**Programmatic Biological Evaluation**
**for**
**Activities in the Lower Columbia River,**
**Washington State**
**for Species Listed or Proposed by**
**National Marine Fisheries Service under the**
**Endangered Species Act**

**March 22, 2002**

# Appendix C

# Species Descriptions

## Appendix C - Species Descriptions

### Marine Mammals:

**Steller Sea Lion (*Eumetopias jubatus*)**[1]
***Status:*** In April, 1990, the western population (located west of 144$^{o}$W long.) of Steller sea lions was designated as endangered. The eastern population (located east of 144$^{o}$W long., which includes those sea lions found along the western U.S. coastline) was designated as threatened.

***Range:*** The range of the Steller sea lion extends from California and associated waters to Alaska, including the Gulf of Alaska and Aleutian Islands, and then into the Bering Sea and North Pacific and into Russian waters and territory.

***Habitat Requirements:*** Steller sea lions breed, pup, and seek rest and refuge on relatively remote islands and points of land along the Alaska coastline. Steller sea lions are opportunistic feeders, that feed primarily on schooling demersal fish, such as walleye pollock, Atka mackerel, herring, and capelin. Declines in sea lion abundance may be related to changes in the availability of sea lion prey.

In California, the reason for the decline of Steller sea lions is not known. Former rookery habitat has been abandoned (San Miguel Island), and some other rookeries (Año Nuevo Island, Farallon Islands) are at lower than historical abundance levels. The availability of suitable terrestrial habitat does not appear to be a factor in the sea lion decline in parts of California.

**Designated Critical Habitat for Steller Sea Lions**
Critical habitat for Steller sea lions was designated on August 27, 1993. Critical habitat includes areas surrounding rookery and major haulout areas in California, Oregon, Washington, and Alaska. In Alaska, some foraging areas within the core of the geographic range of Steller sea lions are also designated critical habitat.

### Fish
For each species, several different evolutionarily significant units (ESUs) and distinct population segments (DPSs) are listed as threatened or endangered. The general range, habitat requirements and life histories for each species are given first, followed by a detailed description of the range and critical habitat designation for each ESU/DPS.

[1] From USDC, 1993

**Chinook Salmon (*Oncorhynchus tshawytscha*)**[2]

***Status:***

- Snake River spring/summer chinook were listed as threatened in April, 1992.
- Snake River fall chinook were listed as threatened in April, 1992.
- Lower Columbia River chinook were listed as threatened in March, 1999.
- Upper Columbia River spring chinook were listed as endangered in March, 1999.
- Upper Willamette River chinook were listed as threatened in March, 1999

Threats to the chinook salmon include watershed development, such as forest practices, mining, agricultural land use, urbanization, hydro power development and water manipulation and withdrawal. Over-fishing, artificial propagation and introduction of nonnative species have also impacted chinook salmon. Forest practices, mining, agricultural land use, urbanization, hydro power development and water withdrawal have resulted in increased sedimentation, changes in flow regimes and channel morphology, decrease in water quality and quantity, loss of riparian ,habitat, loss of large woody debris, and loss of large woody debris recruitment, higher water temperatures, decreased gravel recruitment, reduction in pools and spawning and rearing areas, rerouting of stream channels, degradation of streambanks and loss of estuarine rearing areas (Bishop and Morgan, 1996; Myers et al., 1998). These changes have impacted the spawning and rearing environment of chinook salmon. Harvest, hatchery practices and the introduction of nonnative species have also impacted the expression of the varied life history strategies of chinook salmon within these ESUs.

***Range:*** In North America, the historical range of chinook salmon extended from the Ventura River in California to Point Hope, Alaska. In northeastern Asia, the historical range extended from Hokkaido, Japan to the Anadyr River in Russia (Scott and Crossman, 1973).

***Habitat Requirements:*** The generalized life history of Pacific salmon involves incubation, hatching and emergence in freshwater, migration to the ocean, and subsequent initiation of maturation and return to freshwater for completion of maturation and spawning (Myers et al., 1998). Chinook salmon exhibit two generalized freshwater life history types, "stream-type" and "ocean-type" (Gilbert 1912). There is further life history variation within each type, which allows full utilization of freshwater, estuarine and ocean environments (Spence et al., 1996). In order to complete these life history strategies successfully, chinook salmon need access to freshwater, estuarine, coastal and open ocean environments. In these environments they require adequate: water quantity, quality, temperature, and velocity; substrate, cover and shelter, food resources, riparian vegetation, space, and safe passage conditions. The range of ocean residence for chinook salmon is from 1 to 6 years. A small proportion of yearling males, called "jacks"

[2] From USFWS, 1999.

mature in freshwater or return after 2 to 3 months in saltwater (Myers et al., 1998; Spence et al., 1996). In general, chinook salmon spawn in small to medium-sized rivers; however they may also spawn in larger river systems such as the main-stem Columbia River (Spence et al., 1996).

Stream-type chinook salmon, which is characteristic of spring fish (Spence et al., 1996), reside as fry or parr in freshwater for a year or more before migrating to sea. They perform extensive offshore oceanic migrations and return to their natal river during the spring and early summer, several months prior to spawning. (Healey, 1991). Stream-type chinook salmon tend to enter freshwater as immature or "bright" fish, migrate far upriver, and use upper watersheds for spawning in late summer and early autumn (Myers et al., 1998). Stream-type juvenile chinook salmon, exhibit downstream dispersal and utilize a variety of freshwater rearing environments during their 1 to 2 years of freshwater rearing before migration to the ocean (Meehan and Bjornn, 1991). Stream-type juvenile chinook salmon fry in streams feed on drift insects (Rutter, 1904; cited in Allen and Hassler, 1986) but zooplankton are more heavily preyed on in main river systems and estuaries (Allen and Hassler, 1986). As chinook salmon grow they move from shallow littoral habitats into deeper river channels and their prey base changes from shallow epibenthic prey to larger pelagic species (Allen and Hassler, 1986). Cool, clean water, complex habitat diversity that provides pools, riffles, off-channel habitat, and undercut banks, large woody debris or boulder structures that provide cover and shelter from predation and storm events are important habitat elements. Riparian vegetation provides the following to chinook salmon rearing: shade for temperature regulation, vegetation inputs for food resources, streambank stabilization from roots and large woody debris recruitment. Stream-type life history strategies may be adapted to watersheds or parts of watersheds that are more productive and less susceptible to dramatic changes in water flow, as the long rearing period requires more stable less degraded habitats (Miller and Brannon, 1982; Healey, 1991). ESUs with stream-type life history strategies are: upper Columbia River spring ESU; and the Snake River spring/summer ESU (Myers et al., 1998).

Ocean-type chinook salmon, which is typical of fall- fish, (Spence et al., 1996), migrate to sea normally within a few months after emergence. Ocean type chinook salmon reside in estuaries for longer periods as fry and fingerlings than do stream-type chinook salmon (Reimers, 1973; Kjelson et al., 1982; Healey, 1991). Juvenile chinook and chum salmon utilize estuaries for rearing, physiological transition and refugia and are the most estuarine dependent anadromous salmonids in the Pacific Northwest (Aitkin, 1998). Ocean-type chinook salmon spend most of their ocean life in coastal waters, and return to their natal river during the spring, summer, fall, late fall and winter (NMFS, 1998a). Ocean-type chinook salmon enter freshwater at an advanced stage of maturity, move rapidly to their spawning areas on the mainstem or lower tributaries of rivers, and spawn within a few days or weeks of freshwater entry (Healey, 1991).

For ocean-type chinook salmon, estuarine rearing environments may be more important than the freshwater environment, as these salmon can rear between 3 to 6 months in freshwater and estuarine environments (Healey, 1991; Meehan and Bjornn, 1991). For ocean-type chinook salmon, estuarine environments provide staging, physiological transition, refugia from high water flows and predation; and neustonic, pelagic and benthic prey food bases. In Washington estuaries, chinook salmon fry feed on emergent insects and epibenthic crustaceans (gammarid amphipods, mysids, and cumaceans) in salt marsh habitat (Simenstad et al., 1982). As the chinook salmon grow, their position and food base in estuaries changes. Larger fish move to deeper and more saline water (Healey, 1982; Macdonald, 1987; Wissmar and Simenstad, 1988; cited in Aitkin, 1998), and their prey base changes to include decapod larvae, larval and juvenile fish, drift insects and euphausiids (Simenstad et al., 1982). Both of these benthic prey bases are dependent on detritus (Sibert et al., 1977; Sibert, 1979 in Aitkin, 1998). Juvenile salmonids tend to congregate in areas where estuary morphology favors detritus retention, such as weed beds, braided or meandering channels, and salt marshes (Healey, 1982). Estuaries with a variety of water salinity gradients, microhabitats created by large wood, boulders, channel morphology and vegetation; provide cover from predation, a good prey base and low water velocity refugia at low tide (Aitkin, 1998). ESUs with ocean-type life history strategies are - the Puget Sound ESU, Lower Columbia River ESU, and Snake River fall ESU (Myers et al., 1998).

Snake River Spring/Summer Chinook ESU
This ESU includes all natural populations of spring/summer chinook salmon in the mainstem Snake River and any of the following sub-basins: Tucannon, Grande Ronde, Imnaha and Salmon (NMFS, 1995a).

**Designated Critical Habitat**: In December, 1993 and October, 1999 (revised), critical habitat for Snake River spring/summer chinook was designated to include river reaches presently or historically accessible (except reaches above impassable natural falls, and Dworshak and Hells Canyon Dams) to Snake River spring/summer chinook salmon in the Columbia River from a straight line connecting the west end of the Clatsop jetty (south jetty, Oregon side) and the west end of the Peacock jetty (north jetty, Washington side) and including all Columbia River estuarine areas and river reaches proceeding upstream to the confluence of the Columbia and Snake Rivers; all Snake River reaches from the confluence of the Columbia River upstream to Hells Canyon Dam. Major river basins containing spawning and rearing habitat for this ESU comprise approximately 22,390 square miles in Idaho, Oregon and Washington. The following counties lie partially or wholly within these basins: Idaho - Adams, Blaine, Custer, Idaho, Lemhi, Lewis, Nez Perce, and Valley; Oregon - Baker, Umatilla, Union, and Wallowa; Washington - Adams, Asotin, Columbia, Franklin, Garfield, Walla Walla, and Whitman.

Snake River Fall Chinook ESU

This ESU includes all natural populations of fall chinook salmon in the mainstem Snake River and any of the following sub-basins: Tucannon, Grand Ronde, Imnaha, Salmon and Clearwater (NMFS, 1995a).

**Designated Critical Habitat**: In December, 1993, critical habitat for the Snake River fall chinook was designated to include river reaches presently or historically accessible (except reaches above impassable natural falls, and Dworshak and Hells Canyon Dams) to Snake River fall chinook salmon in the Columbia River from a straight line connecting the west end of the Clatsop jetty (south jetty, Oregon side) and the west end of the Peacock jetty (north jetty, Washington side) and including all Columbia River estuarine areas and river reaches proceeding upstream to the confluence of the Columbia and Snake Rivers; the Snake River, all river reaches from the confluence of the Columbia River, upstream to Hells Canyon Dam; the Palouse River from its confluence with the Snake River upstream to Palouse Falls; the Clearwater River from its confluence with the Snake River upstream to its confluence with Lolo Creek; the North Fork Clearwater River from its confluence with the Clearwater River upstream to Dworshak Dam. Major river basins containing spawning and rearing habitat for this ESU comprise approximately 13,679 square miles in Idaho, Oregon, and Washington. The following counties lie partially or wholly within these basins: Idaho - Adams, Clearwater, Idaho, Latah, Lemhi, Lewis, and Nez Perce; Oregon - Baker, Union, and Wallowa; Washington - Adams, Asotin, Columbia, Franklin, Garfield, Walla Walla, and Whitman.

Lower Columbia River Chinook ESU

The ESU includes all naturally spawned chinook populations from the mouth of the Columbia River to the crest of the Cascade Range, excluding populations above Willamette Falls. Celilo Falls, which corresponds to the edge of the drier Columbia Basin Ecosystem and historically may have presented a migrational barrier to chinook salmon at certain times of the year, is the eastern boundary for this ESU. Not included in the ESU are stream-type spring chinook salmon found in the Klickitat River or the introduced Carson spring chinook salmon. Fall chinook salmon in the Wind and Little White Salmon rivers are included in this ESU, but not introduced upriver bright fall chinook salmon populations in the Wind, White Salmon and Klickitat rivers. Populations in the ESU are considered ocean-type. Populations in this ESU tend to mature at age 3-4.

Ecologically, the Lower Columbia River ESU crosses several ecoregions: Coastal, Willamette, Cascades and east Cascades (NMFS, 1998a). Only naturally spawned chinook salmon are proposed for listing at this time (NMFS, 1998a).

**Designated Critical Habitat**: In February, 2000, critical habitat for lower Columbia River chinook was designated to include all river reaches accessible to listed chinook salmon in Columbia River tributaries between the Grays and White

Salmon Rivers in Washington and the Willamette and Hood Rivers in Oregon, inclusive. Also included are adjacent riparian zones, as well as river reaches and estuarine areas in the Columbia River from a straight line connecting the west end of the Clatsop jetty (south jetty, Oregon side) and the west end of the Peacock jetty (north jetty, Washington side) upstream to The Dalles Dam. Excluded are tribal lands and areas above specific dams or above longstanding, naturally impassable barriers (i.e., natural waterfalls in existence for at least several hundred years). Major river basins containing spawning and rearing habitat for this ESU comprise approximately 6,338 square miles in Oregon and Washington. The following counties lie partially or wholly within these basins (or contain migration habitat for the species): Oregon - Clackamas, Clatsop, Columbia, Hood River, Marion, Multnomah, Wasco, and Washington; Washington - Clark, Cowlitz, Klickitat, Lewis, Pierce, Pacific, Skamania, Wahkiakum, and Yakima.

Upper Columbia River Spring Chinook ESU

This ESU includes stream-type chinook salmon spawning above Rock Island Dam in the Wenatchee, Entiat and Methow Rivers. All chinook salmon in the Okanogan River are considered ocean-type and are considered part of the Upper Columbia River summer and fall ESU (NMFS, 1998a). Only naturally spawned chinook salmon are proposed for listing at this time (NMFS, 1998a).

**Designated Critical Habitat**: In February, 2000, critical habitat for upper Columbia spring chinook was designated to include all river reaches accessible to listed chinook salmon in Columbia River tributaries upstream of the Rock Island Dam and downstream of Chief Joseph Dam in Washington, excluding the Okanogan River. Also included are adjacent riparian zones, as well as river reaches and estuarine areas in the Columbia River from a straight line connecting the west end of the Clatsop jetty (south jetty, Oregon side) and the west end of the Peacock jetty (north jetty, Washington side) upstream to Chief Joseph Dam in Washington. Excluded are tribal lands and areas above specific dams or above longstanding, naturally impassable barriers (i.e., natural waterfalls in existence for at least several hundred years). Major river basins containing spawning and rearing habitat for this ESU comprise approximately 7,003 square miles in Oregon and Washington. The following counties lie partially or wholly within these basins (or contain migration corridors for the species): Oregon - Clatsop, Columbia, Hood River, Gilliam, Morrow, Sherman, Umatilla, and Wasco; Washington - Benton, Chelan, Clark, Cowlitiz, Douglas, Franklin, Grant, Klickitat, Kittitas, Multnomah, Okanogan, Pacific, Skamania, Wahkiakum, Walla Walla, and Yakima.

Upper Willamette River Chinook ESU

The ESU includes all naturally spawned populations of spring-run chinook salmon in the Clackamas River and in the Willamette River, and its tributaries, above Willamette Falls, Oregon.

**<u>Designated Critical Habitat</u>**: In February, 2000, critical habitat for upper Willamette River chinook was designated to include all river reaches accessible to listed chinook salmon in the Clackamas River and the Willamette River and its tributaries above Willamette Falls. Also included are adjacent riparian zones, as well as river reaches and estuarine areas in the Columbia River from a straight line connecting the west end of the Clatsop jetty (south jetty, Oregon side) and the west end of the Peacock jetty (north jetty, Washington side) upstream to and including the Willamette River in Oregon. Excluded are tribal lands and areas above specific dams or above longstanding, naturally impassable barriers (i.e., natural waterfalls in existence for at least several hundred years). Major river basins containing spawning and rearing habitat for this ESU comprise approximately 8,575 square miles. The following counties lie partially or wholly within these basins (or contain migration habitat for the species): Oregon - Benton, Clackamas, Clatsop, Columbia, Douglas, Lane, Lincoln, Linn, Marion, Multnomah, Polk, Tillamook, Washington, and Yamhill; Washington - Clark, Cowlitz, Pacific, and Wahkiakum.

### Sockeye Salmon (*Oncorhynchus nerka*)[3]

***Status***:

- Snake River sockeye were listed as endangered in November 1991.

Threats to sockeye salmon populations include hydro power development, water withdrawal and diversions, water storage, harvest, predation, inadequate regulatory mechanisms (NMFS, 1991), forestry, and associated road building (Dlugokenski, 1981; Blum, 1988), agriculture, mining and urbanization have degraded simplified, and fragmented habitat (NMFS, 1998c).

***Range:*** Sockeye salmon occur in North America from the Columbia River, Washington to the Nome River, Alaska (Gustafson et al. 1997). In Asia, sockeye salmon occur from Hokkaido, Japan to the Anadyr River (Burgner, 1991).

***Habitat Requirements:*** Sockeye salmon exhibit greater variety of life history patterns, greater diversity in the selection of spawning habitat, and greater variation in river entry timing and duration of holding in lakes prior to spawning than chum, coho, chinook or pink salmon (Gustafson et al. 1997). The major distribution and abundance of large sockeye salmon stocks occurs in river systems that have accessible lakes in their watersheds for spawning and juvenile rearing (Burgner, 1991). Other life history forms include river-type and sea-type populations, and resident and kokanee populations. River and sea-type sockeye salmon are common in northern areas and may predominate over lake-type sockeye salmon in some river systems (Wood, 1995). River and sea-type populations have shown much less genetic differentiation than widely separated populations of lake-type Sockeye Salmon (Wood, 1995). This has been

[3] From USFWS, 1999.

interpreted as an indication of relaxed homing adaptions in river and sea-type populations, and has been hypothesized that these populations play an important role in recolonizing habitat (Wood, 1995).

Sockeye salmon lake-type life history patterns spawn in 1) inlet or outlet streams of lakes, 2) suitable habitat between lakes, 3) in the lake along the shoreline with areas of groundwater upwelling, or on outwash fans of tributaries, or 4) along beaches or shoreline with clean gravel substrate and wind driven currents that supply egg oxygenation (Foerster, 1968; Burgner, 1991; Gustafson et al., 1997; NMFS, 1998c). After emergence in streams the fry move either upstream or downstream to rearing lakes, this migration typically occurs at night to avoid predators (Gustafson et al., 1997). After emergence in lakes, they take up residence in the lake.

While rearing in the lake, sockeye salmon fry may initially feed near the lake shoreline and then move into deeper waters of the limnetic zone, or the fry may enter the limnetic zone directly (Gustafson et al., 1997). While in the lakes, the juveniles are visual predators and feed on copepods, cladocerans, and insect larvae (Foerster, 1968; Burgner, 1991; Gustafson et al., 1997). Residence time in the lake is influenced by growth. Growth is influenced by interspecific and intraspecific competition, food supply, water temperature, thermal stratification, migratory movement to avoid predation, lake turbidity, and length of growing season (Gustafson et al., 1997). In Washington State and British Columbia, lake residence time is normally 1 to 2 years (Burgner, 1991).

Lake-type sockeye salmon smolt and migrate to sea in the spring, and spend 1 to 4 years in the marine environment and return to their natal lake system to spawn in the late summer or early autumn (Gustafson et al., 1997). In the ocean, sockeye salmon feed on copepods, euphasiids, amphipods crustacean larvae, fish larvae, squid and pteropods (NMFS, 1998c). Juveniles migrate northward to the Gulf of Alaska, staying relatively close to shore. Offshore movement occurs in late autumn or early winter (NMFS, 1998c).

While migrating upstream, sockeye salmon take advantage of slower water and eddies along streambanks and bottoms, and travel in schools (Burgner, 1991). Adult lake-type sockeye salmon home precisely to their natal stream or lake habitat (Hanamura, 1966; Quinn, 1985, Quinn et al., 1987). This precise homing ability is thought to be adaptive, as it ensures that juveniles will encounter a suitable nursery lake.

Sockeye salmon river-type life history patterns occur where lake rearing area is not available or inaccessible (NMFS, 1998c). River-type sockeye salmon use slow velocity areas of river as juvenile rearing areas for 1-2 years, migrate to sea, spend 1-4 years in the marine environment and return to their natal river system to spawn (Gustafson et al., 1997).

Sockeye salmon sea-type life history patterns use slow velocity areas of river for rearing, similar to river-type life histories. In contrast, sea-type sockeye salmon migrate to sea after only a few months rearing in the river environment. Studies have indicated that sea-type sockeye salmon possess heritable physiological adaptions for successful migration to the sea as underyearlings (Wood, 1995). They use tidewater sloughs and estuaries for further rearing, and then enter the marine environment and spend 1-4 years before they return to their natal river system to spawn (Gustafson et al., 1997).

Riverine spawning sockeye salmon, including both river-type and sea-type life history strategies have been reported in a number of Washington rivers. The presence of riverine spawning sockeye salmon occurring consistently over decades, has been documented in the North and South Fork Nooksack, Skagit, Sauk, North Fork Stillaguamish, Samish and Green rivers (NMFS, 1998c). Riverine spawning sockeye salmon have also been reported from the Nisqually, Skokomish, Dungeness, Calawah, Hoh, Queets and Clearwater rivers (NMFS, 1998c). Riverine spawning aggregations in Washington State are not defined as an ESU at this time, due to insufficient evidence (Gustafson et al., 1997).

Kokanee are a self-perpetuating, non-anadromous form of sockeye that occurs in balanced sex ratio populations and whose parents and back several generations have spent their entire life cycle in freshwater (Gustafson et al., 1997). Kokanee occur in land-locked lakes, where migration to the ocean is difficult or has been cutoff, or in interior lakes where migration to the sea is possible, but not worth the energy expended (Gustafson et al., 1997). Kokanee can produce anadromous offspring, and anadromous sockeye salmon can produce kokanee offspring in lakes without ocean access (Scott, 1984; Kaeriyama et al., 1992). In two instances, (Lake Ozette Washington and Lake Cowichan, Vancouver Island), large viable kokanee populations with no documented anadromous members exist in lake basins where access to and from the ocean is relatively easy (Dlugokenski et al., 1981; Rutherford et al., 1988).

Juvenile anadromous sockeye salmon occasionally remain in their lake rearing environment and have been observed on the spawning ground with their anadromous cohorts. These sockeye salmon are referred to as "resident " sockeye salmon, to indicate that they are the progeny of anadromous parents The degree to which resident sockeye salmon produce anadromous offspring is unknown (Gustafson et al., 1997).

Kokanee and resident sockeye salmon typically spawn in the vicinity of a nursery lake, die after spawning a single time and as juveniles rear in the pelagic zone of the lake. Kokanee and resident sockeye salmon remain in fresh water ' for their entire life cycle (Gustafson et al., 1997). Kokanee and resident life history forms are smaller at maturity than anadromous primarily because of productivity differences between fresh water and oceanic rearing environments (Gustafson et al. 1997).

Genetic differentiation indicates that kokanee are polyphyletic- having arisen from sockeye salmon on multiple independent occasions. Kokanee may occur sympatrically or allopatrically in relation to sockeye salmon (Foote et al. 1989; Wood and Foote, 1990; Foote et al., 1992; Taylor et al., 1996; Wood and Foote, 1996; Winans et al., 1996). Sympatric kokanee, resident and anadromous forms of sockeye salmon may spawn at the same time and place (Foote et al., 1994), although kokanee may spawn earlier than anadromous sockeye salmon. In studied locations where anadromous sockeye salmon and kokanee remain sympatric and spawn in the same place and time, there is a high degree of size-based assortative mating (Foote and Larkin, 1988). Assortative mating by body size usually leads to assortative mating by type; hence kokanee with kokanee and sockeye salmon with sockeye salmon. Some sneak spawning by kokanee males occurs and results in the successful fertilization of sockeye salmon eggs, substantial isolating mechanisms between kokanee and sockeye salmon occur after emergence, which may reduce gene flow (Wood and Foote, 1996).

Snake River sockeye ESU

This ESU includes all natural populations of sockeye salmon in the Snake River basin below Hells Canyon Dam and Dworshak Dam on the Clearwater River including areas that were historically accessible to sockeye salmon.

**Designated Critical Habitat:** On December 28, 1993, critical habitat for Snake River sockey was designated to include river reaches presently or historically accessible (except reaches above impassable natural falls, and Dworshak and Hells Canyon Dams) to Snake River sockeye salmon in the Columbia River from a straight line connecting the west end of the Clatsop jetty (south jetty, Oregon side) and the west end of the Peacock jetty (north jetty, Washington side) and including all Columbia River estuarine areas and river reaches upstream to the confluence of the Columbia and Snake Rivers; all Snake River reaches from the confluence of the Columbia River upstream to the confluence of the Salmon River; all Salmon River reaches from the confluence of the Snake River upstream to Alturas Lake Creek; Stanley, Redfish, Yellow Belly, Pettit, and Alturas Lakes (including their inlet and outlet creeks); Alturas Lake Creek, and that portion of Valley Creek between Stanley Lake Creek and the Salmon River. Watersheds containing spawning and rearing habitat for this ESU comprise approximately 510 square miles in Idaho. The watersheds lie partially or wholly within the following counties: Blaine and Custer.

### Chum Salmon (*Oncorhynchus keta*)[4]

**Status**:

- In March 1999, Columbia River chum were listed as threatened.

[4] From USFWS, 1999.

Threats to the chum salmon include impacts from forest practices, mining, agricultural land use, urbanization and water manipulation and withdrawal. These developments have resulted in loss and degradation of freshwater and estuarine habitat; water withdrawal conveyance, storage and flood control (resulting in insufficient flows, stranding, juvenile entrainment, degradation of spawning habitat and instream temperature increases); logging and agriculture (loss of large woody debris, sedimentation, loss of riparian vegetation, habitat simplification); mining (gravel removal, dredging, pollution); urbanization (stream channelization, increased runoff, pollution, habitat simplification) (NMFS, 1998b). Incidental harvest in salmon fisheries in the Strait of Juan de Fuca and coho salmon fisheries in Hood Canal are a significant threat to the Hood Canal summer chum salmon (NMFS, 1998b). This threat has been decreased with changes in harvest management, but may arise in the future with any rebound of coho salmon stocks to harvestable levels.

***Range:*** Chum salmon have the largest range of natural geographic and spawning distribution of all the Pacific salmon species (Bakkala, 1970). Historically, in North America, chum salmon occur from Monterey, California to the Arctic coast of Alaska and east to the Mackenzie River which flows into the Beaufort Sea. Present spawning populations are found as far south as Tillamook Bay on the northern Oregon coast (Johnson et al., 1997). In Asia, chum salmon occur from Korea to the Arctic coast of the Russian Far East and west to the Lena River which flows into the Laptev Sea (Salo, 1991). Historically, chum salmon in the Columbia River Basin may have spawned in the Umatilla and Walla Walla Rivers, more than 500 kin from the ocean (Nehlsen et al., 1991). These fish would have had to pass Celilo Falls, which was probably only passable at high water flows (Johnson et al., 1997). Currently, chum salmon are present in the lower Columbia River Basin, with more runs on the Washington side than the Oregon side (Salo, 1991). Chum salmon runs occur in the Washougal, Lewis, Kalama, and Cowlitz watersheds in Washington.

***Habitat Requirements:*** Chum salmon spawn in streams and rivers of various sizes, and the fry migrate to sea soon after emergence. They spend more of their life history in estuaries and marine waters than the other Pacific salmon species with the exception of ocean-type chinook salmon. Chum salmon spawning runs can be grouped into three seasonal runs; summer, fall and winter. The chum salmon of the Columbia River chum salmon ESU enter freshwater to spawn from early October to mid-November, with a peak return in early November (Johnson et al., 1997). Peak spawning occurs in late November and is usually complete by early December (WDF et al., 1993). The chum salmon of the Hood Canal summer chum salmon ESU enter freshwater to spawn from August to mid-September (Cook-Tabor, 1995). Hood Canal summer chum salmon spawning periods vary from August 15 through early October, dependent upon the watershed (Cook-Tabor, 1995).

Chum salmon primarily spawn in the lower reaches of rivers, extending from just above tidal influence up to 100 km of the ocean (Johnson et al., 1997). Some chum salmon may spawn in intertidal areas, with the presence of upwelling groundwater potentially being a preferred spawning location (Johnson et al., 1997). Salo (1991) reported that "chum salmon prefer to spawn immediately above turbulent areas or where there was upwelling." Washington Department of Fish and Wildlife biologists reported that chum salmon in Washington do not preferentially choose areas of upwelling groundwater for redd construction; rather they suggest that chum salmon in Washington "most commonly" use "areas at the head of riffles" (Crawford 1997; in Johnson et al., 1997). Generally, chum salmon spawn in shallower, lower gradient, lower velocity streams and side channels (Salo, 1991). The chum salmon shows little persistence in successfully passing falls or blockages. However, in some low gradient systems such as the Yukon River in Alaska or the Amur River in the Russian Federation, they have been documented to migrate up to 2,5 00 kin inland (Johnson et al., 1997).

Egg hatching periods can range widely (from about 1.5 to 4.5 months), due to a large amount of variability in incubation environments (Meehan and Bjornn, 1991; Johnson et al., 1997). Fry typically emerge from the gravel at night and immediately migrate downstream to estuarine waters (Salo, 1991). Cues influencing the timing of downstream migration include: time of adult spawning; stream temperature during egg incubation and after hatching; fry size and nutritional condition; population density; food availability; stream discharge volume and turbidity; physiological changes in the fry; tidal cycles, and day length (Salo 1991). In some populations, fry may spend a few days to several weeks in the stream and then move downstream to the ocean (Salo, 1991; Johnson et al., 1997). Fry outmigration may take only a few hours or days where spawning sites are close to the mouths of rivers (Johnson et al., 1997). In Washington, Oregon and British Columbia, migration to the estuary occurs from February through May with earlier migrations occurring to the south (Johnson et al., 1997). Chum and pink salmon do not have the clearly defined smolt stages that occur in other salmonids, however they are capable of adapting to seawater soon after emergence from the gravel (Johnson et al., 1997).

Juvenile chum salmon use estuaries to feed before starting their long-distance oceanic migrations. Chum and ocean-type chinook salmon exhibit longer residence times in estuaries than do other anadromous salmonids (Healey, 1982). Juvenile chum and pink salmon appear to occupy shallow sublittoral habitats before moving into neritic habitats (Johnson et al.1997). Ina summarization of the diets of juvenile chum salmon from 16 estuaries, Simenstad et al.(1982) concluded that juvenile chum salmon ≤50 to 60 min fork length fed on epibenthic food resources such as harpacticoid copepods, gammarid amphipods and isopods, while larger juveniles >50 to 60 mm fork length in neritic habitats fed on drift insects and calanoid copepods, larvaceans, and hyperiid amphipods. Migration within and out of estuaries appears to be related to the availability of prey (Johnson et al., 1997). As time passes and juvenile chum salmon get larger, they move into deeper habitats in the estuary or move offshore as they reach a size that allows them to feed on larger neritic plankton (Salo, 1991). This movement occurs as inshore prey resources decline (Salo, 1991).

Juvenile chum, sockeye and pink salmon occur together along the coast of North America and Alaska in a band that extends out to 36 km (Hartt, 1980). The chum and sockeye salmon juveniles migrate northerly, westerly and southwesterly along the coastal belt of the Gulf of Alaska, and tend to remain near shore (Salo, 1991). As the chum salmon grow larger, they move offshore into the Gulf of Alaska and remain and migrate through the gulf until they reach maturity and head back towards their watershed of origin (Salo, 1991). Chum salmon age at maturity appears to follow a latitudinal trend where a greater number of older fish occur in the northern section of the species range (NMFS, 1998b). Mature adults return to watersheds of origin at various ages, usually at 3 to 5 years of age, with a majority maturing at 4 years of age (NMFS, 1998b).

<u>Columbia River chum ESU</u>
The biological review team concluded that, historically, at least one ESU of chum salmon in the Columbia River occurred (NMFS, 1998b). Historically, chum salmon were abundant in the lower reaches of the Columbia River and may have spawned as far upstream as the Walla Walla River (over 500 km inland). Today only remnant populations of churn salmon exist in the lower Columbia River (NMFS, 1998b). Based on genetic and ecological data available, the biological review team concluded that chum salmon in the Columbia River were different enough from other populations in nearby Washington and Oregon coastal river systems (e.g., Willapa Bay, Nehalem River, Grays Harbor, Tillamook River). Hence the Columbia River ESU extends only to the mouth of the Columbia River (NMFS, 1998b).

**<u>Designated Critical Habitat</u>**: ***-*** In February 2000, critical habitat for Columbia River chum was designated to include all river reaches accessible to listed chum salmon (including estuarine areas and tributaries) in the Columbia River downstream from Bonneville Dam, excluding Oregon tributaries upstream of Milton Creek at river km 144 near the town of St. Helens. Also included are adjacent riparian zones. Excluded are tribal lands and areas above specific dams or above longstanding, naturally impassable barriers (i.e., natural waterfalls in existence for at least several hundred years). Major river basins containing spawning and rearing habitat for this ESU comprise approximately 4,426 square miles in Oregon and Washington. The following counties lie partially or wholly within these basins (or contain migration habitat for the species): Oregon - Clatsop, Columbia, Multnomah, and Washington; Washington - Clark, Cowlitz, Lewis, Pacific, Skamania, and Wahkiakum.

**Steelhead Trout (*Oncorhynchus mykiss*)**

**Status:**

- In August 1997, Upper Columbia River steelhead trout were listed as endangered.
- In August 1997, Snake River steelhead trout were listed as threatened.
- In March 1998, Lower Columbia River steelhead trout were listed as threatened.
- In March 1999, Middle Columbia River steelhead trout were listed as threatened.
- In March 1999, Upper Willamette steelhead trout were listed as threatened.

Threats to steelhead trout include: grazing, water diversions, hydroelectric development, Forestry and associated road building (Yee and Roelofs, 1980; Platts, 1981; Chamberlin, 1982), contributing to habitat degradation (Busby et al., 1996) failure of natural stocks to replace themselves, genetic homogenization due to hatchery supplementation, high harvest rates on steelhead smolts in rainbow trout fisheries.

***Range:*** Steelhead trout are found from central California to the Bering Sea and Bristol Bay coastal streams of Alaska. Most streams in the Puget Sound region, and many Columbia and Snake river tributaries have populations of steelhead trout present (Pauley et al., 1986). Winter steelhead populations have been documented to occur in the following Washington rivers: Soleduck, Bogachiel, Hoh, Humptulips, Chehalis, Willapa, Cowlitz, Toutle, Kalama, Lewis, Washougal, Nisqually, Puyallup, Green, Snoqualmie, Skykomish and Skagit (Pauley et al., 1986). Summer steelhead populations have been documented to occur in the following Washington rivers: Elwha, Queets, Wynochee, Cowlitz, Toutle, Kalama, Lewis, Washougal, Wind, White Salmon, Klickitat, Walla Walla, Snake, Yakima, Columbia, Wenatchee, Methow, Green, Skykomish, Stillaguamish, and Skagit (Pauley et al., 1986).

***Habitat Requirements:*** *Oncorhynchus mykiss (O. mykiss)* exhibits a great diversity of life history patterns, and are phylogenetically and ecologically complex. *O. mykiss* exhibit varying degrees of anadromy, differences in reproductive biology and plasticity of life history between generations (Busby et al., 1996). Different life history forms include anadromous and non-anadromous, winter or summer steelhead, inland or coastal groupings, and half-pounder strategies. Steelhead along with cutthroat trout can spawn more than once (iteroparity), all other species of *Oncorhynchus* spawn once and then die (semelparity). North of Oregon, repeat spawning is relatively uncommon and more than 2 spawning migrations is rare. Iteroparity occurs predominantly in females (Busby et al., 1996). Anadromous forms can spend up to 7 years; in freshwater and three years in the ocean prior to their first spawning (Busby et al., 1996).

In North America, *O. mykiss* is split into two phylogenetic groups, inland and coastal (Busby et al. 1996). These two groups both occur in Washington, Oregon and British Columbia (Busby et al., 1996), and are separated in the Columbia and Fraser systems in the vicinity of the crest of the Cascade Mountains (Reisenbichler et al., 1992). Coastal steelhead occur in a diverse array of populations in Puget Sound, coastal Washington and the lower Columbia River with modest genetic differences between populations (Busby et al. 1996). Inland steelhead are represented only by populations in the Columbia and Fraser river basins, and consistent genetic differences have been found between populations in the Snake and Columbia rivers (Busby et al., 1996). Inland and coastal forms apply to both anadromous and non-anadromous forms, which means that rainbow trout east of the Cascades are genetically more similar to steelhead from east of the Cascades than they are to rainbow trout west of the Cascades (Busby et al., 1996). Large genetic difference between coastal and inland groups have been demonstrated for both anadromous and non-anadromous forms (Busby et al., 1996). In Washington coastal populations total age at maturity is typically 4 years, 2 years in freshwater and 2 years in the ocean. For Columbia River Basin inland populations, total age at maturity is 4 years with 2 years in freshwater, I year in the ocean and I year in freshwater as an adult prior to spawning (Busby et al., 1996). Steelhead with different run timing (summer or winter) in the same geographic area may be more genetically similar to each other than to fish from another area with similar ran timing (Busby et al., 1996).

*O. mykiss* have two basic reproductive ecotypes, based on the state of their sexual maturity at river entry and the durations of the spawning migration (Burgner et al., 1992). These reproductive ecotypes are 1) stream maturing or summer steelhead, or 2) ocean maturing or winter steelhead (Busby et al., 1996). Summer steelhead enter fresh water from May to October in a sexually immature state, migrate upstream during the spring and summer, and hold in areas of protected cover such as deep pools , undercut banks, overhanging vegetation or large woody debris or boulder structures until they become sexually mature. These summer steelhead do not spawn until the following spring (Pauley et al., 1986), so they hold over the fall and winter in freshwater.

Inland steelhead from the Columbia River Basin, and especially the Snake River Basin are split into two groups, A- and B-run steelhead. This split is based on a bimodal migration of adult steelhead at Bonneville Dam and differences in age at return, and adult size (Busby et al., 1996). Adult A-run steelhead enter freshwater from June to August, and have predominantly spent only l year in the ocean before returning to spawn (IDFG, 1994). A-run steelhead occur throughout steelhead bearing streams in the Snake and Columbia river basins (IDFG, 1994). Adult B-run steelhead enter freshwater from late August to October, and have predominantly spent 2 years in the ocean before returning to spawn (IDFG, 1994). B-run steelhead are thought to reproduce only in the Clearwater, Mid-fork Salmon and South Fork Salmon rivers in Idaho (IDFG, 1994).

Winter steelhead enter their home stream in various stages of sexual maturation from November to April, and spawn within a few months of entering the river between late March and early May (Pauley et al., 1986). Winter steelhead are the most widespread of the two reproductive types. Coastal streams are dominated by winter steelhead, and there are only a few occurrences of inland winter steelhead populations (Busby et al., 1996).

Some basins have both summer and winter steelhead present. Where they both occur, they are often separated by a seasonal hydrologic barrier such as a waterfall (Busby et al., 1996). It appears summer steelhead occur where habitat is not fully used by winter steelhead, and summer steelhead spawn further upstream than winter steelhead (Withler, 1966; Roelofs, 1983; Behnke, 1992). Inland Columbia River Basin steelhead are almost exclusive summer steelhead, winter steelhead may have been excluded from the inland Columbia River by a seasonal barrier at Celilo Falls or the great migration distance from the ocean (Busby et al., 1996).

Steelhead also exhibit a "half-pounder" life history strategy. Half-pounder are immature steelhead that return to freshwater after only 2 to 4 months in the ocean (Busby et al., 1996). These steelhead overwinter in freshwater and outmigrate again the following spring. Occurrence of half-pounder steelhead has been reported to occur in southern Oregon and northern California rivers (Barnhart, 1986).

Non-anadromous forms of *O.* mykiss have been called rainbow or redband trout. For example the inland non-anadromous form is typically called the Columbia River redband trout (Busby et al., 1996). Non-anadromous and anadromous forms co-occur more frequently in inland populations that coastal populations (Busby et al., 1996) In coastal populations where they co-occur, the forms are usually separated by a migration barrier, either natural or man-made (Busby et al., 1996).

Where the two forms co-occur, offspring of resident fish may migrate to sea, and offspring of anadromous steelhead may remain in streams as resident fish (Burgner et al., 1992; Shapolov and Taft, 1954). Mullan et al. (1992) in the Methow River, Washington found evidence that due to very cold stream temperatures, juvenile steelhead had difficulty attaining size for smoltification. He concluded that most of the juvenile fish present that do not emigrate downstream early in life do not grow enough due to the cold temperatures and are hence restricted to a resident life history, regardless of anadromous or non-anadromous parents.

After hatching and emergence, steelhead move to deeper parts of the stream, establish territories and diet changes from microscopic aquatic organisms to larger organisms such as isopods, amphipods and aquatic and terrestrial insects, primarily associated with the stream bottom (Wydoski and Whitney, 1979). During rearing, streamside vegetation and submerged cover (logs, rocks and aquatic vegetation) are important. Cover provides food, temperature stability, protection from predators, and densities of juvenile steelhead are highest in areas containing instream cover (Narver, 1976; Reiser and Bjornn, 1979; Johnson, 1985). Juvenile steelhead remain in freshwater for I to 4 years before smoltification. In areas where anadromous and non anadromous forms co-occur in sympatry, habitat partitioning occurs (Allee, 1981). Smoltification may be initiated by environmental factors such as photoperiod, water temperature and water chemistry (Folmar and Dickhoff, 1980; Wedemeyer et al., 1980). Steelhead remain in the ocean for 2 to 3 years, occasionally for 4 years (Shapolov and Taft, 1954). Distribution in the ocean is hard to track due to no formation of schools, and steelhead do not use areas where commercial harvest of other Pacific salmon stocks occur (Pauley et al., 1986). Distribution at sea appears to be influenced by surface water temperature and conforms closely to the $5^{o}C$ isotherm on the North and the $15^{o}C$ isotherm on the south (Sutherland, 1973).

Upper Columbia River steelhead ESU

This ESU occupies the Columbia River Basin upstream from the Yakima River, and includes the Wenatchee, Entiat, Methow and Okanogan river basins (Busby et al., 1996). Some of the headwaters of these basins occur in British Columbia, therefore the status of steelhead in British Columbia is applicable to this ESU. Recent conversations between the B.C. Ministry of Environment and the NMFS, concluded that "steelhead never occurred in large numbers in British Columbia in the upper Columbia River Basin" (Busby et al., 1996). The NMFS therefore concluded that this ESU includes on U.S. populations of steelhead (Busby et al., 1996). All upper Columbia river steelhead are summer steelhead (Busby et al., 1996). Streams of this region drain the northern Cascade Mountains of Washington, and flow is provided by glacial runoff or snowmelt. This results in extremely cold water temperatures that can retard growth and maturation of juveniles, hence some of the oldest smolt ages, up to 7 years are reported within this ESU, and residualization of juvenile steelhead that fail to smolt also occurs (Busby et al., 1996). The relationship between anadromous and non-anadromous *O. mykiss* is unclear in the geographic area. The NMFS is listing only the anadromous life forms of *O. mykiss* in this ESU (NMFS, 1997). Only naturally spawned populations of steelhead and their progeny which are part of the biological ESU residing below long-term, naturally and man-made impassable barriers ( i.e. dams) are listed (NMFS, 1997). The Wells Hatchery stock of steelhead is included as listed in this ESU because it is essential for recovery, as it probably retains the genetic resources of steelhead populations above Grand Coulee Dam that are now extinct from their native habitats (NMFS, 1997).

**Designated Critical Habitat**: In February, 2000, critical habitat for Upper Columbia River steelhead was designated to include all river reaches accessible to listed steelhead in Columbia River tributaries upstream of the Yakima River, Washington, and downstream of Chief Joseph Dam. Also included are adjacent riparian zones, as well as river reaches and estuarine areas in the Columbia River from a straight line connecting the west end of the Clatsop jetty (south jetty, Oregon side) and the west end of the Peacock jetty (north jetty, Washington side) upstream to Chief Joseph Dam in Washington. Excluded are tribal lands and areas above specific dams or above longstanding, naturally impassable barriers (i.e., natural waterfalls in existence for at least several hundred years). Major river basins containing spawning and rearing habitat for this ESU comprise approximately 9,545 square miles in Washington. The following counties lie partially or wholly within these basins (or contain migration habitat for the species): Oregon - Clatsop, Columbia, Gilliam, Hood River, Morrow, Multnomah, Sherman, Umatilla, and Wasco; Washington - Benton, Chelan, Clark, Cowlitz, Douglas, Franklin, Gilliam, Grant, Kittitas, Klickitat, Okanogan, Pacific, Skamania, Wahkiakum, Walla Walla, and Yakima.

Snake River steelhead ESU

This ESU occupies the Snake River Basin of southeast Washington, northeast Oregon and Idaho. This region has high ecological complexity and supports a diversity of steelhead populations. These populations have been shown to be more genetically and meristically similar to each other than to other steelhead populations occurring outside the Snake River Basin (Busby et al., 1996). This ESU includes the highest elevations for steelhead spawning (up to 2,000 m) and the longest migration distance from ' the ocean (up to 1,500 km) (Busby et al., 1996). Snake River steelhead are summer steelhead, and are classified into two groups, A and B run. These groups are based on migration timing, ocean age and adult size (Busby et al., 1996). The relationship between anadromous and non-anadromous *O. mykiss* is unclear in the geographic area. The NMFS is listing only the anadromous life forms of *O. mykiss* in this ESU (NMFS, 1997). Only naturally spawned populations of steelhead and their progeny which are part of the biological ESU residing below long-term, naturally and man-made impassable barriers ( i.e. dams) are listed (NMFS, 1997).

**Designated Critical Habitat**: In February 2000, critical habitat for Snake River steelhead was designated to include all river reaches accessible to listed steelhead in the Snake River and its tributaries in Idaho, Oregon, and Washington. Also included are adjacent riparian zones, as well as river reaches and estuarine areas in the Columbia River from a straight line connecting the west end of the Clatsop jetty (south jetty, Oregon side) and the west end of the Peacock jetty (north jetty, Washington side) upstream to the confluence with the Snake River. Excluded are tribal lands and areas above specific dams identified or above longstanding, naturally impassable barriers (i.e., Napias Creek Falls and other natural waterfalls in existence for at least several hundred years). Major river basins containing spawning and rearing habitat for this ESU comprise approximately 29,282 square miles in Idaho, Oregon, and Washington. The following counties lie partially or wholly within these basins (or contain migration habitat for the species): Idaho - Adams, Blaine, Boise, Clearwater, Custer, Idaho, Latah, Lemhi, Lewis, Nez Perce, and Valley; Oregon - Baker, Clatsop, Columbia, Hood River, Morrow, Multnomah, Sherman, Umatilla, Union, Wallowa, and Wasco; Washington - Asotin, Benton, Clark, Columbia, Cowlitz, Franklin, Garfield, Gilliam, Klickitat, Skamania, Wahkiakum, Walla Walla, and Whitman.

Lower Columbia River steelhead ESU

This ESU occupies tributaries to the Columbia River between the Cowlitz and Wind rivers in Washington and the Willamette and Hood rivers in Oregon, inclusive (Busby et al., 1996). Excluded are steelhead in the upper Willamette River Basin above Willamette Falls, and steelhead from the Little and Big White Salmon rivers, Washington. Only naturally spawned populations of steelhead and their progeny in streams and tributaries to the Columbia River between the Cowlitz and Wind rivers, Washington, inclusive, and the Willamette and Hood rivers Oregon, inclusive, are listed at this time (NMFS, 1998d). This ESU has both winter and summer steelhead present, and non-anadromous *O. mykiss* co-occur with anadromous forms in the lower Columbia River tributaries (Busby et al., 1996). The relationship between non-anadromous and anadromous forms in this geographic area is unclear (Busby et al., 1996). A number of genetic studies have shown that steelhead in this ESU are of the coastal genetic group (Schreck et al., 1986; Reisenbichler et al,. 1992; Chapman et al., 1994) and are part of a different ancestral lineage than inland steelhead from the Columbia River Basin (Busby et al., 1996).

**Designated Critical Habitat**: In February 2000, critical habitat for Lower Columbia River steelhead was designated to include all river reaches accessible to listed steelhead in Columbia River tributaries between the Cowlitz and Wind Rivers in Washington and the Willamette and Hood Rivers in Oregon, inclusive. Also included are adjacent riparian zones, as well as river reaches and estuarine areas in the Columbia River from a straight line connecting the west end of the Clatsop jetty (south jetty, Oregon side) and the west end of the Peacock jetty (north jetty, Washington side) upstream to the Hood River in Oregon. Excluded are tribal lands and areas above specific dams or above longstanding, naturally impassable barriers (i.e., natural waterfalls in existence for at least several hundred years). Major river basins containing spawning and rearing habitat for this ESU comprise approximately 5,017 square miles in Oregon and Washington. The following counties lie partially or wholly within these basins (or contain migration habitat for the species): Oregon - Clackamas, Clatsop, Columbia, Hood River, Marion, Multnomah, and Washington; Washington - Clark, Cowlitz, Lewis, Pacific, Skamania, and Wahkiakum.

Middle Columbia River steelhead ESU

This ESU occupies the Columbia River Basin from above the Wind River in Washington and the Hood River in Oregon, upstream to the Yakima River in Washington, inclusive (Busby et al., 1996). Upstream of the Dalles Dam all steelhead are summer, inland steelhead (Schreck et al., 1986; Reisenbichler et al., 1992; Chapman et al., 1994). Winter steelhead occur in the Klickitat and

White Salmon rivers in this ESU. Non-anadromous *O. mykiss* co-occur with anadromous forms in the ESU, and information suggests that the two forms may not be isolated except in cases where barriers are involved (Busby et al., 1996). Only naturally spawned steelhead are proposed for listing at this time (NMFS, 1998e).

**Designated Critical Habitat**: In February 2000, critical habitat for Middle Columbia River steelhead was designated to include all river reaches accessible to listed steelhead in Columbia River tributaries (except the Snake River) between Mosier Creek in Oregon and the Yakima River in Washington (inclusive). Also included are adjacent riparian zones, as well as river reaches and estuarine areas in the Columbia River from a straight line connecting the west end of the Clatsop jetty (south jetty, Oregon side) and the west end of the Peacock jetty (north jetty, Washington side) upstream to the Yakima River in Washington. Excluded are tribal lands and areas above specific dams or above longstanding, naturally impassable barriers (i.e., natural waterfalls in existence for at least several hundred years). Major river basins containing spawning and rearing habitat for this ESU comprise approximately 26,739 square miles in Oregon and Washington. The following counties lie partially or wholly within these basins (or contain migration habitat for the species): Oregon - Clatsop, Columbia, Crook, Gilliam, Grant, Harney, Hood River, Jefferson, Morrow, Multnomah, Sherman, Umatilla, Union, Wallowa, Wasco, and Wheeler; Washington - Benton, Clark, Columbia, Cowlitz, Franklin, Kittitas, Klickitat, Pacific, Skamania, Wahkiakum, Walla Walla, and Yakima.

Upper Willamette River steelhead ESU

The ESU includes all naturally spawned populations of winter-run steelhead in the Willamette River, Oregon, and its tributaries upstream from Willamette Falls to the Calapooia River, inclusive.

**Designated Critical Habitat:** In February 2000, critical habitat for Upper Willamette River steelhead was designated to include all river reaches accessible to listed steelhead in the Willamette River and its tributaries above Willamette Falls upstream to, and including, the Calapooia River. Also included are adjacent riparian zones, as well as river reaches and estuarine areas in the Columbia River from a straight line connecting the west end of the Clatsop jetty (south jetty, Oregon side) and the west end of the Peacock jetty (north jetty, Washington side) upstream to, and including, the Willamette River in Oregon. Excluded are tribal lands and areas above specific dams or above longstanding, naturally impassable barriers (i.e., natural waterfalls in existence for at least several hundred years). Major river basins containing spawning and rearing habitat for this ESU comprise approximately 4,872 square miles in Oregon. The following counties lie partially or wholly within these basins (or contain migration habitat for the species): Oregon - Benton, Clackamas, Clatsop, Columbia, Lincoln, Linn, Marion, Multnomah, Polk, Tillamook, Washington, and Yamhill; Washington - Clark, Cowlitz, Pacific, and Wahkiakum.