CHAPTER 4.0 LISTED SPECIES POTENTIALLY AFFECTED BY THE PROPOSED ACTION

4.1 INTRODUCTION

This chapter provides a brief description and ESA status of each listed species potentially affected by the proposed action.

On June 4, 2002, Reclamation sent letters to NMFS and USFWS requesting that they provide an updated listing of ESA listed threatened and endangered species that could potentially be present in the project area or affected by Reclamation O&M activities in the Deschutes River basin. By return letters dated July 3, 2002 and June 28, 2002, respectively, the two agencies provided lists of the ESA-listed species (Appendix A). Reclamation previously requested ESA-listed species in February 2000 and February 2001.

Table 4-1 tabulates all federally-listed ESA species that were initially identified and considered for this consultation. NMFS provided a comprehensive list of 14 anadromous fish ESUs that occur in Oregon. In conjunction with the NMFS, Reclamation determined that only one of the ESUs occurred in the action area (MCR steelhead). Accordingly, analysis was not conducted for 13 of the ESUs as indicated in Table 4-1.

ESA species considered in this consultation include bald eagle, bull trout, MCR steelhead, Canada lynx, and northern spotted owl. The ESA status, distribution, life history, and habitat requirements for these species are presented in this chapter. The environmental baseline for the listed species is stated in Chapter 5, and the effects of the proposed action are described in Chapter 6.

Table 4-1. ESA Federally-Listed Species Initially Considered for Consultation on the Deschutes River Basin Projects O&M

Common Name/ESU	Scientific Name	Occurs in Action Area
Snake River sockeye salmon	*Oncorhynchus nerka*	No
Upper Columbia River spring Chinook salmon	*Oncorhynchus tshawytscha*	No
Upper Columbia River steelhead	*Oncorhynchus mykiss*	No
Middle Columbia River steelhead	*Oncorhynchus mykiss*	Yes

Common Name/ESU	Scientific Name	Occurs in Action Area
Snake River spring/summer Chinook salmon	*Oncorhynchus tshawytscha*	No
Snake River fall Chinook salmon	*Oncorhynchus tshawytscha*	No
S. Oregon/N. California coasts coho salmon	*Oncorhynchus kisutch*	No
Oregon coast coho salmon	*Oncorhynchus kisutch*	No
Upper Willamette River Chinook salmon	*Oncorhynchus tshawytscha*	No
Upper Willamette River steelhead	*Oncorhynchus mykiss*	No
Lower Columbia River Chinook salmon	*Oncorhynchus tshawytscha*	No
Snake River steelhead	*Oncorhynchus mykiss*	No
Lower Columbia River steelhead	*Oncorhynchus mykiss*	No
Columbia River chum salmon	*Oncorhynchus keta*	No
Bald eagle	*Haliaeetus leucocephalus*	Yes
Bull trout	*Salvelinus confluentus*	Yes
Northern spotted owl[1]	*Strix occidentalis caurina*	(occurs in Deschutes and Wapinitia projects only)
Canada lynx[1]	*Lynx canadensis*	(occurs in Deschutes and Wapinitia projects only)
[1] During preliminary analysis, it was determined that routine project operation and maintenance will not affect the Northern spotted owl, Canada lynx, nor their forest habitats.		

4.2 BALD EAGLE

4.2.1 Status

The bald eagle (*Haliaeetus leucocephalus)* is currently listed as threatened in all lower 48 contiguous states. Historically, the bald eagle could be found nesting throughout most of the continent. However, reproduction in North America declined dramatically between 1947 and 1970 largely due to intake of organo-chloride pesticides (USFWS 1986). Habitat degradation, illegal harassment and disturbance, poisoning, and a reduced food base helped contribute to the decline. By 1978 the bald eagle was federally listed as a threatened species in 5 of the lower 48 states and as an endangered species in the remaining lower 43 states.

The USFWS initiated a recovery program for the species in the mid-1970s and divided the 48 states into five bald eagle recovery regions. The Deschutes River basin lies within the Pacific Recovery Region that includes the states of Idaho, Oregon, Washington, Montana, Wyoming,

California, and Nevada. The bald eagle recovery plan for the Pacific Region was approved in 1986.

Bald eagle populations have increased steadily since ESA listing. The improvement is a direct result of:

- bans on DDT and other persistent organochloride pesticides
- habitat protection
- a growing public awareness of the bald eagles' plight

Due to the overall population increase, the bald eagle was reclassified in 1995 from endangered to threatened in all 48 lower states (Federal Register 60:36000). The number of bald eagles in the Pacific Recovery Region is five times what it was when the recovery plan was written (Federal Register 64:36454).

4.2.2 Distribution

In 1990, bald eagles nested in all but 5 of the 50 states. However, most bald eagle nesting is limited to the Pacific Northwest, Alaska, Canada, the Great Lake states, Chesapeake Bay, Arizona, and Florida. Oregon and Washington have been strongholds for bald eagles, with more than two-thirds of the nesting population and one-half of the wintering population of the Pacific recovery area occurring in these two states (USFWS 1994). Occupied breeding territories surveyed in Oregon have increased from 20 in 1971 to 401 in 2002 (Isaacs and Anthony 2002). Figure 4-1 shows the distribution of bald eagle nesting sites in the Deschutes River basin.

Delisting requirements under the Pacific Bald Eagle Recovery Plan include: 1) a minimum of 800 nesting pairs; 2) an average reproductive rate of 1.0 fledged young per pair, with an average success rate per occupied site of not less than 65 percent; 3) breeding population goals met in at least 80 percent of the management zones; and 4) stable or increasing wintering populations. The numeric delisting goals have been met since 1995 (Federal Register 64:36454).

Productivity has averaged about 1.0 young per occupied breeding area since 1990. The average success rate for occupied breeding areas exceeded 65 percent for the 5-year period ending in 1999. For 1998, six of the seven Pacific region states reported an average success rate of 75 percent. However, the plan goal for distribution among management zones is not yet fully achieved for all areas. The number of occupied breeding areas exceeded 800 in 1990 and has continued to increase. In 1998, 1,480 occupied breeding areas were estimated. As of 1999 (Federal Register 64:36454), 28 of 37 (76 percent) management zone targets had been met. Of the 28 zones where target levels have been met, at least 11 have more than doubled the established goal. Wintering populations have been tracked in the Pacific and many other states using the mid-winter bald eagle surveys. However, wintering populations are difficult to assess because concentrations are dependent on weather and food supply and thus can be quite variable from year to year.

4.2.3 Life History

The bald eagle, like most birds of prey, exhibits sexual dimorphism, with the females weighing more than the males. Males and females are thought to mate for life, returning to the same nesting territory year after year. A clutch of one to three eggs is laid and incubated mostly by the female for about 35 days. The young fledge in 72-75 days. Often the younger, weaker bird is killed by its sibling in the competition for food. Bald eagles require 4-5 years to reach sexual maturity and attain full adult plumage. Prior to that time, immature bald eagles are often confused with immature golden eagles.

4.2.4 Habitat Requirements

4.2.4.1 Nesting Habitat

In the Pacific Northwest, bald eagles typically nest in multi-layered coniferous stands with old growth trees within 1 mile of large bodies of water (lakes, reservoirs, large rivers, and coastal estuaries). Availability of suitable trees for nesting and perching is critical. Nest trees in the Pacific Northwest are found primarily in ponderosa pine, mixed conifer, Douglas fir, and Sitka spruce/western hemlock forests (USFWS 1986). Species of trees used for nesting, however, vary among areas. In Oregon, nests are typically found in large conifers or cottonwoods (USFWS 1986). Nests are generally not constructed in areas with nearby human activity. The nesting season for bald eagles in the Pacific Northwest generally extends from January 1 to mid-August (USFWS 1994). Young are usually produced in March and fledged in July; however, they may stay near the nest for several weeks after fledging.

4.2.4.2 Wintering Habitat

More than 25 percent of the wintering bald eagles in the lower 48 states are present in the Pacific Northwest (USFWS 1986). Bald eagles winter in the Northwest from approximately November through March and are primarily associated with open water near concentrated food sources. An important habitat feature is perch trees which provide an unobstructed view of the surrounding area near foraging sites (USFWS 1986). Ponderosa pine and cottonwood snags are preferred perches in some areas, probably due to their open structure and height. Bald eagles may also use communal night roost sites in winter for protection from inclement weather. Characteristics of communal winter roost sites differ considerably from those of diurnal perch sites (USFWS 1986), although both are invariably located near concentrated food sources, such as anadromous fish runs or high concentrations of waterfowl. Roost sites tend to provide more protection from weather than diurnal perch sites. Communal roosts in the Pacific Northwest tend to be located in uneven-aged forest stands with some degree of old-growth forest structure. Conifers might provide a more thermally favorable microenvironment than dead or deciduous trees, which might explain their high use by wintering eagles. In eastern Washington, bald eagles have been observed roosting in mixed stands of Douglas fir and ponderosa pine and in stands of black locust and black cottonwood.

Pacific Northwest Region GIS

Deschutes River Basin

Bald Eagle

0 20 40
Miles

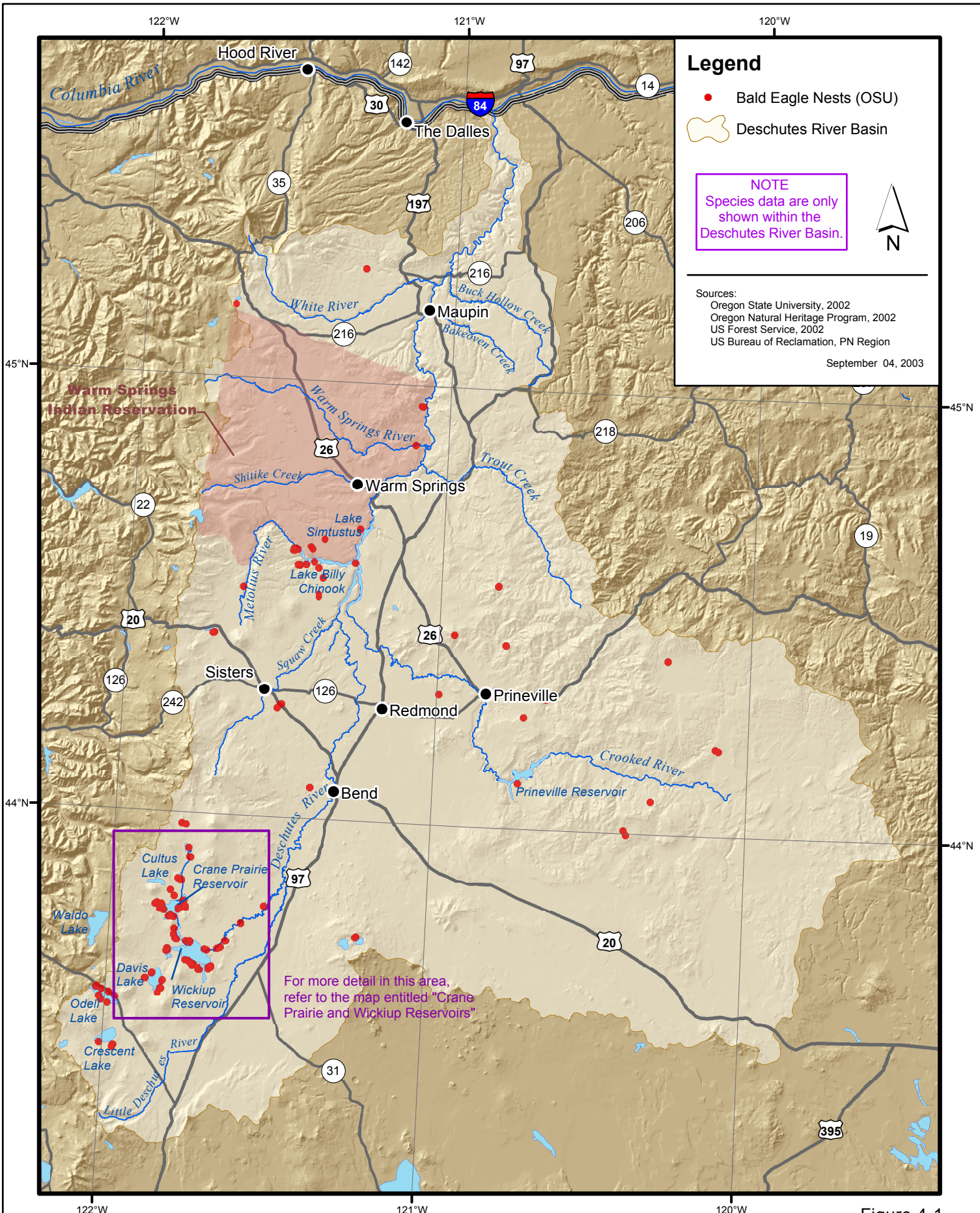


Figure 4-1

4.2.4.3 Foraging Habitat

Bald eagles are opportunistic foragers throughout their range. In the Pacific Northwest, bald eagles consume a range of food including a variety of fish, waterfowl, jackrabbits, and mammalian carrion (USFWS 1994). Game and nongame fish species tend to be the preferred food, but diet is dependent on prey availability. Winter killed mammals can be important on big game winter ranges, while waterfowl are important where concentrations are significant. Fish are also taken as carrion, especially spawned out kokanee (USFWS 1986).

4.3 BULL TROUT

4.3.1 Status

The USFWS issued a final rule listing the Columbia River and Klamath River populations of bull trout (*Salvelinus confluentus)* as a threatened species under the ESA on June 10, 1998 (USFWS 1998). The Columbia River Distinct Population Segment is threatened by habitat degradation and fragmentation, blockage of migratory corridors, poor water quality, and past fisheries management practices such as the introduction of non-native species.

In the final listing rule, the USFWS (1998) identified three subpopulations of bull trout in the Deschutes River basin: 1) Odell Lake in the upper Deschutes River basin, 2) Metolious River-Lake Billy Chinook complex, and 3) lower Deschutes River. Historically bull trout were distributed throughout the Deschutes River basin from the headwaters and headwater lakes to the Columbia River, allowing access to the Columbia River for juvenile rearing and adult foraging (Buchanan et al. 1997). The subpopulations are isolated by the Pelton-Round Butte Project dams on the Deschutes River between RM 100 and 110, and Big Falls, a natural barrier at about RM 132. Bull trout are thought to be extirpated in up to seven reaches or tributaries within the Deschutes River basin (Buchanan et al. 1997).

At the time of listing, bull trout had been extirpated from their historic habitats in the upper and middle Deschutes above Big Falls. Five populations of bull trout currently exist in the basin. These are located in Shitike Creek, Warm Springs River, Whitewater River, Jefferson/Candle/ Abbot complex, and the Canyon/Jack/Heising/mainstem Metolious complex.

In November 2002, a proposed rule for bull trout critical habitat in the Columbia and Klamath River basins was published in the Federal Register by the USFWS. This proposal includes bull trout critical habitat for the Deschutes River basin. Originally, a final decision was expected in October 2003; however, USFWS is proposing deferring work to develop a final rule until fiscal year 2004 because of lack of funding (http://endangeredfish.gov/criticalhabitat/chactions.pdf.) Critical habitat refers to specific geographic areas that are essential for the conservation of a

threatened or endangered species and which may require special management considerations. Reclamation will not be consulting on critical habitat in this BA.

The USFWS prepared a draft recovery plan for bull trout in November 2002. The USFWS is anticipating completion of final bull trout recovery plans in 2004. Recovery plans are a much larger blueprint for the recovery and eventual delisting of a species, as it provides recommendations concerning habitat and various other factors that need to be addressed to achieve recovery.

4.3.2 Historical Distribution

Historical distribution of bull trout in the Deschutes River basin is summarized herein from Buchanan, et al. (1997). Bull trout were historically found throughout much of the Deschutes River basin (Figure 4-2). Bull trout populations upstream from Big Falls (RM 132) were apparently reproductively isolated from populations in the lower river. Historically, adfluvial populations of bull trout were also present in the Blue/Suttle Lake complex, in the upper Metolius River basin, and in Crescent and Davis Lakes of the upper Deschutes basin.

Isolation of upper Deschutes River basin bull trout populations occurred upon completion of upper basin irrigation storage dams. The completion of Crane Prairie Dam in 1922, Crescent Lake in 1928, and Wickiup Dam in 1949, all without fish passage facilities, blocked access for adult bull trout migrating to upper Deschutes River spawning areas. Increased water temperatures, altered streamflow regimes, inundation of some juvenile rearing areas and adult spawning areas, barriers to spawning areas, competition with non-native fish species, and over-harvest eliminated remnant bull trout populations in the Deschutes River above Big Falls during the 1950s.

The last bull trout observed in Crane Prairie Reservoir was in 1955, in Wickiup Reservoir in 1957, and in Crescent Lake in 1959. The last bull trout observed in the Deschutes River above Bend was in 1954. Ratliff and Howell (1992) listed two bull trout populations, upper Deschutes River and Crescent Lake, as "probably extinct." There may have been separate populations in the Fall River and Tumalo Creek, but spawning was not documented in these systems and bull trout are no longer found there.

Construction of Round Butte Dam in 1964 and the subsequent abandonment of passage facilities in 1968 isolated the Metolius River bull trout populations from those found downstream in Shitike Creek and the Warm Springs River. Bull trout are no longer found in Trout Creek, although they were reported there in 1960. Fluvial subpopulations in Shitike Creek and Warm Springs River contributed and still contribute bull trout into the lower Deschutes River.

The Blue Lake-Link Creek-Suttle Lake bull trout group in the Metolius subbasin has been extirpated, possibly due to overharvest and/or creation of passage barriers on Lake and Link Creeks (Marx 2000).

Deschutes River Basin
Bull Trout

Pacific Northwest Region GIS

0 20 40
Miles

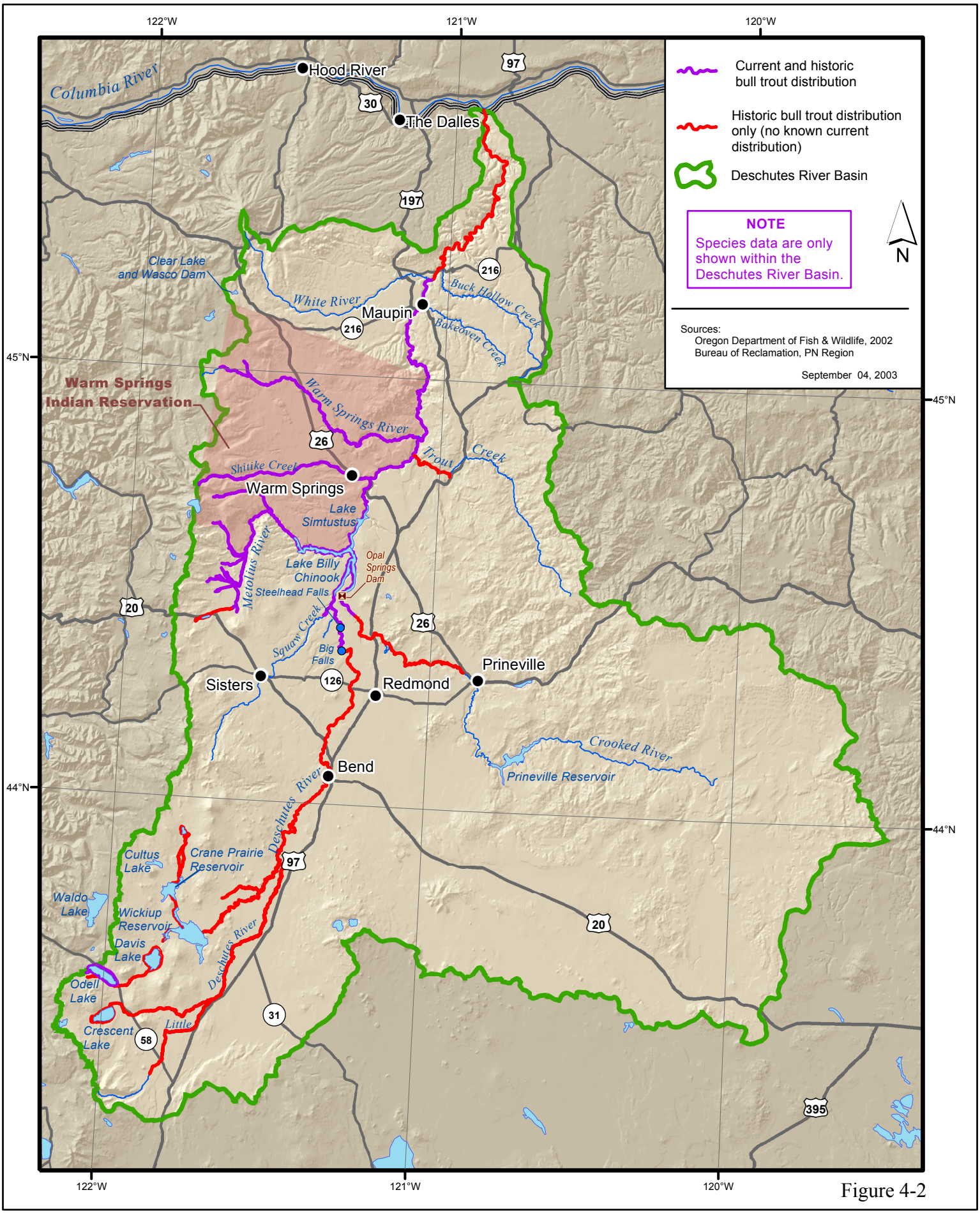


Figure 4-2

The first extensive fish surveys in the Crooked River subbasin were conducted in the 1950s. By this time, the basin had experienced years of water withdrawal that radically altered riparian areas. Wandering subadult and adult bull trout, likely from the Metolius system, were occasionally caught in the Crooked River as far upstream as the city of Prineville through the early 1980s. However, the 1983 enlargement of the Opal Springs Diversion Dam, owned by the Deschutes Valley Water District, on the lower Crooked River created an upstream barrier to bull trout and other fish.

4.3.3 Present Distribution

Information about the current distribution of bull trout in the Deschutes River basin is summarized from Buchanan et al. 1997. Current and historic distribution of bull trout in the basin based on documented reports is portrayed in Figure 4-2. Of the historical adfluvial bull trout population in Oregon, only the Odell Lake population continues to produce bull trout. The abundance of the Odell Lake population remains unknown. However, angler observations of bull trout incidentally caught in the kokanee fishery have been increasing since the harvest of bull trout was prohibited after 1990.

Bull trout currently inhabit most riverine habitats of the Metolius subbasin except Lake Creek, Link Creek, and Suttle and Blue Lakes. The Metolius River, Lake Billy Chinook Reservoir, the Deschutes River above Lake Billy Chinook upstream to Big Falls, and the lower part of Crooked River up to the Opal Springs Dam also support bull trout. Bull trout also use lower Squaw Creek, a tributary to the Deschutes River above Lake Billy Chinook. Bull trout found in the Deschutes River between Lake Billy Chinook and Big Falls, as well as the lower Crooked River and Squaw Creek, appear to originate from the Metolius River and its tributaries, as these are the only sites for which there is evidence of bull trout reproduction above Round Butte Dam (Ratliff et al. 1996, Thiesfield et al. 1996). Extensive surveys of the Deschutes arm of Lake Billy Chinook have not captured significant numbers of juveniles or the stratified age structure typical of a reproductive population of bull trout (as is seen in surveys near the mouth of the Metolius River), but instead reflects a population of foraging migratory or adfluvial fish originating from the Metolius River (Thiesfield et al. 1996).

Bull trout are found in the lower Deschutes River upstream from Sherars Falls, Shitike Creek, and Warm Springs River. Anglers, as recently as 2002, have reported higher incidental hooking of bull trout in the Deschutes River, which may indicate that the population is increasing. One or two adult bull trout are caught in the Pelton Dam trap each year.

4.3.4 General Life History

Bull trout generally exhibit two distinct life history forms–migrant and resident. Migrant fish emigrate from the small streams where the juveniles rear to larger rivers (fluvial) or lakes (adfluvial). Resident fish remain in the rearing streams and mature there. Table 4-2 (Knowles and Gumtow 1996) summarizes the general life history of bull trout.

Table 4-2. Bull Trout Life History Summary

Life Conditions	Criteria/Facts
Age at first reproduction	4-5 years
Number of eggs produced	1,300 to 9,000
Maximum size	Greater than 30 pounds and 36 inches
Life span	Up to 10 years
Food habits	Juveniles are insectivorous. Adults are piscivorus.
Incubation success	Water temperature critical: 32-36 °F = 80-95 percent 43 °F = 60-90 percent 46-48 °F = 0-20 percent Sediment size: 20 percent fines = 40 percent 30 percent fines = 20 percent 40 percent fines = 1 percent
Migration strategies	Resident, adfluvial, fluvial, and anadromous
Closely related species	Dolly Varden, lake trout, and brook trout
Optimal and maximum water temperature	Juveniles = 39-48 °F and 59 °F Adults = 39-48 °F and 64 °F
Spawning season	September through November
Source: Knowles and Gumtow 1996	

Bull trout can live up to 10 years and are sexually mature after 4 or 5 years. They spawn during September through November, in cold, flowing groundwater-fed streams that are clean and free of sediment. The incubation period for bull trout is extremely long, and young fry may take up to 225 days to emerge from the gravel. Juvenile bull trout mature slowly, often spawning for the first time in their fourth or fifth year.

Migrant bull trout usually emigrate from their rearing streams at 2-3 years of age when they are 6-8 inches long; however, younger fish may occasionally outmigrate earlier (Elle et al. 1994). They move downstream to a river or lake and find feeding sites. After entering the river or lake, juvenile bull trout grow rapidly, often reaching over 20 inches long and 2 pounds by the time they are 5-6 years old. The Oregon bull trout record is 23 pounds, 2 ounces, taken from Lake Billy Chinook in 1985 (Buchanan et al. 1997).

Migratory bull trout live several years in larger rivers or lakes, where they grow to a much larger size than resident forms before returning to tributaries to spawn. Growth differs little between forms during their first years of life in headwater streams, but diverges as migratory fish move into larger and more productive waters (Rieman and McIntyre 1993). Resident and migratory forms may live together, but it is unknown if they represent a single population or separate

populations (Rieman and McIntyre 1993). Migratory forms of bull trout appear to use much of the river basin that they are located in through their life cycle (Batt 1996). Adfluvial mature bull trout appear to reside in reservoirs for about 6 months from November to June.

It appears that most bull trout, even those not ready to spawn, migrate upstream beginning in May-June and return to mainstem rivers or lakes in November-December. This migration may be in part to avoid high summertime water temperatures in some areas or insufficient flows or water levels. Rieman and McIntyre (1993) indicate that diverse life-history strategies are important to the stability and persistence of populations of any species. Such diversity is thought to stabilize populations in highly variable environments or to refound segments of populations that have disappeared.

Variation in the timing of outmigration and in the timing and frequency of spawning also represents diversity in life history. Bull trout may spawn each year or in alternate years (see Block 1955 in Batt 1996). It is possible that four or more year classes could compose any spawning population, with each year class including up to three outmigration strategies. This theory supports the idea that the multiple life-history strategies found in bull trout populations represent important diversity (both spatial and genetic) within populations.

4.3.5 Habitat Requirements

Bull trout have some of the most demanding habitat requirements of any native trout species, mainly because they require water that is especially cold and clean. Eggs are extremely vulnerable to siltation problems and bed load movement during the long incubation period. Any activity that causes erosion, increased siltation, removal of stream cover, or changes in waterflow or temperature affects the number of bull trout that hatch and their ability to survive to maturity (Knowles and Gumtow 1996).

In general, bull trout appear to have more specific habitat requirements than other salmonids. Outside of the reservoirs, channel stability, winter high flows, summer low flows, substrate, cover, temperature, and the presence of migration corridors consistently appear to influence bull trout distribution and abundance (see Allen 1980 in Batt 1996).

Water temperature is a critical habitat characteristic for bull trout. Temperatures above 59°F are thought to limit bull trout distribution (Allen 1980 in Batt 1996). Optimum water temperatures for rearing are thought to be 45-46°F (Allan et al. in Batt 1996). Researchers recognized water temperature more consistently than any other factor influencing bull trout distribution. However, it is poorly understood whether the influence of temperature is consistent throughout life or whether a particular stage is especially sensitive.

Bull trout have voracious appetites and take full advantage of any and all food sources available to them. Fish are considered to be the major item in the diet of large bull trout. They feed primarily along the bottom and up to mid-water levels, consuming insects and other fish species

such as suckers, sculpins, minnows, and trout. Mountain whitefish are one of the bull trout's preferred prey (Knowles and Gumtow 1996).

Adult adfluvial bull trout generally spend about one half of every year associated with a natural or man-made lake (generally November-May). These fish most likely forage in shallow areas where the majority of prey exists. Depending on water conditions, bull trout will occupy deeper areas of the reservoir where water temperatures are cooler (45-54°F) and move to the surface when surface water temperatures drop to or below 54°F.

4.4 MIDDLE COLUMBIA RIVER STEELHEAD

4.4.1 Status

Steelhead (*Oncorhynchus mykiss),* that occupy the lower Deschutes River are part of the Middle Columbia River ESU that is currently listed as threatened by the NMFS (Federal Register 64:4517) under the ESA. Critical habitat designated February 16, 2000 for this ESU (Federal Register 65:7764) has been withdrawn effective May 30, 2002 (Stone 2002). The MCR steelhead ESU includes native wild steelhead populations occurring in the Columbia River east of the Cascades, excluding the Hood River in Oregon, and Wind River in Washington, up to and including the Yakima River, but not including the Snake River populations, which constitute a separate ESU. Hatchery steelhead in this MCR ESU are not listed.

According to NMFS (2000a) and Busby et al. (1996), current population sizes in this ESU are substantially lower than historic levels, especially in the rivers with the largest MCR steelhead runs in the ESU: the John Day, Deschutes, and Yakima Rivers. The John Day may be the most robust of these three populations (NMFS 2000a). Busby et al. (1996) indicated that the run size to the MCR steelhead ESU could have been in excess of 300,000 fish. At least two extinctions of native wild steelhead runs in the ESU have occurred, the Crooked and Metolius Rivers, both in the Deschutes River basin (Federal Register 65:7764). The loss of these runs is due primarily to blockage of the migration corridor by the Pelton-Round Butte Project (Federal Register 65:7764).

4.4.2 Distribution

Nehlsen (1995) provided a fairly comprehensive review of historical steelhead runs and their environment in the Deschutes River basin upstream from the Pelton-Round Butte Hydroelectric Project. Steelhead spawned in major tributaries of the upper Deschutes River above Pelton-Round Butte Project (Squaw Creek and the Crooked River); historic occurrence of steelhead in the Metolius River is uncertain and equivocal (NPPC 1990; Lichatowich et al. 1998). Steelhead were documented up to 120 miles from the mouth of the Crooked River (Nehlsen 1995). Historic and current distribution of Deschutes River steelhead is shown in Figure 4-3.

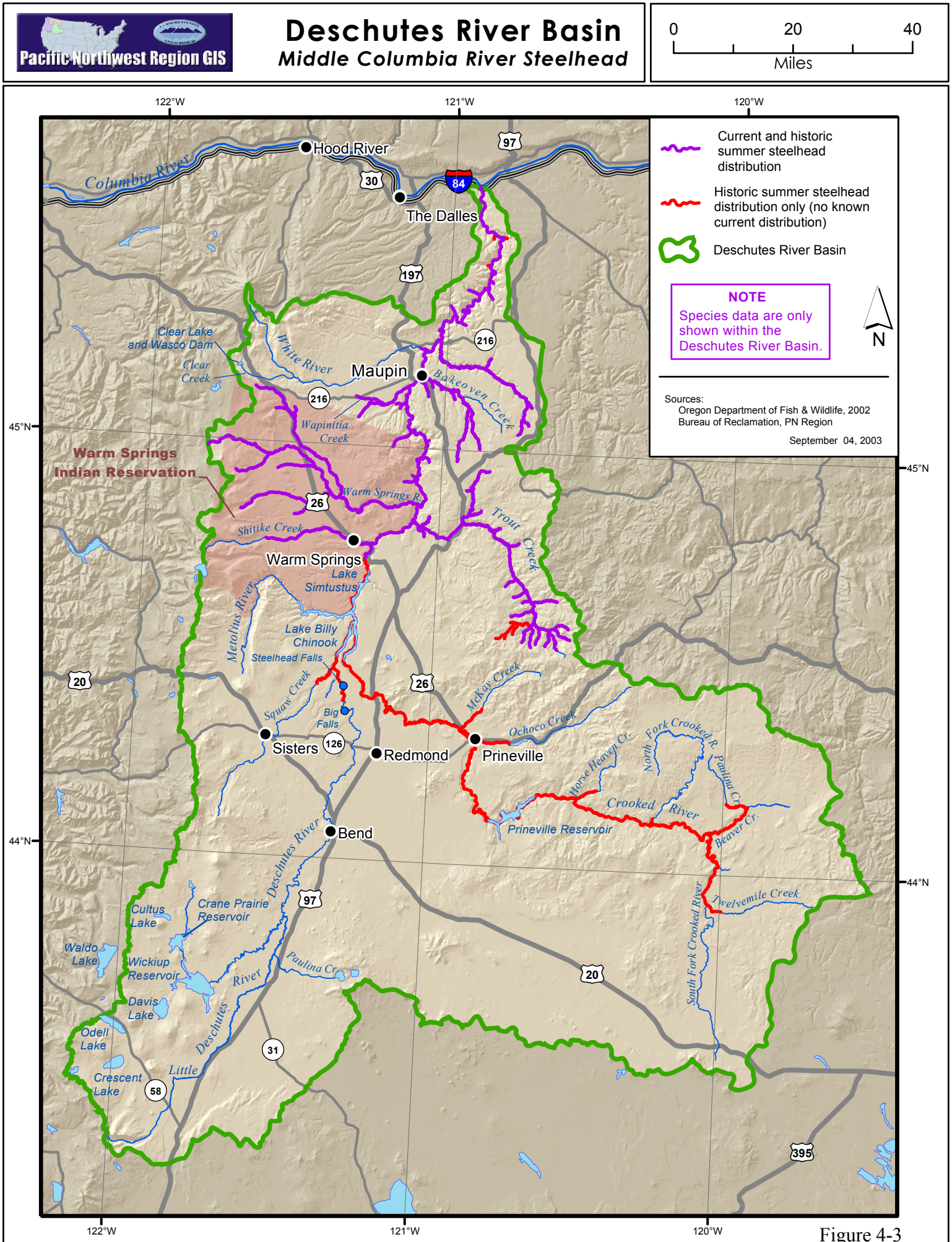

Pacific Northwest Region GIS
Deschutes River Basin
Middle Columbia River Steelhead
0
20
40
Miles
122°W
121°W
120°W
45°N
44°N
Hood River
The Dalles
Columbia River
Maupin
White River
Clear Lake and Wasco Dam
Clear Creek
Bakeoven Creek
Wapinitia Creek
Warm Springs Indian Reservation
Warm Springs R.
Shitike Creek
Warm Springs
Lake Simtustus
Metolius River
Lake Billy Chinook
Steelhead Falls
Squaw Creek
Big Falls
Trout Creek
Sisters
Redmond
Prineville
McKay Creek
Ochoco Creek
Horse Heaven Cr.
North Fork Crooked R.
Paulina Cr.
Crooked River
Prineville Reservoir
Beaver Cr.
Twelvemile Creek
South Fork Crooked River
Bend
Deschutes River
Cultus Lake
Crane Prairie Reservoir
Waldo Lake
Wickiup Reservoir
Paulina Cr.
Davis Lake
Odell Lake
Deschutes River
Little Crescent Lake
Current and historic summer steelhead distribution
Historic summer steelhead distribution only (no known current distribution)
Deschutes River Basin
NOTE
Species data are only shown within the Deschutes River Basin.
N
Sources:
Oregon Department of Fish & Wildlife, 2002
Bureau of Reclamation, PN Region
September 04, 2003

Figure 4-3

In the early part of the past decade, naturally produced steelhead in the Deschutes River declined; however, ODFW (2002) reported that escapement in the Deschutes River during the years 1998, 1999, 2000, 2001, and 2002 show an increasing trend that may be due in part to improved environmental conditions.

Where resident and anadromous forms of *O. mykiss* co-occur, the relationship between these two forms has been questioned as to whether resident *O. mykiss* contribute to the population dynamics and abundance of anadromous *O. mykiss* and provide a buffer against steelhead extinction. The two forms represent genetically distinct populations or two "ecophenotypes" within a single gene pool (Zimmerman and Reeves 1998). Zimmerman and Reeves (2000) reported that in the Deschutes River, based on microprobe analysis of Sr/Ca (strontium/calcium) ratio in otoliths, steelhead and rainbow trout are reproductively isolated. That is to say, adult steelhead from the Deschutes River that they tested were progeny of steelhead females and resident rainbow trout were progeny of resident rainbow trout. There was also spatial and temporal separation of spawning in these two forms (Zimmerman and Reeves 1998).

Fish passage for Chinook salmon and steelhead was attempted at the Pelton-Round Butte Project soon after its construction, with limited success. Passage of adults upstream was relatively successful, but from their upstream rearing habitats, downstream migrating smolts apparently became disoriented once they entered Lake Billy Chinook and did not move directly through the reservoir to an outlet. It became apparent in the late 1960s that upriver salmonid runs could not be sustained naturally with these facilities. Therefore, the efforts to maintain naturally spawning salmonid populations upstream from Pelton-Round Butte were abandoned and hatchery compensation was initiated in 1968 (Nehlsen 1995). In 1970, Portland General Electric agreed to finance the operation of an anadromous fish hatchery at the base of Pelton-Round Butte Dam. The hatchery began operation in 1972 (NPPC 1990).

NMFS (2000a) believes that one of the most significant sources of risk to steelhead in the MCR ESU is the recent and dramatic increase in the percentage of hatchery fish escapement in the Deschutes River basin. ODFW (2002) has estimated from capture of adult steelhead at Sherars Falls (RM 42) that in recent years, the percentage of hatchery steelhead strays in the Deschutes River has exceeded 70 percent, and many of these are believed to be long-distance strays from outside the ESU, based on differential marking. Coincident with this increase in the percentage of strays was a corresponding decline in the abundance of native wild steelhead in the Deschutes River. NMFS (2000a) stated that in combination with the increasing trend in hatchery fish in the Deschutes River, estimates of increased proportions of hatchery fish in the John Day and Umatilla River basins pose a risk to native wild steelhead due to negative effects of genetic and ecological interactions with hatchery fish. The downriver transportation of juvenile hatchery steelhead from upriver locations may contribute to increasing numbers of strays in the Deschutes River (NPPC 1990).

4.4.3 Life History

Biologists classify steelhead into two reproductive ecotypes according to their level of sexual maturity when they enter freshwater and the duration of their spawning migration. Stream maturing or summer steelhead enter freshwater in the spring and summer in a sexually immature condition. They require several months in freshwater to mature prior to spawning. Ocean maturing or winter steelhead enter freshwater in the fall and winter in a sexually mature condition ready to spawn (NMFS 1996). Most Deschutes River steelhead outmigrate at age 2 and spend 1 to 2 years in salt water before returning to spawn; these returning adults are referred to as 1-ocean and 2-ocean fish, respectively.

Adult inland steelhead, the anadromous form of resident redband trout, are found in Columbia River tributaries east of the Cascade Mountains, including the Deschutes River. Winter steelhead occur in Mosier, Chenowith, Mill, and Fifteenmile Creeks, Oregon; and in the Klickitat and White Salmon Rivers in Washington, all of which are downstream from The Dalles Dam, although east of the Cascade Mountains (NMFS 2000a).

All steelhead upstream from The Dalles Dam are summer-run fish. Summer-run steelhead are further divided into A-run and B-run fish. A-run adult summer steelhead are those inland Columbia River steelhead that pass Bonneville Dam up to 25 August, they are predominantly age-1-ocean, and are less than 77.5 cm in length (Schriever 2002). B-run summer steelhead pass Bonneville Dam after 25 August, are predominantly age-2-ocean, and are larger than 77.5 cm. Deschutes River steelhead are typical of A-run fish. B-run steelhead have a limited distribution in some Snake River tributaries, and are differentiated by size but not date of passage at Lower Granite Dam.

4.4.4 Habitat Requirements

In general, summer-run fish enter freshwater 9 to 10 months prior to spawning and ascend the Columbia River from June through October. They spawn from late winter through spring. Deschutes River wild steelhead spawn from about the middle of March to the end of May (Zimmerman and Reeves 1998). Spawning habitat requirements would typically include water depths of 9 inches to 5 feet, water velocity from 1 to 3 feet per second, and a largely sediment-free substrate with gravel to cobble sized from 0.5 to 4 inches in diameter. Spawning females construct several nests in each redd. They usually pair with a dominant male, but sometimes they spawn with different males for each nest. The number of eggs varies between 200 and 9,000, depending on fish size and stock. Adult steelhead, unlike salmon, do not necessarily die after spawning, but may return to the ocean to grow for another year and return to freshwater to spawn again. However, iteroparity (capability of spawning more than once) is not common among steelhead migrating more than several hundred miles upstream from the ocean; the number of repeat spawners in the Deschutes River is very low (NPPC 1990).

Fecundity of wild summer steelhead in the Deschutes River ranged from 3,093 to 10,480 eggs per female, with a mean of 5,341 eggs (NPPC 1990). Average fecundity was higher for age-2-ocean fish.

Eggs hatch in 35 to 50 days, depending on water temperature (about 50 days at 50 °F [10 °C]). Following hatching, alevins remain in the gravel 2 to 3 weeks until the yolk sac is absorbed. About 65-85 percent of the fertilized eggs survive to emerge as fry, while egg to smolt survival is estimated to be 0.75 percent. Steelhead fry emerge from redds in the middle to late summer. Following emergence, fry usually move into shallow and slow-moving margins of stream channels. As they grow, they move to areas with deeper water, a wider range of velocities, and larger substrate, sometimes emigrating from tributaries to the mainstem for a period of time prior to smolting (NPPC 1990). During winter, fry select areas with relatively low velocity and conceal themselves among cobble or rubble substrate.

Information on habitat carrying capacity for summer steelhead in the lower Deschutes River subbasin is not available, although the NPPC (1990) Subbasin Plan stated that the standard estimate of potential smolt production is 513,636 smolts. ODFW (1987, cited in NPPC 1990) estimated maximum steelhead production capacity at 147,659 smolts.

Juvenile steelhead (parr) rear in freshwater for 1 to 4 years, depending on water temperature and growth rates. Downstream migration and smoltification typically occurs from April to mid-June when parr reach a size of 6-8 inches (15-20 cm). Life history information for MCR steelhead indicates that most of these steelhead smolt at 2 years and spend 1 to 2 years in salt water (1-ocean and 2-ocean fish, respectively) prior to re-entering fresh water, where they may remain for up to a year prior to spawning. Pribyl (2002) noted that juvenile Deschutes River steelhead generally spend 2 years in freshwater. Returning adults are about equally divided between 1-ocean and 2-ocean fish.

Diet of steelhead varies considerably according to life history stage and fish size as well as the food items that are available. Juvenile steelhead feed primarily on benthic macroinvertebrates associated with the stream substrate such as immature aquatic insects (e.g., mayfly and stonefly nymphs and caddisfly, dipteran, and beetle larvae), amphipods, snails, aquatic worms, fish eggs, and occasionally small fish. Diets of juveniles can fluctuate seasonally, depending on food availability. At times the diet may include terrestrial insects and emerging adult aquatic insects drifting in the current. In estuaries, steelhead smolts initially feed on invertebrates, but as they grow they begin to feed on larger prey more typical of their diet at sea, which may include crustaceans, and eventually squid, herring, and other fish species.

At any time of the year in the lower Deschutes River and its major tributaries, some life stage of steelhead are present, either migrating, rearing, or spawning adult fish; incubating eggs or developing fry; or rearing or migrating juvenile fish (NPPC 1990). Steelhead may be seasonally absent from smaller tributaries where environmental conditions become unfavorable, such as eastside tributaries that warm up or have reduced flow during the summer.

4.5 CANADA LYNX

4.5.1 Status

In April 2000, the USFWS listed the Canada lynx (*Lynx canadensis)* as threatened under the ESA across the contiguous United States. The United States listing provides protection for lynx within 13 states, including Oregon. The USFWS will develop a proposal to be used for the designation of critical habitat in the future. A recovery plan has not yet been developed; however, in February 2000, the USFS and the USFWS signed a Lynx Conservation Agreement and Strategy which will promote the conservation of lynx and lynx habitat on Federal land managed by the Forest Service (Federal Register 65:16052).

4.5.2 Distribution, Life History, and Habitat Requirements

The Canada lynx is a medium-sized cat with long legs; large, well-furred paws; long tufts on the ears; and a short, black-tipped tail. On average, males weigh 22 pounds and are 33.5 inches in length (head to tail); females weigh 19 pounds and are 32 inches in length (Federal Register 65:16052).

In the contiguous United States, the historic range of the Canada lynx includes forests of the Cascade Range in Washington and Oregon (Figure 4-4). In particular, within the West, lynx primarily inhabit subalpine coniferous forests that receive deep snow, for which they are highly adapted. Snowshoe hare (*Lepus americanus),* also specialized to survive in areas that receive deep snow, are the primary prey of the lynx. Lynx and snowshoe hare are considered to have a classic predator-prey relationship, with lynx populations fluctuating on an approximate 10-year cycle following the hare population cycle. Red squirrels (*Tamiasciurus hudsonicus*) are an important alternate prey when snowshoe hare populations are low (Federal Register 65:16052). Further study into the dynamics of lynx-hare interaction is critical; rather than analyzing only the relationship between lynx and snowshoe hare, research into the hare cycle which is produced by an interaction between predation and food supplies is necessary (Krebs 2001). The USFWS states, “It is imperative that snowshoe hare and alternate prey populations be supported by appropriate habitat management on Federal lands into the future to ensure the conservation of lynx in the contiguous United States” (Federal Register 65:16052).

The USFWS determined that lynx in the lower 48 states emanated from a larger metapopulation whose core is located in the northern boreal forest of central Canada. This boreal forest naturally becomes fragmented at its southern margins where it transitions into other vegetation types. Lower snowshoe hare densities are a result of this patchy, transitional habitat, as well as the presence of more predators and competitors of hares at southern latitudes. It is unknown as to the extent to which the northern lynx populations influence lynx occurrence in the contiguous United States. But because of the naturally fragmented habitat and lower hare densities, it is expected that lynx in the southern boreal forest naturally occur at lower numbers than in the north (Federal Register 65:16052).

In the Cascades region, including Washington and Oregon, most lynx occurrences are found within conifer forests consisting of Douglas fir and western spruce/fir and at elevations between 3,200 and 6,100 feet. Older, mature forests contain large woody debris such as downed logs and windfall that provide habitat for denning sites, escape cover, and protection from severe weather. It appears that for den sites, the age of the forest stand is not nearly as important as the amount of downed woody debris available. Snowshoe hare use these areas and earlier successional forests with dense understories that provide forage, cover, escape routes, and protection from severe weather. Forest structure that provides food and cover for snowshoe hare and cover for lynx dens is determined to be more important than specific vegetation found within the forest type (BLM and USFS 2001; Federal Register 65:16052).

4.6 NORTHERN SPOTTED OWL

4.6.1 Status

In July 1990, the USFWS listed the northern spotted owl (*Strix occidentalis caurina)* as threatened under the ESA throughout its entire range, including western Oregon. Designated CHU on Federal lands became effective February 1992, providing additional protection to the spotted owl with regard to Federal activities (Federal Register 57:1796). In 1994, the U.S. Department of Agriculture (USDA) published the Northwest Forest Plan. In theory, the plan would aid in the conservation of the spotted owl by allowing currently non-suitable, but potential, habitat to regenerate within Late-Successional Reserves, which in turn would allow the population to eventually stabilize across its range. Many CHUs overlap with Late-Successional Reserves within the known spotted owl range in western Oregon (Tuchmann 1996, BLM and USFS 2001). In 1992, the USFWS developed a draft recovery plan for the northern spotted owl, but at this time a final recovery plan has not been published.

4.6.2 Distribution, Life History, and Habitat Requirements

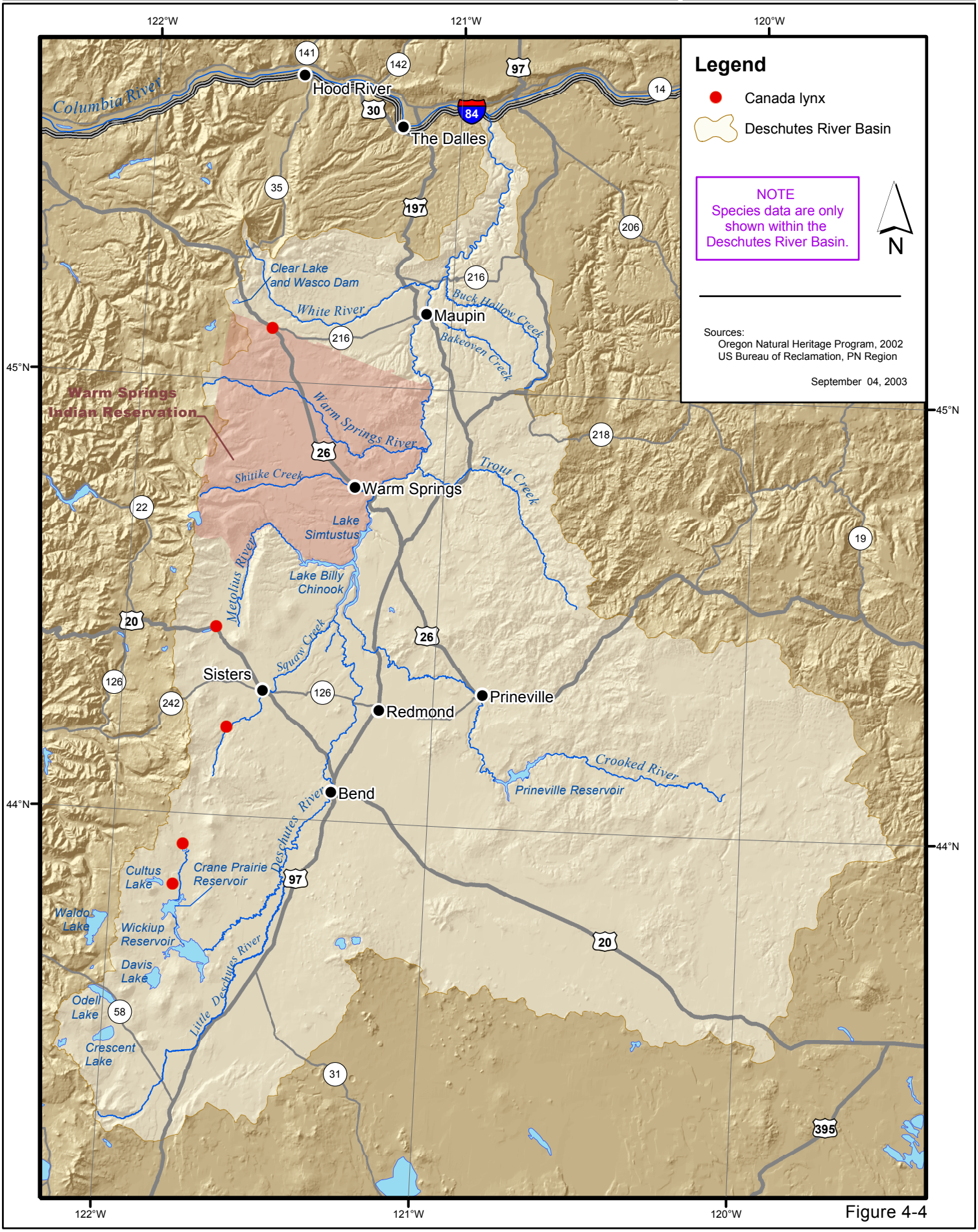
The northern spotted owl is a medium-sized owl with dark eyes, chocolate brown coloring with round to elliptical white spots on the body, and white bars on the tail. The adult female is slightly larger than the male (Federal Register 55:26114).

The current range of the northern spotted owl is southwestern British Columbia, western Washington, western Oregon, and the coast range area of northwestern California south to San Francisco Bay (Figure 4-5). The majority of spotted owls are found in the Cascades of Oregon and the Klamath Mountains in southwestern Oregon and northwestern California (Federal Register 55:26114).

Northern spotted owls are long-lived and monogamous, mating for life. These pairs usually do not nest every year, nor are nesting pairs successful every year. It has been suggested that fluctuations in reproductive activity may be related to fluctuations in prey availability. Nesting activity begins between February and March, with one to four eggs laid soon after. Fledging occurs between mid-May and June, with parental care continuing into September. At that time, the juvenile owls are on their own. It has been estimated that only 18 percent of sub-adult spotted owls survive their first year, with predation by great horned owls and starvation the two main causes of mortality (Federal Register 55:26114).

Adult northern spotted owls maintain a territory year-round, with home ranges varying in size depending on the time of year (breeding and nonbreeding season), the amount of old-growth and mature forest available, and prey base. Within Oregon, median annual pair home ranges were estimated to be 2,955 acres for the Cascades and 4,766 acres for the coast (Federal Register 55:26114).

Northern spotted owls primarily occur in old-growth and mature forest habitats, but may also be found in younger forests that contain the necessary structures, vegetation, and prey. Suitable spotted owl habitat has 60-80 percent canopy closure; a multi-layered, multi-species canopy dominated by large (>30 inches diameter at breast height) overstory trees; an abundance of large trees with various deformities (i.e. cavities, snags); large accumulations of fallen trees and other woody debris; and adequate open space below the canopy for flight. These necessary components are most often associated with stands aged 200+ years. However, spotted owls have been observed using relatively young forests (60+ years) that contain key components of suitable owl habitat, particularly those with significant remains of earlier stands that were affected by fire, wind storms, and inefficient logging. Northern spotted owls are primarily nocturnal predators of small mammals such as flying squirrels (*Glaucomys sabrinus)*, red tree voles (*Arborimus longicaudus)*, and dusky-footed woodrats (*Neotoma fuscipes)* (Federal Register 55:26114).


Pacific Northwest Region GIS
Deschutes River Basin
Canada lynx
0
20
40
Miles
122°W
121°W
120°W
45°N
44°N
Legend
Canada lynx
Deschutes River Basin
NOTE
Species data are only shown within the Deschutes River Basin.
N
Sources:
Oregon Natural Heritage Program, 2002
US Bureau of Reclamation, PN Region
September 04, 2003
Columbia River
Hood River
The Dalles
Clear Lake and Wasco Dam
White River
Maupin
Buck Hollow Creek
Bakeoven Creek
Warm Springs Indian Reservation
Warm Springs River
Shitike Creek
Warm Springs
Trout Creek
Lake Simtustus
Lake Billy Chinook
Metolius River
Squaw Creek
Sisters
Redmond
Prineville
Crooked River
Prineville Reservoir
Bend
Deschutes River
Cultus Lake
Crane Prairie Reservoir
Waldo Lake
Wickiup Reservoir
Davis Lake
Odell Lake
Crescent Lake
Little Deschutes River
141
142
97
14
30
84
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197
206
216
216
218
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22
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126
242
126
97
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58
31
395

Figure 4-4

Deschutes River Basin
Northern Spotted Owl

Pacific Northwest Region GIS

0 20 40
Miles

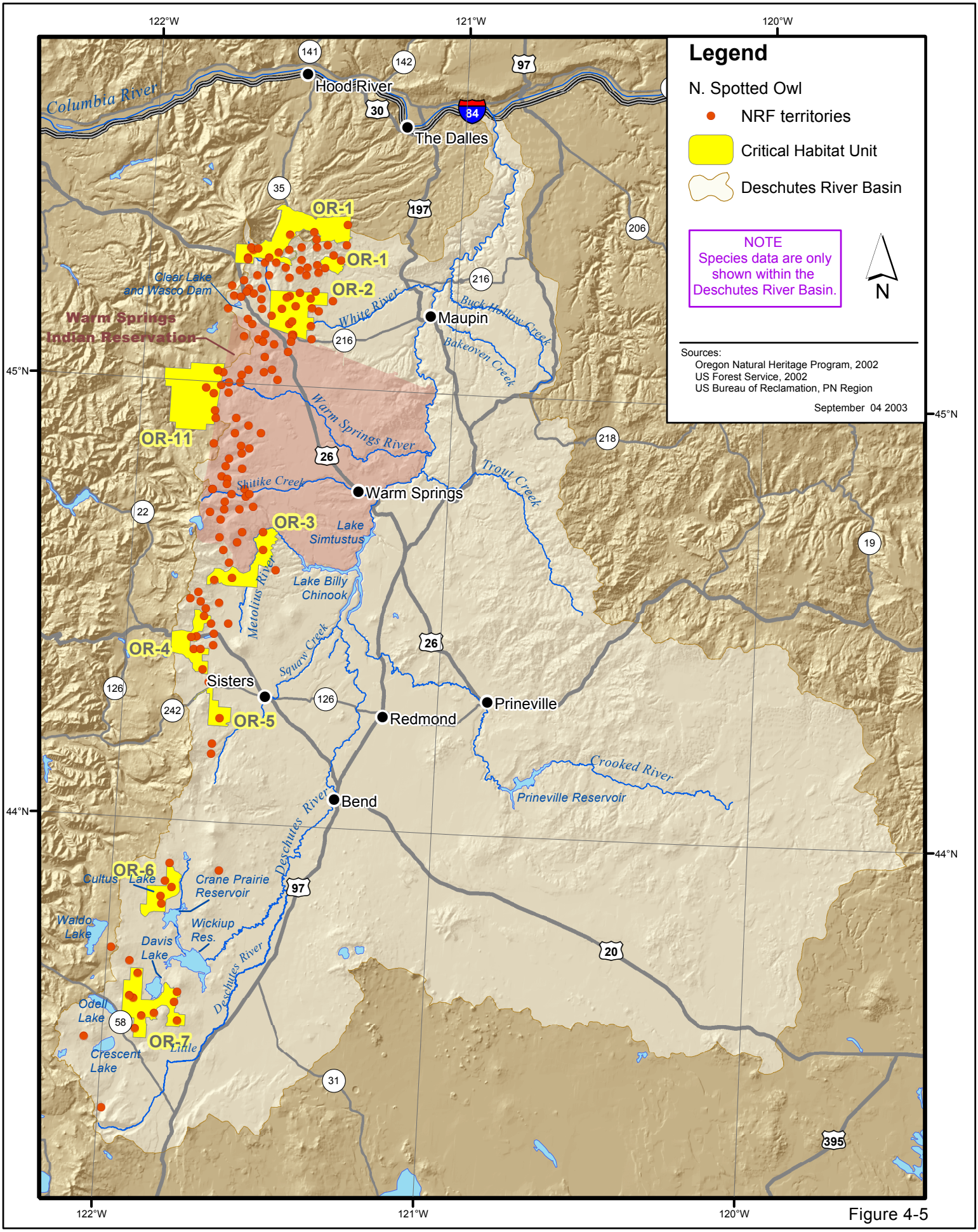

Figure 4-5