2 Fish and Wildlife Species

This section describes the species addressed by this plan. While fundamentally a recovery plan for listed salmon, steelhead and trout, this plan also affects other species by virtue of the broad-based ecosystem focus of salmon and trout recovery as well as the need to address Federal Columbia River hydro system impacts on a variety of fish and wildlife species. This section includes brief descriptions of the life history, status, and limiting factors for each species. Additional detail on species may be found in Appendices A and B.

2.1 Background

This plan is primarily focused on listed salmon, steelhead, and trout – all ESA-listed and candidate salmonid species are included. The plan identifies a comprehensive ecosystem-based approach to salmonid recovery involving all factors and threats that affect these species throughout their life cycle. Because restoration of freshwater habitat and habitat forming processes will be fundamental to this approach, this plan will benefit a wide variety of fish and wildlife species that are part of or are affected by lower Columbia River aquatic ecosystems.

To recognize the ecosystem scope of this effort, the plan also included a representative subset of other significant fish and wildlife species that affect salmon, are affected by salmon recovery, or are useful for characterizing watershed status, functions, or management actions. Biological objectives and strategies are identified for all species. Objectives and strategies take different forms due to inherent differences in species significance, ecological interactions, information available, and management structures in place.

Selected species address both salmonid recovery and NPCC subbasin planning purposes. NPPC subbasin planning needs include species affected by construction and operation of the federal Columbia River hydropower system. The NPCC *Technical Guide of Subbasin Planners (NPCC 2001)* identified criteria for species selection based on designation as federal endangered or threatened species; ecological significance; cultural significance; and local significance. A species list was developed by the LCFRB and the WDFW based on a review of potential candidates of interest in recovery area. As part of the joint LCFRB/LCREP effort to develop the subbasin plan for the Columbia Estuary and Lower Columbia subbasin, a Planning Group[1] was formed to further develop and refine the species list. Additional refinements were included as part of the collaborative plan development process.

The list of species was divided into broad categories that help convey the purpose and significance that individual species play in the planning process (Table 1).

Focal Species.– Listed salmon, steelhead, and trout species received the highest level of attention in this plan. These species were elevated in importance by the focus of state and federal recovery planning efforts. Salmon and steelhead are of region-wide legal, ecological, cultural, economic, and recreational importance. Life cycle requirements of salmon and steelhead have far-reaching implications to landscape-level processes and habitat conditions both within and outside of the subbasins. The plan incorporates elements of an existing bull trout recovery plan developed by the U.S. Fish and Wildlife Service into a regional context that includes other fish and wildlife species of interest.

Other Sensitive Species.– These include other species of special conservation concern. Included are other state or federally-listed threatened or endangered species that may be affected by salmon recovery actions or hydro system construction and operations. Also included are species that are subject to other special conservation protections.

Species of Ecological Interest.– This category of species is important from a management perspective or is related to the general health of the subbasins in terms of quality of the environment or habitat diversity. Individual species may be of interest because of their value as an indicator of ecosystem health or of a specific habitat type. The category also includes significant predators of salmon.

[1] NOAA Fisheries, US Fish & Wildlife Service, WA Dept of Fish & Wildlife, OR Dept of Fish & Wildlife, LCREP, LCFRB, City of Portland, Clatsop County Economic Development, CREST, USACE.

Table 1. Species included in this plan, listing status, and planning context. Ecological significance refers to species that are important components or indicators of the biotic community. Cultural significance is based on historical or current roles in society. Economic significance denotes species directly responsible for economic costs or benefits. Recreational significance identifies species where economic benefits are in the form of use.

Species	Listed[1]	Ecological[2]	Cultural	Economic[2]	Recreation
Focal Species					
Fall Chinook	FT	X	X	X	X
Chum	FT	X	X	X	X[3]
Spring Chinook	FT	X	X	X	X
Winter Steelhead	FT	X	X	X	X
Summer Steelhead	FT	X	X	X	X
Coho	FC	X	X	X	X
Bull Trout	FT	X[4]			
Other Sensitive Species					
Bald Eagle	FT	X	X		
Sandhill Crane	WE			X[5]	X
Dusky Canada Goose				X[5]	X
Col. Whitetail Deer	FE	X[4]	X		
Fisher	FS, WE	X			
Western Gray Squirrel	FS, WT	X			
Seals & Sea Lions	FT[11]	X			
Western Pond Turtle	WE				
Oregon Spotted Frog	WE	X			
Larch Mt. Salamander	FS, WS	X			
Species of Ecological Significance					
Cutthroat Trout		X		X	X
White Sturgeon		X	X	X	X
Green Sturgeon		X		X	
Eulachon		X	X	X	X
Pacific Lamprey		X	X	X	
Northern Pikeminnow		X		X[8]	X
American Shad		X[7]		X	X
Band-tailed Pigeon		X			X
Caspian Tern		X[6]		X	
Osprey		X			
Yellow Warbler		X[10]			
Red-eyed Vireo		X[10]			
River Otter		X[9]			
Species of Recreational Significance					
Walleye[7]		X		X	X
Smallmouth Bass[7]		X		X	X
Channel Catfish[7]		X		X	X

1 Listing status: FT = Federal threatened, FE = Federal endangered, FC = Federal candidate, FS = Federal species of concern, WE = Washington endangered, WT = Washington threatened, WS = Washington sensitive.
2 May be positive or negative ecological or economic impact; this column only indicates relative significance.
3Active recreation potential (e.g., harvest).
4 Likely ecologically important historically.
5 Seasonal crop damage.
6 Historically not present.
7 Non-native species.
8 Some economic importance for control program.
9 Indicator of ecosystem health.
10 Indicator of habitat type.
11 Stellar sea lion is federally listed as threatened, harbor seals and California sea lions are not listed.

Species of Recreational Interest.– This category of non-native species is primarily of recreational interest. These species might also interact with other species of interest.

Categories highlight the primary interest in any species but are not mutually exclusive. For instance many focal, other sensitive, and recreational species are ecologically significant.

Detailed descriptions of the biology and life history of each species are found in Technical Appendix A for focal salmonid species and Technical Appendix B for other fish and wildlife species. The following subsections briefly summarize the life history and status of each species.

2.2 Focal Species

A primary focus of this plan is the recovery of Chinook salmon, chum salmon, coho salmon, steelhead, and bull trout in the Washington lower Columbia region. These salmonid species are also considered focal species for subbasin planning pursuant to the criteria provided in the NPCC's *Technical Guide of Subbasin Planners (NPCC 2001)*. Chinook salmon, chum salmon, steelhead, and bull trout are all listed as Threatened under the U.S. Endangered Species Act. Coho are a candidate species for listing with a listing decision pending. Lower Columbia River chum salmon, chinook salmon, coho salmon, and steelhead along with upper Willamette steelhead and chinook salmon comprise a Willamette/Lower Columbia domain, as part of a multispecies approach that could address common regional recovery issues.

Available evidence clearly indicates that wild salmonid populations have declined significantly. The following are estimates of current and historical population sizes. Current abundance is based on recent year adult return observations. The historic estimates are approximations based on both habitat modeling and an estimate of distribution of the historic Lower Columbia returns.

Table 2. Historical and current abundance of wild salmon and steelhead in the Washington Lower Columbia Recovery Region.

Species Group	Approximate Historical Abundance	Recent Years Wild Escapement
Spring Chinook	125,000	800
Tule fall Chinook	140,000	6,500
Bright fall Chinook	19,000	9,000
Chum	870,000	6,000
Winter steelhead	100,000	3,500
Summer steelhead	28,000	1,500
Coho	430,000	6,000

Today's small wild runs are largely supported by, or at least genetically influenced by, strays from the 20 major hatcheries in the lower Columbia region. Only a few of the many populations are still considered to be genetically wild. Data is insufficient to produce a similar assessment of historical bull trout numbers. In the Lewis River, the only lower Columbia system where bull trout populations have been documented, the population is numbered in the hundreds.

2.2.1 Chinook Salmon

Lower Columbia River Chinook (*Oncorhynchus tshawytscha*) are classified as fall or spring run based on when adults return to fresh water (Table 3). Both spring and fall runs have been designated as part of a lower Columbia River Chinook ESU that includes Oregon and Washington populations in tributaries from the ocean to and including the Big White Salmon River in Washington and Hood River in Oregon.

Table 3. Life history and population characteristics of Chinook salmon originating in Washington portions of the lower Columbia.

	Racial Features		
Characteristic	**Spring**	**Tule fall**	**Late fall bright**
Number of extant populations	7 (including 4 that are possibly extinct)	13	1
Life history type	Stream	Ocean	Ocean
River entry timing	March – June	August – September	August – October
Spawn timing	August – September	September – November	November – January
Spawning habitat type	Headwater large tributaries	Mainstem large tributaries	Mainstem large tributaries
Emergence timing	December – January	January – April	March – May
Duration in freshwater	Usually 12-14 months	1-4 months, a few up to 12 months	1-4 months, a few up to 12 months
Rearing habitat	Tributaries and mainstem	Mainstem, tributaries, sloughs, estuary	Mainstem, tributaries, sloughs, estuary
Estuarine use	A few days to weeks	Several weeks up to several months	Several weeks up to several months
Ocean migration	As far north as Alaska	As far north as Alaska	As far north as Alaska
Age at return	4-5 years	3-5 years	3-5 years
Estimated historical spawners	125,000	140,000	19,000
Recent natural spawners	800	6,500	9,000
Recent hatchery adults	12,600 (1990-2000)	37,000 (1991-1995)	NA

Fall Chinook populations occur in most Washington tributaries of the lower Columbia River (Figure 1). Fall Chinook spawn in large river mainstems and are “ocean type” Chinook that emigrate from freshwater as subyearlings. Most of the fall runs are called “tules” and are distinguished by their dark skin coloration and advanced state of maturation at the time of freshwater entry in August to September; they quickly spawn in September to November. Lower river "bright” Chinook, are later-returning, later-spawning fall Chinook salmon that return to the Lewis and Sandy rivers and are less mature when they enter the Columbia than are tule fall Chinook salmon.

Historically in Washington, spring Chinook returned to the Cowlitz, Lewis, Kalama, and Big White Salmon rivers. Spring Chinook spawn in upstream tributaries of large subbasins and are “stream type” Chinook that emigrate from freshwater as yearlings. Dams have reduced or eliminated access to upriver spring Chinook spawning areas on the Cowlitz, Lewis, Clackamas, Sandy, and Big White Salmon rivers. The spring run on the Big White Salmon River was extirpated following construction of Condit Dam. Remaining naturally-spawning spring-run Chinook salmon populations are low and heavily supported by naturally-spawning hatchery fish.

Lower Columbia Chinook salmon populations began declining by the early 1900s because of habitat alterations and unsustainable high harvest rates given the changing habitat conditions. Long- and short-term trends in abundance of individual populations are mostly negative, some severely so. About half of the populations comprising this ESU are very small, increasing genetic and demographic risks. Today, the once abundant natural runs of fall and spring Chinook have been largely replaced by hatchery production. Apart from the relatively large, and apparently healthy fall-run population in the Lewis River, production in the ESU appears to be predominantly hatchery-driven with few identifiable native, naturally reproducing populations.

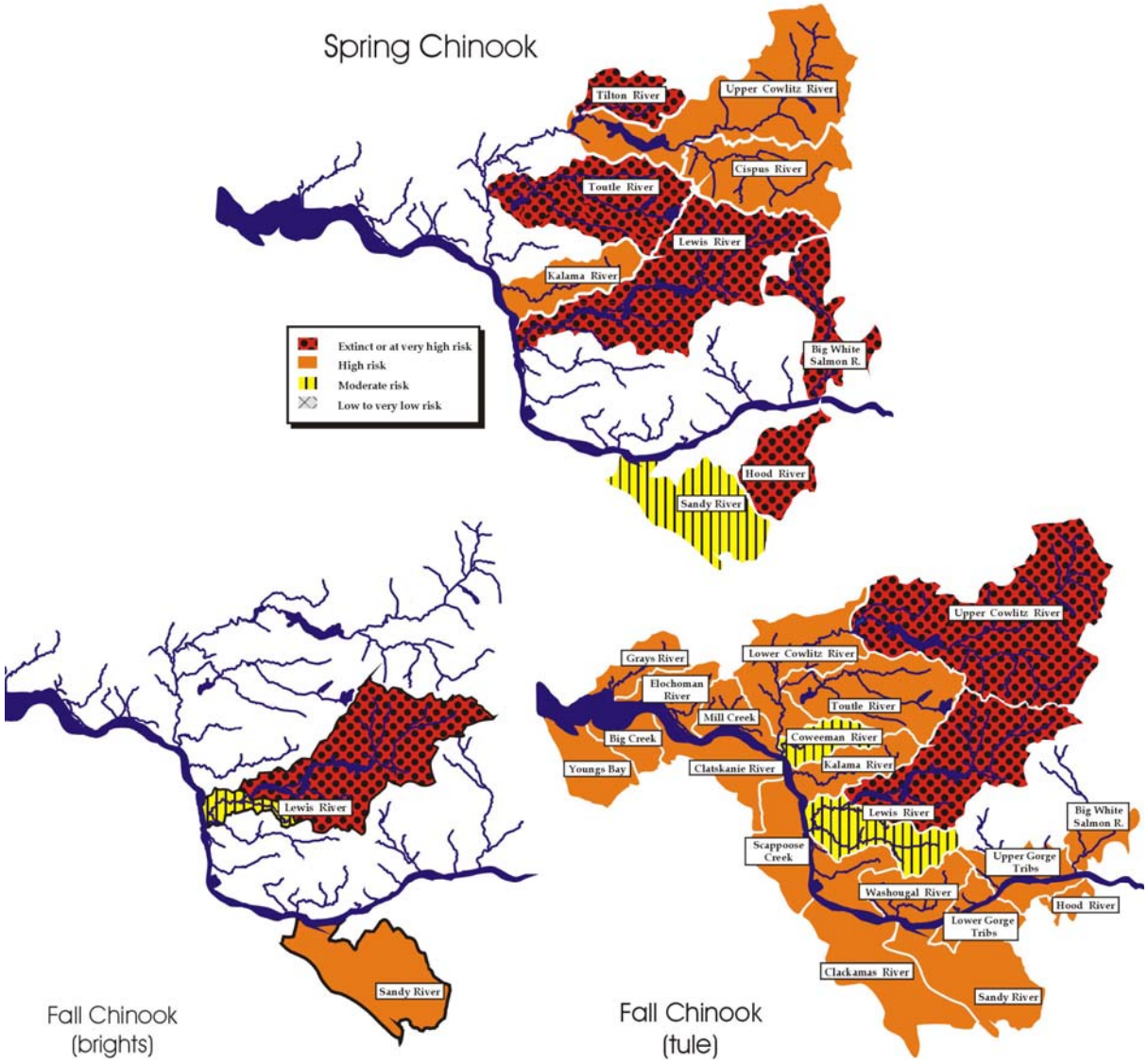

Figure 1. Historical demographically independent Lower Columbia Chinook salmon populations in the lower Columbia River ESU and their present status.

The Lower Columbia River Chinook Salmon ESU includes all native populations from the mouth of the Columbia River to the Cascade Crest, excluding populations above Willamette Falls. Exclusions from the ESU are stream-type spring Chinook found in the Klickitat River (mid-Columbia ESU) and the introduced Carson spring Chinook. Tule fall Chinook from the Wind and Little White Salmon rivers are included in the ESU, but introduced bright fall Chinook salmon populations in the Wind, White Salmon, and Klickitat rivers are not included. The

Willamette/Lower Columbia Technical Recovery Team has identified 31 historical populations of chinook salmon in the Columbia River ESU. Washington accounts for seven of nine spring chinook, 13 of 20 early "tule" fall chinook, and 1 of 2 late "bright" fall chinook.

The Biological Review Team (BRT) established by National Marine Fisheries Service (NMFS) determined in 1998 that the estimated overall abundance of Chinook salmon in the lower Columbia ESU was not cause for immediate concern. However, they found that, apart from the relatively large, and apparently healthy fall-run population in the Lewis River, production in the ESU appears to be predominantly hatchery-driven with few identifiable native, naturally reproducing populations. Long- and short-term trends in abundance of individual populations are mostly negative, some severely so. About half of the populations comprising this ESU are very small, increasing the likelihood that risks because of genetic and demographic processes will be important. Numbers of naturally-spawning spring-run Chinook salmon are very low. The BRT cautioned that it is possible that some native spring Chinook runs are now extinct, but that this loss is masked by the presence of naturally spawning hatchery fish. The BRT was particularly concerned about the inability to identify any healthy native spring run populations. While studies show that genetic and life history characteristics of populations in the lower Columbia ESU still differ from those in other ESUs, the BRT identified the loss of fitness and diversity within the ESU as an important concern. The Lower Columbia River Chinook salmon ESU was listed as a threatened species under the ESA on March 24, 1999 and again proposed for listing on May 28, 2004 following changes in designations.

2.2.2 Chum Salmon

Chum salmon (*Oncorhynchus keta*) return to the Columbia River in late fall (Table 4). Chum spawn primarily in the lower reaches of rivers, digging their redds mostly along the edges of the mainstem, tributaries, or side channels. Many spawning sites are located in areas of upwelling groundwater. Chum fry emigrate from March through May shortly after emergence. Juveniles use estuaries to feed before beginning long-distance oceanic migrations. The period of estuarine residence appears to be a critical life history phase and may play a major role in determining the size of the subsequent adult run back to fresh water.

Table 4. Life history and population characteristics of chum salmon originating in Washington portions of the lower Columbia.

Characteristic	Chum salmon features
Number of extant populations	15
River entry timing	mid-October – December
Spawn timing	November – March
Spawning habitat type	Shallow, slow-moving mainstem, tributaries, or side channels
Emergence timing	February – April
Duration in freshwater	About 1 month
Rearing habitat	Edges/side channels of tributaries, mainstem, estuary
Estuarine use	Up to 4 months
Ocean migration	North Pacific and Bering Sea
Age at return	Primarily 3 & 4 years, a few 5 years
Estimated historical spawners	870,000
Recent natural spawners	6,000
Recent hatchery adults	300 (in 2002)

The lower Columbia River historically produced hundreds of thousands of chum but only a few thousand remain. Chum previously returned to tributaries as far upriver as the Walla Walla River but only a handful are now counted at Bonneville Dam. After substantial declines in the 1950s, returns remained relatively stable but low from 1956 to 2000, returns improved since 2001. The average recent year runs are less than 1% of the historical run size. Production is generally limited to areas downstream of Bonneville Dam (Figure 2). Chum salmon are presently at significant demographic risk and have likely lost much of their original genetic diversity.

NOAA Fisheries defined the Lower Columbia Chum Salmon ESU as including all naturally-spawning populations in the Columbia River and its tributaries in Washington and Oregon. The Willamette/Lower Columbia Technical Recovery Team identified 16 historical populations in the ESU. The NMFS BRT that examines the status of chum concluded that the Columbia River ESU is presently at significant risk. The BRT believes the current abundance is probably only 1% of historical levels and the ESU has undoubtedly lost some (perhaps much) of its original genetic diversity. Lower Columbia chum salmon, including all naturally-spawning populations in the Columbia and its tributaries in Washington and Oregon, were officially listed as threatened on March 25, 1999 and again proposed for listing on May 28, 2004 following changes in designations.

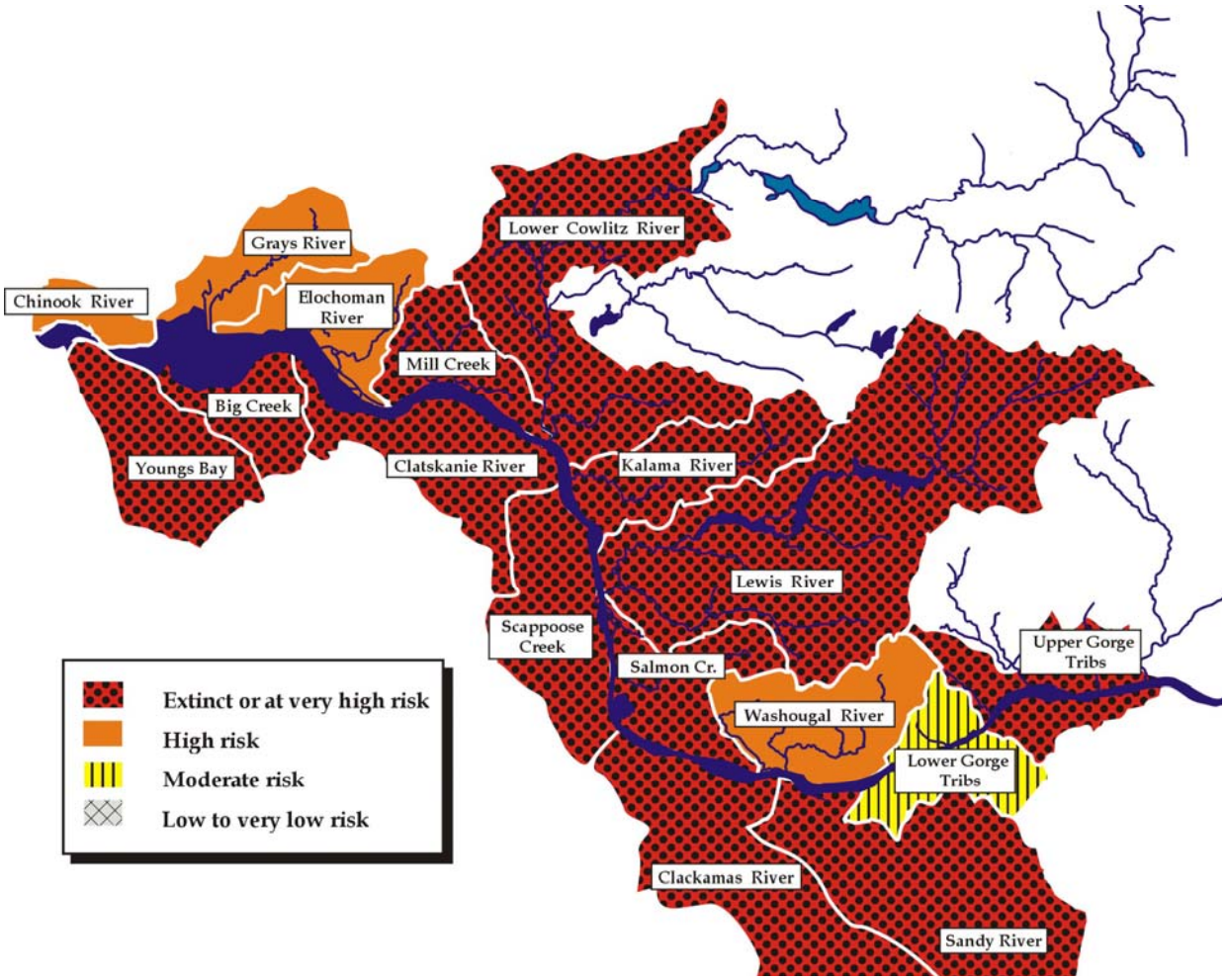

Figure 2. Historical demographically independent chum salmon populations in the lower Columbia River ESU.

2.2.3 Coho Salmon

Lower Columbia adult coho salmon (*Oncorhynchus kisutch*) return in late summer to late fall and spawn in fall or early winter. Eggs incubate over late fall and winter, juveniles rear in freshwater for more than a year, smolts leave freshwater in April – June of their second year, and immature fish spend 1.5 years feeding in coastal oceans. Two general coho stocks are present in the lower Columbia River today (Table 5): Type S refers to an ocean distribution generally south of the Columbia River with an early adult run timing in the Columbia River. Type N refers to an ocean distribution generally north of the Columbia River with a late run timing in the Columbia River.

Table 5. Life history and population characteristics of coho salmon originating in Washington portions of the Lower Columbia.

Characteristic	Racial Features	
	Early – Type S (south migrating)	Late – Type N (north migrating)
Number of extant populations	18	
River entry timing	mid-August – September	late September – December
Spawn timing	mid-October – early November	November – January
Spawning habitat type	Higher tributaries	Lower tributaries
Emergence timing	January – April	January – April
Duration in freshwater	12-15 months	12-15 months
Rearing habitat	Smaller tributaries, river edges, sloughs, off-channel ponds	Smaller tributaries, river edges, sloughs, off-channel ponds
Ocean migration	Coastal Washington, Oregon, Northern California	Coastal British Columbia, Washington, Oregon
Age at return	3 years, some 2-year jacks	3 years, some 2-year jacks
Estimated historical spawners	430,000	
Recent natural spawners	6,000 – mostly of hatchery origin	
Recent hatchery adults	4,800 (1987) - 91,400 (2001)	11,800 (1995) - 177,900 (2001)

Historically, coho were present in all lower Columbia River tributaries (Figure 3). Currently, very few wild coho salmon spawn in lower Columbia River subbasins and a number of local populations have become extinct. Coho populations in Washington tributaries of the lower Columbia River have been heavily influenced by extensive hatchery releases. Widespread inter-basin (but within ESU) stock transfers have homogenized many populations. Unique natural populations of coho salmon can no longer be genetically distinguished in the lower Columbia River (excluding the Clackamas and Sandy rivers in Oregon), or along the Washington coast south of Point Grenville. The NOAA Fisheries Biological Review Team tentatively identified 25 historical lower Columbia River coho populations of which 18 occur in Washington.

In a 1995 status review of coho salmon, National Marine Fisheries Service (NMFS) found that, if an evolutionarily significant unit of coho salmon still exists in the lower Columbia River, it is not presently in danger of extinction, but is likely to become so. NOAA Fisheries was subsequently petitioned to list Lower Columbia coho salmon on an emergency basis and to designate critical habitat. They determined that the petition presented substantial scientific information that a listing may be warranted, but there was insufficient evidence to support an emergency listing. Lower Columbia coho were proposed for listing on May 28, 2004.

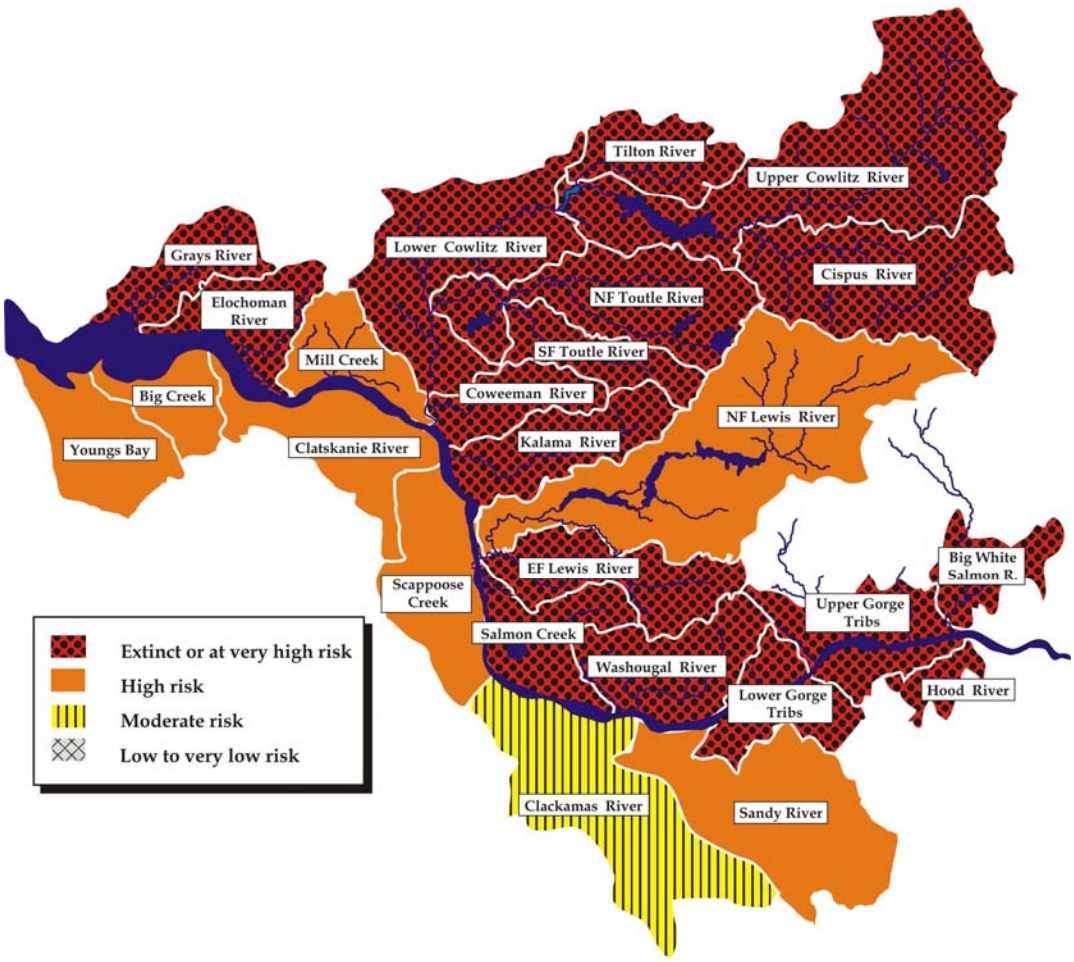

Figure 3. Distribution of historical coho salmon populations among Washington lower Columbia River subbasins.

2.2.4 Steelhead

Steelhead (*Oncorhynchus mykiss*) are rainbow trout that migrate to and from the ocean. Lower Columbia River steelhead include summer and winter runs (Table 6). Summer steelhead return from the ocean between May and November and generally spawn between January and June. Winter steelhead return to freshwater between November and April and generally spawn sometime during the months of March to June. Summer steelhead tend to spawn higher in the watershed than winter steelhead. Headwater areas are often inaccessible to winter steelhead because of natural barriers that are not passable during high flows common during winter steelhead migration. These barriers are often passable during the lower flow conditions when summer steelhead are migrating upstream.

Winter steelhead were historically present in all lower Columbia River subbasins (Figure 4) and also return to other Columbia River tributaries as far upriver as Oregon's Fifteenmile Creek. Summer steelhead were also present in some Washington lower Columbia River tributaries. Most of the aggregate Columbia River steelhead run is comprised of summer fish destined for inland tributaries.

Naturally-producing steelhead populations remain in most subbasins but numbers have been much reduced. Historical steelhead production in Washington basins of the lower Columbia River is believed to have been substantial. For example, total run size for steelhead in the

Cowlitz River alone was estimated to exceed 20,000 fish and 10,000 or more may have been produced in the Lewis basin. Major hydro projects in the Cowlitz and Lewis basins have blocked access to approximately 80% of the historical steelhead spawning and rearing habitat within both basins.

Table 6. Life history and population characteristics of steelhead trout originating in Washington portions of the lower Columbia.

	Racial Features	
Characteristic	**Summer steelhead**	**Winter steelhead**
Number of extant populations	5	14
River entry timing	May – November	November – April
Spawn timing	January – June	March – early June
Spawning habitat type	Clear water rivers and tributaries in upper watersheds	Clear water rivers and tributaries
Emergence timing	8-9 weeks after spawning, March – July	8-9 weeks after spawning, March – July
Duration in freshwater	1-3 years (mostly 2), smolt in April – June	1-3 years (mostly 2), smolt in April – June
Rearing habitat	River and tributary main channels	River and tributary main channels
Estuarine use	Briefly in the spring, peak abundance in May	Briefly in the spring, peak abundance in May
Ocean migration	North to Canada and Alaska, and into the North Pacific, along the continental shelf	North to Canada and Alaska, and into the North Pacific, along the continental shelf
Age at return	3 – 5, occasionally 6 years	3 – 5, occasionally 6 years
Estimated historical spawners	28,000	100,000
Recent natural spawners	1,500	3,500
Recent hatchery adults	1,900 (approximate average annual total returns to six lower Columbia hatcheries, 1995-2002)	9,200 (approximate average annual total returns to six lower Columbia hatcheries, 1995-2002)

Steelhead found in the lower Columbia River in Washington (as delineated by this recovery plan) fall into three separate ESUs defined by NMFS:

- The Southwest Washington ESU includes steelhead from the Grays and Elochoman rivers, and Skamokawa, Mill, Abernathy, and Germany creeks.
- The Lower Columbia ESU includes steelhead from the Cowlitz, Kalama, Lewis, Washougal, and Wind rivers and Salmon and Hardy creeks.
- The Middle Columbia ESU includes steelhead from the Little White Salmon and Big White Salmon rivers.

The Lower Columbia steelhead ESU has been listed as threatened under ESA and again proposed for listing on May 28, 2004 following changes in designations. The Willamette/Lower Columbia Technical Recovery Team has identified 23 historical populations in this ESU. Washington accounts for 5 of 6 summer and 14 of 17 winter steelhead populations. The listed ESU includes only naturally spawned populations of steelhead residing below naturally and man-made impassable barriers (e.g., impassable waterfalls and dams). The Southwest Washington steelhead ESU is not thought to be in danger of extinction. Therefore, the Grays, Elochoman,

Skamokawa, Abernathy, Mill, and Germany populations are not listed under the ESA. However, all of the Columbia River populations in the Southwest Washington ESU were categorized as depressed by WDFW in 2002, with the exception of Mill Creek, which was listed as unknown.

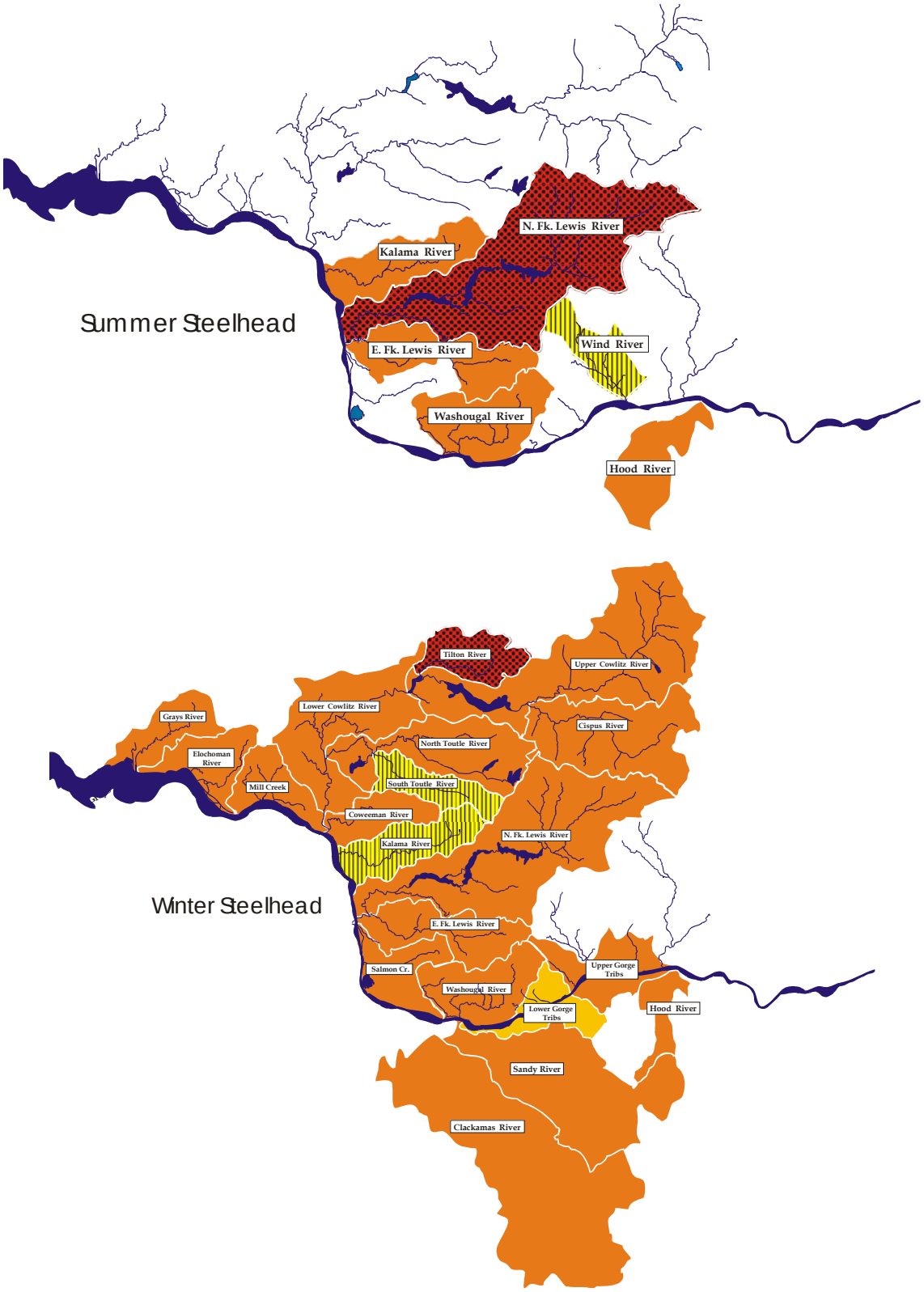

Figure 4. Historical demographically independent summer (upper) and winter steelhead (lower) populations in the lower Columbia River ESU.

2.2.5 Bull Trout

Bull trout (*Salvelinus confluentus*) are found primarily in cold streams; water temperature is consistently a principal factor influencing distribution of bull trout in many streams. Resident and migratory forms are known to coexist in the same subbasin or even in the same stream (Table 7). Resident forms live out their lives in the tributary where they were born and in nearby streams. Freshwater migratory forms include both fluvial and adfluvial strategies. The fluvial form migrates between main rivers and tributaries; the adfluvial form between lakes and streams. In the lower Columbia River, bull trout may exhibit resident or freshwater migratory life history patterns; anadromous bull trout have not been observed.

Table 7. Life history and population characteristics of bull trout originating in Washington portions of the lower Columbia.

Characteristic	Life History Form	
	Migratory	**Resident**
Number of extant populations	20 subpopulations	
Upstream spawning migration	April – September	April – September
Spawn timing	Early fall	Early fall
Spawning habitat type	Runs and tail-outs	Runs and tail-outs
Emergence timing	January – May	January – May
Natal area rearing	1-3 years	5-7 years
Downstream migration of juveniles	April - November	NA
Rearing habitat	Lake or large river	Headwater streams, higher gradient
Lake/river residence	2-6 years	NA
Age at spawning	4-12 years with annual or intermittent spawning	4-12 years with annual or intermittent spawning
Natural spawners	~10-40 in Cougar Creek, Yale Reservoir, Lewis River (1988-2003) ~100-900 in Rush/Pine Creeks, Swift Reservoir, Lewis River (1994-2003)	Unknown
Hatchery adults	None	None

Status of bull trout is difficult to ascertain because data are scarce. Adfluvial populations exist in Yale and Swift reservoirs in the Lewis River system. Bull trout have been reported in the Little White Salmon basin but never above Little White Salmon National Fish Hatchery. Populations might have historically inhabited the Cowlitz and Kalama subbasins, but no records of occurrence exist.

Because of widespread distribution, isolated populations, and variations in life history, bull trout populations are grouped by distinct population segments (DPS). Bull trout are also grouped by recovery units, which serve as subsets of a DPS. On June 10, 1998, the USFWS issued a final rule announcing the listing of bull trout in the Columbia and Klamath river basins as threatened under the ESA. According to WDFW, the bull trout populations in the Lewis River basin are considered at moderate risk of extinction. Within the Columbia River Basin Bull Trout DPS, the Lower Columbia River Recovery Unit includes the Lewis River and Klickitat River core areas in Washington. The Lewis River Core Area consists of the mainstem Lewis River and tributaries downstream to the confluence with the Columbia River, with the exclusion of the East Fork of the Lewis River. The Klickitat River Core Area includes the Klickitat River and all

tributaries downstream to the confluence with the Columbia River. In the two core areas, local populations of bull trout exist in Cougar, Pine, and Rush creeks (tributaries of the Lewis River) and the West Fork of the Klickitat River. No local populations have been identified in the White Salmon River, but that area contains core habitat and, after migratory obstructions are addressed, could support bull trout that migrate from the Columbia River.

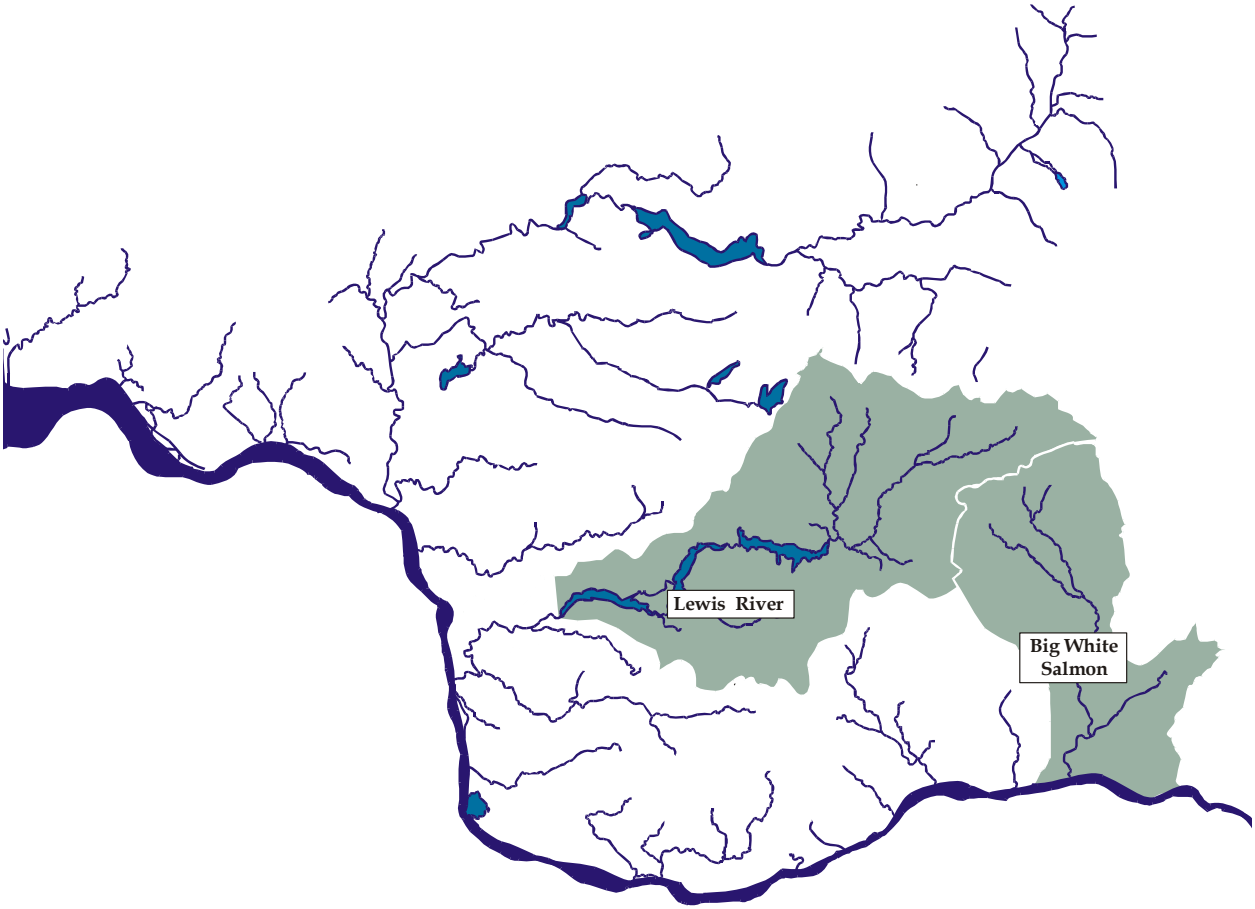

Figure 5. Distribution of historical bull trout populations among lower Columbia River subbasins.

2.3 Other Sensitive Species

2.3.1 Bald Eagle

Bald eagles (*Haliaeetus leucocephalus*) were listed as endangered under the Endangered Species Act in 1978. In 1994, the USFWS proposed to reclassify the bald eagle from endangered to threatened throughout its range; this reclassification was finalized in 1995. In 1999, the USFWS proposed to delist the bald eagle throughout its range, however, this delisting has not been finalized. Bald eagles are distributed throughout North America, breeding in most of their range. Resident and migratory bald eagles are found along the lower Columbia River. Breeding birds are year-round residents and do not migrate during the winter. All bald eagle nest sites in this area have been monitored for productivity since the late 1970s, and in recent years there were 96 occupied breeding territories. The area supports an additional wintering population of over 100 eagles. The lower Columbia River bald eagle population is one of only two regional populations in Washington that has exhibited low reproductive success representative of a decreasing population (the other regional population was in Hood Canal).

2.3.2 Sandhill Crane

The sandhill crane (*Grus Canadensis*) was listed as an endangered species by the State of Washington in 1981. The species was extirpated as a breeder from the state around 1941 by widespread habitat destruction and unregulated hunting. Cranes were again found summering in 1972 in Klickitat County, but it was not until 1979 that nesting was confirmed. Sandhill cranes were not historic breeders in the lower Columbia River, buy have always used the area for staging in migration and wintering. Approximately 2000-3000 sandhill cranes now use the lower Columbia River bottomlands during spring and fall migration..

2.3.3 Dusky Canada Goose

The dusky Canada goose (*Branta canadensis occidentalis*) is a distinctive race of medium size (about 6 lb) and dark brown plumage, that nests on the Copper River Delta, Alaska, migrates through southeastern coastal Alaska and coastal British Columbia, and winters primarily in southwestern Washington and western Oregon. Dusky Canada geese numbers began an abrupt decline after the 1964 Alaska earthquake raised the elevation of nesting area wetlands which precipitated a series of successional vegetation changes and also increased predation. A network of federal and state waterfowl refuges were established in the mid-1960s to provide attraction and protection. In the late 1990s, a group of landowners, agency personnel, and others also formed the Canada Goose Agricultural Depredation Working Group and developed a management plan to deal with increasing goose numbers and impacts on habitats. The plan outlines strategies to reduce numbers of several subspecies, protect the dusky subspecies, improve habitat on public lands, outline critical habitats for acquisition, and quantify the dollar value of agricultural crop losses.

2.3.4 Columbia Whitetail Deer

The Columbian white-tailed deer (*Odocoileus virginianus leucurus*), a subspecies of the white-tailed deer, is on the federal Endangered Species List and is classified as endangered under Washington and Oregon state laws. This deer once ranged from Puget Sound to southern Oregon, where it lived in floodplain and riverside habitat. Habitat conversion and losses coupled with low productivity of the population are the most important threats now to the subbspecies. A recovery team, consisting of members from USFWS, Oregon Department of Fish and Wildlife

(ODFW), WDFW, and Oregon State University (OSU), has completed a Recovery Plan for Columbian white-tailed deer. The plan delineates the need to create three stable, secure, viable subpopulations. Recovery goals identify the need to secure additional habitat for population reintroduction, enforce hunting rules, and manage publicly owned lands.

2.3.5 Fisher

The fisher (*Martes pennanti*) is a Washington state endangered species and a federal species of concern. Overtrapping, and loss and alteration of habitats are considered the most significant reasons for the decline of fishers in Washington. Although extensive surveys for fishers have been conducted throughout their historical range, no known population of fishers exists in Washington. The apparent absence of fishers in Washington represents a significant gap (i.e., lack of population continuity) in the species range from Canada to Oregon and California. Riparian habitats, especially those with large diameter snags, live trees and downed logs, are considered high quality habitats for fishers, especially for resting and reproduction.

2.3.6 Western Gray Squirrel

The western gray squirrel (*Sciurus griseus*) is a Washington state threatened species and a Federal species of concern. Although the western gray squirrel was once abundant and widespread throughout oak-conifer forests, its range in Washington State has contracted to three disjunct populations. Population loss and fragmentation is largely due to disease (i.e., mange) associated with invasion of California ground squirrels and seasonal weather differences, which effect acorn production. Habitat loss and degradation is also a likely long-term factor. In the future, competition from the introduced eastern grey squirrel may also be an issue. In a 2003 Status Review and 12-month finding for a petition to list the Washington population of the western gray squirrel (68 FR 34682), the USFWS concluded that listing was not warranted because the Washington population of western gray squirrels is not a distinct population segment and, therefore, not a listable entity. The WDFW is in the process of writing a draft recovery plan, which is expected to be due out for public review in 2004.

2.3.7 Seals and Sea Lions

Harbor seals, Stellar sea lions, and California sea lions are seasonal residents of the lower Columbia River. Stellar sea lions are listed as federally endangered. Most seals and sea lions are concentrated in or near the estuary but individuals regularly range as far upstream as Bonneville Dam and Willamette Falls. Sea lions regularly travel long distances and marked individuals have been observed to travel between Washington, Oregon, and California. Following the adoption of the Marine Mammal Protection Act, seals and seas lions recovered steadily from critically low population sizes. These animals were historically regarded as a nuisance by fishers and were regularly shot or harassed. Seals and sea lions are predators on fish but diet studies indicate that non-salmonids comprise the majority of the diet. However, seals and sea lions do consume significant numbers of adult salmon and steelhead during some periods. Individual animals can become a fish passage problem where fish are artificially concentrated in the vicinity of locks, dams, and fish ladders.

2.3.8 Western Pond Turtle

The western pond turtle (*Clemmys marmorata*) is listed by Washington State as an endangered species. The species is not listed under the federal Endangered Species Act. This species was essentially extirpated in the Puget lowlands by the 1980s and their present range in

Washington is limited to two small populations in Skamania and Klickitat counties. In addition, two reintroduced populations are now currently found, one in south Puget Sound and one in the Columbia River Gorge.

2.3.9 Oregon Spotted Frog

The Oregon spotted frog (*Rana pretiosa*) is a Pacific Northwest endemic recently differentiated from a close relative, the Columbia spotted frog (*Rana luteiventris*). This species is listed as endangered in the State of Washington and is a federal candidate for protection under the Endangered Species Act. In Washington, the Oregon spotted frog was historically found in the Puget Trough from the Canadian border to the Columbia River and east into the southern Washington Cascades. Only one of eleven historically known population and two recently discovered populations are known to remain in Washington. Factors have included loss of wetland habitat and predation by introduced warmwater fish species (Centrarchidae, Percidae, and Ictaluridae) and the bullfrog (*Rana catesbeiana*).

2.3.10 Larch Mountain Salamander

The Larch Mountain salamander (*Plethodon larselli*) occurs only in Washington and Oregon. Its known distribution includes west-side habitats of the southern Cascades region in Washington and the Columbia Gorge area of Oregon and Washington. Populations of Larch Mountain salamanders are small, isolated, and occur in a limited geographic area. Larch Mountain salamanders depend on cool, moist environments; they require a suitable combination of slope, rock size, shade, and organic debris. Because the habitats preferred by these salamanders are naturally discontinuous, they are vulnerable to disturbances such as logging, rock extraction, and inundation that can alter these habitats and make them unsuitable. For these reasons, the Larch Mountain salamander is a Federally-listed species of concern as well as a sensitive species in the states of Washington and Oregon.

2.4 Species of Ecological Significance

2.4.1 Cutthroat Trout

Cutthroat trout (*Oncorhynchus clarki clarki*) are widely distributed in Washington lower Columbia River tributary systems, in both sea-run and resident forms. Cutthroat trout can rear to maturity in salt or fresh water, migrate large distances, remain in their natal area throughout their life, or exhibit any combination of these behaviors. Because most individuals are either resident or use small streams for a significant portion of their life, cutthroat trout are more affected by local habitat conditions than by mainstem Columbia River and estuary effects. Anadromous, fluvial, and resident life history forms of coastal cutthroat are reported in all Lower Columbia River drainages, and anadromous individuals are either documented or thought to be present in all Washington tributaries of the Columbia downstream of Bonneville Dam. Cutthroat have been documented in over 1,300 locations within the lower Columbia region. The total abundance of coastal cutthroat trout in the lower Columbia basin is difficult to estimate because of their wide range of life history types and poor data availability. However, numbers have declined in almost all lower river tributaries over the past 10–15 years. The USFWS has declined to list the Southwestern Washington/Columbia River DPS of the Coastal Cutthroat Trout as Threatened because some populations are relatively healthy and because of the ability of freshwater forms to produce anadromous progeny. However, WDFW describes cutthroat as depressed in all rivers entering the Columbia from its mouth to the Kalama River, citing either long-term negative trends or short-term severe declines.

2.4.2 White Sturgeon

White sturgeon (*Acipenser transmontanus*) live in large rivers along the Pacific coast of North America and move freely between freshwater and the ocean where they may remain for variable but prolonged periods. White sturgeon historically ranged all the way to the Canadian headwaters of the Columbia River and to Shoshone Falls in the upper Snake River. Columbia River white sturgeon were severely over-fished during the late 1800's prior to the adoption of significant fishery restrictions. Recovery required decades. The lower Columbia population is now among the largest and most productive sturgeon populations in the world and sustains excellent sport and commercial fisheries. However, many upriver populations have declined or disappeared. Mainstem dams block movements, fragment the habitat, and reduce anadromous prey. Bonneville Reservoir continues to support a significant white sturgeon population although numbers and sizes are substantially less than in the lower river. Only the Kootenai River subpopulation of white sturgeon has been listed under the Endangered Species Act (endangered).

2.4.3 Green Sturgeon

Green sturgeon (*Acipenser medirostris*) also occur in the lower Columbia River but rarely range far upstream from the estuary. Green sturgeon are among the most ocean-going of the sturgeons, leaving freshwater around 1-4 years of age and generally only returning to spawn. Green sturgeon do not spawn in the Columbia River but originate from spawning populations in the Sacramento, Klamath, and Rogue rivers. Large numbers of sub-adult and adult green sturgeon gather in the Columbia River estuary during summer and early fall, and individuals are occasionally observed as far upriver as Bonneville Dam. NOAA Fisheries completed a status review for green sturgeon in 2003 and determined that listing under the Endangered Species Act was not warranted but green sturgeon remain a candidate species.

2.4.4 Eulachon

Eulachon or smelt (*Thaleichthys pacificus*) swarm into the lower Columbia River and tributaries to spawn during winter and early spring. Eulachon are a small, anadromous forage fish inhabiting the northeastern Pacific Ocean from Monterey Bay, California, to the Bering Sea and the Pribilof Islands. Huge schools of smelt spawn in the Columbia and Cowlitz mainstems during most years. Pulses of spawners are also seen sporadically in other tributaries including the Grays, Lewis, and Sandy. Smelt support a popular sport and commercial dip net fishery in the tributaries, as well as a commercial gill-net fishery in the Columbia. Smelt are eaten in large numbers by other fishes including sturgeon, birds, and marine mammals. Smelt numbers and run patterns can be quite variable and low runs followed ocean El Niños during the 1990's.

2.4.5 Pacific Lamprey

Pacific lamprey (*Entosphenus tridentatus*) are a native anadromous inhabitant of Pacific Northwest rivers including the Columbia. Lamprey spawn in small tributaries, historically as far upstream as Idaho and British Columbia, and die after spawning. Young lamprey, called ammocoetes, are algae filter feeders that burrow in sandy stream margins and side channels for up to 6 years before downstream migration. Adults are predators that feed only in the ocean and attach themselves to their prey with suction mouths. Relatively little is known about the status of Pacific lamprey. Most data suggests that populations in the Columbia basin have declined concurrent with hydroelectric development and other habitat changes.

2.4.6 Northern Pikeminnow

The northern pikeminnow *(Ptychocheilus oregonensis)* are large (10-20 inches), long-lived (10-15 years), predaceous minnows that are native to freshwater lakes and rivers of the Pacific slope of western North America from Oregon to northern British Columbia.. This opportunistic species has flourished with habitat changes in the mainstem Columbia River and its tributaries. Salmonids are a seasonal food of large pikeminnow and millions of juvenile salmonids are estimated to fall prey each year. Predation can be especially intense in dam forebays and tailraces were normal smolt migration behavior is disrupted by dam passage. A pikeminnow management program has been implemented in the Columbia and Snake rivers since the early 1990s in an attempt to reduce predation mortality by reducing numbers of the large, old pikeminnow that account for most of the losses.

2.4.7 American Shad

Millions of American shad (*Alosa sapidissima*) have colonized the Columbia River after their introduction from the East Coast into California's Sacramento River during the 1870s. Two to four million shad are counted at Bonneville Dam fish each year. Numbers increased steadily until the 1990s as passage improvements for salmon increased access to upriver reservoirs. Shad numbers now appear to have leveled off with some fluctuation based on annual conditions. Shad provide a significant sport fishery and some commercial fishing opportunity although market demand is limited and it is difficult to commercially harvest large numbers of shad without impacting wild salmon. Shad have also become an important link in the Columbia River food web. Divergent trends in shad and salmon numbers occur primarily because the same habitat changes that favor shad are detrimental for salmon but interactions among these species are poorly understood.

2.4.8 Band-tailed Pigeon

Band-tailed pigeons (*Columba fasciata*) are found in coniferous forest zones of mountainous areas of western North America including much of Western Washington. The band-tailed pigeon requires mineral springs as a source of calcium for egg-laying and the production of crop-milk for its young. The proximity of these mineral springs to suitable foraging habitats is an important limiting factor. Band-tailed pigeons are listed as a State and Federal Game species. Breeding Bird Survey data indicated the population of band-tailed pigeons in Washington declined significantly from 1968 to 1993. The hunting season in Washington underwent an emergency closure in 1991 due to a rapid decline in the population as determined from pigeon surveys. However, more recent data showed increases in population that allowed the reinstatement of a limited hunting season in 2002, after a 10-year restriction on hunting. A scarcity of mineral sites combined with the alteration of available nesting habitat jeopardizes band-tailed pigeon populations. Intensive hunting pressure in the past has also been held responsible for declines in the population.

2.4.9 Caspian Tern

Caspian terns (*Sterna caspia*) are a highly migratory species that are distributed throughout the world and present in large numbers in the Columbia River estuary. The species is not listed but is of conservation concern because of the concentration of breeding terns at relatively few sites and and ecological concern because of predation on listed salmon. Protection is provided by the Migratory Bird Treaty Act (1918) in the United States, the Migratory Bird Convention Act (1916) in Canada, and the Convention for the Protection of Migratory Birds and Game

Mammals (1936) in Mexico. Currently two-thirds of the Pacific Coast and one-quarter of the North American population nests in the Columbia River estuary. Dredging the navigational channel created several estuary islands that have been colonized by the birds. A series of Caspian tern management activities have been implemented to encourage significant numbers of nesting terns to nest on East Sand nearer the ocean where diet is more diverse than upstream at Rice Island where predation on salmonids is more significant.

2.4.10 Osprey

The osprey (*Pandion haliaetus*) is a large piscivorous bird of prey that nests and feeds along the lower Columbia River in spring and summer. Ospreys have nearly worldwide breeding distribution; birds that breed in the Pacific Northwest migrate to wintering grounds in southern Mexico and northern Central America. Ospreys nest in forested riparian areas along lakes, rivers, or coastlines; nests are situated atop trees, rock pinnacles, or artificial structures such as channel markers or power/light poles. Adult pairs are thought to mate for life and return to the same area annually for breeding. Along the lower Columbia River during 1997 and 1998, osprey productivity was estimated at 1.64 young/active nest, which is higher than the generally recognized 0.80 young/active nest needed to maintain a stable population. Ospreys feed almost exclusively on fish and are not particular about the species of fish they consume. In the lower Columbia and Willamette rivers, largescale suckers are an important part of the osprey's diet.

2.4.11 Yellow Warbler

Yellow warblers (*Dendroica petechia*) are an excellent indicator of riparian zone structure and function. They are a riparian obligate species most strongly associated with wetland habitats that contain Douglas spirea and deciduous tree cover. Within Washington, yellow warblers are apparently secure and are not of conservation concern.

2.4.12 Red-eyed Vireo

The red-eyed vireo (*Vireo olivaceus*) is locally common in riparian growth and strongly associated with tall, somewhat extensive, closed canopy forests of cottonwood, maple, or alder in the Puget Lowlands and along the Columbia River in Clark and Skamania Counties. Within Washington, the red-eyed vireo is locally common, more widespread in northeastern and southeastern Washington, and not a conservation concern. The red-eyed vireo is an excellent indicator of riparian zone structure and function.

2.4.13 River Otter

The river otter (*Lutra canadensis*) is a top predator of most aquatic food chains that has adapted to a wide variety of aquatic habitats, from marine environments to high mountain lakes of North America. The river otter is a year-round resident of the lower Columbia River mainstem and estuary, although field observations and trapper data indicate that population numbers are relatively low. Otters on the lower Columbia River concentrate their time in shallow, tidal influenced back waters, sloughs, and streams throughout the estuary. Otter home ranges (approximately 11 river miles) are largely defined by local topography and overlap extensively. Otter diets vary seasonally and generally consist of a wide variety of fish species and aquatic invertebrates such as crabs, crayfish, and mussels.

2.5 Species of Recreational Significance

2.5.1 Walleye

Walleye (*Stizostedium vitreum*) were introduced from the Mississippi River basin into the Grand Coulee area and over the last 40 years have gradually expanded downriver until significant populations are now found throughout the lower Columbia. Distribution in the lower Columbia is patchy. Walleye are every bit as voracious a predator on salmon smolts as pikeminnow but are not subject to the sport reward fishery program because predation is by small walleye that are not particularly vulnerable to the effects of fishing. A sport fishery for walleye has been gradually growing in the lower Columbia River since the early 1980s.

2.5.2 Smallmouth Bass

Because of their popularity with anglers, smallmouth bass (*Micropterus dolomeiui*) have been extensively transplanted throughout the continental United States including the Pacific Northwest. Numbers are generally small downstream from Bonneville Dam but greater in upstream reservoirs that have created large amounts of favorable slow water habitat where rocky shorelines and substrate provide structure. Smallmouth bass are omnivorous and occasionally eat juvenile salmonids although they do not comprise a large proportion of the diet except in a few areas (e.g. fall Chinook rearing areas of the Hanford Reach).

2.5.3 Channel Catfish

Channel catfish (*Ictalurus punctatus*) are another species that have been widely introduced outside this native range and can be found almost everywhere in the United States including the Pacific Northwest. Although channel catfish have inhabited Washington waters for more than a century, their abundance and distribution remain very limited. Small numbers of channel catfish can be found in some areas of the lower Columbia.