D-1 DESCRIPTIONS OF LOWER COLUMBIA RIVER LISTED SALMONIDS – EVOLUTIONARILY SIGNIFICANT UNITS AND DISTINCT POPULATION SEGMENTS

1.1 Snake River Fall Chinook

From: Status Review for Snake River Fall Chinook Salmon. Northwest Fisheries Science Center. June 1991.

The Columbia River Basin has historically produced more chinook salmon than any other river system in the world (Van Hyning, 1973). Fall chinook salmon were widely distributed throughout the Snake River and many of its tributaries, from its confluence with the Columbia River upstream 990 kilometers (km) to Shoshone Falls, Idaho (Columbia Basin Interagency Committee, 1957; Haas, 1965; Fulton, 1968; Van Hyning, 1968; Lavier, 1976).

The construction of 12 dams on the mainstem Snake River substantially reduced the distribution and abundance of Snake River fall chinook salmon (Irving and Bjornn, 1981a). Fish passage facilities proved unsuccessful at several projects, and spawning habitats, particularly areas most frequently used by fall chinook salmon, were eliminated with the formation of reservoirs.

The upper reaches of the mainstem Snake River were the primary areas used by fall chinook salmon, with only limited spawning activity reported downstream from river kilometer (RKm) 439. The construction of Brownlee Dam (1958; RKm 459), Oxbow Dam (1961; RKm 439), and Hells Canyon Dam (1967; RKm 397) eliminated the primary production areas of Snake River fall chinook salmon. Habitat was further reduced with the construction of four additional dams on the Lower Snake River. Apart from the possibility of deep-water spawning in lower areas of the river, the mainstem Snake River from the upper limit of the Lower Granite Dam reservoir to Hells Canyon Dam (approximately 165 km) and the lower reaches of the Imnaha, Grande Ronde, Clearwater, and Tucannon Rivers are the only remaining areas available to fall chinook salmon in the Snake River Basin.

Adult Snake River fall chinook salmon enter the Columbia River in July and August and reach the mouth of the Snake River from the middle of August through October. Spawning occurs in the mainstem and in the lower reaches of large tributaries in October and November. Based on what is known of upper Columbia River fall chinook salmon, juveniles in the Snake River presumably emerge from the gravel in March and April and downstream migration usually begins within several weeks of emergence (Chapman, et al., 1991).

Rich (1922) studied the downstream migration of chinook salmon in the lower Columbia River and concluded that fry were present from June to October. Fall chinook salmon fry were found to be abundant in May and June (Reimers, 1964). Van Hyning (1968) reported that chinook salmon fry tend to linger in the lower Columbia River and may spend a considerable portion of their first year in the estuary.

1.2 Lower Columbia River Chinook

From: Status Review of Chinook Salmon from Washington, Idaho, Oregon, and California. Northwest Fisheries Science Center. February 1998.

The Columbia River exerts a dominant influence on the biota of the Pacific Northwest, although smaller, regional distinctions exist within the basin. In the lower Columbia River Basin, the Cowlitz, Kalama, Lewis, White Salmon, and Klickitat Rivers are the major river systems on the Washington side, while the

Willamette and Sandy Rivers are foremost on the Oregon side. Spring chinook salmon, which spawn above the Willamette Falls, will be discussed separately because of their geographic and life-history distinctiveness.

The fall run is predominant in this region. These fall chinook salmon are often called "tules" and are distinguished by their dark skin coloration and advanced maturity at the time of freshwater entry. Tule fall chinook salmon populations may have historically spawned from the mouth of the Columbia River to the Klickitat River (RKm 290). Whatever spawning grounds were accessible to fall chinook salmon on the Klickitat River (below Lyle Falls at RKm 3) would have been inundated following the construction of Bonneville Dam (RKm 243) in 1938 (Bryant, 1949; Hymer, et al., 1992a; WDF, et al.; 1993) There is no record of fall chinook salmon using this lower portion of the Klickitat River (Fulton, 1968). A significant fall run once existed on the Hood River (RKm 272) prior to the construction of Powerdale Dam (1929) and other diversion and irrigation dams (Fulton, 1968); however, this run has become severely depleted and may have been extirpated (Howell, et al., 1985; Nehlsen, et al., 1991; Theis and Melcher, 1995). The Big White Salmon River (RKm 270) supported runs of chinook salmon prior to the construction of Condit Dam (RKm 4) in 1913 (Fulton, 1968). Tule fall chinook salmon begin the freshwater phase of their return migration in late August and the peak spawning interval does not occur until November (WDF, et al. ,1993).

Among other fall-run populations, a later returning component of the fall chinook salmon run exists in the Lewis and Sandy Rivers (WDF, et al., 1993; Kostow, 1995; Marshall, et al., 1995). Because of the longer time interval between freshwater entry and spawning, Lewis and Sandy River fall chinook salmon are less mature at freshwater entry than tule fall chinook salmon and are commonly called lower river "brights" (Marshall, et al., 1995).

The Cowlitz, Kalama, Lewis, Clackamas, and Sandy Rivers currently contain both spring and fall runs; the Big White Salmon River historically contained both spring and fall runs but currently only contains fall-run fish (Fulton, 1968; WDF, et al., 1993). The Klickitat River probably contained only spring chinook salmon because falls blocked access to fall chinook salmon during low autumn flows (Fulton, 1968). The spring run on the Big White Salmon River was extirpated following construction of Condit Dam (Fulton, 1968), while a variety of factors may have caused the decline and extinction of spring chinook salmon on the Hood River (Nehlsen, et al., 1991; Kostow, 1995).

Spring chinook salmon on the lower Columbia River, like those from coastal stocks, enter freshwater in March and April well in advance of spawning in August and September. Fish migrations historically were synchronized with periods of high rainfall or snowmelt to provide access to upper reaches of most tributaries where fish would hold until spawning (Fulton, 1968; Olsen, et al., 1992; WDF, et al., 1993). Dams have reduced or eliminated access to upriver spawning areas on the Cowlitz, Lewis, Clackamas, Sandy, and Big White Salmon Rivers. A distinct winter-spawning run may have existed on the Sandy River (Mattson, 1955) but is believed to have been extirpated (Kostow, 1995).

1.3 Upper Columbia River Spring Chinook

From: Status Review of Chinook Salmon from Washington, Idaho, Oregon, and California. Northwest Fisheries Science Center. February 1998.

East of the Cascade Crest, many river systems support populations of both ocean- and stream-type chinook salmon. Fall-run (ocean-type) fish return to spawn in the mainstem Columbia and Snake Rivers and their tributaries, primarily the Deschutes and Yakima Rivers (Hymer, et al., 1992b; Olsen, 1992). Numerous other Columbia River tributaries in Washington, Oregon, and Idaho historically supported fall runs, but for a variety of reasons these are now extinct (Fulton, 1968; Nehlsen et al.,1991; Hymer et al.,

1992a; Olson, et al., 1992; WDF, et al., 1993). Fall salmon historically migrated as far as Kettle Falls on the Columbia River (RKm 1,090) prior to the completion of Grand Coulee Dam (RKm 961) in 1941 (Mullan, 1987). Chapman (1943) observed chinook salmon spawning in deep water just below Kettle Falls in October 1938. Similarly, fall-run chinook salmon migrated up the Snake River to Shoshone Falls (RKm 976), although Augur Falls (RKm 960) probably blocked the passage of most fish (Evermann, 1896; Fulton, 1968).

Summer chinook salmon populations on the Columbia River exhibit an ocean-type life history, while summer chinook salmon on the Snake River exhibit a stream-type life history (Taylor, 1990a; Chapman, et al., 1991; Chapman, et al., 1994; Matthews and Waples. 1991; Waknitz, et al., 1995). Summer-run fish return to freshwater in June through mid-August—slightly earlier than the fall-run fish, which return from mid-August through October (Fulton, 1968). Summer-run fish were able to ascend Kettle Falls (Evermann,1896; Bryant and Parkhurst, 1950) and probably migrated as far as Lake Windermere in British Columbia (Hymer, et al., 1992b; Chapman, et al., 1994). With the completion of the Grand Coulee Dam in 1941 (RKm 961) and Chief Joseph Dam in 1955 (RKm 877) migration of salmon is blocked at Chief Joseph Dam. Naturally spawning ocean-type summer-run chinook salmon are also found in the Wenatchee (RKm 753) and Methow Rivers (RKm 843) (Waknitz, et al., 1995). Summer chinook are also reported to spawn in the lower Entiat and Chelan Rivers, in addition to below mainstem Columbia River dams (Marshall, et al., 1995); however, it has not been determined whether or not these are self-sustaining populations.

Among ocean-type Columbia River populations above Celilo Falls, summer-run chinook salmon spawn in the mid and lower reaches of tributaries, with peak spawning occurring in October; fall chinook salmon spawn in the mainstem Columbia and Snake Rivers and the lower reaches of the Deschutes and Yakima Rivers, with peak spawning occurring in November (Howell, et al., 1985; Marshall, et al., 1995; Mullan, 1987; Garcia, et al., 1996). Additionally, fall chinook salmon in the mainstem Columbia and Snake Rivers have been observed spawning in water 10 meters (m) deep or more (Chapman, 1943; Bruner, 1951; Swan et al., 1988; Hymer, et al., 1992b; Dauble, et al., 1995).

Ocean-type fry west of the Cascade Crest emerge in April and May, and the majority rear from 1 to 4 months in fresh water prior to emigrating to the ocean (Mullan, 1987; Olsen, et al., 1992; Hymer, et al., 1992a; WDF, et al., 1993; Chapman, et al., 1994; Marshall, et al., 1995). A small proportion of summer- and fall-run fish remains in fresh water until their second spring and emigrate as yearlings (Chapman, et al., 1994; Waknitz, et al., 1995). The proportion of yearling outmigrants varies from year to year, perhaps as a result of to environmental fluctuations. Among summer-run populations, the lowest incidence of yearling outmigrants is found in the Okanogan River, where the waters are relatively warm and highly productive (Chapman, et al., 1994).

1.4 Upper Willamette River Chinook

From: Status Review of Chinook Salmon from Washington, Idaho, Oregon, and California. Northwest Fisheries Science Center. February 1998.

Willamette Falls (RKm 42) has historically limited access to the upper river and thus defines the boundary of a distinct geographic region. High flows over the falls provided a window when returning chinook salmon could ascend the falls in the spring, while low flows prevented fish from ascending the falls in the autumn (Howell et al. 1985). The predominant tributaries to the Willamette River that historically supported spring-run chinook salmon—the Molalla (RKm 58), Santiam (RKm 174), McKenzie (RKm 282) and Middle Fork Willamette Rivers (RKm 301)—all of which drain the Cascades to the east (Mattson, 1948; Nicholas, 1995).

Three major populations of spring chinook salmon are currently located above Willamette Falls (McKenzie River and the North and South Forks of the Santiam River) (Kostow, 1995). Fall chinook salmon are present in the upper Willamette River, but these fish are transplants that have obtained access to the upper Willamette River as a result of the construction of fish passage facilities in 1971 and 1975 (Bennett, 1988). Adult spring-run chinook enter the Columbia River in March and April, but they do not ascend the Willamette Falls until May or June. The migration past the falls generally coincides with a rise in river temperatures above 10ºC (Mattson, 1948; Howell, et al., 1985; Nicholas, 1995). Spawning generally begins in late August and continues into early October, with spawning peaks in September (Mattson, 1948; Nicholas, 1995; Willis, et al., 1995).

1.5 Snake River Spring/Summer Chinook

From: Status Review for Snake River Spring and Summer Chinook Salmon. Northwest Fisheries Science Center. June 1991.

Spring and/or summer chinook salmon have historically spawned in virtually all accessible and suitable habitat in the Snake River upstream from its confluence with the Columbia River (Evermann, 1896; Fulton, 1968). Human activities have substantially reduced the amount of suitable spawning habitat in the Snake River. Even prior to hydroelectric development, many small tributary habitats were lost or severely damaged by construction and operation of irrigation dams and diversions; inundation of spawning areas by impoundments; and siltation and pollution from sewage, farming, logging, and mining (Fulton, 1968). More recently, the construction of hydroelectric and water storage dams without adequate provisions for adult and juvenile passage in the upper Snake River has precluded the use of all spawning areas upstream from Hells Canyon Dam.

The Snake River contains five principal subbasins that produce spring and/or summer chinook salmon (CBFWA, 1990). Three of the five subbasins (Clearwater, Grande Ronde, and Salmon Rivers) are large, complex systems composed of several smaller tributaries, which are further composed of many small streams. In contrast, the other two principal subbasins (Tucannon and Imnaha Rivers) are small systems in which the majority of salmon production is in the main rivers themselves. In addition to the five major subbasins, three small streams (Asotin, Granite, and Sheep Creeks) that enter the Snake River between Lower Granite and Hells Canyon Dams provide small spawning and rearing areas (CBFWA, 1990).

Adult spring chinook salmon migrate upstream past Bonneville Dam from March through May; summer chinook salmon migrate June through July. In both rivers, spring chinook salmon tend to use small, higher elevation streams (headwaters), and fall chinook salmon tend to use large, lower elevation streams or mainstem areas. Summer chinook salmon are more variable in their spawning habitats; in the Snake River, they inhabit small, high-elevation tributaries typical of spring chinook salmon habitat; conversely, in the upper Columbia River they spawn in larger, lower-elevation streams more characteristic of fall chinook salmon habitat. Differences are also evident in juvenile outmigration behavior. In both rivers, spring chinook salmon migrate swiftly to sea as yearling smolts, and fall chinook move seaward slowly as subyearlings. Summer chinook salmon in the Snake River resemble spring-run fish in migrating as yearlings, but they migrate as subyearlings in the Upper Columbia River (Schreck, et al., 1986).

1.6 Columbia River Chum

From: Status Review of Chum Salmon from Washington, Oregon, and California. Northwest Fisheries Science Center. December 1997.

At least one Evolutionary Significant Unit (ESU) of chum salmon was historically present in the Columbia River. Chum salmon were historically abundant in the lower reaches of the Columbia River and

may have spawned as far upstream as the Walla Walla River (more than 500 km inland). Today, only remnant chum salmon populations exist, all in the lower Columbia River. Small spawning populations of chum salmon are regularly found as far south as the lower Columbia River and Tillamook Bay. They are few in number, low in abundance, and of uncertain stocking history.

Chum salmon are limited to tributaries below Bonneville Dam, with the majority of fish spawning on the Washington side of the Columbia River. Chum salmon have been reported in October in the Washougal, Lewis, Kalama, and Cowlitz Rivers in Washington and in the Sandy River in Oregon (Salo, 1991). Only three Washington runs (Grays River, Hamilton Creek, and Hardy Creek) were listed in the SASSI report, and all return in about October (the peak is mid-November), a run time similar to that of chum salmon in rivers along the Washington coast (WDF, et al., 1993). Grays River chum salmon enter the Columbia River from mid-October to mid-November, but apparently do not reach the Grays River until late October to early December. These fish spawn from early November to late December. Fish returning to Hamilton and Hardy Creeks begin to appear in the Columbia River earlier than Grays River fish (late September to late October) and have a more protracted spawn timing (mid-November to mid-January). The Oregon Department of Fish and Wildlife (ODFW) cited 25 locations in that state where chum salmon spawn in the lower Columbia River, but run times for these fish are unavailable (Kostow, 1995).

Observations of chum salmon fry are often more difficult to make than are observations of juveniles of other salmonids because chum salmon outmigrants (1) are smaller than outmigrants of other salmonids; (2) migrate at night; (3) usually have shorter distances to migrate to reach salt water than do other species; and (4) do not school as tightly as some other salmonids. Nonetheless, several key facets of fry outmigration are known. Downstream migration may take only a few hours or days in rivers where spawning sites are close to the mouth of the river, or it may take several months. Juvenile salmon at southern localities, such as those in Washington and southern British Columbia, migrate downstream earlier (late January through May) than fry in northern British Columbia and southeastern Alaska (April to June) do.

1.7 Snake River Sockeye

From: Status Review for Snake River Sockeye Salmon. Northwest Fisheries Science Center. April 1991.

Sockeye salmon are native to the Snake River and historically were abundant in several lake systems in Idaho and Oregon. In this century, a variety of factors have led to the demise of all Snake River sockeye salmon except those returning to Redfish Lake in the Stanley Basin of Idaho. Adults migrate upstream to Redfish Lake from July to September. Juveniles migrate downstream from Redfish Lake during April and May.

1.8 Lower Columbia River Steelhead

From: Status Review of West Coast Steelhead from Washington, Idaho, Oregon, and California. Northwest Fisheries Science Center. August 1996.

The ESU occupies tributaries to the Columbia River between the Cowlitz and Wind Rivers in Washington and the Willamette and Hood Rivers in Oregon, inclusive. Excluded are steelhead in the upper Willamette River Basin above Willamette Falls and steelhead from the Little and Big White Salmon Rivers, Washington. This ESU comprises both winter and summer steelhead. Genetic data show distinction between steelhead of this ESU and adjacent regions, with a particularly strong difference between coastal and inland steelhead in the vicinity of the Cascade Crest. The majority of stocks for which there are data within this ESU have been declining in the recent past, but some have been increasing strongly.

1.9 Upper Willamette River Steelhead

From: Status Review of West Coast Steelhead from Washington, Idaho, Oregon, and California. Northwest Fisheries Science Center. August 1996.

This ESU occupies the Willamette River and its tributaries upstream from Willamette Falls. The native steelhead of this basin are late-migrating winter steelhead, entering fresh water primarily in March and April. This unusual run timing appears to be an adaptation for ascending Willamette Falls. The falls function as an isolating mechanism for upper Willamette River steelhead. Early migrating winter steelhead and summer steelhead have been introduced to the Upper Willamette River Basin; however, these non-native populations are not components of this ESU. Native winter steelhead within this ESU have been declining on average since 1971 and have exhibited large fluctuations in abundance. The main production of native (late-run) winter steelhead is in the North Fork Santiam River, where estimates of hatchery proportion in natural spawning range from 14 percent to 54 percent. The native steelhead of this basin are late migrating winter steelhead, entering fresh water primarily in March and April.

1.10 Middle Columbia River Steelhead

From: Status Review of West Coast Steelhead from Washington, Idaho, Oregon, and California. Northwest Fisheries Science Center. August 1996.

This ESU occupies the Columbia River Basin from above the Wind River in Washington and the Hood River in Oregon upstream to include the Yakima River, Washington. Steelhead of the Snake River Basin are not included. This ESU includes the only populations of winter inland steelhead in the United States, in the Klickitat River and Fifteenmile Creek. Some uncertainty exists about the exact boundary between coastal and inland steelhead, and the western margin of this ESU reflects currently available genetic data. There is good genetic and meristic evidence to separate this ESU from steelhead of the Snake River Basin. The boundary upstream of the Yakima River is based on limited genetic information and environmental differences, including physiographic regions, climate, topography, and vegetation. Total abundance in the ESU appears to have been increasing recently, but the majority of natural stocks for which there are data within this ESU have been declining, including those in the John Day River, which is the largest producer of wild, natural steelhead. There is widespread production of hatchery steelhead within this ESU, but it is largely based on within-basin stocks. Habitat degradation due to grazing and water diversions has been documented throughout the range of the ESU.

Life-history information for steelhead of this region indicates that most middle Columbia River steelhead smolt at 2 years and spend 1 to 2 years in salt water prior to re-entering fresh water, where they may remain up to a year prior to spawning (Howell, et al., 1985; Bonneville Power Administration, 1992). Within this ESU, the Klickitat River is unusual in that it produces both summer and winter steelhead, and the summer steelhead are dominated by age-2-ocean steelhead, whereas most other rivers in this region produce about equal numbers of both age-1- and age-2-ocean steelhead.

1.11 Upper Columbia River Steelhead

From: Status Review of West Coast Steelhead from Washington, Idaho, Oregon, and California. Northwest Fisheries Science Center. August 1996.

This ESU occupies the Columbia River Basin upstream from the Yakima River. All upper Columbia River steelhead are summer steelhead. The streams of this region that are used by steelhead primarily drain the northern Cascade Mountains of Washington. Stream flow is supplied by snowmelt, groundwater, and glacial runoff, often resulting in extremely cold water temperatures that retard the

growth and maturation of steelhead juveniles, causing some of the oldest smolt ages reported for steelhead and residualization of juvenile steelhead that fail to smolt. While total abundance of populations within this ESU has been relatively stable or increasing, this appears to be true only because of major hatchery supplementation programs. Estimates of the proportion of hatchery fish in spawning escapement are 65 percent (Wenatchee River) and 81 percent (Methow and Okanogan Rivers).

Life-history characteristics for Upper Columbia River steelhead are similar to those of other inland steelhead ESUs; however, some of the oldest smolt ages for steelhead, up to 7 years, are reported from this ESU. This may be associated with the cold stream temperatures discussed by Mullan et al. (1992), who stated that the cold water in some of the streams of this area may cause some fish to be "thermally fated to a resident (rainbow trout) life history, regardless of whether they were the progeny of anadromous or resident parents." The relationship between anadromous and nonanadromous *Oncorhynchus mykiss* in this geographic area is unclear. Based on limited data available from adult fish, smolt age in this ESU is dominated by 2-year-olds. Again based on limited data, steelhead from the Wenatchee and Entiat Rivers return to fresh water after 1 year in salt water, whereas Methow River steelhead are primarily age-2-ocean (Howell, et al., 1985). As with other inland steelhead, these remain in fresh water up to a year prior to spawning.

1.12 Snake River Steelhead

From: Status Review of West Coast Steelhead from Washington, Idaho, Oregon, and California. Northwest Fisheries Science Center. August 1996.

This ESU occupies the Snake River Basin of southeast Washington, northeast Oregon, and Idaho. This region is ecologically complex and supports a diversity of steelhead populations; however, genetic and meristic data suggest that these populations are more similar to each other than they are to steelhead populations occurring outside of the Snake River Basin. Snake River steelhead spawning areas are well isolated from other populations and include the highest elevations for spawning (up to 2,000 m) as well as the longest migration distance (up to 1,500 km). Snake River steelhead are often classified into two groups, A-run and B-run, based on migration timing, ocean age, and adult size. While total (hatchery plus natural) run size for Snake River steelhead has increased since the mid-1970s, the increase has resulted from greater production of hatchery fish, and there has been a severe recent decline in natural run size. Parr densities in natural production areas have been substantially below estimated capacity in recent years. Downward trends and low parr densities indicate a particularly severe problem for B-run steelhead, the loss of which would substantially reduce life-history diversity within this ESU. Snake River steelhead enter fresh water from June to October and spawn during the following spring from March to May.

1.13 Cutthroat Southwest Washington/Columbia River

From: Status Review of Coastal Cutthroat Trout from Washington, Oregon, and California. Northwest Fisheries Science Center. January 1999.

The proposed boundaries of this ESU are similar to the Southwestern Washington/Lower Columbia River ESU for coho salmon (Weitkamp, et al., 1995). Support for this ESU designation comes primarily from ecological and genetic information. Ecological characteristics of this region include the presence of extensive intertidal mudflats and sandflats, similarities in fresh water and estuarine fish faunas, and substantial differences from estuaries north of Grays Harbor and south of the Columbia River. The coastal cutthroat trout samples from southwestern Washington show a relatively close genetic affinity to the samples from the Columbia River.

Coastal cutthroat trout parr generally remain in upper tributaries until they are 1 year of age, when they may begin moving more extensively throughout the river system. Once these movements begin, it is difficult to determine whether fish caught in upstream or downstream traps are parr making a freshwater migration or smolts on a seawater-directed migration; many unpaired coastal cutthroat trout of similar size caught in these traps have characteristics of either life-history stage or intermediate characteristics. In Oregon, Lowry (1965) and Giger (1972) found that downstream-directed movement by juveniles in the Alsea River system began with the first springs rains, usually in mid-April with peak movement in mid-May. Giger (1972) also reported that some juveniles entered the estuary and remained there over the summer but apparently did not smolt or migrate to the open ocean. He was unable to determine how many of these parr continued moving seaward and how many remained in the estuaries. Such movement further confounds the difficulty in separating nonanadromous downstream migrations from seaward migrations.

Coastal cutthroat trout may return to freshwater feeding/spawning areas from late June through the following April. Re-entry timing has been found to be temporally consistent from year to year within streams, but varying widely between streams (Giger, 1972). As in other species of anadromous salmonids, entry to large rivers seems to occur consistently earlier than entry to shorter coastal rivers (Giger, 1972; Johnston and Mercer, 1976; Johnston, 1982). These streams usually have low flows. Sumner (1953) found fall-winter movements in Sand Creek, first with large adults (up to 10 years old), followed by smaller (<25 cm) mature freshwater migrants coming from the lower reaches of the estuary. In the Nestucca River, Sumner reported a late reproductive migration in early to mid-May, with large ripe females in rivers as late as June. In large river systems within Washington and Oregon (such as the Stillaguamish, Columbia, Cowlitz, Alsea, and Umpqua Rivers), coastal cutthroat trout return migrations usually begin as early as late June and continue through October, with peaks in late September and October (Lavier, 1963; Bulkley, 1966; Hisata, 1971, 1973; Duff, 1972; Giger, 1972; Wright, 1973; Tipping and Springer, 1980; Tipping, 1981, 1986; ODFW, 1993a).

1.14 Bull Trout

From: Federal Register Notices of Final Listing. November 1, 1999 and June 10, 1998.

Bull trout are char native to the Pacific Northwest and western Canada. They historically occurred in major river drainages in the Pacific Northwest from about 41° N to 60° N latitude, from the southern limits in the McCloud River in northern California and the Jarbidge River in Nevada, north to the headwaters of the Yukon River in Northwest Territories, Canada (Cavender, 1978; Bond, 1992). To the west, bull trout range includes Puget Sound, various coastal rivers of Washington; British Columbia, Canada; and southeast Alaska (Bond, 1992; Leary and Allendorf, 1997). Bull trout are relatively dispersed throughout tributaries of the Columbia River Basin, including its headwaters in Montana and Canada. Bull trout also occur in the Klamath River Basin of south-central Oregon.

The Columbia River Distinct Population Segment (DPS) occurs throughout the entire Columbia River Basin within the United States and its tributaries, excluding bull trout found in the Jarbidge River, Nevada. Although Williams, et al. (1995), identified two distinct clades in the Columbia River basin (upper and lower Columbia River) based on genetic diversity patterns, a discrete geographical boundary between the two clades was not documented. The Columbia River DPS is significant because the overall range of the species would be substantially reduced if this discrete population were lost.

The Columbia River DPS includes bull trout residing in portions of Oregon, Washington, Idaho, and Montana. Bull trout are estimated to have occupied about 60 percent of the Columbia River Basin and currently occur in 45 percent of the estimated historical range (Quigley and Arbelbide, 1997). The Columbia River population segment comprises 141 subpopulations. For discussion and analysis, the U.S.

Fish and Wildlife Service (USFWS) considered four geographic areas of the Columbia River basin: (1) lower Columbia River (downstream of the Snake River confluence), (2) mid-Columbia River (Snake River confluence to Chief Joseph Dam), (3) upper Columbia River (upstream from Chief Joseph Dam), and (4) Snake River and its tributaries (including the Lost River drainage).

The lower Columbia River area includes all tributaries in Oregon and Washington downstream of the Snake River confluence near the town of Pasco, Washington. USFWS identified 20 subpopulations in watersheds of nine major tributaries of the lower Columbia River (number of subpopulations in each watershed): the Lewis River (2), Willamette River (3), White Salmon River (1), Klickitat River (1), Hood River (2), Deschutes River (3), John Day River (3), Umatilla River (2), and Walla Walla River (3). The current distribution of bull trout in the lower Columbia River Basin is less than the historical range (Buchanan, et al., 1997; Oregon Department of Fish and Wildlife [ODFW], 1993). Bull trout are thought to have been extirpated from several tributaries in five river systems in Oregon: the Middle Fork Willamette River, the North and South Forks of the Santiam River, the Clackamas River, the upper Deschutes River (upstream of Bend, Oregon) and the Crooked River (tributary to the Deschutes River) (Buchanan, et al., 1997). Hydroelectric facilities and large expanses of unsuitable, fragmented habitat have isolated these subpopulations. Large dams, such as McNary, John Day, The Dalles, and Bonneville, separate four reaches of the lower Columbia River. Although fish may pass each facility in both upstream and downstream directions, the extent to which bull trout use the Columbia River is unknown. In addition, the nine major tributaries have numerous facilities, many of which do not provide upstream passage.

Migratory bull trout are present with resident fish or exclusively in at least 13 of the 20 subpopulations in the lower Columbia River. Many migratory fish are adfluvial and inhabit reservoirs created by dams. However, this area includes the only extant adfluvial subpopulation in Oregon, which exists in Odell Lake in the Deschutes River basin (Ratliff and Howell, 1992; Buchanan, et al., 1997). The Metolius River-Lake Billy Chinook subpopulation is also found in the Deschutes River basin. It is the only subpopulation considered “strong” and exhibits an increasing trend in abundance. USFWS considers 5 of the 20 subpopulations at risk of extirpation caused by naturally occurring events exacerbated by isolation, single life-history form and spawning area, and low abundance.

The mid-Columbia River area includes watersheds of four major tributaries of the Columbia River in Washington, between the confluence of the Snake River and Chief Joseph Dam. USFWS identified 16 bull trout subpopulations in the four watersheds: Yakima River (8), Wenatchee River (3), Entiat River (1), and Methow River (4). Bull trout have historically occurred in larger areas of the four tributaries and Columbia River. Bull trout are thought to have been extirpated in 10 streams within the area: Satus Creek, Nile Creek, Orr Creek, Little Wenatchee River, Napecqua River, Lake Chelan, Okanogan River, Eightmile Creek, South Fork Beaver Creek, and the Hanford Reach of the Columbia River. Most bull trout in the mid-Columbia River geographic area are isolated by dams or unsuitable habitat created by water diversions. Bull trout in the mid-Columbia River area are most abundant in Rimrock Lake of the Yakima River basin and Lake Wenatchee of the Wenatchee River basin. Both subpopulations are considered "strong" and increasing or stable. The remaining 14 subpopulations are relatively low in abundance, exhibit “depressed” or unknown trends, and primarily have a single life-history form. USFWS considers 10 of the 16 subpopulations at risk of extirpation because of naturally occurring events due to isolation, single life-history form and spawning area, and low abundance.

The upper Columbia River geographic area includes the mainstem Columbia River and all tributaries upstream of Chief Joseph Dam in Washington, Idaho, and Montana. Bull trout are found in two large basins, the Kootenai River and Pend Oreille River, which include the Clark Fork River. Bull trout were historically found in larger portions of the area. Numerous dams and degraded habitat have fragmented bull trout habitat and isolated fish into 71 subpopulations in nine major river basins: Spokane River (1),

Pend Oreille River (3), Kootenai River (5), Flathead River (24), South Fork Flathead River (3), Swan River (3), Clark Fork River (4), Bitterroot River (27), and Blackfoot River (1). Bull trout are thought to be extirpated in 64 streams and lakes of various sizes: Nespelam, Sanpoil, and Kettle rivers; Barnaby, Hall, Stranger, and Wilmont Creeks; 8 tributaries to Lake Pend Oreille; 5 tributaries to Pend Oreille River below Albeni Falls Dam; Lower Stillwater Lake; Arrow Lake (Montana); upper Clark Fork River, 12 streams in the Coeur d'Alene River basin; and approximately 25 streams in the St. Joe River basin.

Bull trout typically spawn from August to November during periods of decreasing water temperatures. However, migratory bull trout may begin spawning migrations as early as April and may move upstream as far as 250 km to spawning grounds in some areas of their range.

1.15 References

Northwest Fisheries Science Center. February 1998. Status Review of Chinook Salmon from Washington, Idaho, Oregon, and California.

Northwest Fisheries Science Center. December 1997. Status Review of Chum Salmon from Washington, Oregon, and California.

Northwest Fisheries Science Center. August 1996. Status Review of West Coast Steelhead from Washington, Idaho, Oregon, and California.

Northwest Fisheries Science Center. June 1991. Status Review of Snake River Fall Chinook Salmon.

Northwest Fisheries Science Center. June 1991. Status Review of Snake River Spring and Summer Chinook Salmon.

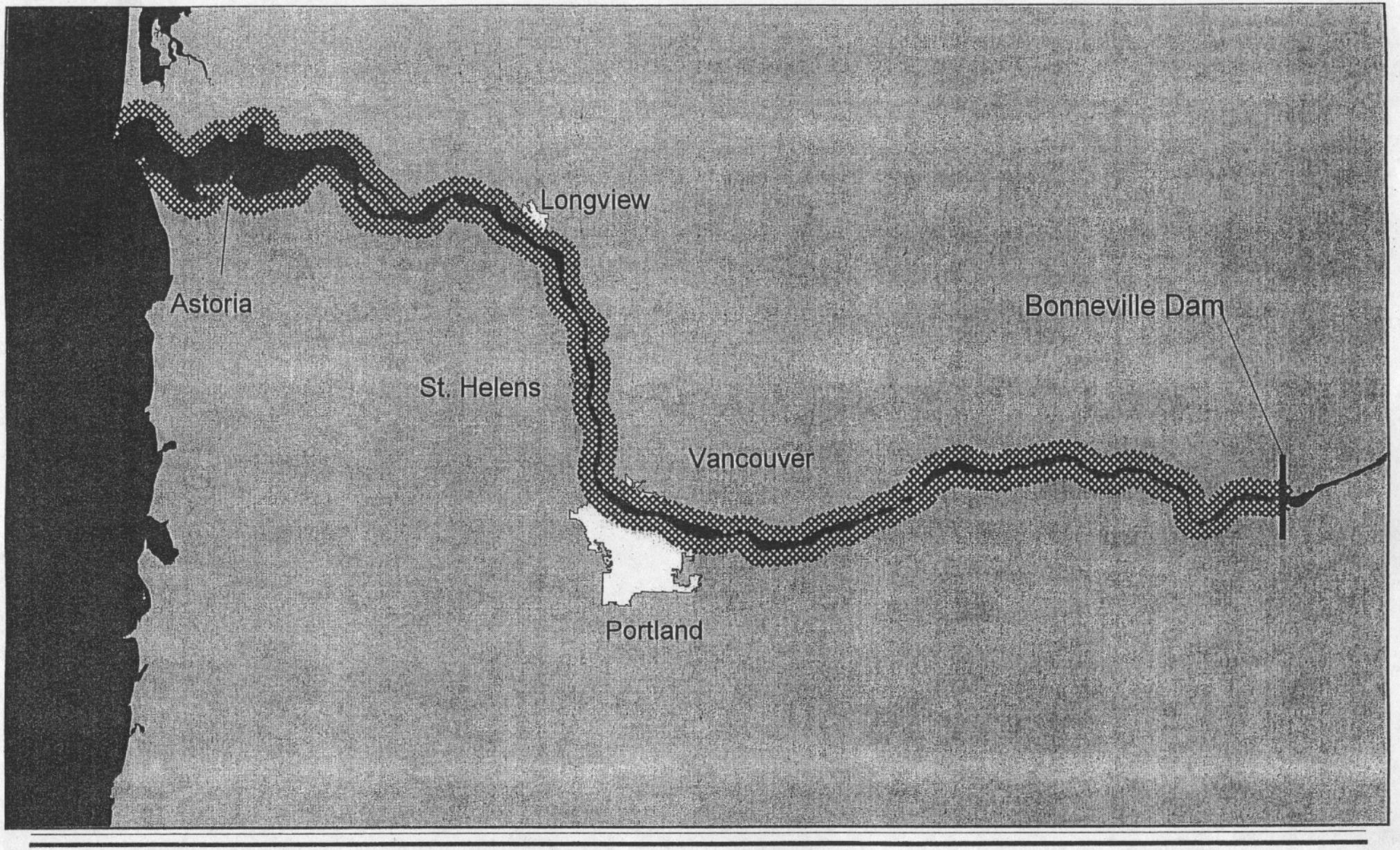
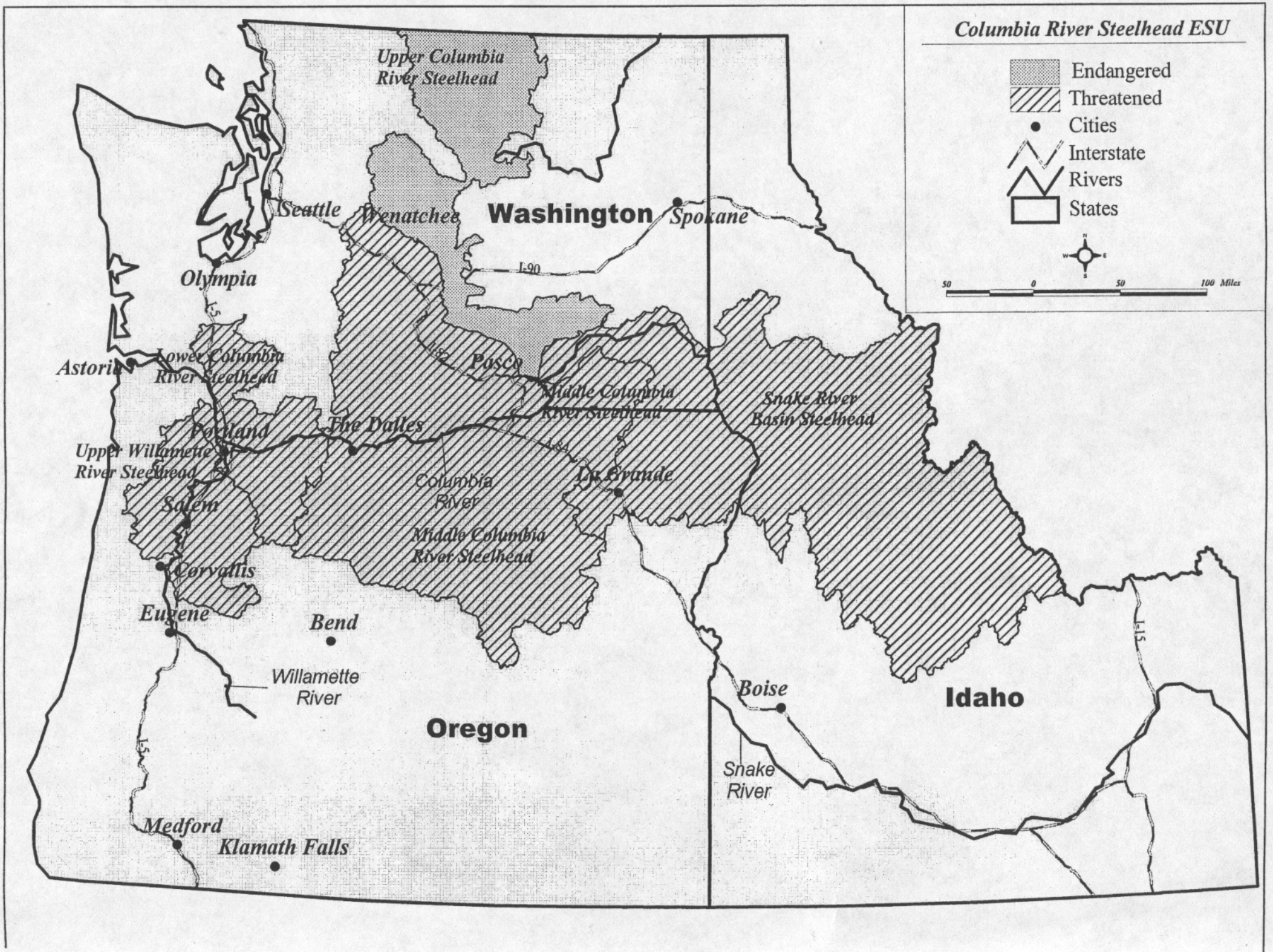


Figure D1-1
Critical Habitat for Listed Salmonid Species Within the Project Area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Endangered
Threatened
Cities
Interstate
Rivers
States
50 0 50 100 Miles
Upper Columbia River Steelhead
Seattle
Wenatchee
Washington
Spokane
Olympia
I-90
I-5
Lower Columbia River Steelhead
Astoria
I-82
Pasco
Middle Columbia River Steelhead
Snake River Basin Steelhead
Portland
The Dalles
I-84
Upper Willamette River Steelhead
Columbia River
La Grande
Salem
Middle Columbia River Steelhead
Corvallis
Eugene
Bend
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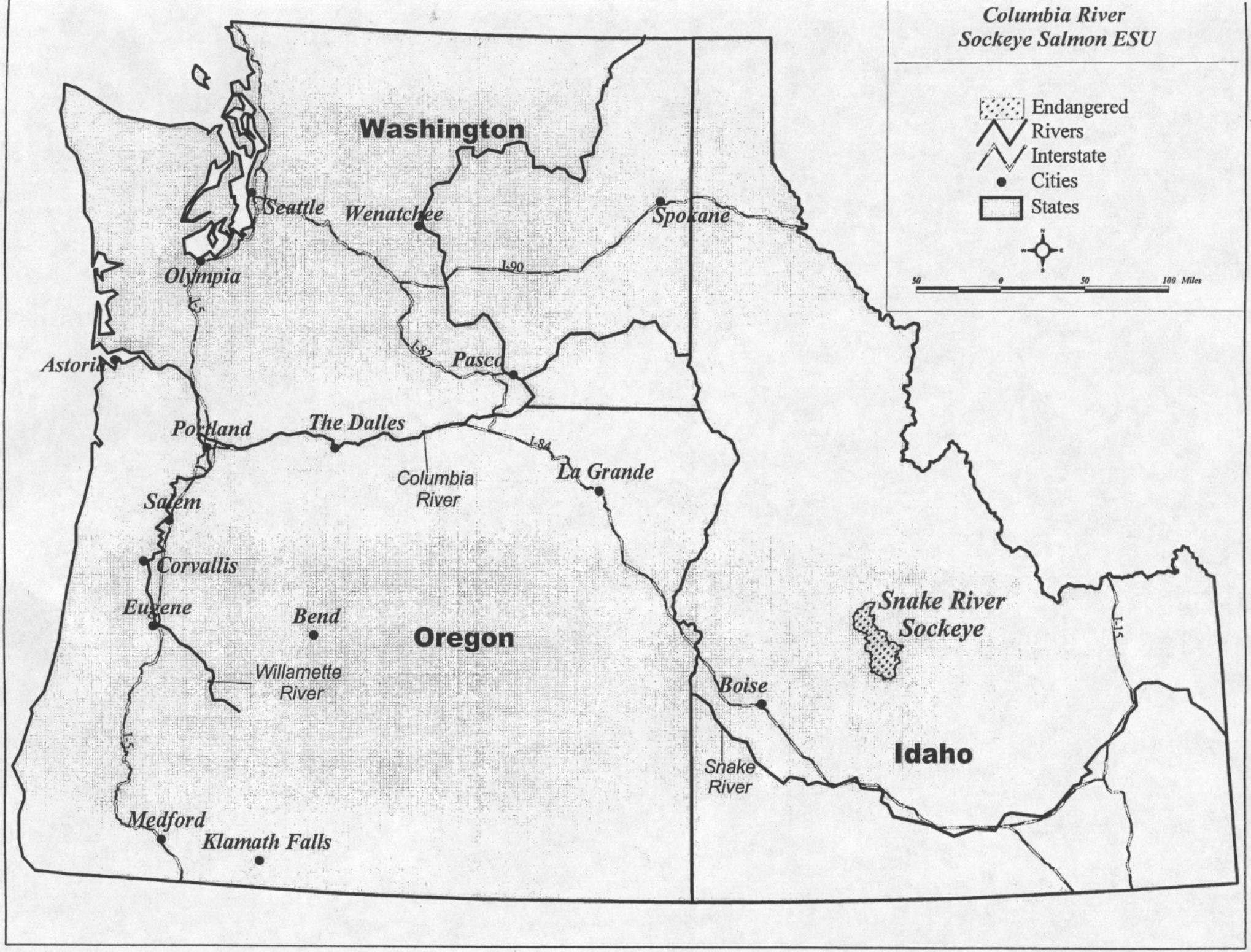
Oregon
Boise
Idaho
I-15
Snake River
I-5
Medford
Klamath Falls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Endangered
Rivers
Interstate
Cities
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Washington
Seattle
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Olympia
I-90
I-5
I-82
Pasco
Astoria
Portland
The Dalles
I-84
La Grande
Columbia River
Salem
Corvallis
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Idaho
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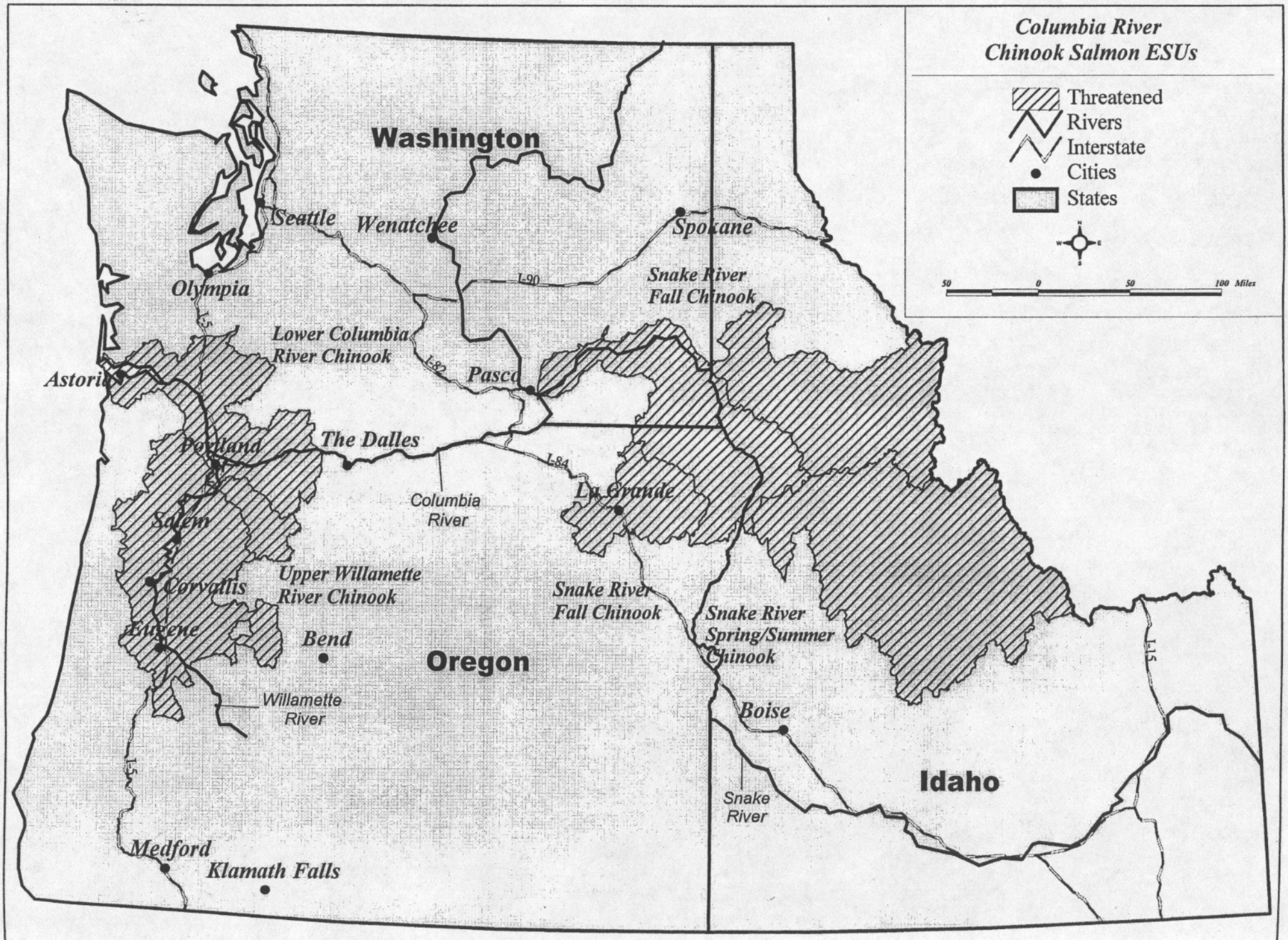
I-5
Medford
Klamath Falls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Chinook Salmon ESUs
Threatened
Rivers
Interstate
Cities
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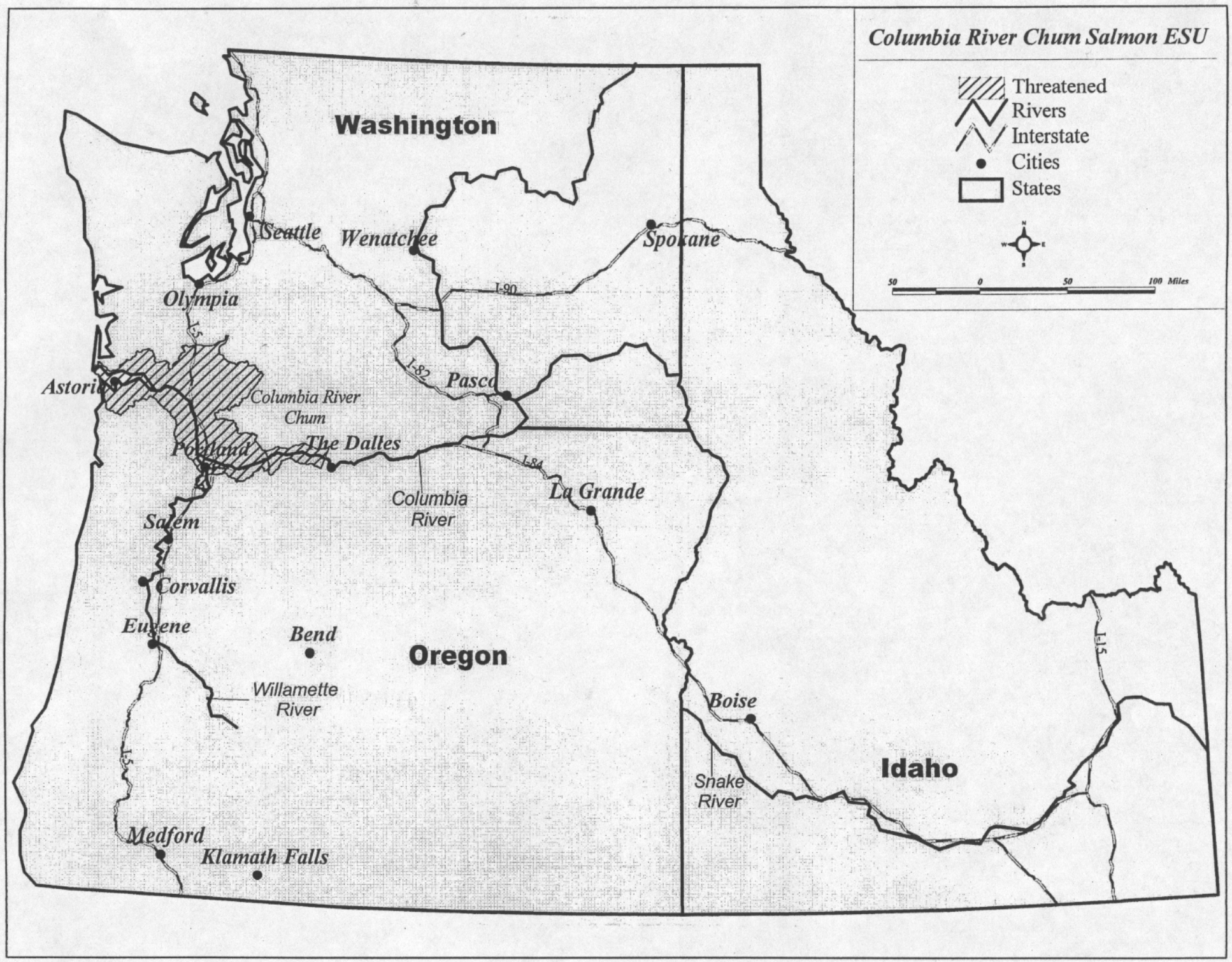
Washington
Seattle
Wenatchee
Spokane
Olympia
I-90
Snake River
Fall Chinook
I-5
Lower Columbia
River Chinook
I-82
Pasco
Astoria
Portland
The Dalles
I-84
La Grande
Columbia
River
Salem
Upper Willamette
River Chinook
Corvallis
Snake River
Fall Chinook
Snake River
Spring/Summer
Chinook
Eugene
Bend
Oregon
I-15
Willamette
River
Boise
I-5
Idaho
Snake
River
Medford
Klamath Falls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Threatened
Rivers
Interstate
Cities
States
50 0 50 100 Miles
Washington
Seattle
Wenatchee
Spokane
Olympia
I-90
I-5
I-82
Pasco
Astoria
Columbia River Chum
Portland
The Dalles
I-84
La Grande
Columbia River
Salem
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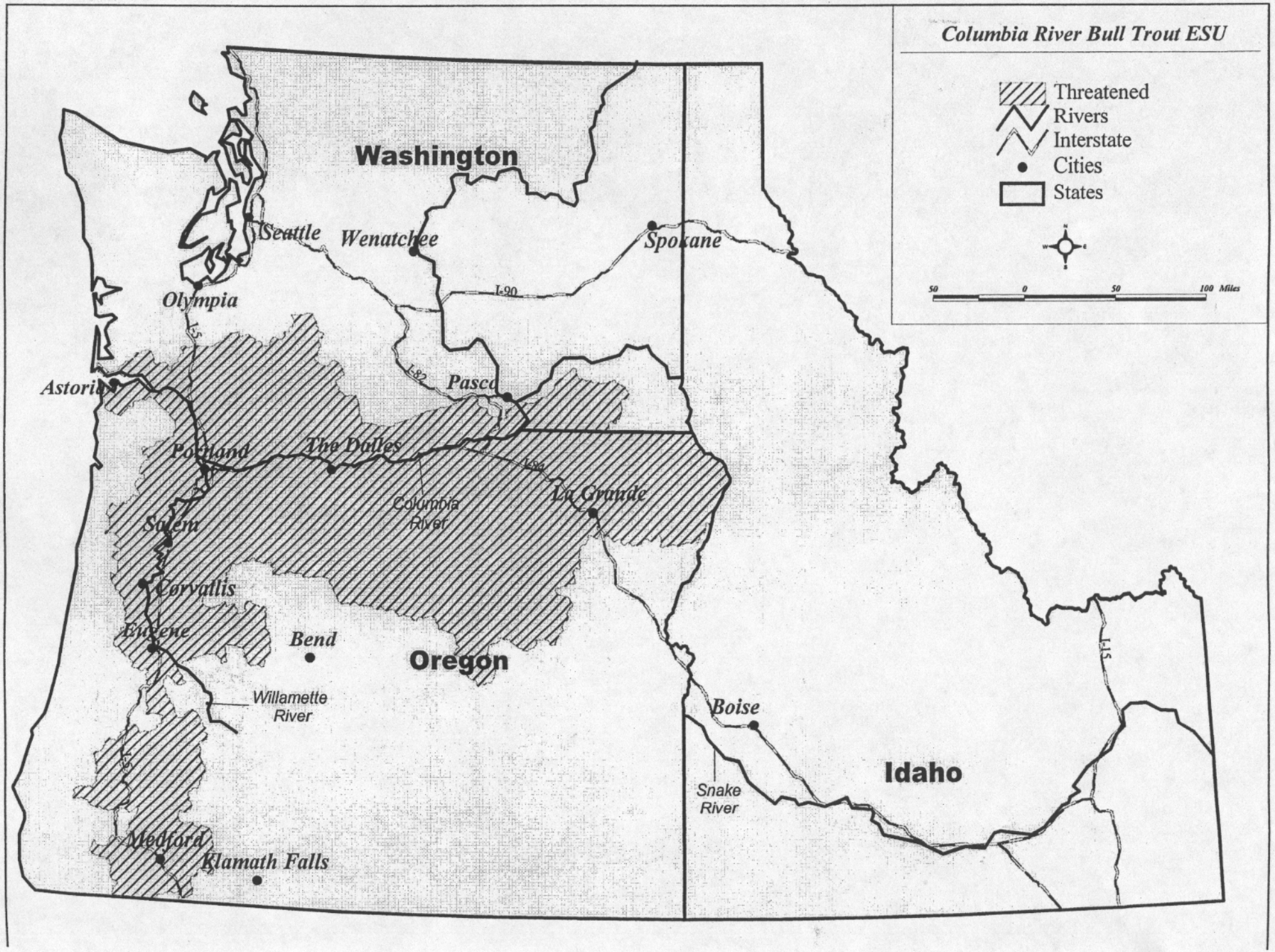
I-15
Boise
Idaho
Snake River
Medford
Klamath Falls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Rivers
Interstate
Cities
States
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Washington
Seattle
Wenatchee
Spokane
Olympia
I-90
I-5
I-82
Pasco
Astoria
Portland
The Dalles
I-84
La Grande
Columbia River
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Bend
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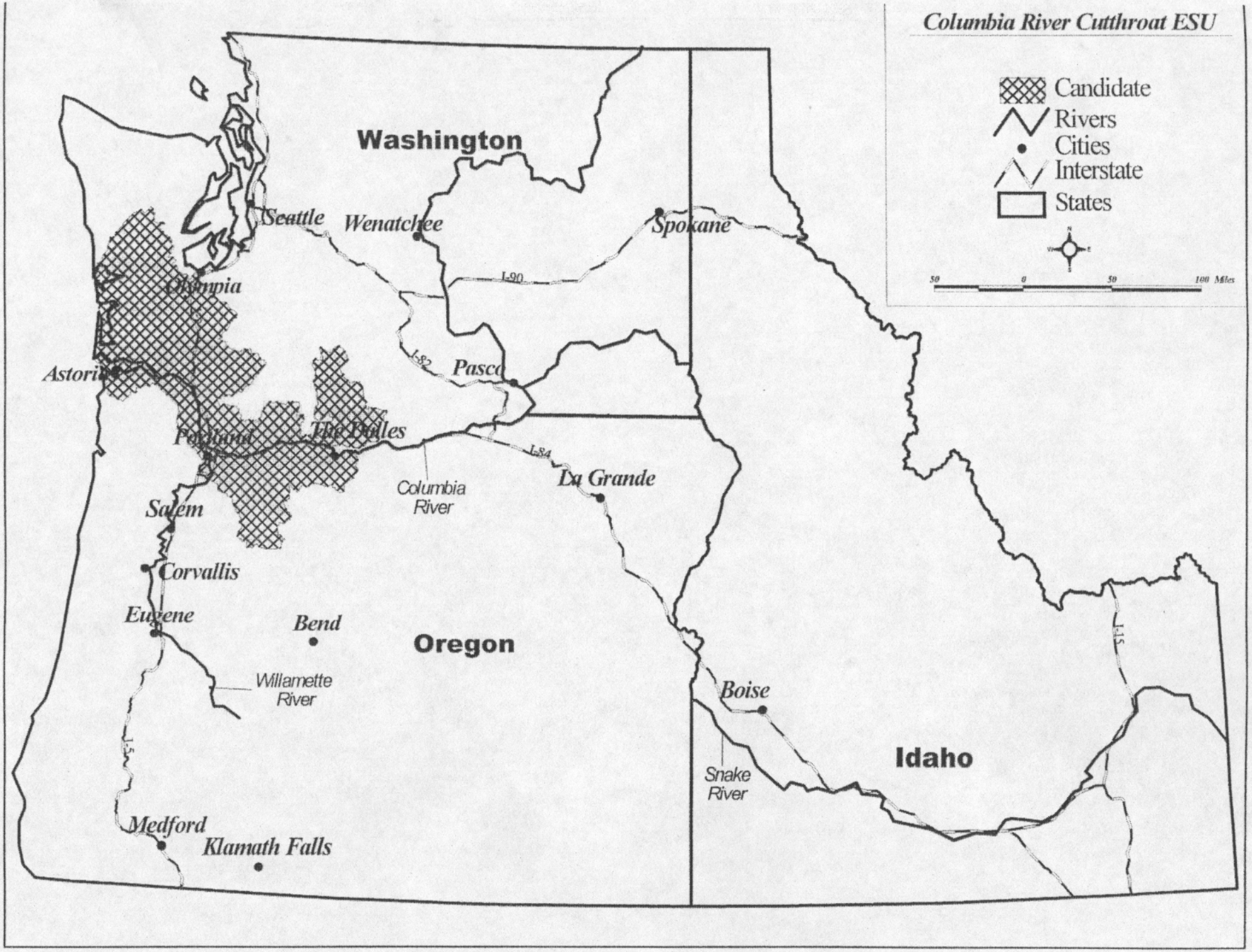
I-15
Idaho
Snake River
Medford
Klamath Falls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Candidate
Rivers
Cities
Interstate
States
50 0 50 100 Miles
Washington
Seattle
Wenatchee
Spokane
Olympia
I-90
Astoria
I-82
Pasco
Portland
The Dalles
I-84
La Grande
Columbia River
Salem
Corvallis
Eugene
Bend
Oregon
Willamette River
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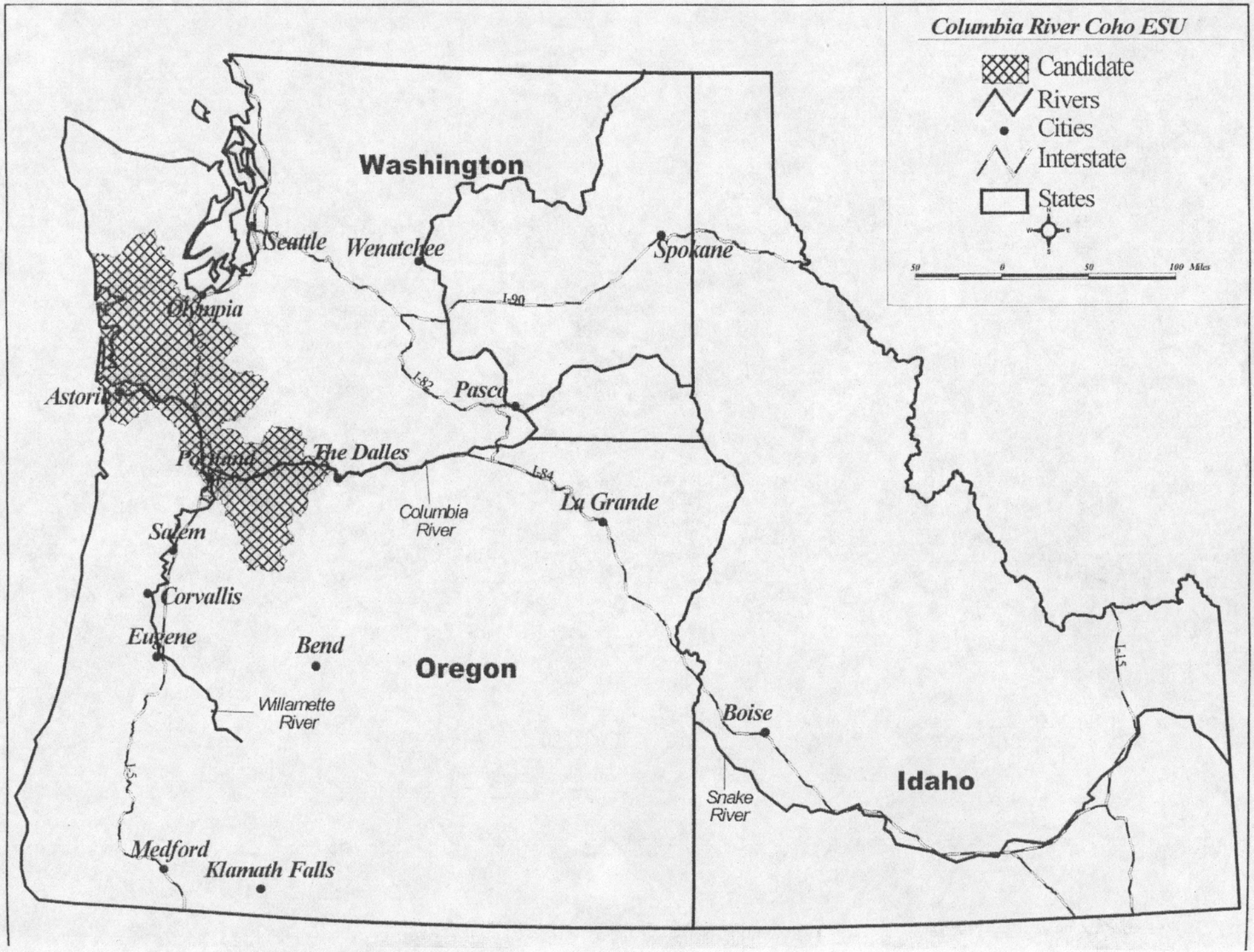
Boise
I-15
Idaho
Snake River
Medford
Klamath Falls


Columbia River Coho ESU
Candidate
Rivers
Cities
Interstate
States
50 0 50 100 Miles
Washington
Seattle
Wenatchee
Spokane
Olympia
I-90
Astoria
I-82
Pasco
Portland
The Dalles
I-84
La Grande
Columbia River
Salem
Corvallis
Eugene
Bend
Oregon
Willamette River
Boise
I-15
Idaho
Snake River
I-5
Medford
Klamath Falls