide a much more accurate picture of the conditions within the watershed.

Populations of Kalama River fall and spring chinook and winter steelhead are all considered “healthy” and generally meeting escapement goals (WDF/WDW 1993; WDFW 1998). The carcasses from these populations are providing nutrients to the lower areas of the river, downstream of the lower falls. However, populations of summer steelhead and coho salmon are considered depressed and not meeting escapement goals for the Kalama River. Returns of chum salmon are almost nonexistent.

The river above the falls is likely the area where nutrient enhancement might provide the greatest benefits. The only fish released above the falls are steelhead and occasionally spring chinook when there are excesses at the hatchery. A nutrient enhancement program is underway for the Kalama River, with the planting of 1,904 fish in 1997 and 3,444 fish in 1998 (Hale 1999, personal comm.). Additional studies are needed to truly define the number of fish that could be supported by the amount of available habitat in the Kalama, and then to determine the level of nutrient enhancement required to maintain that level of productivity.

Table 16. Percent of Optimum Habitat (WUA) at varied flows on the Kalama River.

Flow in cfs	**Steelhead Spawning % Optimum**	**Steelhead Juvenile % Optimum**	**Chinook Spawning % Optimum**	**Chinook Juvenile % Optimum**	**Coho Spawning % Optimum**
2050	52%	91%	59%	75%	56%
1900	55%	90%	63%	75%	57%
1700	61%	92%	69%	76%	63%
1500	70%	94%	81%	83%	73%
1400	78%	95%	86%	89%	79%
1300	84%	97%	91%	91%	84%
1200	90%	97%	95%	93%	89%
1100	94%	99%	99%	93%	94%
1025	96%	100%	100%	92%	96%
1075	95%	99%	100%	92%	95%
1050	95%	100%	100%	92%	96%
1000	98%	100%	99%	92%	97%
975	100%	100%	99%	93%	99%
950	100%	100%	98%	93%	99%
925	100%	100%	98%	94%	100%
900	100%	100%	97%	94%	100%
875	100%	100%	96%	94%	100%
850	99%	100%	94%	95%	99%
825	98%	99%	93%	95%	99%
800	97%	98%	91%	96%	100%
750	95%	97%	87%	98%	99%
700	91%	95%	85%	99%	98%
650	87%	92%	81%	99%	97%
625	85%	91%	80%	100%	96%
600	83%	90%	78%	100%	96%
575	79%	88%	77%	100%	95%
550	75%	87%	75%	99%	94%
500	70%	83%	70%	97%	90%
300	49%	64%	45%	85%	69%
100	33%	36%	27%	60%	49%

Existing and Past Efforts

Management activities on the Kalama River system have occurred over many years. Recent major emphasis has focused on reconstruction of Kalama Falls Hatchery, Salmon and Steelhead Initiative, Integrated Landscape management, Limiting Factors Analysis, and the Steelhead Habitat Inventory Assessment Program (SSHIAP) which document barriers to fish passage.

Table 17. Bonneville Power has funded a series of projects in this basin in the past. They are presented in the following table:

Project	Program Category	Project Focus 1	Project Focus 2	Primary Agency
CODED-WIRE TAG RECOVERY	(A)	Monitoring / Baseline	Adult Mainstem Passage	PACIFIC STATES MARINE FISH COM
SURVEY OF ARTIFICIAL SALMON PRODUCTION FACILITIES	(A)	Monitoring / Baseline	Baseline / Feasibility Efforts	US SMALL BUSINESS ADMIN.
ANADROMOUS FISH HEALTH MONITORING IN WASHINGTON	(A)	Research / Evaluation	Fish Health	WASHINGTON DEPT. of WILDLIFE
ANADROMOUS FISH HEALTH MONITORING (WDF)	(A)	Research / Evaluation	Fish Health	WASHINGTON DEPT of FISHERIES
ANN CD WIRE TAG PROG-MISSING PROD WASHINGTON HATCH	(A)	Monitoring / Baseline	Program Outcome / Impacts	WASHINGTON DEPT of FISHERIES
FISH PASSAGE EVALUATIONS - LOWER COLUMBIA RIVER	(A)	Research / Evaluation	Adult Mainstem Passage	COE (PORTLAND DISTRICT)
AUDIT COLUMBIA BASIN ANADROMOUS HATCHERIES	(A)	Monitoring / Baseline	Facility Design / Construction	MONTGOMERY WATSON

Present Subbasin Management

Existing Management

Management of the Kalama River subbasin is split between many Federal, State and local agencies. Both the U.S. Forest Service and Washington State Department of Natural Resources own and manage land in the watershed. Approximately 96% of the Kalama River Watershed is owned and managed by private timber companies. The city of Kalama lies in the lower watershed. WDOE monitors water quality and WDFW and the National Marine Fisheries Service (NMFS) manage the fishery resource.

Federal Government

The National Marine Fisheries Service

NMFS administers the Endangered Species Act (ESA) for anadromous fish. They also review and comment on activities that affect fishery resources and develop recovery plans for listed species in the subbasin. Under ESA, summer steelhead, chinook salmon, chum salmon, and steelhead found in the Kalama River are listed as "threatened" by NMFS and coho salmon are listed as a candidate species. Under the ESA's 4(d)rule, "take" of listed species is prohibited and permits are required for handling. Biological opinions, recovery plans, and habitat conservation plans for federally listed fish and aquatic species help target and identify appropriate watershed protection and restoration measures.

- Federal Caucus All-H Paper (2000). This document provides a framework for basin-wide salmon recovery and identifies strategies for harvest management, hatchery reform, habitat restoration, and hydropower system operations.
- FCRPS BiOp (2000). This is a biological opinion written by NMFS and the Fish and Wildlife Service regarding the operation of the federal hydropower system on the Columbia River, and fulfills consultation requirements with the US Army Corps of Engineers, the Bureau of Reclamation, and the Bonneville Power Administration under Section 7 of the ESA. This recent BiOp also concluded that off-site mitigation in tributaries is necessary to continue to operate the hydropower system.

United States Fish and Wildlife Service

Coastal cutthroat are proposed for a "threatened" listing, and since these are considered as non-anadromous fish they are in the process of being evaluated by the United States Fish and Wildlife Service.

United States Forest Service

A portion of the upper Kalama River is located within the USFS Gifford Pinchot National Forest. Fish bearing waters are managed under the North West Forest Plan.

Bonneville Power Authority

The Bonneville Power Authority wholesales hydroelectric power throughout the West. It also provides funding to deal with impacts of the Columbia River Hydrosystem on fish and wildlife (see Table 17).

Yakima Indian Nation

The Yakima Nation has historic and current interest to the upper Kalama area. The Yakima Nation desires that native plants, wildlife, lamprey, salmonids, and suckers be protected and enhanced to the fullest extent possible consistent with tribal treaty rights. Utilize ecosystem management of the watershed to:

- Protect and restore ecosystem process and functions to support spawning, rearing, and migratory habitat.
- Protect and restore ecosystem process and functions to support native plant and wildlife.
- Eliminate or control negative impacts of introduced plant, animals and fish.
- Maintain water quality consistent with fish needs and human consumption.

Cowlitz Indian Nation

The Cowlitz tribe has recently been granted tribal status from the Federal Government.

State Government

Washington Department of Fish and Wildlife

WDFW manages fish and wildlife resources in the subbasin. Bull trout, fall chinook salmon, chum salmon, and steelhead are listed as "threatened" and coho salmon are listed as a candidate species under the ESA. WDFW management attempts to protect these fish and provide harvest opportunity on hatchery fish through the Fish Management and Evaluation Plan (FMEP).

The objectives of the WDFW's FMEP are based on the WDFW Wild Salmonid Policy. In that policy, it states that harvest rates will be managed so that 1) spawner abundance levels abundantly utilize available habitat, 2) ensure that the number and distribution of locally adapted spawning populations will not decrease, 3) genetic diversity within populations is maintained or increased, 4) natural ecosystem processes are maintained or restored, and 5) sustainable surplus production above levels needed for abundant utilization of habitat, local adaptation, genetic diversity, and ecosystem processes will be managed to support fishing opportunities (WDFW 1997). In addition, fisheries will be managed to insure adult size, timing, distribution of the migration and spawning populations, and age at maturity are the same between fished and unfished populations. By following this policy, fisheries' impacts to listed steelhead, chinook salmon, and chum salmon in the Lower Columbia River (LCR) Evolutionary Significant Unit (ESU) will be managed to promote the recovery of these species and not at rates that jeopardize their survival or recovery. The full text of the Fish Management and Evaluation Plan appears in Appendix C.

<u>Artificial Production</u>

WDFW has a long history of hatchery production on the Kalama River. Fallert Creek is one of the oldest hatcheries in the Northwest dating to 1895. Kalama Falls hatchery opened in 1959. There also is an upper watershed rearing pond, Gobar Pond and a chinook trap located just upstream from Modrow Bridge. All hatchery-produced fish within the subbasin are marked with an adipose fin clip. Spawners are randomly selected, with one to one mating.

Fallert Creek Hatchery produces coho salmon. Kalama Falls produces spring and fall chinook and some native brood stock steelhead.

Other Activities
WDFW has established a Kalama Research team, funded through Mitchell Act since 1978. Its main emphasis has been studying interactions between wild and hatchery steelhead. It is also at work evaluating a "wild" steelhead broodstock and producing smolt production estimates, investigating residualism in steelhead and resident fish investigations in the upper Kalama watershed.

WDFW is presently conducting or has conducted habitat inventories within the subbasin. Ecosystem Diagnosis and Treatment (EDT) compares habitat today to that of the basin in a historically unmodified state. It creates a model to predict fish population outcomes based on habitat modifications. WDFW is also conducting a Salmon Steelhead Habitat Inventory Assessment Program (SSHIAP) which document barriers to fish passage.

WDFW's habitat program issues hydraulic permits for construction or modifications to streams and wetlands. This provides habitat protection to riparian areas and actual watercourses within the watershed.

Washington SERF Board
The Salmon Recovery Funding Board's mission is to support salmon recovery by funding habitat protection and restoration projects, and related programs and activities that produce sustainable and measurable benefit for the fish and their habitat.

Joint Natural Resources Cabinet
In May 1997, Governor Gary Locke and thirteen agency heads signed a memorandum of agreement to establish a forum to serve as the "formal and ongoing institutional framework to promote interagency communication, coordination, and policy direction on environmental and natural resource issues". This forum was named the Joint Natural Resources Cabinet (JNRC or Joint Cabinet) and is chaired by Curt Smitch, the Governor's Special Assistant for Natural Resources.

Government Council on Natural Resources
As a way to bring together a wider forum to assist with the review and development of the three-part effort to recover salmon, which includes the Statewide Salmon Recovery Strategy, state and federal budget proposals, and a comprehensive legislative package, the Government Council on Natural Resources (GCNR or Government Council) was developed. This group includes representation from JNRC, the Legislature, tribes, cities, counties, federal government, and ports.

Governors Salmon Recovery Office
To assist the Joint Cabinet and Government Council in accomplishing their mission, the Governor's Salmon Recovery Office was established by the Legislature through the Salmon Recovery Planning Act (Engrossed Substitute House Bill 2496). The Salmon office's role is to coordinate and produce a statewide salmon strategy, assist in the development of regional salmon recovery plans, and submit the strategy and plans to the federal government. The office will also provide the Biennial State of the Salmon report to the Legislature.

Department of Natural Resources
DNR through the Forest Practice Board has developed a Forestry Module. The results are presented in the Forest and Fish Rule. The Board has established the following Forestry Module goals: To provide compliance with the ESA for aquatic and riparian dependent species on state

and private lands; To restore and maintain riparian habitat on state and private forest lands to support a harvestable supply of fish; To meet the requirements of the Clean Water Act for water quality on state and private forest lands; and To keep the timber industry economically viable in the state of Washington.

Washington Department of Ecology

The WDOE impacts habitat in the subbasin in a variety of ways. Most importantly is the issuance of permits under the State Environmental Policy Act (SEPA) and the Shoreline management Act. WDOE also participates in the development of county comprehensive plans for growth management and the development of DNR's Forestry Module.

WDOE also issues municipal and industrial wastewater and storm water permits. It is involved in setting water allocations and instream flow.

Local Government

Cowlitz County

Cowlitz County encompasses the Kalama watershed. Under the Growth Management Act the county must identify and protect critical lands. The county is in the process of bringing their ordinances into compliance.

Lower Columbia Fish Recovery Board

Established in 1998 by state law, the Lower Columbia Fish Recovery Board (LCFRB) encompasses five counties in the southwest Washington region. The Board's mission is to recover steelhead and other species listed under the ESA through the development and implementation of a comprehensive recovery plan. The 15-member board is responsible for implementing the habitat portion of an approved state and federal recovery plan. To accomplish this, the Board is authorized to establish habitat project criteria, prioritize and approve projects, acquire and distribute funds for projects, enter into contracts on behalf of project sponsor, and assess and monitor project outcomes. The Board holds regular monthly meetings on the first Friday of each month at different locations across the region.

Existing Goals, Objectives, and Strategies

In the State of Washington's Statewide Salmon Strategy, its goal is to "restore salmon, steelhead, and trout populations to healthy harvestable levels and improve the habitat on which fish rely on". WDFW has a mission statement of "Sound stewardship of fish and wildlife". The WDFW Wild Salmonid Policy goal is to "Protect, restore, and enhance the productivity, production, and diversity of wild salmonids and their ecosystems to sustain ceremonial, subsistence, commercial, and recreational fisheries; non-consumptive fish benefits; and other related cultural and ecological values" (WDFW 1997).

WDFW also has goals and objectives for wildlife. These goals are:

Maintain the historic statewide diversity of native wildlife species. Determine the ecological needs and population status of wildlife species of concern.

Develop an inventory of the current habitats of wildlife populations. Protect and manage for recovery of all native wildlife classified as endangered, threatened or sensitive.

Manage game populations for sustainable natural production where feasible.

Nez Perce, Umatilla, Warm Springs, and Yakima Tribes in the Tribal Restoration Plan listed the following goals: "Restore anadromous fishes to the rivers and streams that support the historic cultural and economic practices of the tribes. Emphasize strategies that rely on natural production and healthy river systems to achieve this goal. Protect tribal sovereignty and treaty rights. Reclaim the anadromous fish resource and the environment on which it depends for future generations.

Objective 1: The Draft Endangered Species Act Implementation Plan for the Federal Columbia River Power System has a section on research monitoring and evaluation. It states," the primary objectives of the RM&E component of this Plan are: Track the status of fish populations and their environment relative to required performance standards; identify the physical and biological responses to management actions: and resolve critical uncertainties in the methods and data required for the evaluation of future population performance and needed survival improvements".

Strategy 1. Monitor effects of HGMP's (Appendix B.) It is imperative to be able to monitor the freshwater production of naturally spawning salmon, cutthroat and steelhead in the subbasin in order to understand the potential effects of hatchery stocking. Spawning and rearing areas should be identified and protected. Smolt production should be determined through the use of downstream migrant traps on major tributaries. Wild escapement should be documented through the use of redd surveys and carcass counts.

Strategy 2. Hatchery and wild interactions on spawning grounds need to be monitored. Spatial and temporal differences between hatchery and wild fish of the same species need to be documented. Spawning ground surveys should provide this information. Snorkel surveys could document interactions of hatchery residuals and wild juvenile fry.

Objective 2: Monitor the effect of FMEP.

Strategy 1. The objectives of the WDFW's FMEP are based on the WDFW Wild Salmonid Policy. In that policy, it states that harvest rates will be managed so that 1) spawner abundance levels abundantly utilize available habitat, 2) ensure that the number and distribution of locally adapted spawning populations will not decrease, 3) genetic diversity within populations is maintained or increased, 4) natural ecosystem processes are maintained or restored, and 5) sustainable surplus production above levels needed for abundant utilization of habitat, local adaptation, genetic diversity, and ecosystem processes will be managed to support fishing opportunities (WDFW 1997a). In addition, fisheries will be managed to insure adult size, timing, distribution of the migration and spawning populations, and age at maturity are the same between fished and unfished populations.

Strategy 2. Intensive efforts will be needed to determine the extent of the balance between harvest and escapement to fully seed the available habitat. Commercial and recreational fisheries will be monitored to prevent over harvest and insure comparable and temporal similarities between fished and unfished populations. Coded wire tags will identify the disposition of captured fish. Genetic sampling should be conducted to ascertain wild and hatchery genetic profiles and potential stray rates.

Objective 3: Develop management guidelines for game and nongame species that are endangered, threatened or sensitive (ETS) and identify, map, and update the Priority Habitats and Species (PHS) data.

Strategy 1. Maintaining diversity statewide can best be achieved by maintaining diversity in individual watersheds. The wildlife species in the Washougal are a diverse group of native, game and ETS species. Proper management of these species in the watershed will aide in maintaining diversity.

Objective 4: Conduct and support research to investigate the population status, habitat requirements and the natural ecology of wildlife species of concern and determine abundance, distribution and composition of game populations and incorporate into GIS database.

Strategy 1. Spotted owls, bald eagles, and Larch Mountain salamanders are all species of concern statewide and in the Washougal River watershed. Whereas the ecological needs and population status of owls and eagles have been well described, little is understood regarding Larch Mountain salamanders. Work being conducted in the watershed will increase our understanding of this species.

Strategy 2. Mapping and inventorying wildlife habitats is key to protection of the Washougal River wildlife. Remote sensing and GIS technologies have been used elsewhere to map current conditions of critical habitat components. We need to do the same for the Washougal subbasin for the key species and then model habitat changes and their impacts on wildlife in the future.

Objective 5: Develop and implement recovery and management plans for ETS species and develop management plans for game species in the Washougal subbasin.

Strategy 1. Managing the Washougal River watershed at the landscape scale will aid in protecting all native species, including ETS species. Understanding individual species habitat requirements and interactions with other will improve long-term sustainability of wildlife diversity in the watershed.

Objective 6: Identify and evaluate acquisition needs for important habitat of game species in WRIA #27.

Interim Regional Habitat Strategy.

SECTION 1. Introduction

This document outlines the goals and strategies the Lower Columbia Fish Recovery Board and its Technical Advisory Committee will use to:

A. Identify and rank habitat restoration and protection needs; and
B. Evaluate and rank habitat project proposals.

It should be noted that this document is an ***interim*** habitat strategy. The adequacy and sophistication of available information on fish stocks, watershed functions, and habitat conditions varies significantly across the lower Columbia region. The strategy will be refined, as better information and analytical tools become available. It is anticipated that this strategy will evolve over the next several years to become an integral element in a comprehensive salmonid recovery plan for the lower Columbia.

In the near-term, this strategy will assist the Board and project sponsors to better target limiting factors and habitat protection needs in a way that will help maximize benefits for fish recovery and ensure the most effective use of limited resources.

The strategy provides fish recovery and habitat recovery goals. It prioritizes fish stocks and habitat recovery and protection needs. And, finally, it sets forth the means the Board and TAC will use to evaluate and rank project proposals.

SECTION 2. Goals

The LCFRB was established by RCW 77.85.200 to coordinate fish recovery activities in the lower Columbia region of Washington State. The Board's key activities include recovery planning, watershed planning and habitat restoration and protection.

It is the overall habitat goal of the Lower Columbia Fish Recovery Board to provide the habitat necessary to support healthy, harvestable populations of ESA listed fish species in the lower Columbia region of Washington. Specific goals for fish recovery and habitat restoration and protection are:

A. Fish Recovery Goals

1. **Support Recovery of ESA listed stocks.**

   First priority in achieving this objective will be given to stocks that are listed under the federal ESA. Four of six lower Columbia salmonid species are currently listed as threatened. These are chinook and chum salmon, steelhead, and bull trout. The ESA defines species as threatened when it is "likely to become endangered within the foreseeable future throughout all or a significant portion of its range." A species is considered endangered when it is "in danger of extinction throughout all or a significant portion of its range."

Second priority will be given to species that are candidates or are proposed for listing under the ESA. Currently coho salmon are a candidate for listing. Sea-run cutthroat are proposed for listing as a threatened species.

2. **Support biodiversity through recovery of native wild stocks.**

The maintenance of genetic and life-cycle diversity across the region is critical to the recovery of listed fish species. To help preserve this diversity, priority will be given to habitat projects benefiting naturally spawning, locally adapted fish stocks with minimal hatchery influence. The stock origin and production type classifications used for identifying and prioritizing stocks to achieve this objective are those provided in:

a) The 1993 Washington Department of Fish and Wildlife (WDFW) Salmon and Steelhead Stock Inventory (SASSI);
b) The 1998 Salmonid Stock Inventory for bull trout (SaSI);
c) The 2000 Salmonid Stock Inventory for coho (SaSI); and
d) The Lower Columbia Steelhead Conservation Initiative (LCSCI, 1997).

SASSI notes that its stock origin designations should be considered as preliminary until such time as more detailed information confirms or refutes the current origin designations. For this reason, the SASSI data will be augmented by more recent information where and when it becomes available. In developing project proposals, sponsors are encouraged to bring forward any additional information available regarding stock identification, origin, production and status.

Based on the SASSI information, first priority under this objective will be given to stocks that are designated as being of **native** origin and **wild** production. Second priority will be given to stocks of **mixed** or **unknown** origin and **wild** production. Third priority will be given to stocks of **mixed** origin and **cultured** or **composite** production.

SASSI defines a **native** as "an indigenous stock of fish that has not been substantially impacted by genetic interactions with non-native stocks, or by other factors, and is still present in all or part of its original range." **Mixed** stocks are defined as those whose individuals originated from commingled native and non-native parents, and/or by mating between native and non-native fish; or a previously native stock that has undergone substantial genetic alteration." Stocks of **unknown** origin are those "where there is insufficient information to identify stock origin with confidence."

SASSI defines a **wild** production stock as one that "is sustained by natural spawning and rearing in natural habitat, regardless of parentage." A **cultured** stock is defined as one that "depends upon spawning, incubation, hatching, or rearing in a hatchery or other artificial production facility." A **composite** stock is a stock "sustained by both wild and artificial production."

3. **Restore or sustain geographic distribution of stocks.**

Maintaining multiple stocks across the region is necessary to reduce the risk that changes in environmental conditions, catastrophic events, and disease will result in unacceptable risk of species extinction. Priority will be given to restore or sustaining the historic geographic distribution of stocks. Noteworthy in this regard are listed chum stocks. Currently only three relatively small stocks of chum exist in the region. They are located in the Grays River, Hardy Creek and Hamilton Creek. Other stocks with limited geographic distribution are summer steelhead and bull trout. Efforts should be made to increase the number and distribution of these stocks throughout their historic range within the region through habitat restoration activities.

4. **Maintain healthy stocks of a listed species.**

Maintaining healthy stocks of listed salmonid species can substantially reduce the biological risk and costs of species recovery. Rather than allowing habitat conditions to deteriorate to the point that healthy stocks are reduced to depressed or critical levels, priority will be given to projects that protect or restore habitat conditions and habitat – forming processes upon which existing healthy stocks of listed salmonid species depend.

Healthy stocks in the lower Columbia region are identified in Attachment 1. Of the 46 stocks of listed salmonid species in the lower Columbia, 17 are identified as healthy (13 fall chinook, 2 spring chinook, 1 winter steelhead, and 1 chum). The list is based on the WDFW SASSI and SaSI, LCSCI, and Limiting Factor Analysis (LFA, 1999-2001) reports for WRIA's 26 through 29. The information contained in Attachment 1 will be updated and augmented by more recent data when available.

5. **Support recovery of critical stocks of listed species**

SASSI classifies a stock as "critical" if it is "experiencing production levels that are so low that permanent damage to the stock is likely or has already occurred." SASSI further states that these stocks are "in need of immediate restoration efforts to ensure their continued existence and to return them to a productive state."

The loss of a critical stock can reduce genetic and life cycle diversity within the region. For this reason habitat restoration and protection actions needed to support the recovery of critical stocks will be given priority. The SASSI report did not identify any critical stocks in the lower Columbia. However, the LCSCI classified Wind River summer steelhead stocks (Mainstem, Panther Creek, Trout Creek) as being in critical condition. Accordingly, habitat projects benefiting these stocks will be a high priority.

B. Habitat Protection and Restoration Goals

Recovery of salmonid species requires the restoration and protection of the habitat conditions and processes upon which the fish depend. The following goals are listed in priority order.

1. **Restore access to habitat**

   Removal of man-made barriers to substantial reaches of good quality habitat provides important benefits to fish in both the near and long term. Actions to improve access can include removal or replacement of blocking culverts and reconnecting isolated habitats, such as side channel areas. Protecting or restoring properly functioning habitat conditions are only beneficial if fish have the necessary access to the habitat. In assessing the need to remove a barrier consideration must be given to the stocks and life-history stages affected and the type, quality and quantity of habitat that would be made accessible. LFA reports, barrier inventories, and other watershed and habitat assessments will be used in assessing the need to remove or correct a barrier.

2. **Protect existing properly functioning habitat conditions.**

   Existing high quality habitat is critical to sustaining current fish abundance and productivity. Habitat restoration can be expensive and technically difficult, if not impossible. For this reason, protecting properly functioning habitat from degradation and loss is an important priority. LFA reports, other watershed and habitat assessments, and stock priorities will be used to identify and rank habitats for protection.

   The quality and quantity habitat, the potentially affected stocks, and the nature and urgency of the threat to habitat values are key considerations in determining habitat protection needs. Priority will be given to protection of high quality habitat facing serious near-term threats.

3. **Restore degraded watershed processes needed to sustain properly functioning habitat conditions.**

   Habitat projects should focus on the restoration of watershed functions that will sustain habitat conditions upon which salmon stocks depend over the long-term. Projects that address a habitat need on a temporary or near-term basis may be justified as a critical interim step in a comprehensive effort to restore natural habitat forming processes over the long-term. IFA reports and other technical assessments will be used to help identify and prioritize key watershed functions requiring restoration or protection in each basin.

4. **Support of critical salmonid life-history stages.**

   Projects may target habitat conditions needed to support critical life-history stage needs. LFA information and other technical assessments should be used to help identify the key habitat needs for each species in a given basin. Sponsors should provide adequate supporting information linking:

   - The habitat requirements of target species and life-history stages.
   - The availability of those habitat conditions relative to historic conditions.
   - The likelihood that the lack of suitable habitat is restricting population abundance.

   Consideration will also be given to a project's contribution to critical life-history stages on a regional level. Some basins, such as the Chinook River, play an important role in the life history of fish stocks from outside the lower Columbia region. (Dewberry, 1997).

Project proposals should clearly identify each species and its life-history stages that will benefit from the proposed action.

5. Secure near and long-term benefits

Addressing habitat protection and restoration needs that will provide both near-term and sustainable long-term benefits for fish should receive a higher priority than addressing conditions that will provide benefits to fish only in the long-term. Projects that provide only short-term benefits may be justified if they are:

a) Part of a comprehensive effort to restore natural habitat processes over the long-term, and
b) Designed to sustain or protect a stock(s) until natural habitat processes are restored.

SECTION 3. Fish Stock Priorities

Stocks for each salmonid species have been categorized into four tiered priority groupings to assist setting habitat priorities within each watershed and across the lower Columbia region. Stocks for each watershed, except the Chinook River, were identified using SASSI. SASSI defines a stock as "the fish spawning in a particular lake or stream(s) at a particular season, which fish to a substantial degree do not interbreed with any group spawning in a different place, or in the same place at a different season."

Since SASSI stock information is not available for the Chinook River, stocks for this watershed were identified using information from Sea Resources (Dewberry, 1997), WDFW, and the WRIA 24/25 LFA.

The tiered breakdown integrates goals 1 through 5 discussed in Section 2.A above. It uses stock information taken from SASSI, LFA reports, and LCSCI. SASSI definitions of stock origin, production type, and status are outlined in Section 1.A. Attachment 1 provides a list of stocks by watershed or basin. Attachment 2 provides a listing of stocks by tier. The criteria for each of the four tiers is provided below:

A. Tier 1 (Highest Priority)

This Tier includes stocks that are (1) listed as threatened pursuant to the ESA <u>and</u> are (2) classified by SASSI as native, mixed, or unknown in origin and wild in production. It also includes all chum, summer steelhead, and bull trout stocks due to their limited geographic distribution. It may include stocks designated by SASSI as healthy, depressed, or critical if the stocks satisfy the ESA, origin, and production type designations for this Tier.

B. Tier 2

This Tier includes stocks that are (1) listed as threatened pursuant to the ESA <u>and</u> are (2) classified by SASSI as mixed, non-native, or unknown in origin and composite in production. It includes all stocks designated by SASSI as healthy or critical and not included in Tier 1. It may also include a stock designated as depressed if the stock satisfies the ESA, origin, and production type designations for this Tier.

C. Tier 3

Tier 3 includes all stocks that are proposed or are candidates for listing under the ESA. They may be of any stock origin, production type, or status designation.

D. Tier 4 (Lowest Priority)

Tier 4 includes all stocks that are not listed or proposed for listing under the ESA. They may be of any stock origin, production type, or status designation.

SECTION 4. Habitat Protection and Restoration Priorities

The number of affected stocks and their importance along with the degree to which correction of a limiting factor or protection of habitat would help achieve or sustain properly functioning habitat conditions are key considerations in determining habitat priorities.

As discussed in Section 3, Attachment 1 identifies fish stocks by basin and their priority rating, tiers 1 through 4. It should be noted that not all stocks will be present throughout the basin. Stocks likely to be present in a given river reach can be determined using the LFA fish presence information and maps.

Attachment 3 provides a ranked list of limiting factors. Limiting factors have been identified using LFA reports. The importance of each limiting factor is ranked as high, medium, or low based on the habitat goals set forth in Section 2.B. Attachment 3 presents this ranking information in matrix form. It is organized by basin using the LFA sub-basin designations. In addition to ranking limiting factors within a basin, potential restoration and protection actions have been identified for each limiting factor. Finally, fish stocks and their priorities are also listed for each basin.

In general, limiting factors rated as high and affecting multiple high priority (Tier 1 or 2) stocks are a higher priority than limiting factors rated moderate or low and affecting few or lower priority (Tier 3 or 4) stocks.

This information is provided to assist project sponsors in identifying and developing projects that will address the most important habitat protection and restoration needs. It is intended to serve as guidance. It will be refined as additional information on fish stocks and habitat conditions becomes available. It should be further noted that basing a project on a limiting factor that is rated as high and affects high priority fish stocks substantially enhances the likelihood, but does not ensure, that a project will receive a high priority for funding. As discussed in Section 5 below, a project's priority for funding is based on both its benefit to fish and certainty of success. Certainty of success takes into consideration a project's relationship to other limiting factors and restoration efforts as well as project design, cost, and management elements.

SECTION 5. Evaluation and Ranking of Habitat Projects

The ranking of habitat project proposals will be done using the same basic approach outlined for establishing habitat priorities but also takes into consideration the degree to which a project addresses an identified habitat priority and factors affecting the level of certainty that a project will produce its intended benefits for fish.

A. Evaluation Criteria

Each proposed habitat project will be evaluated using the following criteria:

1. Benefits to Fish

a. The number of stocks that will be affected and their priorities.

The number of stocks that would benefit from a project and their priority will be determined using the tiered stock listing discussed in Section 3 and the fish presence information contained in the applicable LFA report or other comparable source.

b. The nature and significance of the benefit's the project will have for the affected stocks.

While the benefit for all affected stocks will be considered, greatest weight will be given to the project's potential value to ESA listed species or unique stocks essential for recovery.

c. The degree to which the proposed correction of a limiting factor or protection of habitat would help to achieve and sustain properly functioning habitat conditions.

Factors to be considered include the extent to which a project addresses:

(1) An identified habitat priority as discussed in Section 4 or limiting factors identified in an LFA report or other technical assessment.
(2) Section 2.B habitat goals. These include the value of the project in:
   (a) The importance of the project in restoring access to habitat;
   (b) Achieving and sustaining properly functioning habitat conditions; and
   (c) Providing for critical salmonid life history stages in the reach or basin.

2. Certainty of Success

The level of certainty that the project would produce its intended benefit for fish will be assessed based on the extent to which the proposed project:

a. Complements other habitat protection and restoration programs and projects within a basin.

Habitat projects should be designed, coordinated, and sequenced in concert with other salmon recovery activities with a watershed or basin. This can help to achieve the greatest benefit to fish in the shortest possible time and with the most efficient use of resources.

Specific consideration will be given to whether a project is:

(1) An element of a comprehensive watershed or basin restoration and protection strategy;
(2) Well coordinated and logically sequenced with other habitat projects completed, underway, and planned for a watershed or basin; and/or
(3) Complements and supports other local and state salmon recovery regulations and programs, including land use and development regulations, critical area ordinances, storm water management programs, shoreline master plans, forest management regulations, etc.

b. Has a sound technical basis in addressing habitat forming processes and limiting factors.

The success of a project requires a solid understanding of conditions and watershed processes that cause or contribute to the problem or limiting factor being addressed. For some projects, existing LFA information may be sufficient. More complex problems may require a more thorough assessment of conditions and watershed processes. This information may be available through existing studies and evaluations. In some cases, site-specific assessments and design work may be required. In order to assess whether a project has an adequate supporting technical basis, it will be important that the project proposal addresses considerations listed for its project type contained in the Guidance on Watershed Assessment for Salmon, Part 3 (Joint Natural Resources Cabinet, State of Washington, May 2001).

c. Demonstrates that sponsor experience and capabilities are commensurate with project requirements.

The success of a habitat project is dependent on the project sponsor's ability to design, plan, implement and monitor a project. Ideally, project sponsors should have experience in successfully completing project of similar nature, scope, and complexity. At a minimum, sponsors should indicate how they would acquire needed experience and expertise that they do not possess. Options for doing so could include partnerships with other agencies or organizations, or contracting for needed services.

d. Applies proven methods and technologies.

The certainty of a projects success can be enhanced through the use of proven and accepted methods and technologies. Projects should utilize approaches and technologies that are commensurate with the nature, scope, and complexity of the problem being addressed.

Innovative or experimental approaches may be acceptable if no proven method exists or it can be shown that they will reasonably extend knowledge of restoration methodologies.

e. Has community support. The long-term success of habitat restoration and protection efforts depends on the acceptance and support of local communities. Projects should be designed and implemented in a manner that accommodates local values and concerns.

f. Demonstrates that costs are reasonable for the work proposed and the benefit to be derived.

Given that resources for habitat protection and restoration are limited, projects should be designed and implemented in the most efficient and effective manner possible. Project costs should be commensurate with those for projects of similar nature, scope, and complexity. A project's chance of success can also be enhanced through the use of partnerships that can leverage expertise, contributions of materials and labor, and funding.

g. Demonstrates an effective maintenance and monitoring element.

Monitoring the effectiveness of the project is critical to determining the success of the project in meeting its objectives. Maintenance of a completed project may be critical to the project's performance and long-term effectiveness.

B. Scoring and Ranking of Habitat Project Proposals

Habitat projects will be scored by the TAC using a score sheet that is based on the evaluation criteria discussed in section 4.A. above. A sample score sheet is provided as Attachment 4.

Each project will be scored on both its benefits for fish and certainty for success. As discussed above a project's benefit to fish is determined by the affected stocks and their priority and the degree to which the proposed correction of a limiting factor or protection of habitat would help to achieve and sustain properly functioning habitat conditions. Certainty of success is the level confidence that a project will achieve its goals.

The scores for each project will be used to rate its benefit for fish and certainty of success as high, medium, or low. Based on these designations a project will be assigned to a priority using the matrix below. Within each priority category projects will be ranked based on their combined benefit and certainty scores. Projects in categories 1, 2 and 3 will be recommended for funding.

Research, Monitoring, and Evaluation Activities

Fisheries

These activities occur in all lower Columbia subbasins:

- Activity 1: Collection of coded wire tags from hatchery returns and fish spawning in river.
  - Activity 1.1: WDFW staff at Washougal and Skamania Hatcheries collect and process coded wire tags from returning fish. Tags are read at the WDFW laboratory in Olympia.
  - Activity 1.2: Pacific States Marine Fish Commission (PSMFC) staff conduct spawning ground surveys, marking redd sites and collecting coded wire tags from returned spawners.
- Activity 2: Creel checks and coded wire tags are recovered through sport check surveys.
- Activity 3: SSHIAP will provide data for the Washougal River basin area. This data will include:
  - Activity 3.1: Comprehensive fish barrier coverage.
  - Activity 3.2: Fish Distribution by species, life stages.
  - Activity 3.3: Habitat Typing by segment- breaks stream reaches into small/large tributary, gradients, habitat type (wetlands, etc), and confinement.
  - Activity 3.4: Hydromodifications. SSHIAP will catalogue various hydromodifications in the drainage. Hydromodifications include anthropogenic structures that in some way prohibit natural alluvial processes. These can include riprap banks, bulkheads, roads, and other features present in the active floodplain.
  - Activity 3.5: Other background information such as stream widths and flow will also be added. Habitat typing will be completed by mid November. Hydromodifications will be completed by Dec. 31, 2001. All of this information will be available in GIS format on the web sometime after Dec. 31.

Wildlife

1. Activity 1: Develop management guidelines for game and nongame species that are endangered, threatened or sensitive (ETS) and identify, map, and update the Priority Habitats and Species (PHS) data.
2. Activity 2: Conduct and support research to investigate the population status, habitat requirements and the natural ecology of wildlife species of concern and determine abundance, distribution and composition of game populations.
3. Activity 3: Develop and implement recovery and management plans for ETS species and develop management plans for game species in the Washougal subbasin.
4. Activity 4: Identify and evaluate acquisition needs for important habitat of game species in Washougal subbasin.

Statement of Fish and Wildlife Needs

Evaluate and monitor fisheries for meeting performance indicators identified in the NMFS Fisheries Management and Evaluation Plan (FMEP) for the Lower Columbia River.
Rationale: Limited monitoring of fish populations is presently occurring (see existing monitoring activities), but should be expanded to insure populations are not exceeding levels identified in the FMEP. This would allow harvest of surplus population while protecting wild populations.

Determine abundance, distribution, and survival by life-stage, and status of fish and wildlife native to the watershed including steelhead, coastal cutthroat, fall chinook, coho salmon, crayfish, and others.
Rationale: Lewis River steelhead, chum and chinook salmon are part of the Lower Columbia River ESU and are currently listed under the ESA. Abundance and survival estimates will be needed to determine if habitat restoration programs are working and to determine if these fish can be removed from the Endangered Species list. Coastal cutthroat trout have been proposed for listing under ESA and coho salmon are considered a candidate for listing under ESA because of possible lowered status across their distributional range. Little is known about historical and current distribution and status of these fish in this watershed. ecosystem.

Determine genetic and life history types of native fish and wildlife and the strength of their current expression relative to historical and desired future conditions.
Rationale: Maintaining life history and genetic diversity allow fish to be productive under the current and a wide variety of future conditions. Determining these levels of diversity will help develop successful recovery strategies.

Determine the effectiveness of habitat restoration projects on achieving the desired physical change and measure the response of fish and wildlife populations to these changes.
Rationale: The State of Washington and the Lower Columbia Fish Recovery Board have spent thousands of dollars on habitat restoration in the Washougal River and requests have been made to continue this effort. Large-scale monitoring and site-specific monitoring projects are needed to evaluate the effectiveness of these actions to rebuild fish and wildlife populations.

Conduct routine surveys for chum salmon in the lower Kalama subbasin. Evaluate seeps and other potential spawning areas for chum production.
Rationale: Chum were present in the Kalama River. Seeps and springs within the lower Kalama subbasin may prove to be alternative sites for successful chum spawning.

Implement restoration actions identified in the watershed assessments that are consistent with recovery of fish and wildlife populations and their habitat.
Rationale: Restoration projects that are the outcome of watershed assessments and have gone through a review process have addressed factors that limit the recovery of fish and wildlife populations. These projects should have a high probability for success. The above or modified monitoring and evaluation programs should be funded as part of these restoration activities.

Continue watershed coordination and local stewardship programs.
Rationale: The land and resource management decision needed to recover fish and wildlife populations and their habitat will impact local residents. Many of these people are knowledgeable about these resources and should be part of the decision process. The involvement of the Clark Skamania Flyfishers and Fish First is important to the outcome of management decisions and address local concerns about long-term community and economic sustainability.

Evaluate the needs and results of a nutrient enhancement project. If determined it is successful, design and implement a comprehensive nutrient introduction plan.
Rationale: Salmon carcasses play a major role in ecosystem health by directly and indirectly contributing to watershed and fish productivity. In recent years, salmon carcasses from the Kalama Falls Hatchery were used as a nutrient source.

Implement aquatic macro invertebrate monitoring program.
Rationale: Aquatic macroinvertebrates serve as an effective measure of a stream's natural potential for productivity, habitat quality and water quality. Analysis of the macroinvertebrate communities can reveal conditions and trends in aquatic ecosystems. Few samples of aquatic macroinvertebrates have been collected in the Kalama River subbasin. Macroinvertebrates are a recommended means of monitoring the effects a nutrient enhancement program.

Implement needed hatchery repairs to bring Kalama Falls, and Fallert Creek Hatcheries into compliance with "wild" fish protection measures.
Rationale: Kalama River intake and adult holding areas are not in compliance with current standards. Adult holding areas are not conducive for rapid sorting of fish and exclusion of wild steelhead. Intakes and holding areas should be brought up to current standards. Old pump systems at Kalama River need more efficient replacement. The intake at Speelyai Hatchery and upstream water diversion need to be modified to reflect the extensive logging and development occurring in the Speelyai basin.

Expand enforcement program for the entire Lower Columbia Basin.
Rationale: Successful fish and wildlife management programs require citizen compliance. While some users will intuitively act in the best interests of the resource, an effective enforcement and compliance regime is necessary to insure full cooperation with management goals.

Kalama Subbasin Recommendations

Projects and Budgets

No project proposals were submitted in the Kalama Subbasin.

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