

## **Chapter 9**

**State(s) Oregon**

**Recovery Unit Name: John Day River**

**Region 1**

**U S Fish and Wildlife Service**

**Portland, Oregon**

## DISCLAIMER

Recovery plans delineate reasonable actions that are believed necessary to recover and protect listed species. Plans are prepared by the U.S. Fish and Wildlife Service, and in this case with the assistance of recovery unit teams, State and Tribal agencies, and others. Objectives will be attained and any necessary funds made available subject to budgetary and other constraints affecting the parties involved, as well as the need to address other priorities. Recovery plans do not necessarily represent the views nor the official positions or approval of any individuals or agencies involved in plan formulation, other than the U.S. Fish and Wildlife Service. Recovery plans represent the official position of the U.S. Fish and Wildlife Service *only* after they have been signed by the Director or Regional Director as *approved*. Approved recovery plans are subject to modification as dictated by new findings, changes in species status, and the completion of recovery tasks.

*Literature Cited:* U.S. Fish and Wildlife Service. 2002. Chapter 9, John Day River Recovery Unit, Oregon. 82 p. *In:* U.S. Fish and Wildlife Service, Bull Trout (*Salvelinus confluentus*) Draft Recovery Plan, Portland, Oregon.

## ACKNOWLEDGMENTS

The following individuals contributed to the development of the John Day River Recovery Unit Chapter.

**John Day River Recovery Unit Team:**

Larry Bright, U.S. Forest Service

Dave Crabtree, U.S. Forest Service

Tim Cummings, U.S. Fish and Wildlife Service

Jackie Dugan, Bureau of Land Management

Perry Edwards, U.S. Forest Service

Lisa Gaudette, Oregon Department of Fish and Wildlife

Kristy Groves, U.S. Forest Service

Mary Hanson, Oregon Department of Fish and Wildlife

Kristine Hirsch, U.S. Forest Service

Alan Matthews, U.S. Forest Service

Alan Mauer, U.S. Fish and Wildlife Service

Tom Mendenhall, U.S. Forest Service

Alan Miller, U.S. Forest Service

John Morris, Bureau of Land Management

Herb Roarick, U.S. Forest Service

Shaun Robertson, Confederated Tribes of the Warm Springs Reservation

Jason Shappart, Oregon Department of Fish and Wildlife

Jennifer Stafford, Confederated Tribes of the Warm Springs Reservation

Gary Torretta, Bureau of Reclamation

Tim Unterwegner, Oregon Department of Fish and Wildlife

Joel Waldo, U.S. Forest Service

Doug Young, U.S. Fish and Wildlife Service

**Additional review and comments were provided by:**

Ron Rhew, U.S. Fish and Wildlife Service

Jennifer O'Reilly, U.S. Fish and Wildlife Service

## **EXECUTIVE SUMMARY**

### **CURRENT SPECIES STATUS**

The U.S. Fish and Wildlife Service issued a final rule listing the Columbia River populations of bull trout (*Salvelinus confluentus*) as a threatened species under the Endangered Species Act on June 10, 1998 (63 FR 31647). The John Day River Recovery Unit encompasses the John Day River basin in Oregon. The John Day River is the fourth largest drainage basin in the State of Oregon, consisting of a mainstem, North, Middle, and South forks. The 20,979 square kilometer (8,100 square mile) river basin contains one of the longest free-flowing streams in the continental United States. The mainstem John Day River flows 457 kilometers (284 miles) from its source near the Strawberry Mountains to its mouth at River kilometer 351 (River Mile 218) of the Columbia River.

Little data exists on the historical or current use of the mainstem Columbia River by bull trout in this recovery unit. However, the John Day River Recovery Unit Team believes that defining the current and potential bull trout use of the Columbia River should be considered a primary research need. Following collection of additional information the John Day River Recovery Unit may be expanded to include portions of the mainstem Columbia River.

The John Day River Recovery Unit Team identified one core area (the John Day River Core Area). For the purposes of recovery, a core area represents the closest approximation of a biologically functioning unit. Core areas consist of both habitat that could supply all the necessary elements for every life stage of bull trout (*e.g.*, spawning, rearing, migratory, and adult) and have one or more groups of bull trout. Core areas are the basic units on which to gauge recovery within a recovery unit.

### **HABITAT REQUIREMENTS AND LIMITING FACTORS**

A detailed discussion of bull trout biology and habitat requirements is provided in Chapter 1 of this recovery plan. The limiting factors discussed here are specific to the John Day River Recovery Unit. Two overriding factors have

influenced fish habitat in the John Day River basin. Past, recent, and current land use practices (primarily forestry, mining, agriculture, and livestock grazing) are responsible for altering, at the landscape level, the storage, movement and character of water resources over entire areas of the John Day River subbasin and its tributary system. These prevalent land uses, in combination with the resulting altered hydrologic responses, are translated into stream channel instability in many area streams. Degraded fish habitat conditions, due to a variety of causes, are identified as occurring in approximately 966 kilometers (600 miles) of stream. Erosion and sedimentation which reduce pool habitat, alter hydrographs, and cause loss of instream habitat elements are prevalent factors in the decline of bull trout and other salmonids. Key symptoms of this habitat degradation are stream dewatering, high summer water temperatures, substrate embeddedness, streambank instability, and high road densities throughout much of the basin.

## **RECOVERY GOALS AND OBJECTIVES**

The goal of the bull trout recovery plan is to **ensure the long-term persistence of self-sustaining, complex, interacting groups of bull trout distributed across the species native range, so that the species can be delisted.**

To accomplish this goal the following objectives have been identified for bull trout in the John Day River Recovery Unit.

- ▶ Maintain current distribution of bull trout and restore distribution in previously occupied areas within the John Day River Recovery Unit.
- ▶ Maintain stable or increasing trends in adult bull trout abundance.
- ▶ Restore and maintain suitable habitat conditions for all bull trout life history stages and forms.
- ▶ Conserve genetic diversity and provide opportunity for genetic exchange.

## STRATEGY FOR RECOVERY

Recovery criteria for bull trout in the John Day River Recovery Unit reflect the stated evaluation of population status, and recovery actions necessary to achieve the overall goal.

- 1) **Bull Trout are distributed among 12 or more local populations in the John Day River Recovery Unit.** The team identified 12 current and 12 potential local bull trout populations in the John Day River Recovery Unit. This recovery criterion recognizes the uncertainty in clearly defining local populations and the possibility that some local populations isolated by human-caused barriers may, in a recovered state, become part of another local population (*e.g.*, Boulder Creek in the Granite Creek Watershed). In addition, there is potential to further refine the local populations within the several identified population complexes in the recovery unit, if additional information indicates the need to do so. Better understanding of bull trout movement patterns in the drainage is needed to more accurately define local populations in the recovery unit. There is also a potential need to expand into historic habitat and establish new local populations.
  
- 2) **Estimated abundance of adult bull trout is at least 5,000 individuals distributed within the John Day River Recovery Unit.** Recovered abundance range was derived using the professional judgement of the recovery unit team and estimated productive capacity of identified local populations in a recovered condition. The estimate includes resident fish where connectivity between populations exists or could be restored. Population estimates have not been made for local populations isolated above natural barriers, although partial (one-way) connectivity may exist. Population estimates may be refined as more information becomes available, through monitoring and research. Increased abundance in the recovery unit is expected to occur by securing and expanding seasonal distribution of current local populations and expanding or restoring local populations into historic habitat.

- 3) **Adult bull trout exhibit stable or increasing trends in abundance over a period of at least 10 years in the recovery unit, as determined through contemporary and accepted abundance trend data analyses.**

Developing a standardized monitoring and evaluation program to accurately describe trends in bull trout abundance is identified as a priority research need. As part of the overall recovery effort, the U.S. Fish and Wildlife Service will take the lead in addressing this research need by forming a multi-agency technical team to develop protocols necessary to evaluate trends in bull trout populations.

- 4) **Specific barriers inhibiting recovery as listed in this recovery unit chapter must be addressed.** Functional migration corridors for bull trout between the North Fork John Day River and the mainstem John Day River, and between the North Fork John Day River and the Middle Fork John Day River must be established and the following priority one barriers must be addressed: restoring flow in Boulder Creek (tributary to Granite Creek - North Fork John Day River) and Indian Creek (mainstem John Day River, connected seasonally), assessing connectivity between West Fork, Clear, Salmon, Lightning, and the Mainstem of Clear Creek (North Fork John Day River), and addressing barriers associated with roads, *e.g.*, culverts barriers or roads without culverts.

## **ACTIONS NEEDED**

Recovery for bull trout will entail reducing threats to the long-term persistence of populations and their habitats, ensuring the security of multiple interacting groups of bull trout, and providing habitat and access to conditions that allow expression of various life history forms. Specific tasks falling within seven categories are discussed in Chapter 1. Tasks specific to this recovery unit are provided in this chapter.

## **ESTIMATED COST OF RECOVERY**

Total cost of bull trout recovery in the John Day River Recovery Unit is estimated at \$25 million spread over a 25-year recovery period. Total costs

include estimates of expenditures by local, Tribal, State, and Federal governments and by private business and individuals. These costs are attributed to bull trout conservation, but other aquatic species will also benefit. Cost estimates are not provided for tasks which are normal agency responsibilities under existing authorities.

### **ESTIMATED DATE OF RECOVERY**

Time required to achieve recovery depends on bull trout status, factors affecting bull trout, implementation and effectiveness of recovery tasks, and responses to recovery tasks. It may be 3 to 5 bull trout generations (15 to 25 years), or possibly longer, before significant reductions can be made in the identified threats to the species and bull trout can be considered for delisting.

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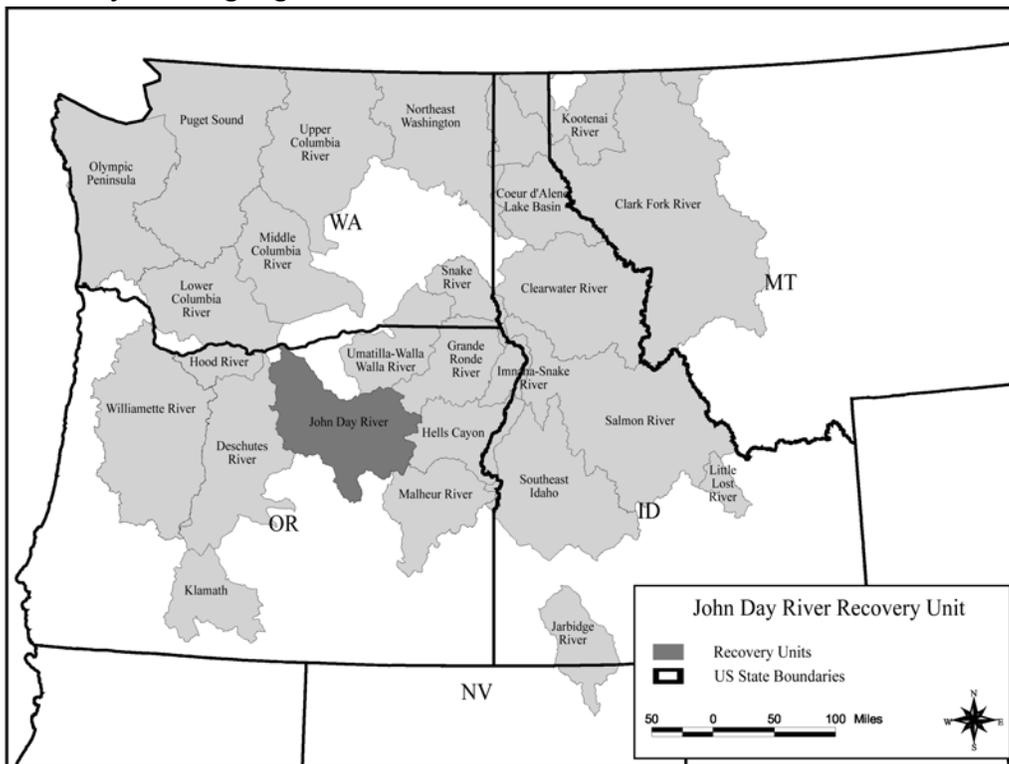
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## INTRODUCTION

### Recovery Unit Designation

The John Day River Recovery Unit is one of 22 recovery units designated for bull trout in the Columbia River basin (Figure 1). Designation of the John Day River Recovery Unit is based on the designation of bull trout in the John Day River basin as a Gene Conservation Group by Oregon Department of Fish and Wildlife (Kostow 1995).

Figure 1. Bull trout recovery units in the United States, with the John Day River Recovery Unit highlighted.



### Geographic Description

The John Day River is the fourth largest drainage basin in Oregon, consisting of a mainstem, north, middle, and south forks. The 20,979 square kilometer (8,100 square mile) river basin contains more than 804 kilometers (500

miles) of stream in the mainstem and its three forks and the John Day River is one of the longest free-flowing streams in the continental United States. The mainstem, middle and north forks originate in the Blue Mountains, and the south fork originates in the Ochoco Mountains. The mainstem originates southeast of Prairie City and flows west through John Day to Dayville where it is joined by the south fork. Downstream from Dayville, the river turns north through Picture Gorge and continues on to Kimberly, where it joins with the north fork. The John Day River then flows west from Kimberly for approximately 64 kilometers (40 miles) before turning to the north to the Columbia River confluence at River kilometer 351 (River Mile 218) at an elevation of approximately 61 meters (200 feet) (Oregon Water Resource Department 1986). The lower John Day River from Parish Creek downstream to Tumwater Falls is included in the Oregon Scenic Waterways and National Wild and Scenic River systems.

The largest tributary to the John Day River is the North Fork John Day River which originates in the Elk Horn Mountains at approximately 2,440 meters (8,000 feet) in elevation. From its source, the north fork flows primarily west for 188 kilometers (117 miles) where it joins the mainstem at an elevation of approximately 1,007 meters (3,300 feet) near the town of Kimberly. The North Fork John Day River watershed consists of approximately 155,351 hectares (383,582 acres). The middle fork flows into the north fork upstream of the town of Monument, about 50 kilometers (31 miles) before the confluence of the north fork with the mainstem. The north fork is included in the Oregon Scenic Waterways and National Wild and Scenic River systems from the North Fork John Day wilderness boundary to River kilometer 32.5 (River Mile 20.2) above the town of Monument. Major tributaries to the north fork include Desolation and Granite creeks.

The Middle Fork John Day River originates approximately 16 kilometers (10 miles) east of Austin Junction at an elevation of approximately 2,242 meters (7,350 feet) and flows west for 121 kilometers (75 miles) before it enters the North Fork, 50 kilometers (31 miles) upstream of the town of Kimberly (Oregon Water Resource Department 1986). The Middle Fork John Day watershed consists of approximately 83,257 hectares (205,572 acres). The section from the Crawford Bridge crossing to the confluence with the North Fork is included in the Oregon

Scenic Waterways system. A total of 343 kilometers (213 miles) of fish-bearing streams occur in the upper Middle Fork John Day River and Galena watersheds (Malheur National Forest 1998a).

The South Fork John Day River originates south of the Aldrich Mountains and extends approximately 97 kilometers (60 miles) to its confluence with the mainstem near Dayville. Izee Falls, a 5 meter (15 foot) waterfall followed by a cascading stream segment through large boulders, blocks upstream fish migration. The South Fork John Day River is included in both the Oregon Scenic Waterways and National Wild and Scenic River systems from the Post-Paulina road crossing to Murderers Creek Wildlife Area above Dayville, Oregon.

The John Day River basin is comprised of about 62 percent private, 30 percent U.S. Forest Service, and 7 percent Bureau of Land Management, lands. The State of Oregon manages most of the remaining (less than 1 percent) of the John Day River basin, mostly as wildlife management areas near Bridge Creek and Murderers Creek. Over 95 percent of the basin is zoned for agriculture and forestry uses (Oregon Department of Fish and Wildlife 1990). Most of the land within the John Day River basin is ceded territory to the Confederated Tribes of the Warm Springs Reservation. Part of the North Fork John Day River subbasin is land ceded to the Confederated Tribes of the Umatilla Indian Reservation (Buchanan *et al.* 1997).

About 24,342 hectares (60,103 acres) of land are irrigated in the John Day River basin. Additionally, the Soil Conservation Service identified another 4,860 hectares (12,000 acres) for potential irrigation in the North Fork and lower mainstem John Day River watersheds. Most irrigation water is derived from surface water diversions along the river. The Oregon Department of Fish and Wildlife maintains over 300 rotary drum screens to prevent loss of juvenile salmonids in the diversions (Oregon Department of Fish and Wildlife 1990). Predominant land uses in the basin are agriculture (animal production and animal feed production), timber production, and recreation.

The climate of the John Day River basin is semiarid, characterized by low annual precipitation, low winter temperatures, high summer temperatures and dry summers. Mean annual air temperature is 3 degrees Celsius (38 degrees Fahrenheit) in the upper basin, and 14 degrees Celsius (58 degrees Fahrenheit) in the lower basin. John Day River basin daily temperatures range from below zero at Ukiah and Austin in the winter to above 38 degrees Celsius (100 degrees Fahrenheit) at Arlington in the summer. Inflows of moist Pacific air moderate extreme winter temperatures (Oregon Water Resources Department 1986).

Climate is closely related to, and differs between, the basin's two physiographic provinces: the Deschutes-Umatilla Plateau and the Blue Mountains. Winters are cold on the Deschutes-Umatilla Plateau. In summer, days are generally hot and nights cool. Since moist Pacific air drops most of its precipitation on the Coast Range and Cascade Mountains before reaching the province, the air is dry (Oregon Department of Fish and Wildlife 1990).

The Blue Mountains exhibit a great range of climatic variation due to the diverse physiography of the region. Weather is generally cool to cold in the winter, and hot and dry in the summer, with the exception of the higher elevations of the Blue Mountains. Precipitation across the region is strongly influenced by elevation. Lower elevations are warmer and receive less precipitation than higher elevations. Highlands over 1,525 meters (5,000 feet) elevation receive markedly more precipitation. The average frost-free period is 50 days in the upper basin and 200 days in the lower basin (Oregon Department of Fish and Wildlife 1990).

In the Blue Mountain province, most of the annual precipitation occurs as snow. Seventy percent of the precipitation occurs during the cooler months from November to May. Less than 10 percent falls as rain during July and August. Precipitation ranges from over 102 centimeters (40 inches) in headwater areas to as little as 23 centimeters (9 inches) in the lower elevation areas (Oregon Water Resources Department 1986).

Much of the John Day River basin consists of extensive interior plateau lying between the Cascade Range and the Blue Mountains. The basin includes

portions of two physiographic provinces: the Deschutes-Umatilla Plateau and the Blue Mountains. The Deschutes-Umatilla Plateau province is a broad upland plain formed by floods of molten basalt overlain with wind-deposited sediments. In contrast, the Blue Mountains province is a diverse assemblage of older sedimentary, volcanic, and metamorphic rock that was uplifted, tilted and faulted to form rugged hills and mountains. These two provinces roughly divide the basin in half (Oregon Water Resources Department 1986).

The basin has a complicated geologic history, resulting in a complex and diverse geology. Masses of oceanic crust, marine sediments, various volcanic materials, ancient river and lake deposits, and recent river and landslide deposits contribute to this interesting assemblage of rock.

More than 65 million years ago, during pre-Tertiary time, sediments and volcanic rocks of the oceanic crust were contorted, uplifted and eroded. Roughly 54 to 37 million years ago, a series of widespread volcanic eruptions produced lava, mudflows, and tuffs of the Clarno Formation. The John Day Formation resulted from the deposition of thick layers of volcanic ash from 19 to 37 million years ago. During the period approximately 19 to 12 million years ago, the region experienced volcanic eruptions which resulted in a series of flood basalts known collectively as the Columbia River Basalt Group. Sometime after these basalt flows blanketed the region, fine grained volcanic sediments of the Mascall Formation were deposited locally atop the basalts. The Rattlesnake Formation, a thick sequence of sand and gravel, was finally deposited in the John Day valley 5 to 2 million years ago (Oregon Water Resources Department 1986). The Quaternary Alluvium has been deposited and eroded during the past 2 million years.

Distribution of these formations was largely influenced by the presence of topographic and structural features which developed prior to the Tertiary Period. These older features such as the Strawberry Mountains, Aldrich Mountains, Blue Mountains, and the Blue Mountain anticline still influence the basin. (The Blue Mountain anticline is a long structural unwarping of the Earth's crust extending from Powell Butte to Lewiston, Idaho and should not be confused with the mountain range by the same name) (Oregon Water Resources Department 1986).

The John Day Fault is an east-west fault zone along the base of the Aldrich Mountains and Strawberry Mountains, which influences the location of the John Day River upstream of Picture Gorge. The thick accumulation of fragmented debris representing the Rattlesnake Formation, confined to this portion of the fault zone, shows evidence of a major valley for the past 1.5 to 13 million years (Oregon Water Resources Department 1986).

Loess, volcanic ash, and pumice were deposited over a basalt plateau in this region. Erosional forces have redeposited much of the loess and ash from upland areas to valley bottoms. Soils are comprised of silt, clay loams, stony loams, cobbly loams, and clay (Oregon Department of Fish and Wildlife 1990). Erosional processes are mainly superficial, occurring along steep tributary streams, road corridors, and areas with poor ground cover (Malheur National Forest 1998a).

Gold was formed along with quartz and a host of other low temperature minerals that were last to crystalize from the original magma and found along the margins of huge batholiths that were intruded during the Cretaceous and Jurassic periods. Lode gold is formed as veins and is found along the shattered rock walls of the batholiths. Older gold veins exposed by erosion from ancient and present streams made the gold easily exploitable (Orr *et al.* 1992). Early settlers in the region discovered gold veins by following the crystalline quartz exposed through the surface of the soil. The Blue Mountain region produced about three-fourths of all of Oregon's gold (Orr *et al.* 1992). Although small claims are active to some degree throughout the entire upper basin, most of the active gold mining in the John Day River basin today occurs in the North Fork subbasin.

The John Day River flows over 451 kilometers (280 miles) from its source southeast of Prairie City, Oregon, to its confluence with the Columbia River east of the town of Rufus Oregon. The John Day River is typical of streams in semiarid regions which exhibit extreme variations in seasonal flows and annual discharges. Average annual discharge of the John Day River into the Columbia River is slightly more than 1.9 billion cubic meters (1.5 million acre feet). Due to variations in yearly weather patterns, the total annual discharge varies between 617 million and 3.1 billion cubic meters (0.5 million and 2.5 million acre feet, Oregon Water

Resources Department 1986). Generally, the sources of tributaries to the John Day River are from high elevation springs, and snow melt forming intermittent streams. Therefore, discharge is highest in the spring during snow melt.

The John Day River basin's capacity to store water in snow fields and the subsurface aquifer and gradually release it later in the growing season is greatly diminished due to management practices and land use activities over the past 140 years. Analysis of historic flow data indicates that precipitation falling as snow now runs off immediately instead of staying in the basin. Use of the watershed's resources for forest products and other commodities has increased winter runoff and decreased spring runoff (Oregon Water Resources Department 1986). Timber harvest, road building, loss of riparian vegetation, and over-grazing by livestock are factors influencing increased flooding and scour in tributaries to the John Day River. Increased flooding has resulted in deepened channels and lowered water tables in the immediate vicinity of the deepened channel, further reducing the water holding capacity of the watersheds.

Irrigation water diversions also affect streamflow within the John Day River basin by disrupting the natural flow patterns of the river. Water quality varies with the flow of the river. Excessive turbidity levels are evident during high flow events, and low flows during summer months result in higher than natural stream temperatures (Oregon Water Resources Department 1986).

Coniferous forests and meadows are prevalent above 1,220 meters (4,000 feet); the plant community includes grasses (Gramineae), sagebrush (*Artemisia spp.*), and juniper trees (*Juniperus spp.*), except on north facing slopes where higher moisture levels support vigorous perennial grasses. The lower basin is a plateau of nearly level to rolling Columbia River basalt deeply dissected by the John Day River and tributaries. Vegetation in the lower basin was essentially a bunchgrass (*Agropyron spp.*) climax community with timber at higher elevations, but introduction of livestock grazing and farming has altered its character (Oregon Water Resources Department 1986).

Land uses in the John Day River basin include timber production, transportation, livestock grazing, irrigated agriculture, mining, and recreation. Timber (including special forest products harvesting, reforestation, and stand improvement activities) and livestock grazing are the principal activities which occur on federally administered lands in the John Day River basin (Malheur National Forest 1999a). Currently, recreation is increasing in importance in the basin. Limited road density information is available especially for private land in the headwaters of the upper mainstem John Day River (Malheur National Forest 1999a).

More than a third of the John Day River basin is forested. A large portion of these lands are managed by the U.S. Forest Service (Oregon Water Resources Department 1986). Management policies controlling harvest of timber on these lands has emphasized the extraction of mature trees to supply local mills. Road development to service timber sales has resulted in high road densities on National Forest System lands. In recent years most of the privately owned lands have been selectively cut using ground-based logging equipment on steep (greater than 30 percent) slopes and increasing road density in the area (Malheur National Forest 1998a and 1999) leading to more erosion and hydrologic alteration.

Following the gold rush in California in the mid-1800's, European and other immigrants prospected the John Day River basin area, and established mines and settlements. Early mining practices used water from ditches, hydraulic mining methods, installation of hard rock mills, and later use of bucket line dredges and doodlebugs in the streams. Early Federal minerals legislation encouraged the settlement and economic development of western lands. The General Mining Law of 1872 opened the public domain to mining activities. A significant portion of the private lands in the basin are patented mining claims.

The area is characterized by many placer mines, some of which have been worked since 1862. There are also numerous lode mines with important quartz veins in argillite. Placer deposits in some areas are deep. Historically, these deposits were hydraulically mined when located on hillsides and mined using bucket line dredges in stream bottoms. Extensive gold mining has occurred throughout the upper mainstem

and tributaries, the upper Middle Fork and tributaries, and the North Fork between Desolation Creek and Big Creek and the Granite Creek basin. Large gold dredges operated in the three major basins up until the 1940's. Ongoing recreational and commercial mining operations continue in the basin.

Gold mining continues to be a major activity in the basin. Placer claims are filed on many miles of streams; lode claims are filed on the historic quartz mines as well as on areas of more recent discovery. Gold and silver are the primary minerals extracted. Ditches are still used to transport water to mining sites.

The John Day River watershed is a popular recreation destination, with the heaviest use occurring in summer and fall. Winter use is relatively low, however snowmobile use is increasing. Primary recreation activities occurring in this watershed include camping, hunting, fishing, hiking, mountain biking, horseback riding, all terrain vehicle use, pleasure driving, picnicking, gold panning, snowmobiling, cross-country skiing, and snowshoeing. Big game hunters utilize this area heavily during the fall.

Developed recreation facilities in the John Day River basin are maintained at a limited level. Recreation trails are managed in the more remote areas such as the Strawberry Mountain Wilderness, North Fork John Day Wilderness, and other specially designated recreation areas.

### **Fish Species**

Fish species found in the John Day River basin include spring chinook salmon (*Oncorhynchus tshawytscha*), steelhead trout (*O. mykiss*), rainbow trout (also referred to as Columbia River redband trout) (*O. mykiss*), westslope cutthroat trout (*O. clarki lewisi*), bull trout (*Salvelinus confluentus*), mountain whitefish (*Prosopium williamsoni*), Pacific lamprey (*Lampetra tridentata*), brook lamprey (*Lampetra richardsoni*), bridgelip sucker (*Catostomus columbianus*), largescale sucker (*Catostomus macrocheilus*), chiselmouth (*Acrocheilus alutaceus*), speckled dace (*Rhinichthys osculus*), longnose dace (*Rhinichthys cataractae*), torrent sculpin (*Cottus rhotheus*), mottled sculpin (*Cottus bairdi*), northern pike minnow (*Ptychocheilus*

*oregonensis*), and redbreasted shiner (*Richardsonius balteatus*). These native species are managed by the Oregon Department of Fish and Wildlife for natural production and to insure ecosystem viability.

Brook trout (*Salvelinus fontinalis*), were introduced via stocking on a limited basis in the upper basin and still persist to some degree in several tributaries as well as the mainstem. Smallmouth bass (*Micropterus dolomieu*) were introduced into the lower mainstem John Day River and are managed for their sport fishing value. Other introduced species include: carp (*Cyprinus carpio*), largemouth bass (*Micropterus salmoides*), black crappie (*Pomoxis nigromaculatus*), bluegill (*Lepomis macrochirus*), channel catfish (*Ictalurus punctatus*), bullheads (*Ictalurus spp.*), and Lahontan cutthroat trout (*Oncorhynchus clarki henshawi*).

## **DISTRIBUTION AND ABUNDANCE**

### **Status of Bull Trout at the Time of Listing**

Bull trout were historically found throughout most of the John Day River basin. Complete distribution is undocumented, but seasonal use of the Columbia River by bull trout from the John Day River system was likely (Claire and Gray 1993). Bull trout in the North Fork John Day River were considered as a population of special concern by Ratliff and Howell (1992). Buchanan *et al.* (1997) considered this population in moderate risk of extinction due to the low number of bull trout detected in snorkel surveys in 1993. Ratliff and Howell (1992) considered bull trout to be extirpated from the Middle Fork John Day River and at high risk of extinction in the tributaries. The status evaluation by Buchanan *et al.* (1997), maintains this assessment with the addition of Clear Creek as a high risk tributary. In the final listing rule (63 FR 31647), six subpopulations identified included: (1) the North Fork John Day River, (2) the Middle Fork John Day River, (3) Granite Boulder Creek, (4) Big Creek, (5) Clear Creek, (6) and the upper mainstem John Day River. Although subpopulations were an appropriate unit upon which to base the 1998 listing decision, the recovery plan has revised the biological terminology to better reflect the current understanding of bull trout life history and conservation biology theory. Therefore, subpopulation terms will not be used in this chapter.

### **Current Distribution and Abundance**

Presently, bull trout distribution is limited primarily to headwaters of the North Fork John Day River, Middle Fork John Day River, and upper mainstem John Day River and tributaries, with seasonal use of the mainstem river downstream to the vicinity of the town of John Day (Ratliff and Howell 1992, Buchanan *et al.* 1997). The John Day River Recovery Unit Team has identified 12 extant local populations in the recovery unit. The known status of each local population occurring in the North Fork, Middle Fork, and upper mainstem John Day River is described below.

**North Fork John Day River.** Based on distribution information contained in Buchanan *et al.* (1997), and professional judgement of the John Day River Recovery

Unit Team, seven local populations have been identified in the North Fork John Day River subbasin: (1) upper North Fork John Day River (Crawfish, Baldy, Cunningham, Trail, Onion, and Crane creeks as well as the North Fork John Day River upstream of Granite Creek; (2) upper Granite Creek including Bull Run, Deep, and Boundary creeks and the upper mainstem Granite Creek); (3) Boulder Creek; (4) Clear/Lightning creek including Salmon Creek, (5) Clear Creek below the Pete Mann ditch (including Lightning Creek below the ditch), (6) Desolation Creek (includes South Fork Desolation Creek below the falls and North Fork Desolation Creek), and (7) South Fork Desolation Creek above the falls. Based upon inventories conducted in 1992, bull trout distribution in the North Fork John Day River and tributaries is limited to 18 percent of the previously known range (Claire and Gray 1993).

**Middle Fork John Day River.** Distributional information for the Middle Fork John Day River indicates that three local populations currently exist within the drainage. Local populations include Clear Creek, Granite Boulder Creek, and Big Creek (Buchanan *et al.* 1997). The Malheur National Forest (1998) identifies Deadwood Creek, upper Big Boulder Creek, Badger Creek, Indian Creek, and Vinegar Creek as potential habitat for bull trout local populations (potential local populations).

Current distribution in the Middle Fork John Day River is based on isolated sightings with the primary distribution restricted to tributaries and limited to 22 percent of stream miles previously known to support bull trout (Claire and Gray 1993, Buchanan *et al.* 1997). Biological assessments for the Middle Fork John Day River subbasin (Malheur National Forest 1998a and 1999) and Prairie City Ranger District (Malheur National Forest 1998b) provide detailed descriptions of baseline habitat conditions. Summer distribution of bull trout, based on the 1990 and 1992 Oregon Department of Fish and Wildlife Aquatic Inventory Project, indicated bull trout occupy approximately 16 miles of stream in the Middle Fork John Day River watershed, including: 8.8 kilometers (5.5 miles) in Big Creek, 4 kilometers (2.5 miles) in Deadwood Creek (a tributary to Big Creek), 6.4 kilometers (4 miles) in Granite Boulder Creek; and 6.4 kilometers (4 miles) in Clear Creek. Bull trout migration from these tributary streams during the summer is highly unlikely due to high water temperatures and habitat modifications in the mainstem. Aquatic inventory surveys conducted by the Oregon Department of Fish and Wildlife in 1990 and 1991 detected

60 bull trout in the Middle Fork John Day River basin; two fish were measured at 260 millimeters (10 inches) and 360 millimeters (14 inches), all others were less than 210 millimeters (8 inches) in length (Buchanan *et al.* 1997). In the 1999 and 2000 surveys of Clear Creek, eight redds were observed each year (Malheur National Forest 2001).

Bull trout in the Middle Fork John Day River persist at low abundance levels. In 1999, population surveys were conducted in Clear Creek, Big Creek, Deadwood Creek, and Granite Boulder Creek to estimate abundance. Total numbers of bull trout consisting of primarily juvenile and subadult fish, were estimated to be 1,950 individuals in Big Creek, 640 individuals in Clear Creek, and 368 individuals in Granite Boulder Creek (Hemmingsen 1999).

**Upper Mainstem John Day River.** Based on distribution information contained in Buchanan *et al.* (1997), and professional judgement of the John Day River Recovery Unit Team, two bull trout local populations were identified in the upper mainstem John Day River. The upper John Day River local population includes Deardorff Creek, Reynolds Creek, Rail Creek, Roberts Creek, and Call Creek) and the Indian Creek local population occurs above the flow barrier (Buchanan *et al.* 1997).

Spawning surveys of bull trout habitat in tributary streams to the mainstem John Day River showed few fish spawning in the stream. The 1999 and 2000 surveys were done on portions of Call Creek, Deardorff Creek, John Day River, Rail Creek, Reynolds Creek, and Roberts Creek. Only Deardorff Creek was surveyed for 2 consecutive years. The number of redds observed in Deardorff Creek was 12 the first year and 10 the second year (Malheur National Forest 2001). Total numbers of redds from the first to second year is not comparable for the other streams surveyed (Table 1).

**Table 1.** Number of redds observed during 1999 and 2000 in upper John Day River, Oregon, during spawning surveys (N/S = not surveyed).

<b>Stream</b>	<b>1999</b>	<b>2000</b>
Call Creek	N/S	28
Deardorff Creek	12	10
John Day River	N/S	27
Rail Creek	N/S	18
Reynolds Creek	3	N/S
Roberts Creek	N/S	16

Within the upper John Day River and tributaries, 10-year average irrigation bypass trap count information from the upper mainstem, Reynolds, Deardorff, and Roberts creeks, indicate a decline from 152 bull trout between 1971 and 1980 to 95 from 1981 to 1992, or a 37.5 percent reduction (Claire and Gray 1993). The Oregon Department of Fish and Wildlife (1995) reported that 1990 surveys estimate that the upper mainstem, and Call and Rail creeks may have more than 300 total spawning adults.

Inventory data indicates distribution has been reduced by 55 percent from historical (Claire and Gray 1993) and bull trout are considered to be at moderate risk of extinction in the mainstem and tributaries (Ratliff and Howell 1992; Buchanan *et al.* 1997).

Aquatic inventory information collected from 1990 through 1992 indicates that summer distribution of bull trout is limited to about 25 percent of the stream area where bull trout were historically present (104 kilometers (65 miles) occupied out of 428 kilometers (266 miles) of previously estimated bull trout habitat), based on prior information on species presence (Buchanan *et al.* 1997). Creel survey information for the John Day River drainage indicates a reduction in the percentage of bull trout taken versus other trout species from approximately 22 percent during the period from 1961 to 1970 to 4.5 percent from 1981 to 1992 (Claire and Gray 1993).

Streams inventoried in 1990 revealed limited amounts of summer habitat in the mainstem. Survey crews in 1990 were unable to find bull trout in Roberts Creek, but bull trout were documented in the water diversion trap in Roberts Creek in 1990, 1991, and 1992, finding 39, 26, and 52 bull trout respectively in the bypass trap. Crews

conducting cutthroat surveys on August 25, 1997, documented bull trout in Roberts Creek, North Fork Reynolds Creek, and Deardorff Creek (Oregon Department of Fish and Wildlife 1997). A radio telemetry study of bull trout movements in the John Day River detected movement of individuals from headwater streams extending downstream to the town of John Day (Hemmingsen *et al.* 2001a).

The Malheur National Forest (1998a and 1999) provides detailed descriptions of baseline habitat conditions, and additionally list Crescent Creek, Graham Creek and Mossy Gulch as currently, occupied bull trout habitat. Historical records indicate presence of bull trout in Dads Creek, Dixie Creek, Pine Creek, Canyon Creek, Laycock Creek, and Beech Creek (Buchanan *et al.* 1997). Resident (summer distribution) bull trout currently occupy approximately 77 kilometers (48 miles) of stream in the upper mainstem John Day River (Malheur National Forest 1998a and 1999).

**Mainstem John Day River.** Recent survey work by the Oregon Department of Fish and Wildlife (Hemmingsen *et al.* 2001b) detected bull trout in the mainstem John Day River at River kilometer 273 (River Mile 170) near the town of Spray, downstream of the confluence with the North Fork John Day River at River kilometer 295 (River Mile 183). Two bull trout were radio tagged and tracked upstream during the summer. One bull trout was tracked to River kilometer 107 (River Mile 66) of the North Fork John Day River. It had traveled about 181 kilometers (112 miles) upstream during a period of 77 days. The second bull trout traveled about 220 kilometers (137 miles) upstream to River kilometer 6.1 (River Mile 3.8) in Granite Creek, a tributary to the North Fork John Day River (Hemmingsen *et al.* 2001b). Presence of bull trout below the confluence of the two tributaries is an indication the local bull trout populations of the North Fork and Middle Fork may be connected via seasonal migration between these two subbasins and that the mainstem may serve as bull trout overwintering and migration habitat.

In 2000, the Oregon Department of Fish and Wildlife captured 11 bull trout in the mainstem John Day River near the town of Spray, Oregon, while seining for juvenile chinook salmon. Two of the fish were implanted with radios and both were subsequently tracked into the North Fork John Day River. One was tracked upstream

to Granite Creek , and the second was tracked as far as Texas Bar Creek, although it may not have gone that far on its own. The radio tag was found at the base of a tree containing an osprey nest. One of the fish tagged was 234 millimeters (9.2 inches), the other was 248 millimeters (9.7 inches) long (Hemmingsen *et al.* 2001b).

## REASONS FOR BULL TROUT DECLINE

According to the Northwest Power Planning Council (2001) two overriding factors influencing fisheries and fish habitat are that past, recent, and current land use practices are responsible for altering, at the landscape level, “the storage, movement and character of water resources over entire areas of the John Day River subbasin and its tributary system,” and these prevalent land uses in combination with altered hydrologic responses are translated into stream channel instability in many area streams. Degraded fish habitat conditions are identified as occurring in approximately 966 kilometers (600 miles) of stream, due to erosion and sedimentation which reduce pool habitat, alter hydrographs, and result in loss of instream habitat elements (Northwest Power Planning Council 2001). Although a variety of factors are at play in each of the major stream segments (south, north, middle, and upper mainstem), the results have been similar across the basin.

Claire and Gray (1993) demonstrate these conditions for the North Fork John Day River reporting that the North Fork has the most bull trout habitat of the three John Day River subbasins, but note many areas are still affected by mining, logging, grazing, and road building. They list bull trout spawning and rearing habitat in the North Fork as highly vulnerable, due to water temperature increases from destruction of cold water springs, riparian habitat loss, and loss of instream structure and gravel. Buchanan *et al.* (1997) indicates other limiting factors including: (1) chemical mine waste, (2) reduction in anadromous fish populations, (3) past opportunities for over-harvest and poaching, and (4) hybridization and competition with brook trout.

Key habitat and population elements identified in Middle Fork John Day River subbasin biological assessments, of concern to bull trout, include isolated populations, high summer water temperatures, substrate embeddedness, and high road densities (Malheur National Forest 1999a, 1998a and b).

Numerous habitat and population elements of concern to bull trout were identified in the upper mainstem John Day River biological assessments, especially when individual, occupied subwatersheds were reviewed (Malheur National Forest 1999a). Overall, habitat conditions detrimental to bull trout include high summerwater

temperatures, high sediment concentrations, substrate embeddedness, and poor bank stability.

### **Dams**

There are no major hydropower dams located in the John Day River basin (Oregon Department of Agriculture 2002). Anadromous fish access to the John Day River basin is constrained by passage through the three mainstem Columbia River Dams: Bonneville, The Dalles, and John Day. Bull trout use of the mainstem Columbia in the vicinity of these dams is not well documented, and obtaining additional use information is identified as a term and condition in the U.S. Fish and Wildlife Service's Biological Opinion on operation of the Federal Columbia River Power System (U.S. Fish and Wildlife Service 2000). At a minimum, limiting production of anadromous fish in the John Day River basin has a negative effect on stream productivity due to the loss of nutrients imported by the anadromous fish. This resource loss affects bull trout in the John Day River basin by the direct loss of potential prey, as well as limiting the productive capacity of area streams for other fish and invertebrate prey species. Known water storage in the basin as of 1986 is indicated as occurring in 478 permitted reservoirs ranging from 123.4 cubic meters (0.1 acre feet) to 2,837,050 cubic meters (2,300 acre feet), with only 22 greater than 61,675 cubic meters (50 acre feet) in size (Oregon Water Resources Department 1986). Many locations in the John Day River and its tributaries are seasonally dammed (push-up dams) for irrigation purposes, as described below in the agricultural section.

### **Forest Management Practices**

Approximately 30 percent of the John Day River basin is managed by the U.S. Forest Service, with most of the remaining 60 percent being privately owned (Northwest Power Planning Council 2001). As rail lines were expanded into the rural west, including the Blue Mountains, timber extraction followed, and, as cited in Robbins and Wolf (1994), "timber was taken from each gulch and creek along the way." With rail access came the additional opportunity to transport wood to distant markets, leading to large-scale harvest of the ponderosa pine forests and industrial lumber production (Robbins and Wolf 1994). According to the Oregon Water Resources Department

(1986), large volumes of trees were harvested from private lands within the basin as of 1986, and harvest attention was expected to turn toward public lands, as most private stands had been exhausted.

Fire suppression policies and land management practices have affected both the composition and structure of forest stands in the basin (Malheur National Forest 1998a and 1999b). With the use of early detection and suppression methods over the last 40 years, fire cycles and periodicity has resulted in alteration of the forest vegetation communities (Umatilla National Forest 1997). Without periodic low or moderate intensity fires, stand densities tend to increase and tree species composition shifts to favor the more shade-tolerant trees (Umatilla National Forest 1997). Fire suppression results in reducing the frequency of "low intensity" fires since the early 1900's when fire suppression became a top priority for resource managers.

In addition to the fire suppression program, timber harvesting has played a significant role in the current vegetative composition outside of designated wilderness. Emphasizing forest management for timber extraction dates back to the early 1900's, although, to supply local demand, the first sawmills quickly followed the discovery of gold in the John Day valley in 1862 (Robbins and Wolf 1994). The practice of removing large diameter, fire-tolerant trees, and the subsequent management of the faster growing fir tree species resulted in dense stands of trees that are more susceptible to larger fires and less conducive to the more frequent low intensity fires (Umatilla National Forest 1997, Malheur National Forest 1998a). The increase in large fires can be attributed to both weather conditions that followed the fire starts, along with the type of fuels (Malheur National Forest 1999b). Lightning fires that burned the area also affected bull trout habitat, indirectly increasing sedimentation and water temperatures by loss of ground covering vegetation (Buchanan *et al.* 1997). According to Wissmar *et al.* (1994), the riparian canopy is completely gone in many parts of the John Day River basin, due to poor livestock and forestry practices.

Throughout the John Day River basin, logging practices have directly and indirectly affected fish and aquatic resources, and degraded water quality (Oregon Department of Fish and Wildlife 1990). Forest management practices can affect stream systems in a variety of ways. In the John Day River basin, impacts include increased sedimentation from ground disturbing activities, the road system (specific road-related

impacts will follow in the transportation section), and fire-related sedimentation (from runoff over bare ground following fires); the immediate loss of large wood from stream channels, and loss of future wood recruitment due to riparian harvest, especially on private land (due to the less stringent requirements imposed by the State Forest Practices Act relative to Federal standards); increased stream temperatures due to the loss of streamside shade; impaired stream bank stability due to the loss of root structure from riparian harvest and site preparation activities; passage barriers due to road crossings and impassable culverts; and altered hydrologic patterns due to changes in the frequency, timing, magnitude, and spatial distribution of peak, high, and base flows (see for example Meehan 1991; U.S. Department of Agriculture and U.S. Department of the Interior 1994; Spence *et al.* 1996; Lee *et al.* 1997). Further, historic forest management practices have shifted forest composition from lodgepole pine to white fir as the dominate overstory in some areas of the forest and from ponderosa pine to douglas fir in other areas (Oregon Department of Fish and Wildlife (ODFW) *in litt.* 2000). This management legacy will take decades to correct (see, for example, U.S. Department of Agriculture and U.S. Department of the Interior 1994).

**North Fork John Day River.** According to the Umatilla National Forest (1999), integrity ratings for the North Fork John Day River subbasin were low for forest conditions, and low for overall ecological integrity. Late and old structure forest stands are not well represented in the North Fork John Day River subbasin, due primarily to harvest and large wildfires (ODFW, *in litt.* 2000; Umatilla and Wallowa Whitman National Forest 1997a and 1997b). Outside the North Fork John Day Wilderness Area, road construction to support harvest activities has resulted in high road densities with many stream crossings. Fish habitat has been affected through high water temperatures due to a lack of streamside shade, increased amounts of fine sediments, altered hydrologic patterns, lost pool habitat, and low amounts of instream woody structure (Umatilla National Forest and Wallowa Whitman National Forest 1997a and 1997b).

**Middle Fork John Day River.** High road densities, (Malheur National Forest 1998a) and large acreage wild fires in the Middle Fork John Day River basin (Summit Fire 1996) have contributed to altered stream hydrology and increased sediment delivery to streams especially spawning and rearing areas (ODFW, *in litt.* 2000). With the exception of Clear Creek and Lunch Creek, the amount of large wood, in streams and stream pool depths have been reduced in many reaches due to past harvest, railroad, and road building activities (Malheur National Forest 1998a). The Oregon Department of Environmental Quality (1998) has identified most tributaries in the Middle Fork John Day River subbasin as water quality limited, primarily due to high stream temperatures. In the Granite Boulder Creek subwatershed, approximately 60 percent of the area has been altered by timber harvest activity (Malheur National Forest 1998a).

**Upper Mainstem John Day River.** Commercial timber harvest of area forests began in the 1950's and focused on removing larger overstory fire-tolerant trees such as ponderosa pine (Malheur National Forest 1999a). The upper mainstem exhibits a checkerboard public/private (alternate section) ownership pattern that does not facilitate good watershed management, and in recent years most of the privately owned lands have been selectively cut (Malheur 1999a; ODFW, *in litt.* 2000). Steep slope logging began in the 1970's and continued through the 1990's (Malheur National Forest 1999a). Use of ground based logging equipment on steep (greater than 30 percent) slopes and high road densities contribute sediment to bull trout spawning and rearing areas (ODFW, *in litt.* 2000). This logging method has been used extensively in the upper John Day River drainage (ODFW, *in litt.* 2000). Fires such as the Wildcat Fire, have also increased sediment loading in the mainstem John Day River (ODFW, *in litt.* 2000). Increased stream temperatures and sediment delivery, and loss of large pools, in part from past and ongoing forest management activity are the main factors limiting bull trout productivity in this area.

### **Livestock Grazing**

Historic, and to a lesser degree, current grazing practices have removed extensive amounts of riparian vegetation that help stabilize stream channels and provide essential shade and cover to streams throughout the entire basin (ODFW, *in litt.* 2000). In many

areas native bunch grasses have been replaced with invasive nonnative vegetation such as cheat grass and medusa head wild rye (ODFW, *in litt.* 2000). These nonnative grasses are more susceptible to frequent fires and retard the growth of native species by reducing the amount of water available during critical growing periods (ODFW, *in litt.* 2000). Present grazing on National Forest System land varies in use, with little consistency in compliance with current grazing standards. Several areas lack adequate riparian vegetation and shrubs necessary to prevent bank erosion and heating of water. The absence of shrubs and deciduous trees in meadows has been attributed to summer long grazing.

High intensity livestock grazing and agricultural development has contributed to aquatic habitat degradation. Local areas may experience concentrations of livestock sufficient to damage streambanks and degrade habitat quality (ODFW, *in litt.* 2000). Grazing on private land varies widely, but often times shows ongoing stream bank damage from livestock (ODFW, *in litt.* 2000).

**North Fork John Day River.** As in most other areas in the west, there was historically a much higher intensity of livestock grazing in the past over much of the North Fork John Day River drainage, which no doubt contributed to aquatic habitat degradation (Umatilla National Forest, *in litt.* 2000). Severely damaged riparian areas, attributable to livestock grazing occur in the lower North Fork John Day River tributaries, and Camas Creek, a tributary to the upper North Fork John Day River (Oregon Department of Fish and Wildlife 1990). Current grazing on National Forest land is much lighter, but localized areas may experience concentrations of livestock sufficient to damage streambanks and degrade habitat quality (Umatilla National Forest, *in litt.* 2000). Grazing on private land varies widely, but lower Camas and Owens creeks show ongoing stream bank damage from livestock (Umatilla National Forest, *in litt.* 2000).

**Middle Fork John Day River.** Livestock grazing occurs over much of the area along the Middle Fork John Day River and its tributaries, and during the hot season, livestock tend to congregate near water sources, often leading to damaged riparian zones. This is particularly true on private lands adjacent to the river and tributaries where livestock are allowed to graze during summer and fall months. Several areas of the

Middle Fork John Day River lack adequate riparian vegetation and shrubs necessary to prevent bank erosion and heating of water (ODFW, *in litt.* 2000). The absence of shrubs and deciduous trees in meadows along the upper reaches of the Middle Fork has been attributed to summer long grazing (ODFW, *in litt.* 2000).

**Upper Mainstem John Day River.** Although livestock grazing practices on public lands have improved in recent years, some sites continue to be problem areas (Oregon Department of Fish and Wildlife *in litt.* 2000). According to the Malheur National Forest (1999a), negative effects of livestock grazing are particularly evident near water sources, and degraded riparian conditions are of great concern. The Deardorff, Hot Springs, Rail Creek and Reynolds Creek livestock grazing allotments contain streams inhabited by bull trout in the upper John Day River (Malheur National Forest 1999a). Streams with suspected or potential distribution occur in the Dixie and Indian creek allotments (Malheur National Forest 1999a).

### Agricultural Practices

Agriculture production, primarily hay, grain crops and fruit orchards, is one of the main economic activities in the John Day River basin (Northwest Power Planning Council 2001). Agricultural practices have contributed to degraded stream and riparian conditions throughout the basin. Draining and conversion of wetlands to pastures, diking and channelizing of streams, and removal of extensive beaver colonies and large trees in the riparian corridor have all had a negative effect on the river's interaction with its floodplain (Oregon Department of Fish and Wildlife *in litt.* 2000). Irrigation withdrawals decrease streamflow during the summer when water temperature increases to critical levels and widespread flood irrigation return flows in the middle fork and mainstem subbasins return warmed water to the river (Oregon Department of Fish and Wildlife *in litt.* 2000). Cumulatively, warm return flow combined with decreased instream flow has significantly altered the temperature regime of area streams and rivers (Oregon Department of Fish and Wildlife *in litt.* 2000). Attempts to armor riverbanks to prevent erosion have also simplified the river channel and reduced habitat diversity (Oregon Department of Fish and Wildlife *in litt.* 2000).

A high number of “push up dams” are used within migratory bull trout habitat (Northwest Power Planning Council 2001). “Push up dams” are created by using a bulldozer to pile stream substrate across the stream and divert water into an irrigation ditch. Some of these temporary dams result in intermittent passage, and interrelated impacts such as sedimentation, reduced flows and associated water quality impacts (Northwest Power Planning Council 2001). Although participation in the screening program is extensive, there still remain 30 legal diversions which are unscreened and 228 existing screens that do not meet current screen criteria (Northwest Power Planning Council 2001). The Oregon Department of Fish and Wildlife currently performs operation and maintenance on 314 screens in the John Day River basin (Northwest Power Planning Council 2001). Elevated water temperature and reduced stream flow due to water diversions in the mainstem river and larger tributaries acts as a barrier to migration during summer and early fall (Buchanan *et al.* 1997), isolating local populations.

**North Fork John Day River.** Irrigation water rights for the North Fork John Day River subbasin total 8.3 cubic meters persecond (291.5 cubic feet persecond), and are used to irrigate a total of 5,423 hectares (13,400 acres), mostly by sprinkler (Oregon Department of Agriculture 2002). The Pete Man Ditch diverts most of the West Fork Clear Creek and virtually all of Salmon and Lightning creeks before continuing on to the North Fork Burnt River. The Pete Man Ditch also partially dewateres East Fork Clear Creek, Dry Creek, Spring Creek, and Lightning Creek, all of which contain bull trout (Oregon Department of Fish and Wildlife *in litt.* 2000, Umatilla National Forest *in litt.* 2000). Although most of the water right is for mining use, the portion that is delivered to the Burnt River basin is used to irrigate agricultural crops, primarily hay (Oregon Department of Fish and Wildlife *in litt.* 2000).

**Middle Fork John Day River.** Irrigation water rights for the Middle Fork John Day River subbasin total 2.5 cubic meters persecond (88.5 cubic feet persecond), with most water delivered through flood irrigation to 1,983 hectares (4,900 acres) near Long Creek and above Galena (Oregon Department of Agriculture 2002). The total amount of cropland in the Middle Fork John Day River subbasin is approximately 4,290 hectares (10,600 acres) with alfalfa, meadow and grass hay, pasture, grain, and grain hay the

principle crops (Oregon Department of Agriculture 2002). The Oregon Department of Environmental Quality (1998) identified all streams inhabited by bull trout in the middle fork system (Middle Fork John Day River, Big Creek, Granite Boulder Creek, and Clear Creek) as water quality limited, primarily for high summer temperatures, but also flow modification of the middle fork. Although not solely the result of agricultural practices (forestry, livestock grazing, and the transportation network are also implicated), agriculture, and particularly irrigated agriculture is implicated. High water temperatures in the middle fork are a factor contributing to isolating bull trout local populations in the middle fork subbasin (Oregon Department of Fish and Wildlife *in litt.* 2000). Potential habitat is also limited by irrigation structures. For example, Bridge Creek is adjacent to Clear Creek (currently inhabited) and could provide about 11 miles of high quality habitat with good water quality that could be recolonized by bull trout (Oregon Department of Fish and Wildlife *in litt.* 2000). Access to Bridge Creek is blocked by a 4.5 meter-high (15 foot) dam, and plans are underway to either remove the dam or provide fish passage over it (Oregon Department of Fish and Wildlife *in litt.* 2000).

**Upper Mainstem John Day River.** Over 90 percent of the total appropriated water volume in the upper mainstem subbasin is allocated to irrigation (Oregon Water Resources Department 1986). Water rights for irrigation use total 26 cubic meters-persecond (927 cubic feet-persecond) and are applied primarily by flood irrigation, with greater use of sprinklers below the town of Mt. Vernon, Oregon (Oregon Water Resources Department 1986). Over 80 ditches divert water from the mainstem river, including three major ditches (Oregon Water Resources Department 1986). The total amount of cropland in 1986 was 10,643 hectares (26,300 acres), with the majority, 10,117 hectares (25,000 acres), being irrigated (Oregon Water Resources Department 1986). Streams currently occupied, historically occupied, or that are potential habitat for bull trout, are affected by agricultural activities in the upper mainstem. Indian Creek, currently inhabited by a small population of bull trout above the Strawberry Wilderness boundary, has virtually no flow during part of each summer, which seasonally isolates the local population (Oregon Department of Fish and Wildlife *in litt.* 2000). Irrigation withdrawals completely dry Pine Creek, a historic bull trout stream, for several miles each summer (Oregon Department of Fish and Wildlife *in litt.* 2000). Strawberry Creek, which contains core bull trout habitat, has passage problems attributable to multiple diversions with inadequate jump pools or the presence of concrete aprons (Oregon

Department of Fish and Wildlife *in litt.* 2000). This stream is inadequately screened, has multiple channels once it leaves National Forest land, and one of the diversions intercepts the main channel blocking all upstream passage (Oregon Department of Fish and Wildlife *in litt.* 2000). The Oregon Department of Environmental Quality (1998) indicates that the upper mainstem is water quality limited due to high bacterial concentrations, low dissolved oxygen, modified stream flow, and high summer temperature. Both inhabited (Rail, Reynolds, and Indian creeks) and core habitat (Pine and Strawberry creeks) streams are listed as water quality impaired due to high summer temperatures (Oregon Department of Environmental Quality 1998).

### **Transportation Network**

As with many stream systems throughout the Pacific Northwest and the country, extensive road networks may parallel existing stream channels imposing a variety of impacts. A partial list includes increasing sediment loading from runoff over gravel or native surface roads, intercepting surface and shallow subsurface water flow and altering runoff patterns, constraining stream channels from normal movement and adjustment patterns, interacting hydrologically with the stream network, and acting as a conveyance for introduction of nonnative species, poachers, and toxic substances via spill during transport. Landscape analysis correlating road density to the status of four nonanadromous salmonids indicated that road densities had a strong negative correlation with the status of the particular salmonid species (Lee *et al.* 1997). According to Lee *et al.* (1997) bull trout were generally found to be absent where geometric mean road densities were greater than or equal to 0.7 kilometers per square kilometer (1.13 miles per square mile) and the arithmetic mean road density of all upstream subwatersheds was 1.06 kilometers per square kilometer (1.71 miles per square mile). No attempt was made by Lee *et al.* (1997) to establish the causal mechanisms for the observed relationships, due to the large number of pathways for impact to aquatic species and habitat from road construction and use.

**North Fork John Day River.** Road densities, the number of stream crossings, and the amount of road within the riparian habitat conservation area are generally quite

high on Federally managed lands in North Fork John Day River subbasin, with the exception of wilderness areas. As stated above, there are many causal mechanisms for the negative relationship between road density and the health of salmonid populations, and in some cases, a relatively small overall length of road can be responsible for most of the observed impact. In the North Fork John Day River watershed, where roads were present in the non-wilderness portion of the subwatersheds, (7 out of 9 subwatersheds with 1 missing data), road densities ranged from 1.9 to 4.2 kilometers per square kilometer (3.0 to 6.7 miles per square mile). Miles of road within the riparian habitat conservation area range from zero to 13, and in some cases occur in 71 percent of the riparian habitat conservation areas adjacent to fish bearing streams, with up to 61 stream crossings (Umatilla and Wallowa Whitman National Forests 1997a). Data from the Granite Watershed indicate that road-related problems are likely more extensive, with non-wilderness road densities ranging from 0.2 to 4.9 kilometers per square kilometer (0.4 to 7.09 miles per square mile), with, in some subwatersheds, the length of road in riparian habitat conservation areas over double that of fish bearing streams, and up to 135 observed stream crossings (Umatilla and Wallowa Whitman National Forests 1997b).

Illustrating another threat from the road system, an estimated 3,500 gallons of hydrochloric acid spilled from a tanker truck into the North Fork John Day River at the confluence with Camas Creek at River kilometer 91.4, (River Mile 56.8) in 1990 (U.S. Fish and Wildlife Service 1994). The spill killed an estimated 98,000 to 145,000 fish including 4,000 anadromous fish, 300 bull trout, and 9,500 lamprey within a 19-kilometer (12 mile) reach of the North Fork John Day River (U.S. Fish and Wildlife Service 1994). Modeling suggested pH changes may have extended for 66.8 kilometers (41.5 miles) before being diluted and neutralized to a pH of 6.5 (U.S. Fish and Wildlife Service 1994).

**Middle Fork John Day River.** According to the Oregon Department of Fish and Wildlife *in litt.* (2000) highways 26 and 7 cross or follow parts of the Middle Fork John Day River, and culverts on Clear Creek and the middle fork could be either replaced with bridges, or with culverts that are more fish passage friendly. Many of the roads on Federal lands were built to support timber harvest, mining and grazing, and have led to a substantial network of roads throughout the area (Malheur National Forest

1998a). Road densities in roaded areas within the subwatersheds supporting bull trout range from 1.5 to 3.5 kilometers per square kilometer (2.4 to 5.7 miles per square mile), with approximately 20 percent of roads occurring in the riparian habitat conservation areas (Malheur National Forest 1999a and 1999b).

**Upper Mainstem John Day River.** A paved county and Forest Service road follows the upper mainstem with several crossings and placement that constrains the flood plain (Oregon Department of Fish and Wildlife *in litt.* 2000). Improved roads also make bull trout spawning and rearing areas more accessible to the public and increase susceptibility to overharvest, poaching, and harassment (Oregon Department of Fish and Wildlife *in litt.* 2000). Road densities and riparian road mileage is expected to be comparable to that reported for the north and middle forks.

### **Mining**

According to the Northwest Power Planning Council (2001), although reduced in frequency and intensity, mining still continues in the John Day River basin. Gold and locatable mineral mining occurs on the upper North and Middle Forks John Day River and tributaries to the upper mainstem John Day River (Northwest Power Planning Council 2001). Aggregate (rock and gravel) mining for road construction occurs throughout the basin (Northwest Power Planning Council 2001). Extensive gold mining throughout the upper mainstem and tributaries, the upper Middle Fork and tributaries, the North Fork between Desolation Creek and Big Creek and in the Granite Creek basin have greatly reduced habitat diversity and contributed to reduced water quality (Oregon Department of Fish and Wildlife *in litt.* 2000). Inadequate buffer strips between mining activity and streams, flooded settling basins during high flows, and the cumulative impact of numerous small recreational operations degrade habitat quality, removing shade, and large wood, displacing aquatic invertebrates, and destabilizing spawning gravels (Oregon Department of Fish and Wildlife *in litt.* 2000). According to the Oregon Department of Fish and Wildlife (*in litt.* 2000) gold dredges operated in the three major basins up until the 1940's.

**North Fork John Day River.** Presently, water rights for 5.7 cubic meters persecond (202 cubic feet persecond) are identified in the North Fork to support mining activities in the subbasin (Oregon Department of Agriculture 2002). According to the Umatilla National Forest (1999) 661 claims are filed within the boundaries of the North Fork John Day Ranger District, but only about 40 claims have the necessary approval to actually extract minerals. Both active and inactive claims are present in the Desolation Creek watershed, with one active and three abandoned mines located within the watershed, and substantial levels of activity noted on private lands (Umatilla National Forest 1999). There are 50+ mining claims in the Granite Creek System on the Umatilla National Forest and a larger number on the Wallowa Whitman National Forest (Umatilla National Forest *in litt.* 2000). Shaft mining in the Granite Creek system has, in some cases, produced a mine shaft effluent high in iron, which precipitates as the oxide, coating the stream substrate with a fine orange flocculent precipitate (Umatilla National Forest *in litt.* 2000). The Red Boy Mine affects water quality in Clear Creek from heavy metals leaching out of the mine adit (Oregon Department of Fish and Wildlife *in litt.* 2000). Boulder Creek, a tributary inhabited by bull trout in the Granite Creek watershed, has a dewatered section which isolates it due to past mining activities (John Day River Recovery Unit Team *in litt.* 2001). Lightning and Salmon creeks, in the Granite Creek watershed, are negatively affected by the Pete Mann mining ditch. The ditch diverts water from Granite Creek to the Burnt River watershed, and impedes bull trout movement upstream (Umatilla and Wallowa Whitman National Forests 1997b, Oregon Department of Fish and Wildlife *in litt.* 2000). The Crane Creek stream channel is currently dominated by historic and current mining impacts (Umatilla and Wallowa Whitman National Forests 1997a). Past placer mining throughout the North Fork John Day River subbasin has flushed fine sediment into area streams (Umatilla National Forest *in litt.* 2000).

Extensive dredge mining on the North Fork John Day River and in the Granite and Clear creek system in the 1950's and 1960's drastically altered the stream channel, effectively channelizing the stream and restricting its access to the flood plain (Umatilla National Forest *in litt.* 2000). Mining activities are indicated as ongoing in Desolation Creek. One active lode mine and three inactive placer mines are located on Federal lands, and other lode and placer mines occur on private lands in the watershed (Umatilla National Forest 1999). The Oregon Department of Environmental Quality (1998), has

identified habitat modification as a parameter limiting beneficial water uses in the North Fork John Day River. Streams indicated as water quality limited due to habitat modification are Baldy, Crane, Crawfish, Trail, North Fork Trail, South Fork Trail, Bull Run, Boulder, and Granite creeks and the North Fork John Day River, from its mouth to the headwaters (Oregon Department of Environmental Quality 1998).

**Middle Fork John Day River.** Existing water rights for mining in the Middle Fork John Day River subbasin total 1.4 cubic meters per second (49.5 cubic feet per second), and are generally dated later than 1970 (Oregon Department of Agriculture 2002). According to the Malheur National Forest (1998a), lode mining in the Middle Fork occurs in the upper watershed, and many areas in the Middle Fork John Day River have been dredged or placer mined. Mining activity is relatively minimal at present, but the Middle Fork has some of the highest amount of mining activity on the Malheur National Forest (Malheur National Forest 1999b). Currently there is one vertical mine shaft and several mine adits that are open, and old ore processing facilities still exist in the Middle Fork area (Malheur National Forest 1999b). In the Granite Boulder subwatershed, hand-dredging streams involved lifting and washing stream rocks by hand and stacking them in the adjacent floodplain or terraces, removing the majority of the larger stream substrate from the channels in Elk, Deep, Big, Placer Gulch, Davis, Vinegar, and Vincent creeks (Malheur National Forest 1999b).

**Upper Mainstem John Day River.** Mining activity in the upper mainstem John Day River was extensive in the past, and included large scale dredging of the upper John Day River and lode mines in the Canyon Creek watershed and above Praire City (Oregon Water Resources Department 1986). Although active claims exist in a number of tributaries, the majority of current activity consists of small scale placer mining along area streams, such as Canyon Creek (Oregon Water Resources Department 1986). According to the Malheur National Forest (1999a) there are no active mining operations in the upper mainstem, and recreational mining has not been observed for the last 5 years.

### **Residential Development**

The John Day River basin is sparsely populated, with a human population density ranging from 2.3 to 5.6 people per square kilometer (0.9 to 2.2 people per square mile) and urban lands comprising 0.3 percent of the basin (Northwest Power Planning Council 2001). There are several towns in the basin with populations varying from 138 at Dayville to 1,821 for the town of John Day in the year 2000. Given these statistics, residential development in a relative sense, is not an appreciable factor in bull trout decline.

The sewage treatment plant at Prairie City has issued public health alerts regarding raw sewage entering the John Day River on several occasions during high stream flows in late winter or early spring (Oregon Department of Fish and Wildlife *in litt.* 2000). According to the Oregon Department of Fish and Wildlife (1990), problems with individual septic systems also exist within the basin, but bacterial and nutrient pollution from residential sources do not pose a significant problem for fisheries resources within the basin. The upper North Fork John Day River, from the north fork confluence to Reynolds Creek, is identified as water quality limited, year-long, due to high bacteria concentrations (Oregon Department of Environmental Quality 1998).

### **Recreation**

The John Day River subbasin offers a variety of recreational opportunities, from wilderness hiking and camping in wilderness areas (North Fork John Day River, Strawberry, Black Canyon, and Bridge Creek), to Federal Wild and Scenic Rivers and State Scenic Waterways, and the John Day Fossil Beds National Monument (Northwest Power Planning Council 2001). Recreation activities include hunting, fishing, hiking, cross country skiing, snowshoeing, camping, horseback riding, all terrain vehicle riding, mushroom and berry picking, horn hunting, rock hounding, firewood and post and pole cutting, and driving for pleasure. Both developed and undeveloped camping facilities are present. Impacts to bull trout habitat from recreational activities include increased sediment delivery to streams from road and trail use, disturbed stream beds and banks from vegetation removal at camp sites and local recreation use, introduction of noxious

weeds from feed for stock animals or vehicles, increased opportunity for poaching, and potential introduction of nonnative fishes. Recreational activity can occur locally at high levels, especially during the fall big game hunting.

**North Fork John Day River.** The upper North Fork John Day River is a popular recreation area, with heavy use in summer and fall and relatively low amounts of winter use due to limited vehicle access under winter weather condition (Umatilla and Wallowa Whitman National Forests 1997a). The North Fork John Day River, from its headwaters to the Camas Creek confluence was designated as a National Wild and Scenic River in 1988 (Bureau of Land Management 1999). Recreation activities include camping, hunting, fishing, hiking, picnicking, cross-country skiing, snowshoeing, horseback riding, snowmobiling, all-terrain vehicle use, driving for pleasure, and gold panning (Umatilla and Wallowa Whitman National Forests 1997b). This area is heavily utilized by big game hunters during the fall (Umatilla and Wallowa Whitman National Forests 1997a).

Recreation facilities in the North Fork John Day River watershed are at a limited level of development (primitive) and include one campground, seven trailheads, and seven trails accessing both units of the North Fork John Day Wilderness (Umatilla and Wallowa Whitman National Forests 1997a). Wilderness trails follow the North Fork John Day River and do not appear to adversely affect stream habitat; however, the potential for unlawful harvest of bull trout exists due to the proximity of these trails to the North Fork John Day River and Baldy Creeks especially during the fall spawning season (Umatilla and Wallowa Whitman National Forest 1997a). In September of 1999, the remains of a large female bull trout were found in Baldy Creek, immediately adjacent to the existing trail (John Day River Recovery Unit Team *in litt.* 2001). The U.S. Forest Service was unable to determine who had poached the fish (John Day River Recovery Unit Team *in litt.* 2001).

**Middle Fork John Day River.** According to the Malheur National Forest (1999b) recreation use in the Middle Fork John Day River watershed is gradually increasing and activities extend throughout the year. Along the Middle Fork John Day River, campgrounds and streams receive moderate to heavy continuous use, especially

during big game hunting seasons (Malheur National Forest 1999b). Recreation facilities include three Forest Service developed campgrounds and 93 kilometers (58 miles) of trails that are open to hikers, cyclists, and horseback riders. About 19 kilometers (12 miles) of the 93 are open to motorcycles and offroad vehicles, and approximately 24 kilometers (15 miles) are designated snowmobile trails (Malheur National Forest 1999b). Dispersed campsites generally lack features present in developed campgrounds, may only have toilets and fire rings, and are generally located on flat terrain off main travel routes, near water (Malheur National Forest 1999). The Malheur National Forest (1999b) notes impacts occur to aquatic habitat through damage to vegetation and riparian zones from camping activity, vehicles, and sanitation practices.

**Upper Mainstem John Day River.** There are a variety of recreation facilities in the upper John Day River, both wilderness and non wilderness. According to the Malheur National Forest (1999a) there are five developed campgrounds encompassing approximately 20 hectares (49.5 acres) and located within 30 meters (100 feet) of the John Day River and Strawberry Creek. Existing trails are of four different types: wilderness (50 kilometers or 31 miles), non wilderness (13 kilometers or 8 miles), snowmobile (35 kilometers or 22 miles), and bicycle (67 kilometers or 42 miles). Many trails are dual purpose (Malheur National Forest 1999a). Seven trailheads are located on U.S. Forest Service-managed lands in the upper John Day River basin, with capacities ranging from 2 or 3 to 15 passenger vehicles (Malheur National Forest 1999a). Dispersed campsites are located within and outside of wilderness, with half of the wilderness sites occurring at Strawberry Lake (Malheur National Forest 1999a).

### **Fisheries Management**

Historical descriptions portray the John Day River as a stable and productive river with good summer flows, high water quality, and heavy riparian cover (Oregon Department of Fish and Wildlife 1990). The Peter Skene Ogden journals support these claims, describing an abundance of beaver (*Castor canadensis*), diverse riparian vegetation, and good stream flows (the party was unable to ford horses through the river in July near the present town of Prairie City) and channel structure (Oregon Department of Fish and Wildlife 1990). Large runs of spring and fall chinook salmon and numerous

beaver sightings indicate that the John Day River contained an abundance of diverse instream habitat for fish (Oregon Department of Fish and Wildlife 1990).

The John Day River remains a significant producer of anadromous fish in the Columbia River basin. Annual runs of 2,000 to 5,000 spring chinook salmon and 15,000 to 40,000 summer steelhead trout are estimated (Oregon Department of Fish and Wildlife 1990). Limits to distribution and abundance are generally attributed to high egg and smolt mortality resulting from degraded habitat within the John Day River basin and to high juvenile and adult mortality at the three Columbia River dams that migrating fish must pass to return to their natal streams (Oregon Department of Fish and Wildlife 1990). Reduced populations of anadromous fish represent a large loss of nutrient inputs and system productivity. The impacts to bull trout are both direct, in terms of direct loss of prey species (Oregon Department of Fish and Wildlife *in litt.* 2000), and indirect, in terms of reduced aquatic productivity.

Brook trout, introduced into the upper mainstem and North Fork drainages in the first half of the 20th century, have persisted to date (Oregon Department of Fish and Wildlife *in litt.* 2000). Several high lakes in current or historic bull trout habitat were stocked and now have self sustaining brook trout populations (Crawfish, Baldy, Slide, Little Slide, Strawberry, Little Strawberry, and Olive lakes)(Oregon Department of Fish and Wildlife *in litt.* 2000).

Harvest of bull trout was a problem in previous years because of high vulnerability to angling. However, recent regulation changes prohibiting take of bull trout appear to be working well (Oregon Department of Fish and Wildlife *in litt.* 2000).

Rotenone projects to rehabilitate headwater lakes and streams were historically common, however treatments were conducted at times and locations where it is very unlikely that bull trout were killed. Water temperatures where drip stations were placed were not suitable for bull trout survival (Oregon Department of Fish and Wildlife *in litt.* 2000). Following a 1982 Middle Fork rotenone treatment that was poorly executed, there have been no rotenone projects in the John Day River basin (Oregon Department of Fish and Wildlife *in litt.* 2000). However, previous rotenone projects may have locally

reduced the forage base for migratory bull trout (Oregon Department of Fish and Wildlife *in litt.* 2000).

There are no significant fish disease issues in the recovery unit at this time, bull trout may be resistant to some diseases that are more devastating to other salmonids. In challenge studies conducted by Oregon State University researchers, Metolius (Deschutes) bull trout exposed to high and low doses of the infectious stages of *Myxobolus cerebralis* (causative agent in whirling disease) showed no signs of infection as measured by presence of spores, clinical disease signs, or histopathology. Rainbow trout exposed simultaneously showed high infection prevalence and disease severity. Nor were infections detected in Metolius (Deschutes) bull trout exposed to infection by *Ceratamyxosis shasta* (Bartholomew 2001). Disease studies conducted on bull trout from the Deschutes River basin, showed them to be relatively resistant to all strains of Infectious Hematopoietic Necrosis Virus tested. Bull trout had detectable levels of antigen to *R. salmoninarum* (bacterial kidney disease) but no evidence of the disease.

**North Fork John Day River.** Brook trout inhabit the North Fork drainage including Crawfish, Baldy, Slide, and Little Slide lakes (Oregon Department of Fish and Wildlife *in litt.* 2000). Most of the lakes are in drainages where bull trout are currently or historically were found. According to the Umatilla National Forest (*in litt.* 2000), strong populations of brook trout occur in North Fork John Day River tributaries (Winom and Big Creeks, Trout Creek, Crane Creek, Camas Creek tributaries Cable, Frazier, and Hidaway Creeks. Less robust brook trout populations occupy the mainstem and lower south fork of Desolation Creek, Lake Creek, upper East Fork Meadow Brook, (North Fork John Day River tributaries), and Wilson Creek a tributary to Wall Creek (Umatilla National Forest *in litt.* 2000). Bull trout brook trout hybrids have been found at several locations in the north fork (Claire and Gray 1993). Historic angling included targeting bull trout in the North Fork, but has since markedly diminished (Oregon Department of Fish and Wildlife *in litt.* 2000). Some poaching may occur, especially during the hunting season (John Day River Recovery Unit Team *in litt.* 2001)

**Middle Fork John Day River.** At present, there are no brook trout known to inhabit the Middle Fork or its tributaries, and no bull trout x brook trout hybrids have

been reported (Claire and Gray 1993). Angling effort in middle fork areas inhabited by bull trout is described as very low, attributable to the discontinued stocking of legal sized and fingerling trout (Oregon Department of Fish and Wildlife *in litt.* 2000)

**Upper Mainstem John Day River.** Historically, brook trout and hatchery rainbow trout stocking occurred on a limited basis in the upper subbasin (Oregon Department of Fish and Wildlife 1990). Steelhead were stocked on an experimental basis in the early 1960's, but stocking failed to establish a viable population (Oregon Department of Fish and Wildlife 1990). The upper John Day River is currently managed for natural fish production (Oregon Department of Fish and Wildlife 1990). A few specialized put-and-take fisheries continue to be implemented in ponds and lakes (*e.g.* Trout Farm Pond and Magone Lake), but angling effort in areas inhabited by bull trout is described as low (Oregon Department of Fish and Wildlife *in litt.* 2000).

### **Isolation and Habitat Fragmentation**

The major isolating mechanism affecting bull trout local populations in the John Day River basin is seasonally inadequate water quality and quantity in the mainstem river and tributaries, due to degraded riparian and stream habitat conditions. Other barriers include low head dams, diversions, and natural waterfalls (Claire and Gray 1993, Oregon Department of Fish and Wildlife *in litt.* 2000).

**North Fork John Day River.** Natural waterfalls on South Fork Desolation, East Meadowbrook, and Big creeks potentially isolate bull trout into separate local populations (Claire and Gray 1993). Seasonally high water temperatures, and reduced water flow in the connecting mainstems prevent migration and seasonally isolate local populations. The Pete Man Ditch on Clear Creek impedes upstream movement of bull trout from Lightning and Salmon creeks (Oregon Department of Fish and Wildlife *in litt.* 2000). No barrier culverts or unscreened diversions were identified by Claire and Gray (1993).

**Middle Fork John Day River.** Populations within the Middle Fork subbasin are at greatest risk from isolation due to habitat fragmentation, seasonally high water

temperatures, and reduced flows in the connecting mainstems (Oregon Department of Fish and Wildlife *in litt.* 2000). Bull trout are found in only three Middle Fork tributaries that are geographically distant. Population estimates for two of the tributaries are below 800 total fish of all ages, and existing data show no evidence of interchange between the local populations (Oregon Department of Fish and Wildlife *in litt.* 2000). There is a natural 5 meter (15 foot) waterfall on Bridge Creek that prevents access to approximately (11 miles) of good habitat, but bull trout likely never occurred there because of the barrier. (Oregon Department of Fish and Wildlife *in litt.* 2000). There is also a natural waterfall on Granite Boulder Creek that is a fish barrier, and no fish have been found above it (Claire and Gray 1993).

**Upper Mainstem John Day River.** Local populations in the upper mainstem subbasin are seasonally isolated due to high water temperatures, and reduced flows in the connecting mainstems. Multiple diversions in the core habitat on Strawberry Creek, prevent all upstream fish passage (Oregon Department of Fish and Wildlife *in litt.* 2000). A section of Indian Creek is virtually dewatered during the summer, isolating the small local bull trout population (Oregon Department of Fish and Wildlife *in litt.* 2000).

## **ONGOING RECOVERY UNIT CONSERVATION MEASURES**

Efforts to recover anadromous fish species are ongoing in the John Day River basin with a high level of cooperation between agencies on a variety of projects. Spawning surveys have been a cooperative effort for many years. The John Day River basin has several active local watershed groups dedicated to finding workable solutions to restoring native fish runs. The following list of actions is by no means complete, but is representative of ongoing efforts within the recovery unit that provide at least some benefit to bull trout.

### **State of Oregon**

The Oregon Department of Fish and Wildlife adopted changes in angling regulations to prohibit take of bull trout and modified regulations on other fisheries to reduce incidental take. Oregon Department of Fish and Wildlife no longer stocks hatchery trout in any flowing water, which should reduce competition with rearing bull trout for space and food, and has reduced or eliminated brook trout stocking programs. The Oregon Department of Fish and Wildlife hired a bull trout coordinator in 1995, to complete Statewide bull trout status assessment, map bull trout distribution, and develop conservation strategies for bull trout. The Oregon Department of Fish and Wildlife initiated a bull trout research project in 1997 that has been ongoing for several years. Oregon Department of Fish and Wildlife has also made permit changes to in-water work periods to better address bull trout needs.

When bull trout were listed a portion of the effort shifted to recovery planning. The Oregon Department of Fish and Wildlife has developed and distributed bull trout identification posters, and has a section 6 cooperative agreement with the U.S. Fish and Wildlife Service to support bull trout recovery actions. Funding through section 6 has been used to work cooperatively on spawning and habitat surveys, conduct research, and develop habitat projects in cooperation with the Confederated Tribes of the Warm Springs Indian Reservation, and U.S. Forest Service staff.

### **Federal Activities**

The Bonneville Power Administration has provided funding for numerous anadromous salmonid and bull trout habitat and research projects conducted by the Oregon Department of Fish and Wildlife, U.S. Forest Service and the Confederated Tribes of the Warm Springs Indian Reservation in the recovery unit. The Bonneville Power Administration and U.S. Bureau of Reclamation have also provided funding for local Soil and Water Conservation districts, watershed councils, and the Confederated Tribes of the Warm Springs Reservation of Oregon to convert push-up dams to permanent features or pump/infiltration gallery systems.

The U.S. Forest Service is implementing Riparian Habitat Conservation Areas (stream corridor buffers) for present and future management activities on the national forests to protect streams from future degradation. The U.S. Forest Service has completed planting in some riparian areas burned intensely by the 1996 fires (Oriental Creek, Texas Bar Creek, Cable Creek, Hideaway Creek, South Fork Desolation Creek) to speed restoration of stream shade and large woody debris recruitment. The U.S. Forest Service has also fenced riparian areas and changed timing of livestock use to help recover riparian areas on the national forests. Road removal in portions of some national forests is being undertaken to reduce stream sedimentation over the long-term and help restore natural hydrologic function to the watersheds. The U.S. Forest Service has redistributed dredge tailing piles in the North Fork John Day River and the Clear/Granite creek system to restore floodplain function and natural river flow. The U.S. Forest Service can require plans of operation, including mitigation, which should reduce habitat damage from mining activities. The U.S. Forest Service has completed several habitat projects on Bull Run and Boulder Creek in the North Fork.

### **Nongovernmental Activities**

Nongovernmental organizations have conducted a number of bull trout recovery tasks. The Nature Conservancy has established a preserve on the Middle Fork John Day River and will manage it to restore stream channel conditions in the

mainstem Middle Fork John Day River. The Northeast Oregon Assembled Land Exchange legislation would block up 13 miles of migratory bull trout habitat on the North Fork John Day River to be managed by the Prineville District of the U.S. Bureau of Land Management.

## RELATIONSHIP TO OTHER CONSERVATION EFFORTS

### State of Oregon

On January 14, 1999, Governor Kitzhaber expanded the Oregon Plan for Salmon and Watersheds to include all at-risk wild salmonids throughout the State through Executive Order 99-01. The goal of the Oregon Plan is to “restore populations and fisheries to productive and sustainable levels that will provide substantial environmental, cultural, and economic benefits.” Components of this plan include 1) coordination of efforts by all parties, 2) development of action plans with relevance and ownership at the local level, 3) monitoring progress, and 4) making appropriate corrective changes in the future. It is a cooperative effort of State, local, Federal, Tribal and private organizations, and individuals.

The Oregon Department of Fish and Wildlife and Oregon Water Resources Department have established priorities for restoration of streamflow as part of the Oregon Plan for Salmon and Watersheds (Measure IV.A.8). The Oregon Department of Fish and Wildlife has prioritized streamflow restoration needs by ranking biophysical factors, water use patterns, and the extent that water limits fish production in a particular area. Oregon Water Resources Department watermasters will incorporate the priorities into their fieldwork activities as a means to implement flow restoration measures. The needs priorities will be used by the Oregon Watershed Enhancement Board as one criterion in determining funding priorities for enhancement and restoration projects. Watershed councils and other entities may also use the needs priorities as one piece of information to determine high priority restoration projects. Occupied bull trout streams in the recovery unit are included in the highest priority designation for streamflow restoration (R. Kruger, Oregon Department of Fish and Wildlife, 2001, pers. comm.).

Opportunities to convert existing out-of-stream flows to instream flows in Oregon are available through a variety of legislatively mandated programs administered by Oregon Water Resources Department, *e.g.*, transfers of type and place of use (ORS 536.050(4)), voluntary written agreement among water users to

rotate their use of the supply to which they are collectively entitled (ORS 540.150 and OAR 690-250-0080), allocation of “conserved water” to instream use (ORS 537.455 to 537.500), lease of all or a portion of consumptive water rights to instream purposes (ORS 537.348, OAR 690-77-070 to 690-77-077), exchange of a water right for an instream purpose to use water from a different source, such as stored water, surface, or ground water (ORS 540.533 to 540.543), and substitute a ground water right for a primary surface water right (ORS 540.524). Oregon Water Trust provides purchase of water rights from willing landowners for conversion to instream water rights.

Water Quality Management Plans will be developed to address forest, agricultural, urban and transportation sources of water quality impairment in the North Fork and Middle Fork John Day River subbasin in 2003, the upper John Day River subbasin in 2004, and the lower John Day River subbasin in 2005. Plans will be developed through the Oregon Total Maximum Daily Load determination process administered by Oregon Department of Environmental Quality.

The Agricultural Water Quality Management Program, established through the Senate Bill 1010 process (ORS 568.900 through 568.933), addresses water pollution associated with agricultural lands and activities. A final plan has been completed for the North and Middle Fork subbasin. The plan’s primary strategy for reducing pollution will rely on a combination of educational programs, land treatment, implementation of sound management practices, installation of erosion control structures, and monitoring of implementation effectiveness (Oregon Department of Agriculture 2002).

### **Confederated Tribes of the Warm Springs Indian Reservation of Oregon**

The Confederated Tribes of the Warm Springs Indian Reservation of Oregon are active in a number of conservation activities in the John Day River basin, as well as a treaty co-manager of fisheries resources with the Oregon Department of Fish and Wildlife. The Tribe maintains an office in the town of John Day, and implements watershed conservation programs, focusing on water conservation, riparian restoration, land acquisition, monitoring, research and planning (Northwest

Power Planning Council, 2001). In addition, the Confederated Tribes of the Warm Springs Indian Reservation of Oregon contributed to developing “WY-KAN-USH-MI WA-KISH-WIT” or “Spirit of the salmon”, the Columbia River anadromous fish restoration plan of the Nez Perce, Umatilla, Warm Springs and Yakima Tribes (Columbia River Inter-Tribal Fish Commission 1995).

### **Confederated Tribes of the Umatilla Indian Reservation**

The Confederated Tribes of the Umatilla Indian Reservation are treaty co-managers of fish and wildlife resources with the Oregon Department of Fish and Wildlife (Northwest Power Planning Council 2001). The Tribes activities include habitat conservation, fish passage, hatchery actions, and research (Northwest Power Planning Council, 2001). In addition, the Confederated Tribes of the Umatilla Indian Reservation contributed to developing WY-KAN-USH-MI WA-KISH-WIT or Spirit of the salmon, the Columbia River anadromous fish restoration plan of the Nez Perce, Umatilla, Warm Springs and Yakima Tribes (Columbia River Inter-Tribal Fish Commission 1995).

### **Local Planning Efforts**

There are at least two active watershed councils in John Day River basin. The North Fork John Day River subbasin and Middle Fork John Day River subbasin have watershed coordinators listed on the Oregon Watershed Enhancement Board web site. In addition there are five soil and water conservation districts that operate within the basin. The Grant Soil and Water Conservation District has been working with the Bureau of Reclamation and other partners to convert push-up dams to other types of facilities that allow fish passage. The Monument Soil and Water Conservation District contributed to development of the agricultural water quality management plan for the North and Middle forks.

**Northwest Power Planning Council's Subbasin Planning**

As part of the Pacific Northwest Electric Power Planning and Conservation Act of 1980, the Bonneville Power Administration has the responsibility to protect, mitigate and enhance fish and wildlife resources affected by operation of Federal hydroelectric projects in the Columbia River and tributaries. The Northwest Power Planning Council develops and coordinates the Columbia River basin Fish and Wildlife Program that is implemented by the Bonneville Power Administration, U.S. Army Corps of Engineers, U.S. Bureau of Reclamation, and Federal Energy Regulatory Commission. Coordination of Bonneville Power Administration's responsibilities for protection, enhancement, and mitigation and incorporation of recommendations by Northwest Power Planning Council is in part accomplished through the development of subbasin summaries, which identify status of fish and wildlife resources, limiting factors, and recommended actions at the subbasin level.

The draft John Day Subbasin Summary (Northwest Power Planning Council 2001) encompasses the John Day River Recovery Unit and is consistent with bull trout recovery planning efforts to identify limiting factors. The draft John Day Subbasin summary identifies elevated water temperature, degraded channel conditions, reduced instream habitat diversity, reduced streamflow, degraded riparian habitat, and restricted fish passage as contributing to the decline of bull trout. The John Day River Recovery Unit Team will continue to utilize this planning process to identify and seek funding for projects to aid bull trout recovery.

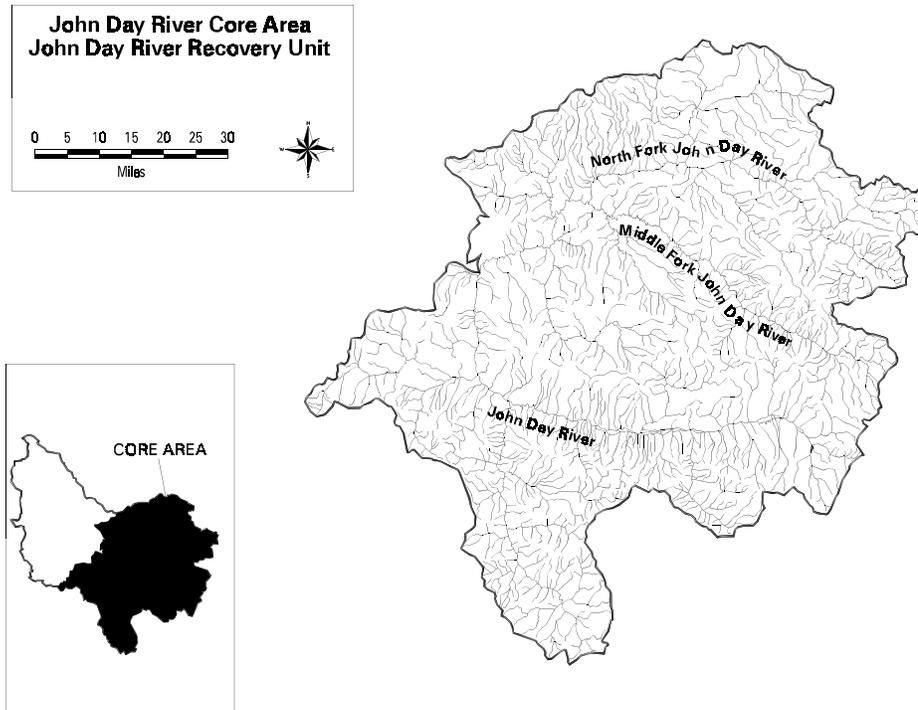
## STRATEGY FOR RECOVERY

A core area represents the closest approximation of a biologically functioning unit for bull trout. The combination of core habitat (*i.e.*, habitat that could supply all the necessary elements for the long-term security of bull trout, including for both spawning and rearing, as well as for foraging, migrating, and overwintering) and a core population (*i.e.*, bull trout inhabiting a core habitat) constitutes the basic core area upon which to gauge recovery within a recovery unit. Within a core area, many local populations may exist.

For purposes of recovery, the John Day River Recovery Unit contains one core area (John Day River Core Area) encompassing tributaries containing local populations (both current and potential as identified by the recovery unit team) and the foraging, migrating, and overwintering habitat in the mainstem John Day River from headwaters downstream to the confluence with the North Fork John Day River (Figure 2).

Understanding the contributions of the mainstem John Day River downstream of the North Fork confluence was defined as a research need. Migratory bull trout have recently been observed in the lower mainstem John Day River as far as the town of Spray. However, little is known about their use of the lower river and its relative importance to bull trout populations upstream. Additional information may indicate that the core area should extend further downstream. Streams with documented bull trout spawning, by subbasin, are Crane, Baldy, Bull Run, Trail, Middle, and South Trail creeks in the North Fork John Day River; Clear, Big Creek, Deadwood, Granite Boulder creeks in the Middle Fork John Day River; and John Day River, Call, Deardorff, Rail, Reynolds, Roberts creeks.

**Figure 2.** The map of the John Day River Recovery Unit of the Columbia River basin, Oregon, with the core area delineated.



### Recovery Goals and Objectives

The goal of the bull trout recovery plan is to **ensure the long-term persistence of self-sustaining, complex interacting groups of bull trout distributed throughout the species's native range, so that the species can be delisted.** To achieve this goal, the following objectives have been identified for bull trout in the John Day River Recovery Unit:

- ▶ Maintain current distribution of bull trout and restore distribution in previously occupied areas within the John Day River Recovery Unit.
- ▶ Maintain stable or increasing trends in abundance of bull trout.

- ▶ Restore and maintain suitable habitat conditions for all bull trout life history stages and strategies.
- ▶ Conserve genetic diversity and provide opportunity for genetic exchange.

Rieman and McIntyre (1993) and Rieman and Allendorf (2001) evaluated the bull trout population numbers and habitat thresholds necessary for long-term viability of the species. They identified four elements, and the characteristics of those elements, to consider when evaluating the viability of bull trout populations. These four elements are 1) number of local populations; 2) adult abundance (defined as the number of spawning fish present in a core area in a given year); 3) productivity, or the reproductive rate of the population (as measured by population trend and variability); and 4) connectivity (as represented by the migratory life history form and functional habitat). For each element, the John Day River Recovery Unit Team classified bull trout into relative risk categories based on the best available data and the professional judgment of the team.

The John Day River Recovery Unit Team also evaluated each element under a potential recovered condition to produce recovery criteria. Evaluation of these elements under a recovered condition assumed that actions identified within this chapter had been implemented. Recovery criteria for the John Day River Recovery Unit reflect 1) the stated objectives for the recovery unit, 2) evaluation of each population element in both current and recovered conditions, and 3) consideration of current and recovered habitat characteristics within the recovery unit. Recovery criteria will be revised in the future as more detailed information on bull trout population dynamics becomes available. Given the limited information on bull trout, both the level of adult abundance and the number of local populations needed to lessen the risk of extinction should be viewed as a best estimate.

This approach to developing recovery criteria acknowledges that the status of populations in some core areas may remain short of ideals described by conservation biology theory. Some core areas may be limited by natural attributes or by patch size and may always remain at a relatively high risk of extinction. Because of

limited data within the John Day River Recovery Unit, the recovery unit team relied heavily on the professional judgment of its members.

**Local Populations.** Metapopulation theory is important to consider in bull trout recovery. A metapopulation is an interacting network of local populations with varying frequencies of migration and gene flow among them (Meffe and Carroll 1994) (see Chapter 1). Multiple local populations distributed and interconnected throughout a watershed provide a mechanism for spreading risk from stochastic events. In part, distribution of local populations in such a manner is an indicator of a functioning core area. Based in part on guidance from Rieman and McIntyre (1993), bull trout core areas with fewer than 5 local populations are at increased risk, core areas with between 5 and 10 local populations are at intermediate risk, and core areas with more than 10 interconnected local populations are at diminished risk.

Currently, there are 12 local populations of bull trout in the John Day River Recovery Unit: 1) upper North Fork John Day River (Crawfish, Baldy, Cunningham, Trail, Onion, Crane creeks as well as the North Fork upstream of Granite Creek), 2) upper Granite Creek including Bull Run, Deep, Boundary creeks and the upper mainstem Granite Creek), 3) Boulder Creek, 4) Clear/Lightning creeks including Salmon Creek, 5) Clear Creek below ditch (including Lightning Creek below ditch), 6) Desolation Creek (includes South Fork Desolation Creek below falls and North Fork Desolation Creek), 7) South Fork Desolation Creek above the falls, 8) Clear Creek, 9) Granite Boulder Creek, 10) Big Creek, 11) upper John Day River (including Deardorff Creek, Reynolds Creek, Rail Creek, Roberts Creek, and Call Creek), and 12) Indian Creek above the flow barrier. Based on the aforementioned guidance, bull trout in the John Day River Recovery Unit are considered at diminished risk.

**Adult Abundance.** The recovered abundance levels in the John Day River Recovery Unit were determined by considering theoretical estimates of effective population size, historical census information, and the professional judgment of recovery team members. In general, effective population size is a theoretical concept that allows us to predict potential future losses of genetic variation within a population due to small population sizes and genetic drift (see Chapter 1). For the

purpose of recovery planning, effective population size is the number of adult bull trout that successfully spawn annually. Based on standardized theoretical equations (Crow and Kimura 1970), guidelines have been established for maintaining minimum effective population sizes for conservation purposes. Effective population sizes of greater than 50 adults are necessary to prevent inbreeding depression and a potential decrease in viability or reproductive fitness of a population (Franklin 1980). To minimize the loss of genetic variation due to genetic drift and to maintain constant genetic variance within a population, an effective population size of at least 500 is recommended (Franklin 1980; Soule 1980; Lande 1988). Effective population sizes required to maintain long-term genetic variation that can serve as a reservoir for future adaptations in response to natural selection and changing environmental conditions are discussed in Chapter 1 of the recovery plan.

For bull trout, Rieman and Allendorf (2001) estimated that a minimum number of 50 to 100 spawners per year is needed to minimize potential inbreeding effects within local populations. In addition, a population size of between 500 and 1,000 adults in a core area is needed to minimize the deleterious effects of genetic variation from drift.

For the purposes of bull trout recovery planning, abundance levels were conservatively evaluated at the local population and core area levels. Local populations containing fewer than 100 spawning adults per year were classified as at risk from inbreeding depression. Bull trout core areas containing fewer than 1,000 spawning adults per year were classified as at risk from genetic drift.

Overall, bull trout in the John Day River Recovery Unit persist at low abundance. While both the migratory and resident life history forms persist in the core area, only the migratory form was evaluated relative to aforementioned effective population size guidance. Comprehensive adult population estimates for the John Day River Recovery Unit are not available during the preparation of this draft. Given the lack of specific information, the John Day River Recovery Unit Team assumed that abundance levels for migratory bull trout in individual local populations was below 100 spawners per year, and therefore are at risk of inbreeding depression. Similarly, the John Day River Recovery Unit Team concluded that the

core area currently supported less than 1,000 migratory adults per year and consequently was at risk from genetic drift.

**Productivity.** A stable or increasing population is a key criterion for recovery under the requirements of the Endangered Species Act. Measures of the trend of a population (the tendency to increase, decrease, or remain stable) include population growth rate or productivity. Estimates of population growth rate (*i.e.*, productivity over the entire life cycle) that indicate a population is consistently failing to replace itself, indicate increased extinction risk. Therefore, the reproductive rate should indicate the population is replacing itself, or growing.

Since estimates of the total population size are rarely available, the productivity or population growth rate is usually estimated from temporal trends in indices of abundance at a particular life stage. For example, redd counts are often used as an index of a spawning adult population. The direction and magnitude of a trend in the index can be used as a surrogate for the growth rate of the entire population. For instance, a downward trend in an abundance indicator may signal the need for increased protection, regardless of the actual size of the population. A population which is below recovered abundance levels but moving toward recovery would be expected to exhibit an increasing trend in the indicator.

The population growth rate is an indicator of extinction probability. The probability of going extinct cannot be measured directly; it can, however, be estimated as the consequence of the population growth rate and the variability in that rate. For a population to be considered viable, its natural productivity should be sufficient to replace itself from generation to generation. Evaluations of population status will also have to take into account uncertainty in estimates of population growth rate or productivity. For a population to contribute to recovery, its growth rate must indicate that the population is stable or increasing for a period of time. In the John Day River Recovery Unit, bull trout were classified at an increased risk, due to either the short duration of population census information, or the incomplete record of the redd count surveys within each core area.

**Connectivity.** The presence of the migratory life history form within the John Day River Recovery Unit was used as an indicator of the functional connectivity of the system. If the migratory life form was absent from core area, or if the migratory form is present but local populations lack connectivity, the core area was considered to be at increased risk. If the migratory life form persists in at least some local populations, with partial ability to connect with other local populations, the core area was judged to be at intermediate risk. Finally, if the migratory life form was present in all or nearly all local populations, and had the ability to connect with other local populations, the core area was considered to be at diminished risk. While the migratory form persists within the John Day River core area, local populations are fragmented by habitat degradation, and the core area is considered at increased risk.

### **Recovery Criteria**

Recovery criteria for the John Day River Recovery Unit are the following:

1. **Bull Trout are distributed among 12 or more local populations in the John Day River Recovery Unit.** The team identified 12 current and 12 potential local bull trout populations in the John Day River Recovery Unit (Table 2). This recovery criterion recognizes the uncertainty in clearly defining local populations and the possibility that some local populations isolated by human-caused barriers may, in a recovered state, become part of another local population (*e.g.*, Boulder Creek in the Granite Creek Watershed). In addition, there is potential to further refine the local populations within the several identified population complexes in the recovery unit, if additional information indicates the need to do so. Better understanding of bull trout movement patterns in the drainage is needed to more accurately define local populations in the recovery unit. There is also a potential need to expand into historic habitat and establish new local populations.

**Table 2.** List of current and potential local bull trout populations in the John Day River Recovery Unit.

Subbasin	Local Population	Life History Forms Present	
North Fork John Day River	Upper North Fork John Day River (includes Crawfish, Baldy, Cunningham, Trail, Onion and Crane creeks, as well as mainstem North Fork John Day River upstream of Granite Creek)	Fluvial and Resident	
	upper Granite (includes Bull Run, Deep and Boundary creeks, and upper mainstem Granite Creek)	Fluvial and Resident	
	Boulder Creek in Granite Creek subwatershed	Resident	
	Clear/Lightning creeks above the ditch (includes Salmon Creek)	Resident	
	Clear Creek below the ditch (includes Lightning Creek below ditch)	Resident	
	Desolation Creek (includes South Fork Desolation Creek below waterfall and North Fork Desolation Creek)	Fluvial and Resident	
	South Fork Desolation Creek above waterfall	Resident	
	Winom Creek above falls (potential)		
	Hidaway Creek (potential)		
	Cable Creek (potential)		
	Middle Fork John Day River	Clear Creek	Resident
		Granite Boulder Creek	Resident and Fluvial
		Big Creek and tributaries	Resident and Fluvial
Vinegar Creek (potential)			
Big Boulder Creek (potential)			
Indian Creek (potential)			
Butte Creek (potential)			
Davis Creek (potential)			

**Table 2.** List of current and potential local bull trout populations in the John Day River Recovery Unit.

Subbasin	Local Population	Life History Forms Present
	upper Middle Fork John Day River (mainstem and tributaries above Clear Creek) (potential)	
Upper Mainstem John Day River	upper John Day River (includes mainstem John Day River, and Call, Reynolds, Deardorff, and Rail creeks)	Resident and Fluvial
	Indian Creek above flow barrier	Resident
	Pine Creek (potential)	
	Canyon Creek (potential)	
	Strawberry Creek (potential)	

2. **Estimated abundance of adult bull trout is at least 5,000 individuals distributed within the John Day River Recovery Unit.** Recovered abundance range was derived using the professional judgement of the recovery unit team and estimated productive capacity of identified local populations in a recovered condition. The estimate includes resident fish where connectivity between populations exists or could be restored. Population estimates have not been made for local populations isolated above natural barriers, although partial (one-way) connectivity may exist. Population estimates may be refined as more information becomes available, through monitoring and research. Increased abundance in the recovery unit is expected to occur by securing and expanding seasonal distribution of current local populations and expanding or restoring local populations into historic habitat.
  
3. **Adult bull trout exhibit stable or increasing trends in abundance over a period of at least 10 years in the recovery unit, as determine through contemporary and accepted abundance trend data analyses.** Developing a standardized monitoring and evaluation program to accurately describe trends in bull trout abundance is identified as a priority research need. As

4. part of the overall recovery effort, the U.S. Fish and Wildlife Service will take the lead in addressing this research need by forming a multi-agency technical team to develop protocols necessary to evaluate trends in bull trout populations.
  
4. **Specific barriers inhibiting recovery as listed in this recovery unit chapter must be addressed.** Functional migration corridors for bull trout between the North Fork John Day River and the mainstem John Day River, and between the North Fork John Day River and the Middle Fork John Day River must be established and the following priority one barriers must be addressed: restoring flow in Boulder Creek (tributary to Granite Creek - North Fork John Day River) and Indian Creek (mainstem John Day River, connected seasonally), assessing connectivity between West Fork, Clear, Salmon, Lightning, and the Mainstem of Clear Creek (North Fork John Day River), and addressing barriers associated with roads, (*e.g.*, culverts barriers or roads without culverts).

Recovery criteria for the John Day River Recovery Unit were established to assess whether recovery actions have resulted in the recovery of bull trout. The John Day River Recovery Unit Team expects that the recovery process will be dynamic and will be refined as more information becomes available. While removal of bull trout as a species under the Endangered Species Act (*i.e.*, delisting) can only occur for the entity that was listed (Columbia River Distinct Population Segment), the criteria listed above will be used to determine when the John Day River Recovery Unit is fully contributing to recovery of the population segment.

### **Research Needs**

Based on the best scientific information available, the recovery unit team has identified recovery criteria and actions necessary for recovery of bull trout within the John Day River Recovery Unit. However, the recovery unit team recognizes that many uncertainties exist regarding bull trout population abundance, distribution, and recovery actions needed. The recovery unit team feels that if effective management and recovery are to occur, the recovery plan for the John Day River Recovery Unit should be viewed as a “living” document, to be updated as

new information becomes available. As part of this adaptive management approach, the John Day River Recovery Unit Team has identified essential research needs within the recovery unit.

**Columbia River.** There is little information available on the role and importance of the Columbia River mainstem to local bull trout populations in the John Day River basin. Bull trout have now been documented in the mainstem John Day River near the town of Spray, Oregon, providing an indication that seasonal migration to the Columbia River may have been an important life history component in the past, when river conditions were more conducive to successful migration. As recovery proceeds, it is important to research the dynamics between the health of local populations and their pattern of use of the mainstem Columbia River.

**Mainstem John Day River.** It is essential to establish with greater certainty the current bull trout distribution and seasonal use areas within the John Day River Recovery Unit. To this end, the Recovery Unit Team recommends the development and application of a scientifically accepted, statistically rigorous, standardized protocol for determining present distribution of bull trout. Application of such a protocol will improve the team's ability to identify additional core areas, or revise the current classification.

Isolated tributaries, or other sites where anecdotal reports of bull trout capture have occurred, should be targeted to clarify bull trout distribution within the recovery unit. These areas include, but are not limited to Winom Creek, Phipps Creek, Hidaway and Cable creeks in the Camas Creek drainage.

**Resident/Migratory Relationship.** Many areas in the John Day River basin have both resident and migratory local populations. The relationships between these two life history types is not known. For instance, there is uncertainty whether migratory fish can produce resident progeny, and vice versa; what proportion of progeny switch life history types; whether adults can switch from resident to

migratory lifestyles; and whether environmental factors determine the proportion and extent of life history type. Since, in general, the migratory life history type is more robust to environmental and biological challenges, these relationships become very important to bull trout recovery.

## ACTIONS NEEDED

### Recovery Measures Narrative

In this chapter and all other chapters of the bull trout recovery plan, the recovery measures narrative consists of a hierarchical listing of actions that follows a standard template. The first-tier entries are identical in all chapters and represent general recovery tasks under which specific (*e.g.*, third-tier) tasks appear when appropriate. Second-tier entries also represent general recovery tasks under which specific tasks appear. Second-tier tasks that do not include specific third-tier actions are usually programmatic activities that are applicable across the species' range; they appear in *italic type*. These tasks may or may not have third-tier tasks associated with them; see Chapter 1 for more explanation. Some second-tier tasks may not be sufficiently developed to apply to the recovery unit at this time; they appear in *a shaded italic type (as seen here)*. These tasks are included to preserve consistency in numbering tasks among recovery unit chapters and intended to assist in generating information during the comment period for the draft recovery plan, a period when additional tasks may be developed. Third-tier entries are tasks specific to the John Day River Recovery Unit. They appear in the implementation schedule that follows this section and are identified by three numerals separated by periods.

The John Day River Recovery Unit Chapter should be updated or revised as recovery tasks are accomplished, environmental conditions change, or monitoring results or other new information become available. Revisions to the John Day River Recovery Unit Chapter will likely focus on priority streams or stream segments within core areas where restoration activities occurred, and habitat or bull trout populations have shown a positive response. The John Day River Recovery Unit Team should meet annually to review annual monitoring reports and summaries, and make recommendations to the U.S. Fish and Wildlife Service.

- 1 Protect, restore, and maintain suitable habitat conditions for bull trout.

- 1.1 Maintain or improve water quality in bull trout core areas or potential core habitat.
  - 1.1.1 Reduce sediment inputs. Stabilize roads, crossings, and other sources of sediment delivery; remove and vegetatively restore unneeded roads. For example, the Galena and upper Middle Fork Watershed Assessments identify some specific problem roads.
  - 1.1.2 Control agricultural and sewage effluent (nutrients and chemicals). Site-specific sewage problems were identified at the town of Prairie City. Agricultural effluent is a localized problem throughout the basin.
  - 1.1.3 Assess and mitigate effects of nonpoint source pollution. Major mainstem and tributaries across the entire John Day River basin are identified as water quality limited, primarily for high summer temperature. This condition is a result of the widespread and cumulative impact from a variety of nonpoint sources, such as, road building, timber harvest, present and past livestock grazing, and present and past mining impacts.
  - 1.1.4 Reduce mining runoff. Remove sources and/or stabilize effluent from mine shafts in the Granite/Clear Creek system (upper North Fork John Day River). Require and evaluate mitigation for mining activities.
- 1.2 Identify barriers or sites of entrainment for bull trout and implement tasks to provide passage and eliminate entrainment.
  - 1.2.1 Screen water diversions and irrigation ditches. For example, address problems with an old fish screen on Indian Creek (upper

mainstem John Day River) at the Strawberry Wilderness Area boundary.

- 1.2.2 Install appropriate fish passage structures around diversions and/or remove related migration barriers. Ensure all diversions are “fish friendly” including combining diversions, converting to a pump/infiltration gallery, and installing adjustable headgates, water measuring devices, and efficient ditches (low flow loss via seepage or breaching). Maintain and monitor the improved fish passage structures.
- 1.2.3 Secure instream flows. Restore connectivity and opportunities for migration by securing instream flows and/or water rights. Priority areas include Pete Mann ditch, which intercepts Lightning Creek, upper Clear Creek flows; reduce winter stock water runs, etc.
- 1.3 Identify impaired stream channel and riparian areas and implement tasks to restore their appropriate functions.
  - 1.3.1 Revegetate to restore shade and canopy, riparian cover, and native vegetation. Priority sites include Cable, Oriental and Hidaway creeks within the Tower Fire area; South Fork Desolation Creek within the Summit Fire Area; migratory habitat on Federal and private lands of the middle fork and private checkerboard lands in the upper mainstem; private land along the upper mainstem between the headwaters and town of John Day; and portions of the North Fork John Day River watershed. Plant (conifers, hardwoods, shrubs) in riparian zone of areas burned in the 1996 Tower, Summit and Bull fires.
  - 1.3.2 Reduce grazing impacts. Fencing, changes in timing and use of riparian pastures, off site watering and salting, and other

measures can be used to minimize grazing impacts. Priority sites include Reynold Creek allotment in upper mainstem and Sullens in the upper Middle Fork John Day River, Camp Creek and Bear Creek allotments are Federal allotments in the Middle Fork John Day River that have some riparian habitat problems. North Fork John Day River lands (Prineville Bureau of Land Management on lower North Fork John Day River) have poor woody riparian component and problems with unauthorized use. Migratory habitat on Federal and private lands of the Middle Fork is degraded from livestock grazing. This task will depend, in part on findings from implementing 5.2.1, but in addition, should consider lower Camas and Owens creeks.

1.3.3 Conduct stream channel restoration activities where warranted and cost-effective. Continue redistribution of dredge tailing piles in parts of the North Fork John Day River and the Clear Creek system to restore a more natural stream channel morphology and flood plain access for the stream. Restore stream channel to eliminate head cuts in Desolation Meadow (North Fork Desolation Creek) and Owens Creek.

1.4 Identify upland conditions negatively affecting bull trout habitats and implement tasks to restore appropriate functions.

1.4.1 Integrate watershed analyses and restoration activities on public lands. A potential way to integrate identified activities is through the Northwest Power Planning Council's subbasin planning process.

1.4.2 Assess current and historic effects of upland management on changes to the hydrograph. For example, timing and magnitude of peak flows. Priority areas include: the public/private checkerboard lands in the upper mainstem John Day River;

private ranches along upper mainstem John Day River between the checkerboard and the town of John Day, and the Malheur National Forest's historically heavy timber harvest activities in the Middle Fork John Day River subbasin.

- 1.4.3 Plant site appropriate vegetation in the Tower, Summit, and Bull fire areas, focusing on nearby existing seed sources to speed natural recovery.
- 2 Prevent and reduce negative effects of nonnative fishes and other nonnative taxa on bull trout.
    - 2.1 *Develop, implement, and evaluate enforcement of public and private fish stocking policies to reduce stocking of nonnative fishes that affect bull trout.*
    - 2.2 *Evaluate enforcement of policies for preventing illegal transport and introduction of nonnative fishes.*
    - 2.3 *Provide public information about ecosystem concerns of illegal introductions of nonnative fishes.*
    - 2.4 *Evaluate biological, economic, and social effects of control of nonnative fishes.*
    - 2.5 Implement control of nonnative fishes where found to be feasible and appropriate.
      - 2.5.1 Evaluate presence/absence of introduced fishes in bull trout habitat and determine site specific biological, economic, and social impacts. For example, brook trout in Desolation Creek; North Fork John Day River, and upper mainstem John Day River; smallmouth bass in the lower mainstem John Day River.

- 2.5.2 Assess severity of threat due to hybridization with brook trout where the two species co-occur in the North Fork John Day River and upper mainstem John Day River.
- 2.5.3 Implement nonnative species removal efforts wherever feasible and biologically supportable. Investigate the feasibility of removing brook trout from the Desolation Creek system, where the population is still relatively small. Consider Big, Winom, Cable, and Hideaway creeks for brook trout reduction via liberal harvest regulations.
- 2.6 *Develop tasks to reduce negative effects of nonnative taxa on bull trout.*
- 3 Establish fisheries management goals and objectives compatible with bull trout recovery, and implement practices to achieve goals.
  - 3.1 Develop and implement State and Tribal native fish management plans integrating adaptive research.
    - 3.1.1 Integrate multiple planning processes, incorporating bull trout recovery actions into *The Oregon Plan for Salmon and Watersheds* and the Pacific Northwest Power Planning Council Subbasin plans. Request assistance with implementation of recovery strategies for bull trout through both planning processes.
    - 3.1.2 Coordinate monitoring with Oregon Salmon Plan. Coordinate bull trout recovery monitoring with the *Oregon Plan for Salmon and Watersheds* monitoring program.
  - 3.2 Evaluate and prevent overharvest and incidental angling mortality of bull trout.

- 3.2.1 Ensure compliance with angling regulations and policies and target problem areas for enforcement. Unauthorized harvest associated with hunting season activities near the North Fork Wilderness, for example.
- 3.2.2 Reduce angler pressure in key areas where incidental mortality is evaluated as detrimental to recovery. In areas with documented problems, use techniques to limit access (such as seasonal or permanent road restrictions) and consider establishment of conservative regulations for other fisheries whose popularity may result in increased bull trout bycatch.
- 3.3 *Evaluate potential effects of introduced fishes and associated sport fisheries on bull trout recovery and implement tasks to minimize negative effects on bull trout.*
- 3.4 *Evaluate effects of existing and proposed sport fishing regulations on bull trout.*
- 4 Characterize, conserve, and monitor genetic diversity and gene flow among local populations of bull trout.
  - 4.1 *Incorporate conservation of genetic and phenotypic attributes of bull trout into recovery and management plans.*
  - 4.2 *Maintain existing opportunities for gene flow among bull trout populations.*
  - 4.3 *Develop genetic management plans and guidelines for appropriate use of transplantation and artificial propagation.*

5. Conduct research and monitoring to implement and evaluate bull trout recovery activities, consistent with an adaptive management approach using feedback from implemented, site-specific recovery tasks.
  - 5.1 *Design and implement a standardized monitoring program to assess the effectiveness of recovery efforts affecting bull trout and their habitats.*
  - 5.2 Conduct research evaluating relationships among bull trout distribution and abundance, bull trout habitat, and recovery tasks.
    - 5.2.1 Further define bull trout distribution and habitat use in the John Day River Recovery Unit. For example, identify existing spawning habitat for bull trout populations in Desolation Creek (North Fork John Day River) and tributaries, South Fork Desolation, and upper Clear Creek and tributaries (Middle Fork John Day River), and determine movement of fluvial bull trout in the Middle Fork John Day River.
  - 5.3 *Conduct evaluations of the adequacy and effectiveness of current and past best management practices in maintaining or achieving habitat conditions conducive to bull trout recovery.*
  - 5.4 *Evaluate effects of diseases and parasites on bull trout, and develop and implement strategies to minimize negative effects.*
  - 5.5 Develop and conduct research and monitoring studies to improve information concerning the distribution and status of bull trout.

- 5.5.1 Conduct bull trout spawning ground surveys in Desolation and Clear creeks. See task #5.2.1. Document historic distribution and design and implement monitoring program.
- 5.6 Identify evaluations needed to improve understanding of relationships among genetic characteristics, phenotypic traits, and local populations of bull trout.
  - 5.6.1 Evaluate food web interactions in drainages most affected by introduced fishes, such as the North Fork John Day River and upper mainstem John Day River.
- 6 Use all available conservation programs and regulations to protect and conserve bull trout and bull trout habitats.
  - 6.1 Use partnerships and collaborative processes to protect, maintain, and restore functioning core areas for bull trout.
    - 6.1.1 Provide long-term habitat protection through purchase from willing sellers, conservation easements, management plans, land exchanges, etc. Potential candidates include lower Desolation Creek; the privately-held Crown Pacific “Checkerboard Lands” of the upper mainstem John Day River; and the four or five remaining privately-held parcels in the Middle Fork John Day River corridor above Big Creek. Recovery tasks should emphasize private lands. Federal land management should already be protective of the majority of resident spawning habitat
  - 6.2 *Use existing Federal authorities to conserve and restore bull trout.*

- 6.3 *Evaluate enforcement of existing Federal and State habitat protection standards and regulations and evaluate their effectiveness for bull trout conservation.*
  
- 7 Assess the implementation of bull trout recovery by recovery units, and revise recovery unit plans based on evaluations.
  - 7.1 *Convene annual meetings of each recovery unit team to generate progress reports on implementation of the recovery plan for the U. S. Fish and Wildlife Service.*
  
  - 7.2 *Develop and implement a standardized monitoring program to evaluate the effectiveness of recovery efforts.*
  
  - 7.3 *Revise the scope of recovery as suggested by new information.*

## IMPLEMENTATION SCHEDULE

The Implementation Schedule that follows describes recovery task priorities, task numbers, task descriptions, duration of tasks, potential or participating responsible parties, total cost estimate and estimates for the next 5 years, if available, and comments. These tasks, when accomplished, are expected to lead to recovery of bull trout in the John Day River Recovery Unit. Cost estimates are not provided for tasks which are normal agency responsibilities under existing authorities.

Parties with authority, responsibility, or expressed interest to implement a specific recovery task are identified in the Implementation Schedule. Listing a responsible party does not imply that prior approval has been given or require that party to participate or expend any funds. However, willing participants may be able to increase their funding opportunities by demonstrating that their budget submission or funding request is for a recovery task identified in an approved recovery plan, and is therefore part of a coordinated effort to recover bull trout. In addition, section 7 (a)(1) of the Endangered Species Act directs all Federal agencies to use their authorities to further the purposes of the Act by implementing programs for the conservation of threatened or endangered species.

The following are definitions to column headings in the Implementation Schedule:

Priority Number: All priority 1 tasks are listed first, followed by priority 2 and priority 3 tasks.

Priority 1: All actions that must be taken to prevent extinction or to prevent the species from declining irreversibly in the foreseeable future.

Priority 2: All actions that must be taken to prevent a significant decline in species population or habitat quality or to prevent some other significant negative effect short of extinction.

Priority 3: All other actions necessary to provide for full recovery (or reclassification) of the species.

Task Number and Task Description: Recovery tasks as numbered in the recovery outline. Refer to the action narrative for task descriptions.

Task Duration: Expected number of years to complete the corresponding task. Study designs can incorporate more than one task, which when combined may reduce the time needed for task completion.

Responsible or Participating Party: The following organizations are those with responsibility or capability to fund, authorize, or carry out the corresponding recovery task. Identified parties include:

BLM	U.S. Bureau of Land Management
CTWSR	Confederated Tribes of the Warm Springs Reservation of Oregon
ES	Extension Service
ID	Irrigation Districts
JDRUT	John Day River Recovery Unit Team
LCDC	Oregon Land Conservation and Development Commission
NGO	Non-governmental organizations
NMFS	National Marine Fisheries Service
NRCS	U.S. Natural Resource Conservation Service
ODEQ	Oregon Department of Environmental Quality
ODF	Oregon Department of Forestry
ODFW	Oregon Department of Fish and Wildlife
OSP	Oregon State Police
OWRD	Oregon Water Resources Department
PTC	Private Timber Companies
SWCD	Soil and Water Conservation Districts
TMDLWG	Total Maximum Daily Load Working Group
USBOR	U.S. Bureau of Reclamation

USCOE	U.S. Corps of Engineers
USDOT	U.S. Department of Transportation
USEPA	U.S. Environmental Protection Agency
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WC	Watershed Councils

Bold face type in the implementation schedule indicates agency or agencies that have the lead role for task implementation and coordination, though not necessarily sole responsibility.

Cost Estimates: Cost estimates are rough approximations and provided only for general guidance. Total costs are estimated for the duration of the task, are itemized annually for the next 5 years, and include estimates of expenditures by local, Tribal, State, and Federal governments and by private business and individuals.

An asterisk (\*) in the total cost column indicates ongoing tasks that are currently being implemented as part of normal agency responsibilities under existing authorities. Because these tasks are not being done specifically or solely for bull trout conservation, they are not included in the cost estimates. Some of these efforts may be occurring at reduced funding levels and/or in only a small portion of the watershed.

Double asterisk (\*\*) in the total cost column indicates that estimated costs for these tasks are not determinable at this time. Input is requested to help develop reasonable cost estimates for these tasks.

Triple asterisk (\*\*\*) indicates costs are combined with or embedded within other related tasks.

Chapter 9-John Day River

Implementation schedule for the John Day River bull trout recovery unit chapter											
Task Priority	Task Number	Task Description	Task Duration (years)	Responsible Parties	Cost Estimates (in \$1,000 units)					Comments	
					Total Costs	Year 1	Year 2	Year 3	Year 4		Year 5
1	1.2.1	Screen water diversions and irrigation ditches.	7	NMFS, ODFW, USBOR, USFWS, ID, NRCS, SWCD,	350	50	50	50	50	50	New and update existing screens
1	1.2.2	Install appropriate fish passage structures around diversions and/or remove related migration barriers.	5	NMFS, ODFW, SWCD, USBOR, USFWS, NRCS	300	75	75	50	50	50	
1	5.2.1	Further define bull trout distribution and habitat use in the John Day Recovery Unit.	5	ODFW, USFS, BLM, CTWSR, USFWS	200	40	40	40	40	40	
1	5.5.1	Conduct bull trout spawning ground surveys in Desolation and Clear creeks.	7	USFWS, BPA, CTWSR, NPPC, ODFW	500	100	100	100	50	50	
2	1.1.1	Reduce sediment inputs.	25	ODF, ODOT, PTC, USDOT, USFS, SWCD, WC	10,000	500	500	500	500	500	See Watershed Assessments and Travel Management Plans

Chapter 9-John Day River

Implementation schedule for the John Day River bull trout recovery unit chapter											
Task Priority	Task Number	Task Description	Task Duration (years)	Responsible Parties	Cost Estimates (in \$1,000 units)					Comments	
					Total Costs	Year 1	Year 2	Year 3	Year 4		Year 5
2	1.1.2	Control agricultural and sewage effluent.	25	ODA, ODEQ, USEPA, BLM, NRCS, SWCD, USFS	1,000	500	500				Ongoing and changes with landowner and new development
2	1.1.3	Assess and mitigate effects of nonpoint source pollution.	8	ODA, ODEQ, USEPA, BLM, NRCS, ODF, SWCD, USFS,	2,000	250	250	250	250	250	ODEQ lists streams that are water quality limited and there is a plan for ag sources
2	1.1.4	Reduce mining runoff.	8	ODA, ODEQ, USEPA, BLM, NRCS, SWCD, USFS	2,000	250	250	250	250	250	ODEQ lists streams that are water quality limited due to mining effluent
2	1.2.3	Secure instream flows.	15	NMFS, ODFW, OWRD, USFWS, ID, NRCS, SWCD	1,050	70	70	70	70	70	
2	1.3.1	Revegetate to restore shade and canopy, riparian cover, and native vegetation.	25	BLM, NRCS, ODA, ODEQ, USFS, CTWSR, SWCD	375	25	25	25	25	25	

Chapter 9-John Day River

Implementation schedule for the John Day River bull trout recovery unit chapter											
Task Priority	Task Number	Task Description	Task Duration (years)	Responsible Parties	Cost Estimates (in \$1,000 units)					Comments	
					Total Costs	Year 1	Year 2	Year 3	Year 4		Year 5
2	1.3.2	Reduce grazing impacts.	7	BLM, ODA, NRCS, USFS, BPA, CTWSR, SWCD	500	70	70	70	70	70	
2	2.5.1	Evaluate presence/absence of introduced fishes in bull trout habitat and determine site specific biological, economic, and social impacts.	5	ODFW, USFS, BLM, USFWS	250	50	50	50	50	50	
2	2.5.2	Assess severity of threat due to hybridization with brook trout where two species co-occur in the North Fork John Day River and upper mainstem John Day River.	5	ODFW, USFWS, USFS	100	20	20	20	20	20	in conjunctin with 2.5.1
2	2.5.3	Implement nonnative species removal efforts wherever feasible and biologically supportable.	25	ODFW, USFWS, USFS	300	25	25	25	25	25	possibility of new introductins

Chapter 9-John Day River

Implementation schedule for the John Day River bull trout recovery unit chapter											
Task Priority	Task Number	Task Description	Task Duration (years)	Responsible Parties	Cost Estimates (in \$1,000 units)					Comments	
					Total Costs	Year 1	Year 2	Year 3	Year 4		Year 5
2	3.1.1	Integrate multiple planning processes, incorporating bull trout recovery actions into <i>The Oregon Plan for Salmon and Watersheds</i> and the Pacific Northwest Power Planning Council Subbasin plans.	5	NPPC, ODFW, USFWS, BLM, BPA, SWCD, USFS	150	30	30	30	30	30	
2	3.1.2	Coordinate monitoring with the Oregon Salmon Plan.	5	ODFW, OWEB	150	30	30	30	30	30	
2	3.2.1	Ensure compliance with angling regulations and policies and target problem areas for enforcement.	Ongoing <sup>1</sup>	BLM, NMFS, ODEQ, ODFW, OSP, USEPA, USFS, USFWS,	*						Agency responsibility, no additional cost
2	3.2.2	Reduce angler pressure in key areas where incidental mortality is evaluated as detrimental to recovery.	Ongoing	ODFW, OSP, USFWS	50	2	2	2	2	2	

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<sup>1</sup> Ongoing tasks are currently being implemented as part of normal agency responsibilities that may benefit bull trout. Some of these efforts may be occurring at reduced funding levels and/or in only a small portion of the watershed.

Chapter 9-John Day River

Implementation schedule for the John Day River bull trout recovery unit chapter											
Task Priority	Task Number	Task Description	Task Duration (years)	Responsible Parties	Cost Estimates (in \$1,000 units)					Comments	
					Total Costs	Year 1	Year 2	Year 3	Year 4		Year 5
2	5.6.1	Evaluate food web interactions in drainages most affected by introduced fishes, such as the North Fork John Day River and upper mainstem John Day River.	5	ODFW, USFWS, USGS, CTWSR, USFS	150	30	30	30	30	30	
2	6.1.1	Provide long-term habitat protection through purchase from willing sellers, conservation easements, management plans, land exchanges, etc..	25	BPA, CTWSR, NPPC, USFWS, NMFS, ODFW	*						Ongoing management concern, cost dependent on the extent of the action
3	1.3.3	Conduct stream channel restoration activities.	15	BLM, ODFW, USFS, BPA, CTWSR	2,000	50	50	50	50	50	e.g., mine tailings
3	1.4.1	Integrate watershed analyses and restoration activities on public lands.	Ongoing	BLM, NPPC, ODFW, USFS, BPA, SWCD	*						Subbasin plans can be used as vehicle, no additional cost
3	1.4.2	Assess current and historic effects of upland management on changes to the hydrograph.	5	BLM, USFS, USGS, CTWSR	1,000	20	20	20	20	20	

Chapter 9-John Day River

Implementation schedule for the John Day River bull trout recovery unit chapter											
Task Priority	Task Number	Task Description	Task Duration (years)	Responsible Parties	Cost Estimates (in \$1,000 units)					Comments	
					Total Costs	Year 1	Year 2	Year 3	Year 4		Year 5
3	1.4.3	Plant site appropriate vegetation in the Tower, Summit, and Bull fire areas, focusing on nearby existing seed sources to speed natural recovery.	3	USFS, ODF, PTC	*						Agency requirement, no additional cost

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### **Personal Communications**

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**APPENDIX A: LIST OF CHAPTERS**

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- Chapter 3 - Clark Fork River Recovery Unit, Montana, Idaho, and Washington
- Chapter 4 - Kootenai River Recovery Unit, Montana and Idaho
- Chapter 5 - Willamette River Recovery Unit, Oregon
- Chapter 6 - Hood River Recovery Unit, Oregon
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- Chapter 11- Grande Ronde River Recovery Unit, Oregon
- Chapter 12 - Imnaha-Snake Rivers Recovery Unit, Oregon
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