Draft
Clearwater Subbasin Summary

May 25, 2001

Prepared for the Northwest Power Planning Council

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DRAFT: This document has not yet been reviewed or approved by the Northwest Power Planning Council

Clearwater Subbasin Summary

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Introduction

The Clearwater Subbasin Summary has been developed as part of the rolling provincial review process developed by the Northwest Power Planning Council (NWPPC) in February 2000 in response to recommendations by the Independent Scientific Review Panel (ISRP) and the Columbia Basin Fish and Wildlife Authority (CBFWA). This summary is an interim document that provides context for project proposals during the provincial reviews while a more extensive subbasin plan is developed.

Geographic Information System software (GIS) was used extensively in the Subbasin Summary to enable both visual presentation and summarization of broad-scale data. However, the process is limited in some areas by either the spatial extent or scale of available GIS layers. While local detail is sacrificed in some cases, the approach allows project planners to frame restoration efforts within the Clearwater subbasin as a whole. Planners should take into account the source, scale, and extent of GIS data used in this summary when applying the information presented, and supplement with more localized or detailed information supporting their proposed efforts when appropriate. Applicable information related to GIS data used in this summary are presented in Appendix A.

The Clearwater subbasin, located entirely within the state of Idaho (Figure 1), is one of only two subbasins included in the Mountain-Snake province defined under the NWPPC's fish and wildlife program. Due to its substantial size, eight assessment units (AUs) were defined to assist in characterizing broad-scale areas within the Clearwater subbasin. Definition of AUs was based on subjective review of six landscape level characteristics known to influence ecosystem resources at broad landscape scales: lithology, precipitation, elevation, landforms, vegetation and ownership patterns. These six characteristics have impacted both the historic and current status of resources within the subbasin due to their influence on broad-scale ecological function. In a similar manner, they can be expected to influence the applicability and success of future management activities and should be considered during future planning efforts.

Each AU is similar in size to a 4^{th} code Hydrologic Unit Code (HUC), with three AUs sharing boundaries identical to associated 4^{th} code HUCs (upper and lower North Fork and Lochsa AUs; Figure 2). Landscape attribute combinations are similar within and different between individual AUs (Table 1). Ecological regimes/functions should follow a similar pattern. An overview is presented to familiarize the reader with each AU, with more detailed description of resources and conditions within each provided in the remainder of this Summary.

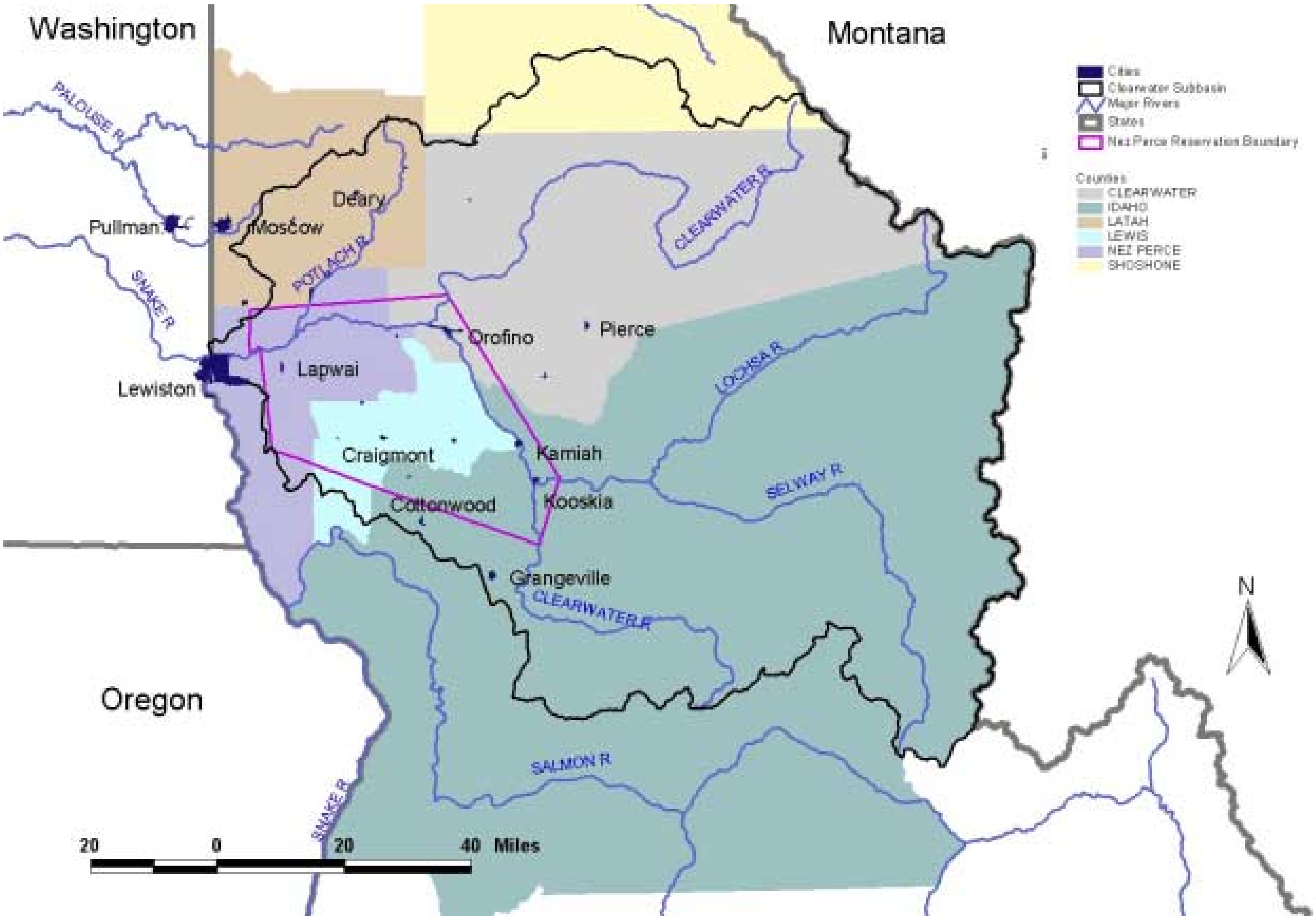

Figure 1. Location of the Clearwater subbasin

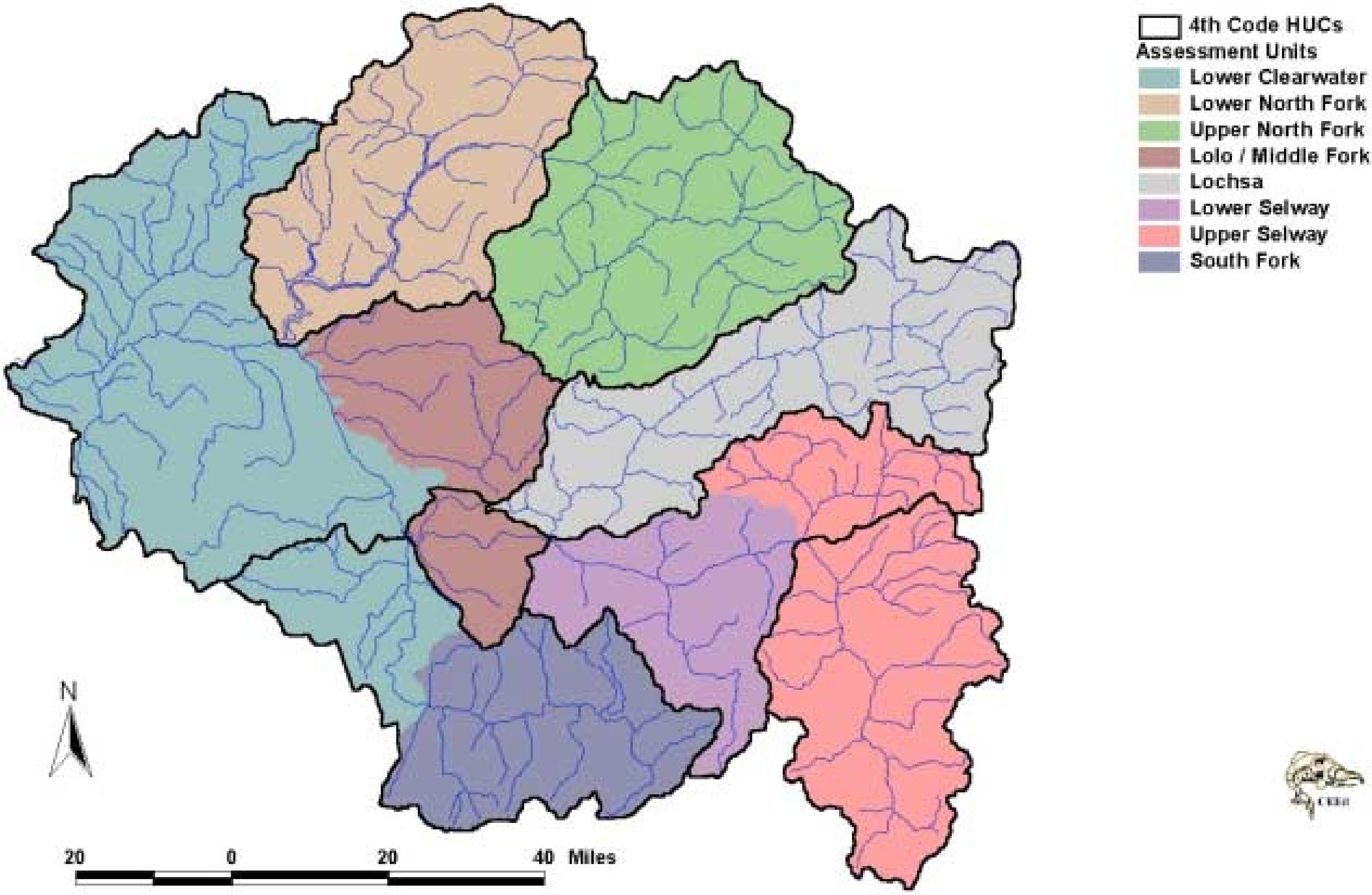

Figure 2. Comparison of assessment units (colored areas) and 4th code HUC boundaries (black outlines) in the Clearwater subbasin

Table 1. Characterization of AUs delineated in the Clearwater subbasin

Assessment Unit	Geology	Precipitation	Dominant Land Use	Primary Ownership	Predominant Landform	Elevation
Lower Clearwater	Col. River Basalt (CRB)	Low Gen. < 25”	Crop/Grazing	Private	Mixed	Low
Lower North Fork	Belt	Moderate 25-50”	Forested	Mixed	Mountains	Low - Moderate
Upper North Fork	Mixed 50/50 Belt/Granites	High Gen. >50”	Forested	Federal (USFS)	Mountains/ Breaks	Moderate
Lolo/Middle Fork	Mixed boundary; CRB/ Granites	Moderate 25-50”	Forested	Mixed	Mixed	Low
Lower Selway	Mixed 50/50 Belt/Granites	Moderate 25-50”	Forested Shrub/Brush	Federal (USFS)	Breaks	Moderate
Lochsa	Granites; Some Belt	High Gen. >50”	Forested Shrub/Brush	Federal (USFS)	Mountains/ Breaks	Moderate - High
Upper Selway/ Moose Creek	Granites	Moderate-High 25-65”	Forested Shrub/Brush	Federal (USFS)	Mountains/ Breaks	High
South Fork Clearwater	Mixed Belt/Granites	Moderate 25-50”	Forested	Federal (USFS)	Mountains	Moderate - High

Lower Clearwater Assessment Unit

The plateau comprising much of Lower Clearwater AU has moderately sloping terrain with local elevations ranging from 2,500 to 3,500 feet, and some isolated buttes reaching as high as 5,000 feet. The plateau is comprised mostly of 0 to 15% slopes with some stream valleys having side slopes exceeding 60%.

Land ownership in the Lower Clearwater AU is predominantly private, and is reflected in the largely agricultural landuse pattern which has occurred since at least the early 1900s. The Nez Perce Reservation lies primarily within the Lower Clearwater AU and Tribal lands (including Fee lands owned and managed by the Nez Perce Tribe, and properties placed in trust status with the BIA) are located primarily within the current Reservation boundaries. Pockets of timberland exist in the upper portions of the Potlatch Creek and Lapwai Creek drainages, with additional smaller scale timberlands distributed throughout many of the steeply incised canyons of the AU. Grazing activity is widely distributed throughout the Lower Clearwater AU, but often limited to the uncultivated canyons and timberlands.

Although annual precipitation in the Lower Clearwater AU is relatively low (<25”), the low elevation results in susceptibility of much of the area to rain on snow events and resultant flashy flows. In tributaries of the Lower Clearwater AU, timing of annual peak flows is highly variable, ranging from early December through late May. Flow variations in the Lower Clearwater are greatest in tributaries in the Camas Prairie where minimum mean monthly discharge can be expected to comprise less than 10% of the mean annual discharge in some areas.

Lava flows from the Columbia River Basalt Group formed the high plateau and deep, clay-rich, fertile soils formed in the wind blown silt (loess) and volcanic ash that was later deposited on the landscape. Soil characteristics coupled with local landuse and climatic patterns make rill and sheet erosion a substantial issue throughout much of the Lower Clearwater AU. However, mass wasting and colluvial processes are cause for concern in areas of bench topography and on over-steepened canyon side slopes.

Road density and distribution is relatively consistent throughout the Lower Clearwater AU, with densities typically less than 3 miles/sq. mile. Localized areas with higher road densities are associated with larger forested areas and with the city of Lewiston, ID. Road distribution is typical of rural-residential areas, with predominantly rural and access roads for modern agriculture easily recognized by their straight north/south and east/west alignment.

Within the Clearwater subbasin, the Lower Clearwater AU is critical for wild A-run steelhead (lower Clearwater tributaries) and fall chinook salmon (mainstem Clearwater River), including all or a substantial majority of their range in the subbasin. With the exception of mainstem migration corridor spring chinook salmon are not known to utilize the Lower Clearwater AU. Bull trout and westslope cutthroat trout have been sporadically noted in tributaries of the Lower Clearwater AU, but their presence is not substantial. These two species do however utilize the mainstem Clearwater River.

Limiting factors to fish in the Lower Clearwater AU tributaries are typically associated with climatic and land use patterns and include temperature, sediment and flow issues (variability and base flow). The lower mainstem Clearwater River is highly influenced by operations at Dworshak Dam which alters natural temperature regimes.

Lower North Fork Assessment Unit

The terrain of the Lower North Fork Assessment Unit is predominantly mountainous, with side slopes commonly steeper than 60%. Elevation ranges from roughly 2,000 to 5,600 feet. Land cover is almost entirely forest, and land use has relied heavily on timber harvest activities. Due to the mixed ownership, little information on grazing intensity was available. However, known allotments and other grazeable lands have been defined only in approximately the western one third of the AU.

Mining activities have occurred throughout the Lower North Fork Assessment Unit. Although mining activity was widely dispersed variable by area, a variety of methods were historically employed included dredging, hydraulics, draglines, drag shovels, and hand operations. Some mining activities have focused on the Little North Fork River drainage where a conglomeration of mining claims have been located.

The Lower North Fork AU contains the most widely and densely distributed forest road network of any AU in the Clearwater subbasin. Subwatershed road densities commonly exceed 5 miles/sq. mile and, in some portions of the AU exceed 7.5 miles/sq. mile. Exceptions to this pattern are predominantly located in the federally owned portion(s) of the Little North Fork Clearwater River drainage which contains both inventoried roadless area(s) and a wild and scenic river corridor. Other areas of protected status within the Lower North Fork AU are minimal in both size and distribution.

Land ownership within the Lower North Fork AU is highly mixed and comprised of private, state and federal holdings. Private timber company holdings (Potlatch Corp. and Plum Creek Timber Co.) make up a substantial percentage of the land area and the state of Idaho owns more property in the Lower North Fork AU than any other area of the Clearwater subbasin. The U.S. Army Corp of Engineers manages property around Dworshak Reservoir.

Annual rainfall in the Lower North Fork AU is moderate for the Clearwater subbasin, ranging from 25-50 inches. With the exception of the highest elevation areas in the northern half of the AU, much of the AU is subject to potential rain on snow events. Meta-sedimentary rocks, granites and lava basalt are mantled by wind blown silt (loess) and ash in a moist, cool to cold environment. Ashy soils are the dominant type and grade into sub-mature, grassland and forest soils in various locations. Steep canyon slopes associated with some local bedrock types, along with local elevation and climatic conditions, make slope failures relatively common in the Lower North Fork AU.

With the exception of the lower 1.9 miles of the mainstem North Fork Clearwater River, passage of anadromous species into the Lower North Fork AU is completely blocked by Dworshak Dam. Dworshak Reservoir is located entirely within the Lower North Fork AU, and provides a substantial fishery for kokanee, smallmouth bass, rainbow trout, and other native salmonids. Limitations to the Dworshak Reservoir fishery are primarily related to dam operations resulting in highly variable flows and fluctuating water levels.

Bull trout distribution is restricted to the highest elevation tributaries of the Lower North Fork AU, and to Dworshak Reservoir. Although westslope cutthroat trout are known to be widely distributed throughout most of the AU, limited information is available on the status of population(s). Strong population(s) of both bull trout and westslope cutthroat trout exist in the Little North Fork Clearwater River drainage. Resident salmonids throughout the AU tributary systems are impacted by sediment and temperature issues associated with land use activities, as well as by introductions of exotic species. Brook trout are widely distributed throughout the AU, however little is known about their population status in most areas.

Upper North Fork Assessment Unit

Like much of the Clearwater subbasin, the terrain of the Upper North Fork Assessment Unit is predominantly mountainous, with side slopes commonly exceeding 60% slope. Elevation ranges from roughly 3,600 to 6,000 feet. Land cover is primarily forested with shrub and brush rangelands intermixed. Ownership is roughly 90% federal (managed by USFS) with the remaining 10% divided among the State of Idaho, Potlatch Corporation, and other private holdings. Non-federal holdings are clustered in the western most portion of the AU.

Approximately 75% of the Upper North Fork AU is included in inventoried roadless areas. Where roads do exist, densities are relatively high for the Clearwater subbasin, ranging from 5 to 7.5 miles/sq. mile at the subwatershed scale. Historic mining activities occurred throughout the North Fork Clearwater drainage, although activities were widely dispersed. A variety of mining methods were historically employed including dredging, hydraulics, draglines, drag shovels, and hand operations, and legacy impacts of past mining is still noted today.

Precipitation in the Upper North Fork AU is higher than any other AU in the subbasin, averaging about 59 inches annually. Portions of the AU receive nearly 100 inches of annual precipitation, more than any other area in the Clearwater subbasin. Winter precipitation falls mainly as snow although lower elevation canyons along mainstem tributaries may be susceptible to rain-on-snow events.

Geologic parent materials are dominated by granitic batholith, with meta-sedimentary rocks also commonly occurring, particularly in the northern most portions of the AU. Frost shattered ridges and mountains tops have shallow, noncohesive, sub-mature soils grading into ashy, grassland soils in cold climates. Landslides on steep canyon slopes are common, and based on the relatively undisturbed nature of much of the area, may be the predominant sediment source to streams.

The Upper North Fork Clearwater AU fishery is predominantly managed for native resident species, with bull trout and westslope cutthroat trout as focal species. The tributary systems also provide important spawning areas for some Dworshak Reservoir salmonids including bull trout and kokanee. Limited information is available on the status of bull trout population(s) in the Upper North Fork AU, but is indicative of a depressed condition where it is available. In contrast, the status of westslope cutthroat trout population(s) is strong throughout the majority of the AU. Recent studies have suggested that introgression of westslope cutthroat trout and introduced rainbow trout may be occurring in the Upper North Fork AU. Information on the distribution and status of brook trout is limited although they are known to be present and relatively strong in some areas where they may compete with bull trout.

Major factors limiting to fish populations in the Upper North Fork AU include sedimentation, localized watershed disturbances. Introduction of exotic species and related competition/introgression is also a major factor influencing native salmonid populations in the Upper North Fork AU.

Lolo/Middle Fork Assessment Unit

The Lolo/Middle Fork AU in many ways represents a transitional area in the Clearwater subbasin. Elevations range from about 2,300 feet in the western portions of this AU along the mainstem Clearwater River to about 4,300 feet in the eastern-most portions. The change in elevation follows a change in topography from west to east, progressing from plateau to foothills to mountainous terrain.

Climatic conditions vary with changes in elevation and terrain, with annual precipitation increasing from roughly 25-75 inches on a west to east gradient through the Lolo /

Middle Fork AU. Average annual precipitation of approximately 40 inches for the AU as a whole is moderate for the Clearwater subbasin. The vast majority of the Lolo / Middle Fork AU lies below 4,000 feet in elevation, making it subject to mixed winter precipitation and the possibility of rain-on-snow events.

Land ownership in this AU is highly mixed, and comprised of private, state, federal and tribal holdings. Potlatch Corporation and the Idaho Department of Lands manage substantial portion of the land within the AU, and properties managed by these two entities are highly intermixed. The eastern-most portion of the Lolo / Middle Fork AU is federally owned and managed by the U.S. Forest Service. Private holdings are an important component in the western half of the AU, which is also interspersed by Nez Perce Tribal lands. Less than 10 percent of the land area is afforded any protected status, with the majority being inventoried roadless area.

Land cover is primarily forest, with agricultural use limited to portions of the western plateaus. Much of the forested area has been intensively harvested in the past, a fact reflected in the high densities of forest roads through much of the AU. Subwatershed-scale road densities exceed 5 miles/sq. mile through most of the AU, and in some areas exceed 7.5 miles/sq. mile.

The Lolo / Middle Fork AU has a rich mining history, the impacts of which are still notable today. Substantial numbers of mining claims are present on federal and state lands throughout the AU. Mines have been located throughout the AU, and the headwaters of Orofino Creek contain numerous mines with relatively high ecological hazard ratings.

Geology and soils also vary considerably throughout the Lolo / Middle Fork AU. Low relief hills lead up into the Clearwater Mountains as the lava basalt from the west interfingers with a series of metamorphic rocks that eventually change into the granite of the Idaho Batholith in the east. Clay-rich grassland soils grade into clay-rich forest soils in cool climates. Based on characteristics of soils, parent material and climate, slope failure can be a serious problem in some areas of this AU.

Steelhead trout and westslope cutthroat trout utilize all major stream systems in the Lolo / Middle Fork AU. Spring chinook salmon and bull trout are found in the Lolo Creek system and tributaries to the Middle Fork Clearwater River. Populations of all four species are depressed throughout their known range in this AU, and current management practices incorporate substantial outplanting of both spring chinook salmon and steelhead trout. Pacific lamprey are thought to occupy portions of the AU, but no information is available on their distribution or status. Brook trout distribution includes all areas where bull trout are known to occur, with potentially important management consequences.

Major factors limiting fish populations within the Lolo / Middle Fork AU include temperature, sediment, and upland and instream habitat disturbance or degradation.

Lochsa Assessment Unit

Topography of the Lochsa Assessment Unit is defined largely by mountainous terrain and breaklands, with side slopes commonly exceeding 60%. Elevations range from about 3,200 feet near the mouth of the drainage to roughly 7,000 feet in the headwaters.

Due to differing climatic regimes in the Clearwater subbasin, the Lochsa AU represents the southern-most area in which the climate is predominantly influenced by maritime conditions. This, coupled with relatively high elevation results in a high level of mean annual precipitation relative to other AUs in the subbasin. Average annual precipitation for the entire AU is about 53 inches, with some areas receiving over 80 inches of annual precipitation. Winter precipitation falls mainly as snow although lower elevation canyons along the Lochsa River and some tributaries may be susceptible to rain-on-snow events.

Land ownership in the Lochsa AU is predominantly federal (managed by USFS) with Plum Creek Timber Company having intermixed holdings of in the Crooked and Brushy Forks. Nearly 80 percent of the Lochsa AU is included in either wilderness or inventoried roadless areas. Road densities related primarily to timber harvest activities in remaining areas are moderate to high, typically ranging from about 3 to greater than 7.5 miles per square mile.

Granitic batholith is the dominant bedrock through much of the AU, with meta-sedimentary rocks predominating in portions of the headwater areas. Frost shattered ridges and mountains tops have shallow, noncohesive, sub-mature soils grading into ashy, grassland soils in cold climates, and landslides may be common on steep slopes. The Lochsa River canyon is dominated by grassland soils grading into the ashy soils on steep slopes, with slumping and landslides as the major form of erosion and sedimentation.

The Lochsa AU provides important habitat areas for steelhead trout, spring chinook salmon, bull trout, and westslope cutthroat trout. Management of anadromous species focuses on maintenance of wild/natural steelhead trout population(s), and naturally reproducing chinook salmon population(s). Chinook salmon are influenced through active hatchery practices. Bull trout population(s) are depressed in most areas where they exist in the Lochsa AU, as are chinook salmon. The Fish and Hungery Creek system maintains one of the strongest steelhead runs in the Clearwater subbasin. Westslope cutthroat trout population(s) are strong throughout most of the Lochsa AU. Information regarding brook trout distribution is limited, but suggests that they are typically widespread where they are know to occur.

Major factors limiting fish populations in the Lochsa AU include sedimentation, poor instream cover, and impacts from upland disturbances. Introgression or competition with exotic species is a concern for resident species. High mainstem temperature conditions are a concern for all species, but are presumed to be due primarily to natural conditions.

Lower Selway Assessment Unit

Topography of the Lower Selway AU is dominated by breaklands and glaciated mountains, with land slopes commonly exceeding 60%. Elevation ranges from about 3,200 feet to over 6,000 feet. Land ownership is almost entirely federal and managed by the U.S. Forest Service.

Nearly 90 percent of the Lower Selway AU is afforded some level of protected status, primarily as inventoried roadless or wilderness area. This status limits land use activities in the area, and results in minimal road densities (<1 mile/sq. mile) in most areas. At the subwatershed scale, the highest road densities in the AU are less than 3 miles/sq. mile.

The climate of the Selway River drainage shows a marked difference from much of the remainder of the Clearwater subbasin, and is dominated by dryer Rocky Mountain climatic regimes. Relative to other AUs in the Clearwater subbasin, the Lower Selway AU experiences a moderate average annual precipitation (approx. 42 inches) despite its moderate to high elevation. Winter precipitation falls mainly as snow although lower elevation canyons along the Selway River and some tributaries may be susceptible to rain-on-snow events.

Parent material is dominated by meta-sedimentary rocks throughout much of the Lower Selway AU, with granitic batholith dominating the north-eastern one third of the AU. Frost shattered ridges and mountains tops have shallow, coarse-grained, noncohesive, sub-mature soils grading into ashy, grassland soils in cold climates. Landslides on steep slopes are common.

Management of anadromous species focuses on maintenance of wild/natural steelhead trout population(s) in the Selway River system. Spring chinook salmon have been re-introduced and although naturally reproducing runs exist, hatchery influences to chinook stock(s) continue. Where status information is available, spring chinook salmon, steelhead trout, and bull trout populations in the Lower Selway AU are generally depressed. However, strong populations of both bull trout and steelhead trout do exist in the Meadow Creek drainage. Westslope cutthroat trout population(s) are considered strong in much of the Lower Selway AU where status information is available. Brook trout are widely distributed throughout the Lower Selway AU.

Due to the predominance of wilderness and roadless area in the Lower Selway AU, limiting factors are closely tied to natural regimes with one primary exception. Introduced species are a threat to resident salmonid populations. Natural temperature and sediment regimes may impact all fish species. High stream gradient is known to limit both steelhead trout and chinook salmon access to some areas, and likely has similar impacts to resident salmonids.

Upper Selway Assessment Unit

Topography of the Upper Selway AU is dominated by high elevation breaklands and glaciated mountains, with steep slopes that commonly exceed 60%. Elevation ranges from about 3,800 feet to over 8,000 feet on the highest peaks. Land cover is mostly evergreen forest, interspersed with shrub and brush rangeland and exposed rocky peaks. Land ownership is almost entirely federal and managed by the U.S. Forest Service.

One hundred percent of the Upper Selway AU is afforded some level of protected status, with the majority of the AU established as wilderness area. This status limits consumptive land use activities in the area. A few roads exist within the wilderness boundary, but densities are minimal (<1 mile/sq. mile) where they do exist.

The climate of the Selway River drainage shows a marked difference from much of the remainder of the Clearwater subbasin, and is dominated by dryer Rocky Mountain climatic regimes. Similar to the Lower Selway AU, the Upper Selway AU experiences a moderate average annual precipitation (approx. 44 inches) despite its high elevation and mountainous terrain. Winter precipitation falls mainly as snow although some portions of lower elevation canyons along the Selway River and some tributaries may be susceptible to rain-on-snow events.

Parent material is almost entirely composed of granitic batholith. Frost shattered ridges and mountains tops have shallow, coarse-grained, noncohesive, sub-mature soils grading into ashy, grassland soils in cold climates. Landslides on steep slopes are common.

Management of anadromous species focuses on maintenance of wild/natural steelhead trout population(s) in the Selway River system. Spring chinook salmon have been re-introduced and although naturally reproducing runs exist, hatchery influences to chinook stock(s) continue. Steelhead trout population(s) are strong in the Moose Creek and Bear Creek drainages, and depressed throughout the remainder of the AU where status information is available. Chinook salmon, like elsewhere in the Clearwater subbasin, are depressed throughout their distribution in the Upper Selway AU.

Bull trout and westslope cutthroat trout are widely distributed throughout the Upper Selway AU. Westslope cutthroat trout population(s) are strong through the majority of their range. Status information on bull trout populations is sporadic, but strong and depressed areas appear to be somewhat evenly divided. Information on distribution and status of brook trout is limited in the Upper Selway AU, but they are known to exist.

Due to the predominance of wilderness and roadless area in the Upper Selway AU, limiting factors are closely tied to natural regimes with one primary exception. Introduced species, particularly brook trout, are a threat to resident salmonid populations. Natural sediment regimes may impact some fish species, and high stream gradients and other natural barriers are known to limit the distributions of multiple species.

South Fork Assessment Unit

The South Fork AU is differs dramatically in character from most other AUs in the Clearwater subbasin. Elevation is relatively high, ranging from about 4,000 to over 7,000 feet. However, the general topography differs from much of the other high elevation topography in the subbasin in that it is comprised, to a large degree, of rolling hills rather than the more jagged mountainous peaks commonly associated with the Bitterroot Mountain range.

The South Fork AU is strongly influenced by the dry Rocky Mountain climatic patterns rather than maritime patterns which influence much of the northern and western portions of the subbasin. Mean annual precipitation throughout the AU is only about 36 inches. Most precipitation falls as snow, with very little of the area potentially subject to rain-on-snow events. Only about 10-15 percent of the precipitation falls in the summer months.

The Clearwater Mountains in this area are composed of a variety of bedrock including basalt, granite, metamorphic and some sedimentary rocks, that have been exposed to a variety of climatic conditions and erosional processes causing many landforms. Ashy soils are the dominant soil in the area and have greatly varying characteristics making erodibility highly variable and difficult to predict.

Ownership is primarily federal (managed by USFS and BLM) with a small percentage held by the State of Idaho or private landowners. Approximately 25 percent of the South Fork AU is designated as either wilderness or inventoried roadless area. Forestry activities are represented in both past and present landuse patterns. Forest road densities are unevenly distributed as a result of interspersed wilderness or inventoried roadless areas ranging to over 5 miles/sq. mile in some roaded areas, and commonly exceeding 3 miles/sq. mile in others.

The South Fork AU has the most diverse and extensive mining histories of any area in the Clearwater subbasin. A large number of the historic mines have high ecological hazard ratings, and many of the major tributary systems have been historically dredged. In addition, hydraulic mining was commonly used throughout the South Fork AU, leaving glory holes which still produce high sediment loads today.

Both chinook salmon and steelhead trout populations in the South Fork AU are widely distributed and currently influenced by hatchery practices. Populations of both species are considered depressed throughout their known range in the South Fork Clearwater drainage. Westslope cutthroat trout are widespread but depressed through much of their range, with strong populations in southern tributaries originating in the wilderness area. Bull trout follow a similar pattern of distribution and status to westslope cutthroat trout. Known strong population(s) of bull trout are located in tributaries originating in the wilderness area although a strong population is known to exist in the Newsome Creek drainage as well. Brook trout are widely distributed throughout the South Fork drainage, and may compete with resident salmonids.

Sedimentation is a principal factor limiting fish populations within much of the South Fork AU. Upland and instream habitat disturbances are also important, and temperature limits the use or distribution of some species, particularly in the mainstem South Fork Clearwater River. Steep stream gradients are know to limit use of some areas by anadromous species, and similar impacts probably impact resident species as well.

Subbasin Description

Subbasin Location

The Clearwater River subbasin is located in north central Idaho between the 46th and 47th latitudes in the northwestern portion of the continental United States. It is a region of mountains, plateaus, and deep canyons within the Northern Rocky Mountain geographic province. The subbasin is bracketed by the Salmon River subbasin to the south and St. Joe River subbasin to the north. The Clearwater River drains approximately a 9,645 square mile area. The subbasin extends approximately 100 miles north to south and 120 miles east to west (Maughan 1972). There are four major tributaries that drain into the mainstem Clearwater River : the Lochsa, Selway, South Fork Clearwater, and North Fork Clearwater Rivers. The Idaho–Montana border follows the upper watershed boundaries of the Lochsa, Selway, and eastern portion of the North Fork Clearwater Rivers in the Bitterroot Mountains. The North Fork Clearwater then drains the Clearwater Mountains to the north, while the South Fork Clearwater River drains the divide along the Selway and Salmon Rivers. Dworshak Dam, located two miles above the mouth of the North Fork Clearwater River, is the only major water regulating facility in the subbasin. Dworshak Dam was constructed in 1972 and eliminated access to one of the most productive systems for anadromous fish in the subbasin. The mouth of the Clearwater is located on the Washington–Idaho border at the town of Lewiston, Idaho where it enters the Snake River 139 river miles upstream of the Columbia River.

Climate

The Clearwater subbasin experiences a wide variety of climates. Warm, moist maritime air masses from the Pacific strongly influence the climate across the Clearwater subbasin (Lipscomb 1998; Stapp et al. 1984), except for the southern-most and high elevation eastern portions of the subbasin which experience dryer and colder climatic conditions more typical of the northern Rocky Mountains (Bugosh 1999; Finklin 1977; N. Gerhardt, Nez Perce National Forest, personal communication February 2000).

There is a general increase in precipitation from west to east across the subbasin coincident with increasing elevation (Stapp et al. 1984), resulting in greater precipitation in the mountainous terrain in the eastern half of the subbasin compared to the low elevation canyons and plateaus to the west. Mean annual precipitation ranges from 12 inches (310 mm) at the Clearwater River's confluence with the Snake River to greater than 90 inches (2,000 mm) in the higher elevations near the continental divide. Precipitation also varies seasonally, with little occurring during the summer months (Stapp et al. 1984; Bugosh 1999). Due to colder average temperatures, winter precipitation above 4,000 feet falls largely as snow (McClelland et al. 1997; Paradis et al. 1999b; Bugosh 1999), where it may remain through late spring to early summer. Below 4,000 feet, there is a higher probability of winter precipitation falling as rain with subsequently reduced storage duration. The area below the 4,000-foot elevation band also defines the rain-on-snow zone in the subbasin, an area susceptible to rapid melting and extreme runoff events. Such rain-on-snow events can occur from November through March (Thomas et al. 1963). The highest precipitation areas tend to be in the northeastern portion of the subbasin, with the Upper North Fork Clearwater AU averaging nearly 60 inches per year. The Lower Clearwater AU has the lowest annual precipitation, averaging 25.7 inches (Figure 3;Table 2).

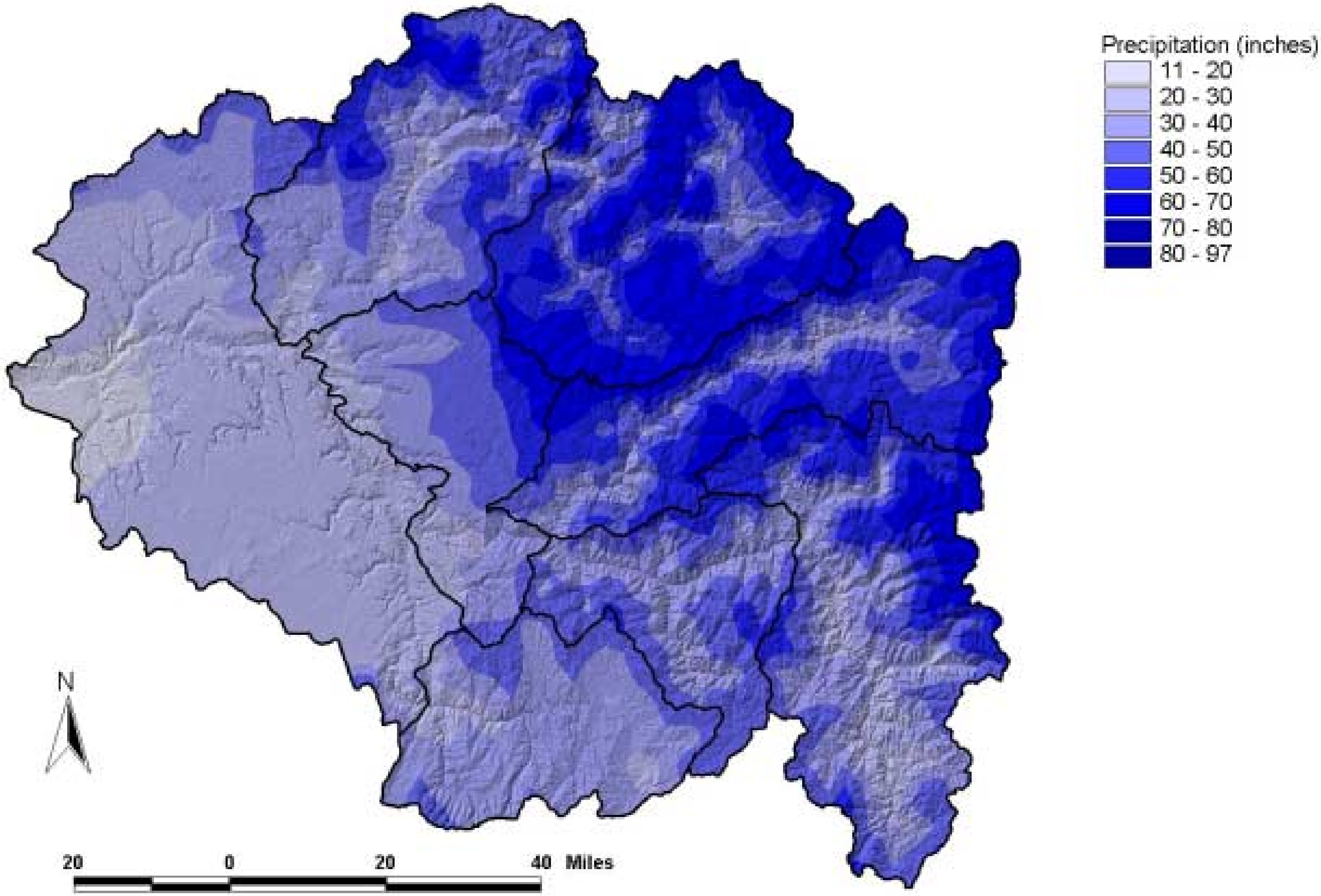

Figure 3. Mean annual precipitation levels in the Clearwater subbasin

Table 2. Minimum, maximum, and mean annual precipitation

Assessment Unit	Min. Precipitation (inches)	Max. Precipitation (inches)	Mean Precipitation (inches)
Lower Clearwater	11.0	57.0	25.7
S. F. Clearwater	25.0	53.0	36.0
Lolo/Middle Fork	23.0	75.0	40.2
Lower Selway	27.0	61.0	41.6
Lower North Fork	23.0	87.0	43.1
Upper Selway	19.0	71.0	43.7
Lochsa	27.0	81.0	53.0
Upper North Fork	31.0	97.0	59.0

Mean annual temperature throughout the Clearwater subbasin ranges from 50–55^{0}F (10–13^{0}C) at lower elevations to 25-32^{0}F (-3–0^{0}C) in the upper elevations (Figure 4). Temperatures are generally below freezing in higher elevations of the subbasin during the winter and can be in excess of 90°F in the lower elevation canyons during the summer (Bugosh 1999; Maughan 1972). The highest temperatures recorded in Idaho occurred at Orofino and Lewiston, Idaho (118° and 117°, respectively; Stapp et al. 1984). Both towns are located at low elevation at the bottom of the main Clearwater canyon, with Lewiston having the lowest elevation of any location in Idaho (679 feet above MSL; Figure 4).

Based on a statewide classification of climate, the National Climatic Data Center (NCDC) has defined three distinct climatic zones in the Clearwater drainage. These areas are roughly characterized as the North Central Prairies (zone #2), North Central Canyons (zone #3), and Central Mountains (zone #4). Combined, the North Central Prairie and Canyons encompass the vast majority of privately owned and agricultural lands found within the Clearwater subbasin. More specifically, the North Central Prairies encompass areas surrounding the mainstem Clearwater River upstream to its confluence with the Middle Fork Clearwater River. The North Central Canyons include mid-elevation areas surrounding the North Central Prairies, and also include lands surrounding Dworshak Reservoir. The Central Mountains division encompasses primarily mid to high elevation, forested areas, primarily owned by the U.S. Forest Service.

The NCDC classification allows for a characterization of drought regimes in the subbasin. Since 1895, these have been computed for each climatic division. As drought patterns have been similar between zones, only the North Central Prairies are presented here using the Modified Palmer Drought Severity Index (Figure 5). The Palmer Drought Severity Index (PDSI) is a meteorological index used to assess the severity of dry or wet weather periods. The index is calculated monthly and is based on the principles of a balance between moisture supply and demand. The index generally ranges from –6 to +6, although values to $\pm$7 may occur. Negative index values indicate dry periods (drought), and positive values indicate wet periods.

Geology

Geology is an important factor for the Clearwater subbasin because it influences soils, topography, climate, and sedimentation. Metamorphic, granitic and basalt rock types are the main geologic parent material for soils and sediment (Figure 6). Windblown dust deposits called loess, along with volcanic ash, are less common in the subbasin but also play an important role in soil formation, erosion and how sediment enters stream channels.

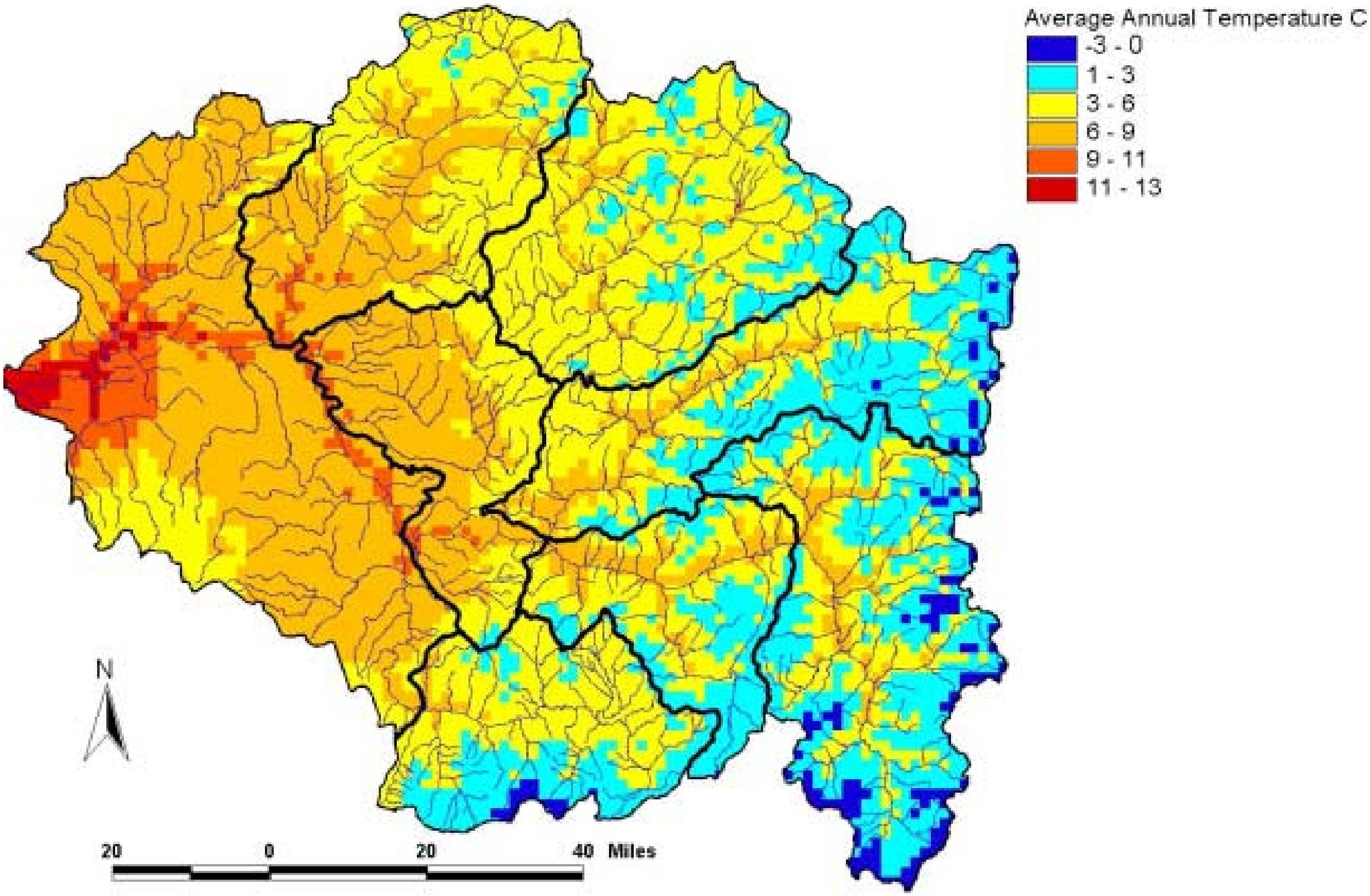

Figure 4. Average annual temperature in the Clearwater subbasin

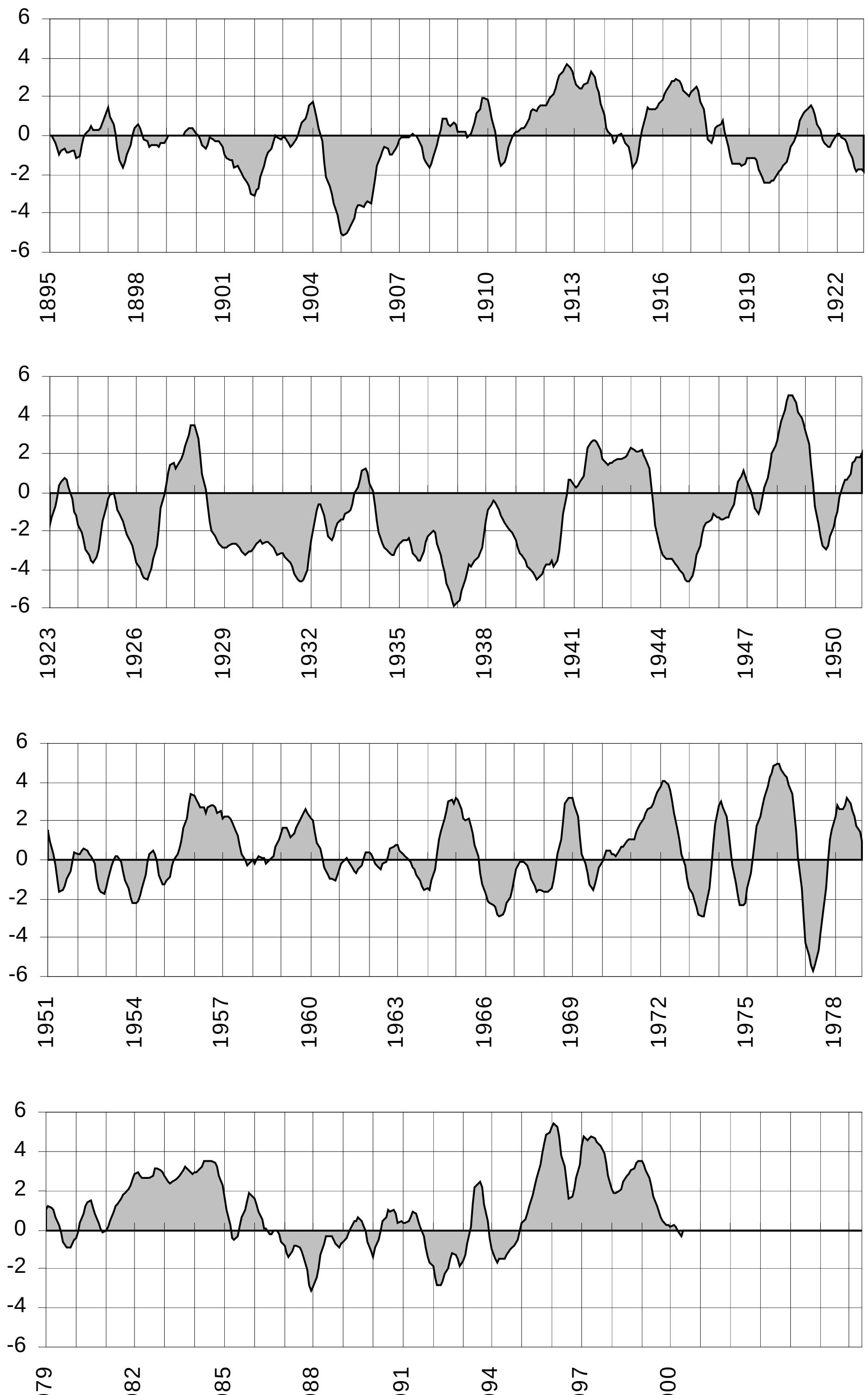

Figure 5. Modified Palmer Drought Index for Clearwater subbasin areas within the North Central Prairies. Data has been smoothed using a 6 month rolling average

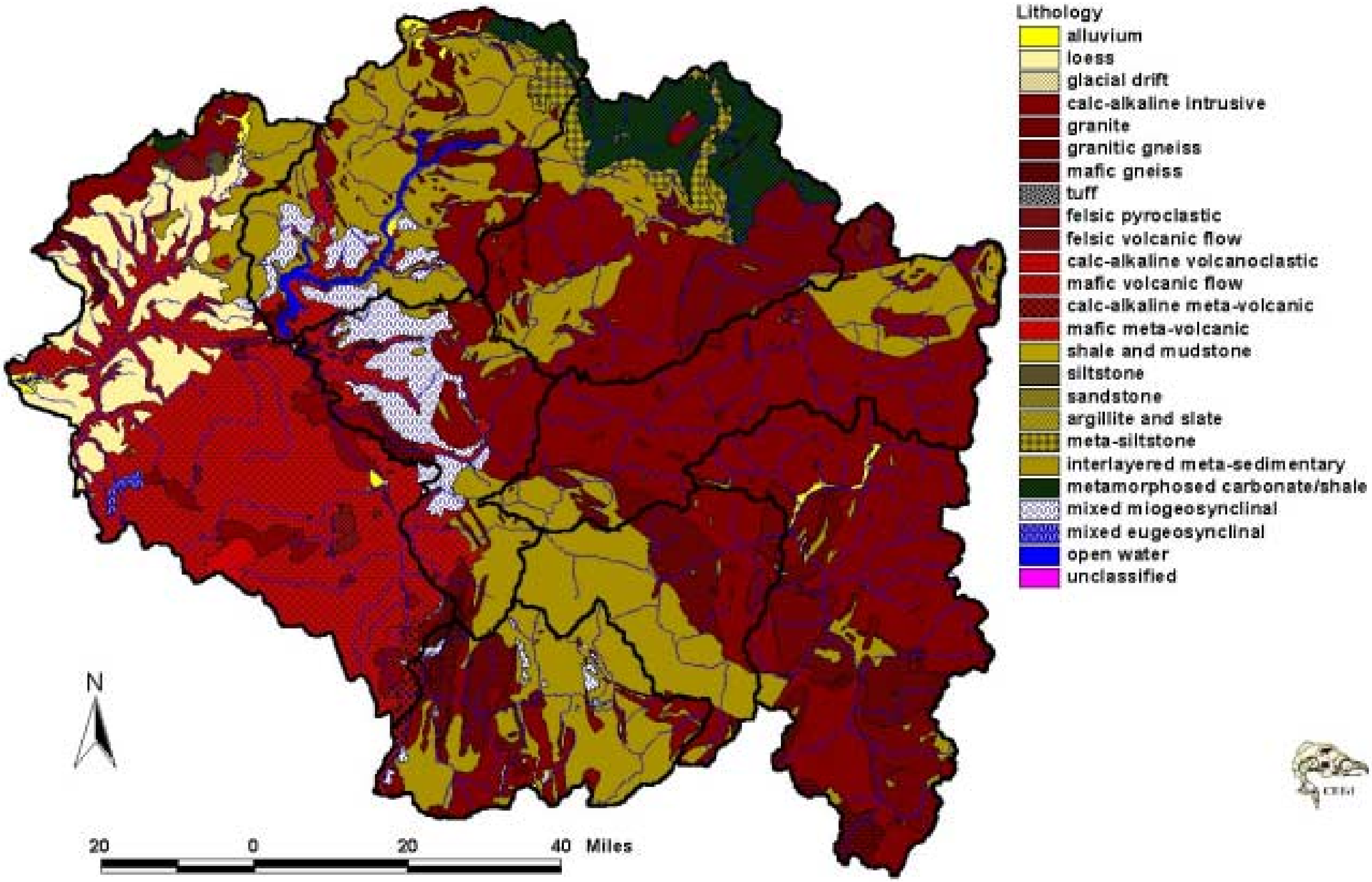

Figure 6. Lithology of the Clearwater subbasin

The Idaho granite batholith, formed during the Cretaceous-Tertiary periods (100 to 60 million years ago), is the most prominent geological feature of Idaho (Orr and Orr 1996) and makes up much of the bedrock found in the Clearwater and Bitterroot mountains in the central and eastern part of the Clearwater subbasin. Most of the soils in the eastern part of the subbasin as well as erosion processes and sediment transport are heavily influenced by the way the granite weathers into coarse grained granular sediment.

There are two distinct suites of metamorphic rocks that occur in the Clearwater subbasin. Various forms of gneiss associated with the intrusion of the granite batholith occur in many location surrounding the batholith and as small inselbergs (island hills) within the granite in the Upper and Lower Selway, Lochsa and Upper and Lower North Fork AUs. The other suite of metamorphic rocks are associated with the Precambrian belt group (0.5 to 1.5 billion years ago, (Orr and Orr 1996) and are predominantly metamorphic gneiss, with lesser schist and sedimentary rock also present. These weather-resistant gneisses are found mostly in the Lower North Fork, South Fork and Lower Selway AUs with some occurrences in the Upper North Fork and Upper Selway AUs. They play a similar role in influencing erosion and sedimentation processes as do the granites (Megahan and Kidd 1972; McGreer 1981; Jones et al. 1997; Ries et al. 1991). Some of the metamorphic rock found in the North Fork AUs called schist contains platy mica minerals. These platy minerals are weakly cohesive and can cause landscapes to erode into steep slopes with less integrity, where they are more likely to have landslides and slumps than many other rock types (McClelland et al. 1997; Glenn Hoffman, NRCS Soils Scientist, personal communication February 27, 2001).

The high plateau on the western part of the Clearwater subbasin in the Lolo/Middle Fork and Lower Clearwater AUs, is made up of Miocene-age (17.5 to 6 million years ago) Columbia River basalt lava flows that flooded the ancestral valleys leaving preexisting hilltops standing like islands (steptoes) in a sea of basalt (Hooper and Swanson 1990; Hubbard 1956). The easternmost extension of the Palouse loess system deposited windblown silt-sized material called loess on the basalt planes (Busacca and McDonald 1994), and along with volcanic ash from many Cascade eruptions, mantle the western part of the Clearwater subbasin, strongly influencing soil formation, erosion and sedimentation into streams and rivers.

The Northern Rocky geologic uplift that has taken place over the past 13 million years, formed the prominent mountains in the central and eastern part of the subbasin. As a result, stream gradients have increased, leading to the rapid down-cutting of channels, deepening of canyons and the formation of what is called the breaklands (Wilson et al. 1983). The steep side slopes of the canyon walls play an important role in erosion from both landslides and surface runoff (Jones et al. 1997; McGreer 1981).

Pleistocene glaciation caused alpine glaciers to form in the upper elevations around the rim of the subbasin in the Lower and Upper North Fork, Lochsa and Upper and Lower Selway AUs, which moved down the valleys reaching elevations as low as 3,000 feet but usually not below 5,000 feet (Anderson 1930). Many of the mountainous lakes form in the cirques at the head of these glacial valleys in the headwaters of the Clearwater River (Hubbard 1956).

Topography

The Clearwater subbasin is well known for its rugged mountainous terrain with many deep canyon-walled rivers and streams with whitewater rapids. The topographic relief, slope percent, and aspect of the subbasin vary greatly from the river valley near Lewiston, Idaho to the crest of the mountains along the Idaho/Montana border to the east.

The many ridges and mountains of the Clearwater and Bitterroot mountains in the central and eastern part o the subbasin have convex slopes ranging from 20-65% (McClelland et al. 1997). Steeper slopes exist in the glacial cut valleys in the upper elevations around the Clearwater subbasin at the head of many river and tributary valleys. These glaciated areas are prevalent in the Lower and Upper North Fork, Lochsa, Upper Selway and South Fork AUs.

The breaklands of the Clearwater subbasin refer mainly to the larger river valleys, like the main Clearwater River canyon between Lewiston and Kooskia in the Lower Clearwater AU, the North Fork, Lochsa, Selway and South Fork Rivers in the eastern part of the subbasin. The breaklands formed as a result of the rapid geologic uplift, which in turn, lead to the rapid down cutting by many rivers and streams into the high plateau in the western part of the subbasin and into the mountain ranges in the central and eastern part of the subbasin (Figure 7). These deeply incised canyons commonly have side slopes steeper than 60% (McClelland et al. 1997; Figure 8).

The plateau in the Lower Clearwater AU and parts of the Lolo/Middle Fork AU have moderately sloping terrain with local elevations ranging from 2,500 to 3,500 feet with 0 to 15% slopes with stream valleys such as Cottonwood and Lawyer's Creeks having (15 to > 60%) side slopes. The isolated buttes in the western part of the plateau reach as high as 5,000 feet and have slopes ranging from 30 to 60%. The valleys that have been eroded into the plateau have bench topography from the multiple underlying lava layers forming a series of stepped cliff-faced outcrops of basalt up the steep slopes. Areas with bench topography have very rough non-continuous slopes that greatly influence erosion processes and sediment transport.

Soils

The Clearwater subbasin provides a unique and diverse area for soil development due to the diversity of geologic parent material, varying climatic conditions, and the wide range of slopes and slope aspects. As a result, the various types of soils found in the subbasin have greatly differing erosion-resistant properties that directly impact sedimentation rates into rivers and streams and indirectly influence stream channel morphology and stream productivity (Guscinski et al. 2000).

Changes in precipitation and temperature from west to east influence the types of soils that form on the landscape. In the western part of the subbasin on the Columbia Plateau geologic province, where the precipitation is less, a wide variety of grassland soils called Mollisols formed on shallow slopes with parent material dominated by basalt, silt, and volcanic ash. These fertile soils once supported the rich flora found on the Camas and Weippe prairies in both the Lower Clearwater and Lolo/Middle Fork AUs. They are now used mostly for wheat farming and cattle grazing and are a source of sedimentation into local drainages such as Cottonwood and Lawyer's Creeks (Rich Spencer, NRCS Soils Scientist, personal communication February 28, 2001).

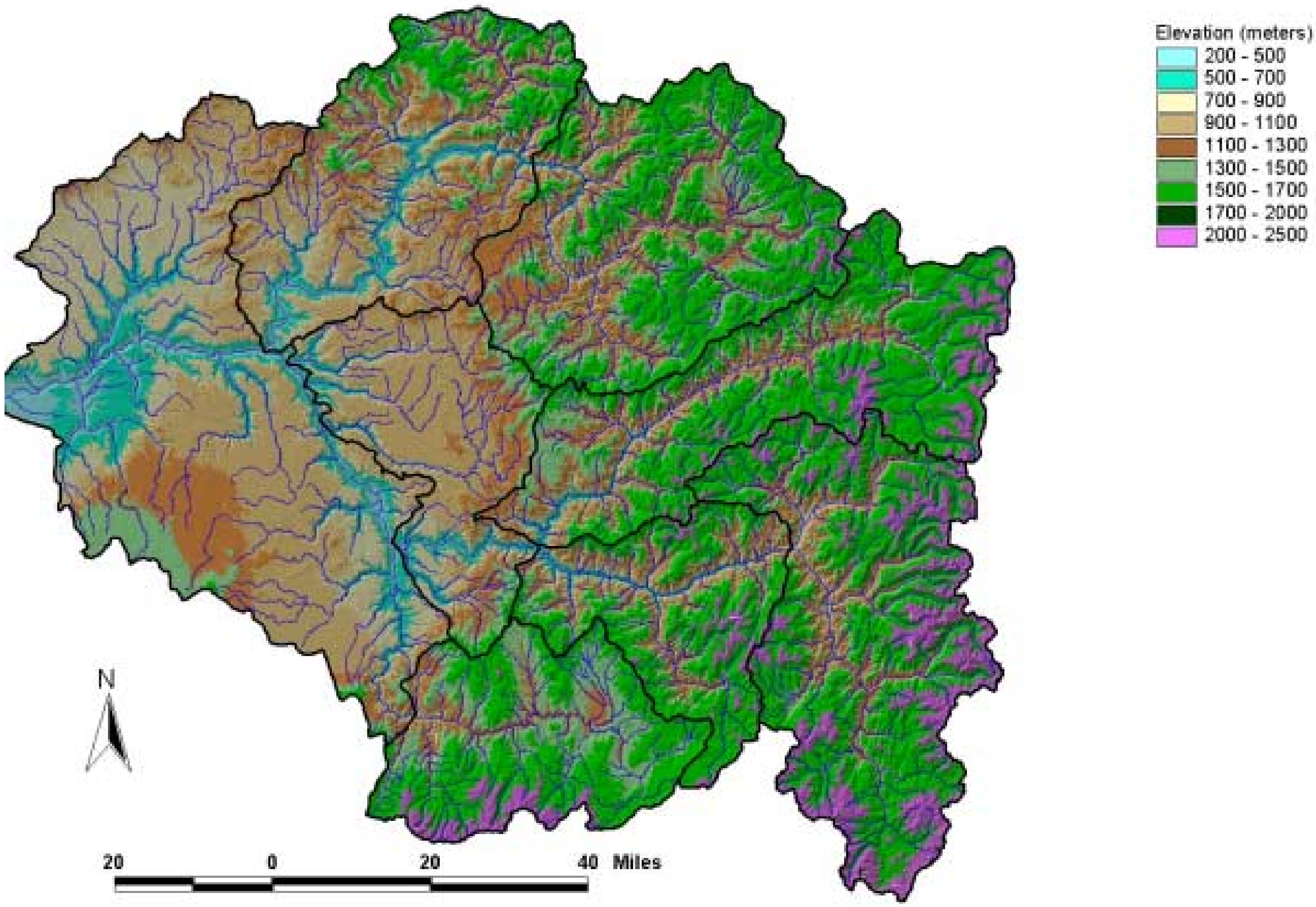

Figure 7. Elevation and topography of the Clearwater subbasin

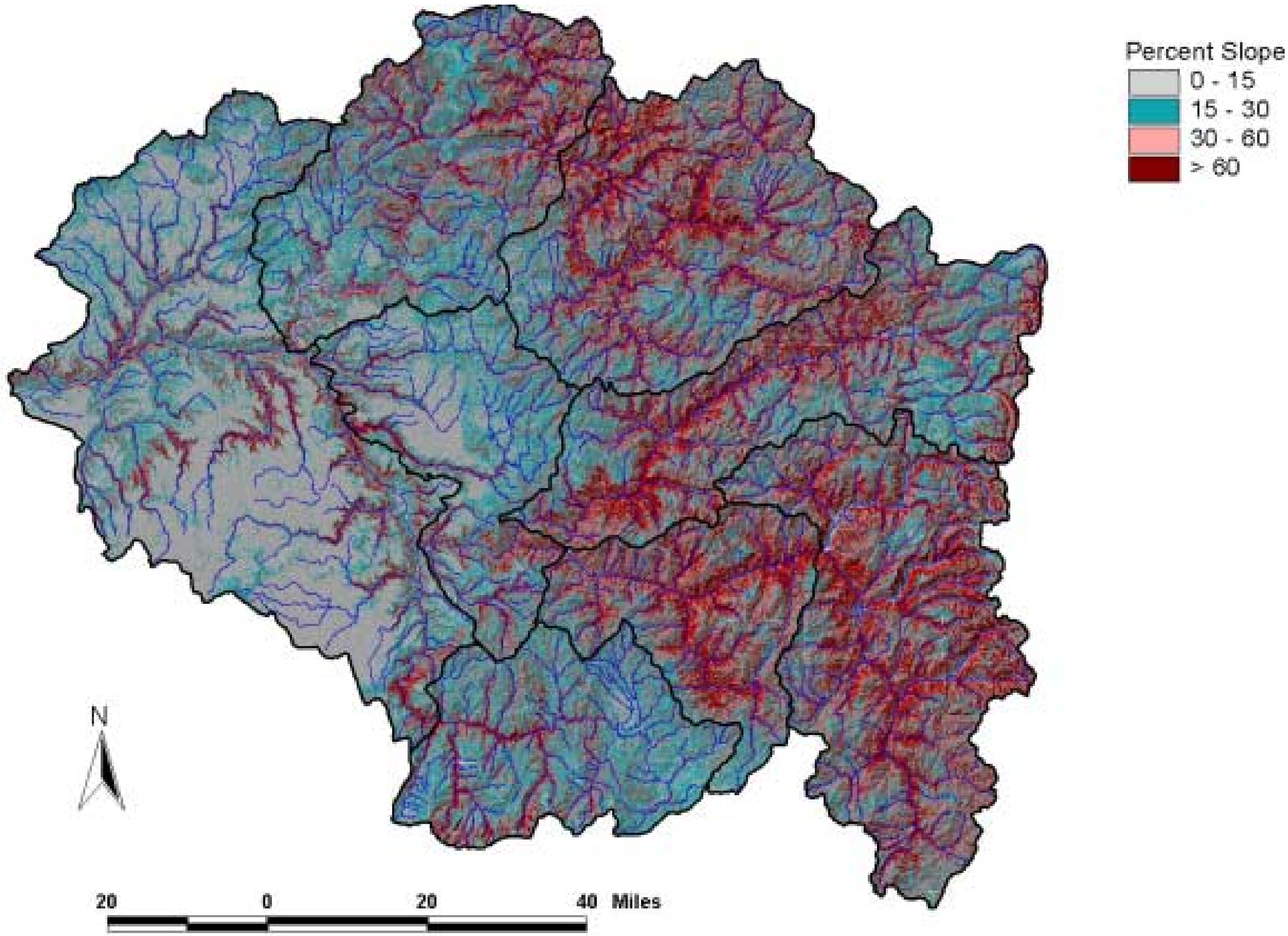

Figure 8. Relative distribution of land slope classes throughout the Clearwater subbasin

With increased elevation and precipitation in the central part of the subbasin the soils grade into forest soils called Alfisols and are associated with ponderosa pine and Douglas fir forests. This gradation takes place in the Potlatch drainage, the Craig Mountains and around the isolated buttes in the Lower Clearwater AU as well as in the foothills to the Clearwater Mountains in the Lower North Fork, Lolo/Middle Fork and South Fork AUs. These soils have thinner topsoil horizons than those commonly found on the plateau, but often have a protective organic litter layer that helps reduce surface erosion (Barker 1982). Forest soils often form on the steep granitic terrain of the central and eastern parts of the subbasin, particularly in the Upper North Fork, Lochsa and Upper/Lower Selway AUs, and can be prone to mass wasting and surface erosion processes when their topsoil is disturbed or removed (Jones et al. 1997; McGreer 1981).

Many of the grassland and forest soils in the western and central part of the subbasin develop clay-rich subsurface horizons with shrink/swell properties and are prone to soil creep along streambanks where peak flows cause the overhanging sediment to enter the stream channel (Swanston and Swanson 1976). When these soils overlie crystalline bedrock on steeper slopes slumping is the most common form of mass wasting.

Volcanic ash becomes more predominant in the central and eastern part of the subbasin, mainly due to less loess being deposited by winds from the west, and where the ash accumulated enough to be the dominant parent material the soil type is called Andisol. This soil type, which has a wide variety of properties making erodibility difficult to predict (Soil Survey Staff 1975), ranges from the most dominant soil type to sporadic occurrence on landscapes in much of the Lower and Upper North Fork, Lochsa and Upper and Lower Selway AUs. Some soils formed from volcanic ash in the North Fork AUs have been found to posses great water retention capabilities and are extremely resistant to erosion when the topsoil is left undisturbed. However, subsurface horizons may have little cohesiveness and can be a serious erosion problem when exposed (Glen Hoffman, NRCS Soil Scientist, personal communication February 27, 2001).

Some soils in the Lower and Upper North Fork AUs formed from metamorphic rock called schist are very rich in platy mica minerals, making them noncohesive, prone to erosion, and when used for roadbed material, unsafe for vehicle traffic (McClelland et al. 1997; Glenn Hoffman, NRCS Soils Scientist, personal communication February 27, 2001).

Hydrology

The mainstem Clearwater River originates in the Bitterroot Mountains at elevations ranging from 8,400-9,000 feet. The Clearwater River contributes approximately one-third the flow of the Snake River and 10% of the flow of the Columbia River system annually (U.S. Forest Service 1969, cited in Maughn 1972), with a mean annual discharge of approximately 15,300ft^3/s near its mouth (Lipscomb 1998).

The Clearwater derives its flow from a network of tributaries, four of which are primary. The Selway and Lochsa Rivers both originate at the Idaho – Montana border in the Selway Bitterroot divide and flow in a westerly to northwesterly direction through precipitous breaklands and forested canyons to their junction at Lowell, ID. The confluence of the Lochsa and Selway form the Middle Fork of the Clearwater, which flows in a westerly direction before joining the South Fork Clearwater at the town of Kooskia, ID. From this point on, the river is known as the mainstem Clearwater. The Clearwater continues to flow in a westerly to northwesterly direction through sparsely vegetated and weathered canyonlands to the town of Ahsahka, at which point the North Fork of the Clearwater enters. From Ahsahka, the Clearwater

River courses through semi-arid canyons and agricultural land until joining the Snake River at Lewiston, ID.

Gauging

There are a total of 53 gauging stations in the Clearwater subbasin. The stations are widely distributed and occur in all assessment units. Seventeen out of the fifty-three stations have only peak or historical records, and only twelve of the stations are currently active. The gauging station on the Selway River near Lowell, Id (#13342500) represents the longest period of record (70 years), compared to the Walton Creek Station near Powell Ranger Station (#1336635), which has collected data for only three months (Table 3).

The primary tributaries supplying the majority (>60%) of flow to the Clearwater are relatively similar in drainage area yet differ in flow contribution (Table 4). Other tributaries that supplement mainstem Clearwater flows include the Potlatch River (drainage area), Lolo Creek (drainage area), Orofino Creek (drainage area), and a number of tributaries which drain into Dworshak reservoir.

Mean monthly flows for select active gauging stations are shown in Table 5. Records indicate that peak flows generally occur in the months of May and June. Base flows most often occur during the months of August and September, a period during which instream temperatures are highest and precipitation is lowest in much of the Clearwater subbasin.

In lower elevation areas, occasional thunderstorms occurring from late spring through summer may result in flash floods which produce annual peak flows in localized areas (U.S. Army Corps of Engineers 1967). However, thunderstorms are generally brief in duration and of limited size resulting in highly localized impacts where they occur.

Timing, duration, and volume of peak flows are driven by snowmelt and/or by seasonal rainstorms at lower elevations (<4,000’) in the Clearwater subbasin. Therefore, interannual variability in both the timing and volume of peak flows can be expected to be much greater than that at higher elevations. Rainstorms having the greatest impacts to hydrology at lower elevations are those occurring during winter or spring, with precipitation falling on frozen or snow covered ground (U.S. Army Corps of Engineers 1967). Such rain-on-snow events can occur from November through March (Thomas et al. 1963), and may result in hydrograph peaks throughout this period. Table 6 shows the magnitude and frequency of instantaneous peak flows at gauging stations in the Clearwater River basin.

Annual flow variation is greatest in tributaries in the Camas Prairie, where minimum mean monthly discharge can be expected to comprise less than 10% of the mean annual discharge in some areas (Figure 9). The most stable annual flows exist in the Lower North Fork AU where minimum monthly flows make up 37-46% of the mean annual flow in most tributaries flowing into Dworshak Reservoir, with the exception of the Elk Creek system (10-18%). With the exception of the Lower North Fork AU, patterns in annual flow variation follow a similar pattern to other hydrologic regimes, with a gradient from the east (least variable) to the west (most variable) through the subbasin.

Table 3. Period of record (in bar chart) for all USGS gaging stations in the Clearwater River subbasin

Station Number	Station Name	Period of records in years (0 0 0 0 0 1 1 1 1 1 2 2 2 2 2 3 3 3 3 3 4 4 4 4 4 5 5 5 5 5 6 6 6 6 6 7 7 7 7 7 8 8 8 8 8 9 9 9 9 9 0 / 0 2 4 6 8 0 2 4 6 8 0 2 4 6 8 0 2 4 6 8 0 2 4 6 8 0 2 4 6 8 0 2 4 6 8 0 2 4 6 8 0 2 4 6 8 0 2 4 6 8 0)
13335690	Selway River Abv Moose Creek Nr Moose Creek R. S.	
13335700	Moose Creek At Mouth Nr Moose Creek Ranger Station	
13336000	Selway River Ab Meadow Creek Nr Lowell Id	
13336100	Meadow Creek Nr Lowell Id	
13336300	Gedney Creek Nr Selway Falls Guard Station Id	
13336450	Rackcliff Creek At O'Hara Guard Station Id	
13336500	Selway River Near Lowell, Id	
13336600	Swiftwater Creek Nr Lowell Id	
13336635	Walton Creek Nr Powell Ranger Station Id	
13336650	Ef Papoose Creek Nr Powell Ranger Station Id	
13336800	Warm Spring Creek Nr Powell Ranger Station Id	
13336850	Weir Creek Nr Powell Ranger Station Id	
13336900	Fish Creek nr Lowell Id	
13337000	Lochsa River Near Lowell, Id	
13337100	Clear Creek Nr Kooskia Id	
13337200	Red Horse Creek Nr Elk City Id	
13337500	Sf Clearwater River Nr Elk City Id	
13337540	Leggett Creek Nr Golden Id	
13337700	Peasley Creek Nr Golden Id	
13338000	Sf Clearwater River Nr Grangeville Id	
13338200	Sally Ann Creek Nr Stites Id	
13338500	South Fork Clearwater River At Stites, Id	
13338800	Lawyer Creek Nr Nezperce Id	
13339000	Clearwater River At Kamiah Id	
13339500	Lolo Creek Nr Greer Id	
13339700	Canal Gulch Creek At Pierce Ranger Station	
13339800	Orofino Creek Nr Orofino Id	
13339900	Deer Creek Nr Orofino Id	
13340000	Clearwater River At Orofino, Id	
13340500	Nf Clearwater River At Bungalow Ranger	

Table 3 (Continued)

Station Number	Station Name	Period of Records in Years																																																
		00	02	04	06	08	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	00
13340600	North Fork Clearwater River Near Canyon																																		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
13340615	Beaver Creek Nr Canyon Ranger Station Id																																										■	■	■	■						
13340760	Little Nf Clearwater River Nr Elk River Id																																				■	■														
13340780	Breakfast Creek Nr Elk River Id																																				■	■														
13340855	Reeds Creek Nr Headquarters Id																																										■	■	■							
13340950	Dworshak Reservoir Nr Ahsahka, Id																																					■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
13340999	Nf Clearwater R - Peck Minus Orofino																																							■	■	■	■	■	■							
13341000	Nf Clearwater River At Ahsahka Id																																		■																	
13341002	Test Site For Base Q (13341002)						■																																													
13341050	Clearwater River Near Peck, Id																																	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
13341100	Cold Springs Creek Nr Craigmont Id																															■	■	■	■	■	■	■	■	■	■	■										
13341128	Long Hollow Creek At Nezperce Id																																											■	■							
13341200	Ef Potlatch River Bl Mallory Creek Nr Bovill Id																														■																					
13341300	Bloom Creek Nr Bovill Id																														■	■	■	■	■	■	■															
13341400	Ef Potlatch River Nr Bovill Id																														■	■	■	■	■	■	■															
13341500	Potlatch River At Kendrick Id																							■	■	■	■	■	■	■	■																					
13341600	Arrow Gulch Nr Arrow Id																															■	■																			
13342000	Mission Creek Nr Winchester Id																					■	■																													
13342200	Twenty One Ranch Spring Nr Waha Id																													■	■																					
13342450	Lapwai Creek Near Lapwai, Id																																						■	■	■	■	■	■	■	■	■	■	■	■	■	■
13342500	Clearwater River At Spalding, Id						■	■						■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
13343000	Clearwater River Nr Lewiston Id														■																																					
13343010	Lindsay Creek Trib No 4 Nr Lewiston Id																																				■	■	■	■	■	■										

Table 4. Drainage area and runoff of major tributaries in the Clearwater subbasin

Drainage	Drainage Area (sq. mi.)	Drainage % of subbasin	Average Annual Runoff (acre/feet)	Runoff % of subbasin[1]
Selway (7 mi. abv. confl. w/Lochsa)	1,910	20	883,207	16
Lochsa (0.9 mi. abv. confl. w/Selway)	1,180	12	789,095	14
South Fork Clearwater (at Stites, ID)	1,150	12	324,325	6
North Fork Clearwater (nr. Canyon Ranger station)	1,360	14	1,151,065	21

[1]Based on comparison of average annual runoff (5,552,620 acre/feet) measured at the mainstem Clearwater River at Spalding, ID (RM 11.6)

Table 5. Average monthly flows for principle tributaries and portions of the mainstem Clearwater River

Tributary/ Stream Segment	USGS Gauge #	General Location	Period of Record	Average Monthly Flows (cfs)											
				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Selway R.	13336500	nr. Lowell ID	69 yrs.	1277	1555	2255	5998	13380	11910	3168	926	752	964	1298	1439
Lochsa R.	13337000	nr. Lowell ID	70 yrs.	1119	1303	1840	4854	10200	8395	2210	677	562	747	1091	1247
SF Clearwater	13338500	@ Stites, ID	34 yrs.	542	651	1003	2085	3304	2512	828	293	245	282	362	462
Lolo Cr.	13339500	nr. Greer, ID	20 yrs.	232	443	634	890	771	417	146	60	61	78	172	189
Clearwater R.	13340000	@ Orofino, ID	40 yrs.	4176	5133	7798	15550	28880	24450	6764	2141	1794	2139	3227	3934
NF Clearwater R.	13340600	nr. Canyon R.S.	30 yrs.	1837	2374	3222	6168	10910	8408	2684	1160	947	1039	1641	1864
Clearwater R.	13341050	nr. Peck, ID	33 yrs.	9869	11150	15020	21990	38470	34010	13050	6643	6627	4388	7033	9178

Table 6. Magnitude and frequency of instantaneous peak flow at gauging stations in Clearwater River subbasin

Station Number	Station Name	Period of Record	Discharge, in cfs based on the period of record for indicated recurrence interval in years and exceedance probability in percent							
			2 50%	5 20%	10 10%	25 4%	50 2%	100 1%	200 0.5%	500 0.2%
13336500	Selway River near Lowell	1911,1930-99	25,800	33,100	37,500	42,600	46,200	49,500	52,700	56,800
13336900	Fish Creek near Lowell	1958-67	1,710	2,030	2,220	2,440	2,590	2,740	2,880	3,061
13337000	Lochsa River near Lowell	1911-12,38-99	18,800	24,400	28,000	32,500	35,700	39,000	42,100	46,400
13337500	South Fork Clearwater River near Elk City	1945-74	1,940	2,610	3,050	3,610	4,030	4,440	4,870	5,430
13338000	South Fork Clearwater R near Grangeville	1911-20,23-63	5,040	6,800	7,990	9,540	10,700	11,900	13,200	14,900
13338500	South Fork Clearwater River at Stites	1964-99	6,470	9,480	11,600	14,400	16,500	18,800	21,100	24,300
13339000	Clearwater River at Kamiah	1911-65	53,300	67,800	76,500	86,400	93,200	99,700	106,000	114,000
13339500	Lolo Creek near Greer	1980-99	2,220	3,290	3,990	4,870	5,510	6,130	6,750	7,550
13340000	Clearwater River at Orofino	1931-38,65-99	54,300	68,900	77,400	87,200	93,900	100,000	106,000	114,000
13340500	NF Clearwater R at Bungalow Ranger Sta	1945-69	16,300	20,400	23,000	26,100	28,400	30,600	32,800	35,700
13340600	NF Clearwater River near Canyon Ranger Sta	1967-69,71-99	18,800	24,900	29,000	34,200	38,100	42,000	46,000	51,400
13341000	North Fork Clearwater River near Ahsahka	1927-68	31,100	44,300	53,700	66,100	75,700	85,700	96,000	111,000
13341050	Clearwater River near Peck	1965-97	67,800	87,800	99,900	114,000	124,000	138,000	143,000	155,000
13341300	Bloom Creek near Bovill	1960-71,73-79	58	93	120	159	192	227	266	323
13341400	East Fork Potlatch River near Bovill	1960-71	640	915	1,110	1,370	1,580	1,800	2,020	2,340
13341500	Potlatch River at Kendrick	1945-71	6,160	9,020	11,100	13,900	16,100	18,500	21,000	24,500
13342450	Lapwai Creek near Lapwai	1975-97	798	1,880	2,960	4,800	6,590	8,770	11,400	15,700
13342500	Clearwater River at Spalding	1911-13, 1923-97	79,300	106,000	122,000	141,000	155,000	168,000	180,000	19,600

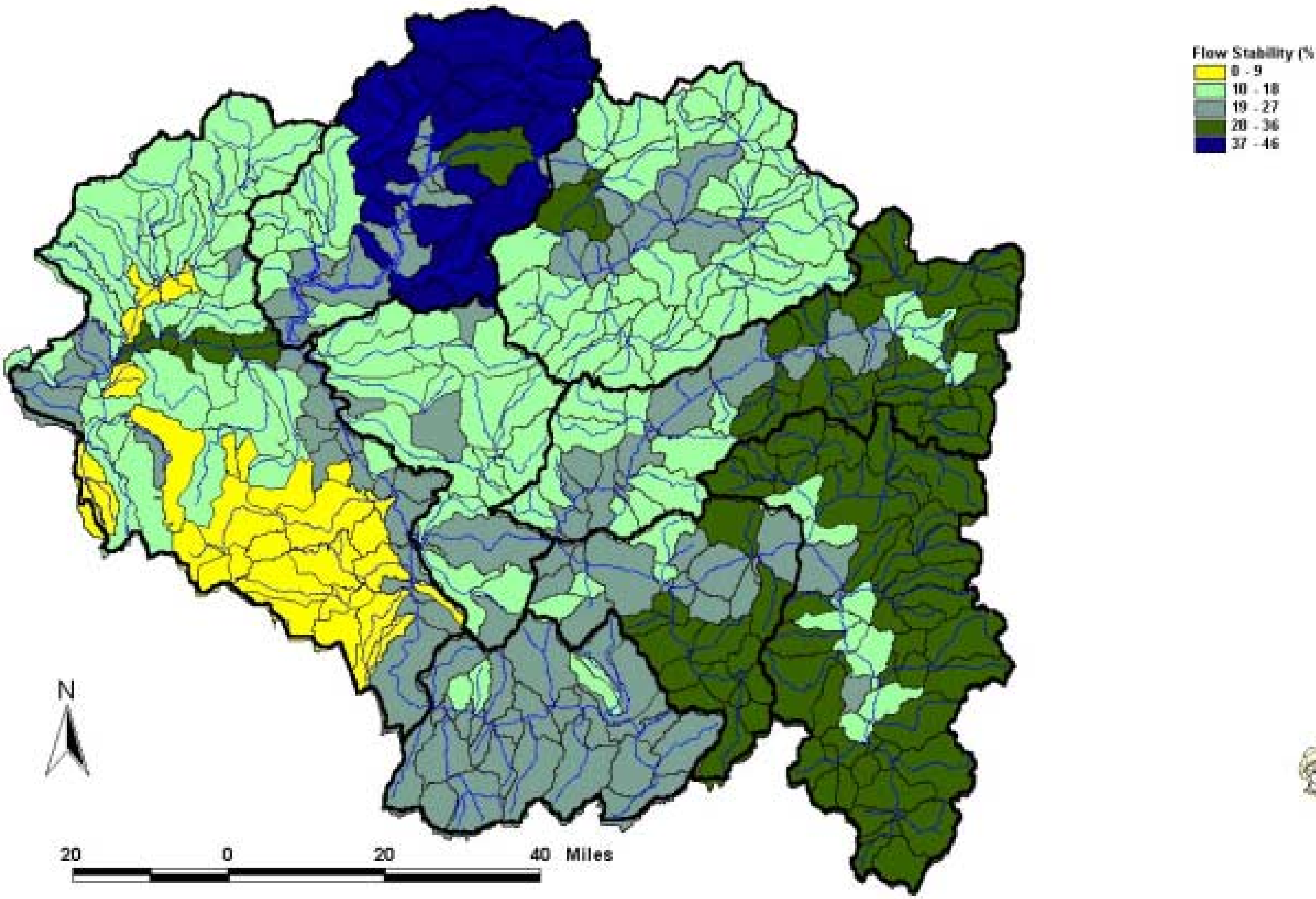

Figure 9. Flow variation for the Clearwater subbasin, summarized using subwatersheds defined by Lipscomb (1998)

Flood Regime

Major flood events occurred within the subbasin in 1919, 1933, 1948, 1964, 1968, 1974, and the winter/spring of 1995/1996 (McClelland et al. 1998). Stream records are not available for the 1919 event. Peak flows during these years are summarized for various areas throughout the subbasin in Table 7. The data illustrates to some degree the spatial variability of discharge throughout the Clearwater subbasin. The flood events presented in Table 7 were recorded at the mouth of the Clearwater River. Relative flow contributions from major tributaries during each of these events is highly variable. The 1934 flood event appears to have been driven primarily by events originating in the North Fork Clearwater River, with relatively low flows in the South Fork Clearwater, Lochsa, and Selway AUs. Similarly, in comparing flood events of similar magnitude in the Lower Clearwater River (i.e. 1957 vs. 1964 or 1933 vs. 1938), substantial differences can be seen is the corresponding discharge from individual AUs. This data clearly illustrates the importance of considering local hydrologic conditions in project planning and development, and accounting for the variable climatic conditions within the Clearwater subbasin which contribute to annual runoff conditions.

Water Quality

For the purposes of providing an overview of various water quality parameters throughout the Clearwater subbasin, summaries are made using data collected at USGS gaging sites. The USGS data was selected for use because it provided consistent and widespread sampling sites with relatively long periods of record for multiple parameters. It is important to note that the USGS data is intended for trend monitoring, and does not supply adequate information for detailed analysis (spatial or temporal) of water quality. Substantial amounts of water quality data exist from other sources within the subbasin which are useful for more detailed analyses, although parameters sampled, locations and period of record are often inconsistent resulting in more localized applicability of these data. A substantial effort to conduct consistent, coordinated temperature monitoring throughout the Clearwater subbasin has been implemented in recent years, and information regarding sampling periods and locations is maintained by the Idaho Department of Environmental Quality.

U.S. Geological Survey (USGS) water quality data for the Clearwater River drainage was gathered from the National Water Information System (NWIS) and EarthInfo, Inc. databases, as well as the annual Water Resources Data reports for Idaho. Fifty-seven gauging stations were identified within the basin where water quality data was, or is still being, collected. Individual data sets vary with respect to the number of data points and parameters, as well as the period of record and sampling intensities. A summary of water quality information available from these stations is presented in Appendix B.

The seven stations that have data for the longest period are detailed in Table 8, and can be subdivided into four broad categories. The first category includes the stations at Peck, Orofino, and the North Fork Clearwater near Canyon Ranger Station. Temperature and specific conductance (conductivity) were the most data-rich parameters at these locations. The second category includes the stations at Selway and Lochsa near Lowell, Idaho. These two sites are closer to the headwaters than the other six, and a suite of analytes were evaluated between 1974 and 1980. This information, although dated, provides important background information and is useful for comparing reaches at that time or as baseline data if new monitoring programs are initiated. The third category includes the stations at Stites on the South Fork of the Clearwater and Lapwai Creek near Lapwai, Idaho. These stations were also monitored from the mid 1970s to the early 1980s, but sampling was resumed in the early 1990s for many of the same parameters. The final category belongs to the Spalding gauging station on the mainstem of the Clearwater. This station stands out among the others as having the largest number of analytes and the longest period of record. In addition, many of the parameters evaluated by the USGS at this location were analyzed during limnological studies by researchers at the University of Idaho and Washington State University during the late 1970s and mid 1990s.

Table 7. Comparison of discharge at various locations throughout the Clearwater subbasin during major flood events measured near the mouth of the Clearwater River

Location	1933	1934	1938	1948	1957	1964	1974
Lower Clearwater AU							
Clearwater R. at Spalding	136,000	172,000	134,000	177,000	143,000	141,000	131,000
Clearwater R. at Orofino	81,500	----	72,300	----	----	----	85,800
Potlatch River at Kendrick	----	----	----	13,000	8,500	3,800	----
Lower North Fork AU							
North Fork Clearwater R. near Ahsahka	46,700	100,000	62,700	55,600	40,600	41,800	----
Upper North Fork AU							
North Fork Clearwater R. near Bungalow Ranger Station	----	----	----	27,400	16,300	21,400	----
Lolo/Middle Fork AU							
	No Data Available						
Lower Selway AU							
Selway R. near Lowell	33,800	20,500	32,800	48,900	26,500	43,400	43,100
Upper Selway AU							
	No Data Available						
Lochsa River AU							
Lochsa R. near Lowell	34,800	22,500	24,500	34,600	21,100	35,100	32,000
South Fork AU							
South Fork Clearwater near Grangeville	6,090	2,380	6,740	12,600	8,910	----	----
South Fork Clearwater near Stites	----	----	----	----	----	17,500	6,750

Table 8. Median values for selected parameters at seven USGS gauging stations within the Clearwater River subbasin

Station	Period of Interest	Specific Conductance (µS/cm)	NO_2+NO_3-N (mg/L)	Total Phosphorus (mg/L)	Chloride (mg/L)	Fecal Coliforms (CFU/ 100mL)
Lower Clearwater AU						
Stites	1972–1981		0.04	0.030	0.6	
	1972–1996	64			0.8	
	1990–1993					30
	1990–1998					21
Orofino	1973–1996	58				
Lapwai	1975–1996	220				
	1975–1981		0.63	0.095	3.1	
	1975–1997				3.2	
	1991–1993					267
	1991–1998		1.01	0.100	3.7	212
Spalding	1973–1995	44				
	1972–1982		0.11	0.030	0.6	
	1959–1995				0.5	
	1991–1993					13
	1990–1995					8
Lochsa AU						
Lochsa	1973–1996	27				
	1974–1980		0.03	0.015	0.4	
Lower Selway AU						
Selway	1973–1996	24				
	1974–1980		0.04	0.020	0.4	
Upper North Fork AU						
Canyon	1973–1996	33				

Temperature

Daily temperature information is available for only eight gauging stations within the subbasin, and periods of record vary for each one. The most complete long-term data set is from the station at Spalding (RM11.6) where maximum and minimum temperatures have been recorded daily since October 1959. The second most complete set is upstream at the Peck gauging station (RM 37.4) where over 11,000 average measurements were calculated for the period beginning in October 1964 to the present. Daily temperature data from the discontinued gauging station at Ahsahka and the current one near the Canyon Ranger station provide a relatively long period of record for the North Fork Clearwater. The Ahsahka station at RM 0.4 was operated from October 1958 until December 1970–shortly before Dworshak Reservoir became operational. The current North Fork Clearwater station is located at RM 58, and temperature data is available from February 1970 through September 2000. The daily measurements taken at Kamiah represent the earliest daily USGS temperature data available for the Clearwater system.

Information from the latter half of the 1956 water year, along with most of the 1957 and 1959 water years is available and useful from a historical perspective.

Temperature, and total dissolved gas data is also available from monitoring stations operated by the U.S. Army Corps of Engineers (USACE) along the lower reaches of the Clearwater River. This data is collected hourly, allowing the study of diel variability. Three stations are maintained within the Clearwater drainage area. The first is on the right bank of the Clearwater River at about RM 4. Data from this location is available from 1996 through 2000, with monitoring beginning in April or May and continuing through August or September depending on the year. The second site is located approximately 32 miles upstream on the left bank near Peck. This station has also been in place since 1996, but temperature information is also available from April 1997 through December 1998, and from March 1999 through August 2000. The final station is in the North Fork Clearwater below Dworshak Dam. The collection schedule at that site was the same as the one at Peck, with the addition of April through September 1994 and July through September 1993. However, the temperature data obtained below Dworshak Dam is not representative of natural conditions. The selector gates at the dam are controlled so that released water is between 10–12°C.

The ability to regulate the outflow temperature at Dworshak has impacts beyond the immediate outlet. Prior to 1992, the facility was operated primarily for flood control. The water level was kept close to full pool through the summer and lowered beginning September 1st. Reservoir water was then used throughout the winter for power production, effectively lowering the pool elevation to provide storage for flood control. Additional water up to about 20 kcfs was spilled in May when additional snow course information became available. This scenario changed in 1992 when up to 25 kcfs was released during parts of July and August to facilitate anadromous fish migration in the lower Snake River. The NMFS 2000 BIOP calls for an 80 foot summer drawdown of Dworshak Reservoir for flow augmentation and cooling of the Lower Snake River.

This action also changed the thermal regime of the downstream Clearwater River (Figure 10). The primary differences occur between early July and late September. Between 1974-1990, mean temperatures peaked close to 19°C during the last week of July and first week of August before declining towards the winter lows. During the 1993-1998 period, three peak averages of about 17°C occurred during the first weeks of July, August, and September. Two troughs averaged 14°C and were recorded during the latter parts of July and August. Water temperatures during September 1993-1998 were 1-3°C higher than during the historical period as a result of the 30% reduction in reservoir discharges (Figure 10).

Another interesting aspect related to temperature can be seen by comparing Spalding data to sites higher in the watershed. No comparable long-term daily data is available from stations in the Selway River or Lochsa River, but there is from the discontinued station at Ahsahka and near the Canyon Creek Ranger Station on the North Fork Clearwater. When the data from these three stations is divided into three time intervals, some interesting patterns are evident. First, the temperature values for the 1950-1970 Ahsahka and 1960-1970 Spalding data are quite similar (Table 9; Figure 10). The comparison shows that temperatures in all categories increased by about a 1°C between Ahsahka and downstream Spalding; downstream warming is common. Second, statistics for the 1970-1990 and 1992-2000 intervals at the upstream site on the North Fork Clearwater are quite close, suggesting that mean water temperatures have not changed significantly in that 30-year interval. Also, it should be noted that water temperatures at the Canyon Creek Ranger Station site were generally cooler than at the two other locations.

Finally, the data from the Spalding site provides information that further suggests temperatures in that reach changed as a result of construction and operation of Dworshak Dam. The mean and maximum temperatures decreased slightly in the 1970-1990 period relative to the ten years prior to that. This shift was more noticeable in the maximum values. However, the same trends continued into the 1992-1999 interval. The overall average decreased slightly, but the maximum declined by an additional 2°C after the implementation of summer drawdowns at Dworshak. These shifts are apparent in Figure 10, as is the increase in minimum temperatures.

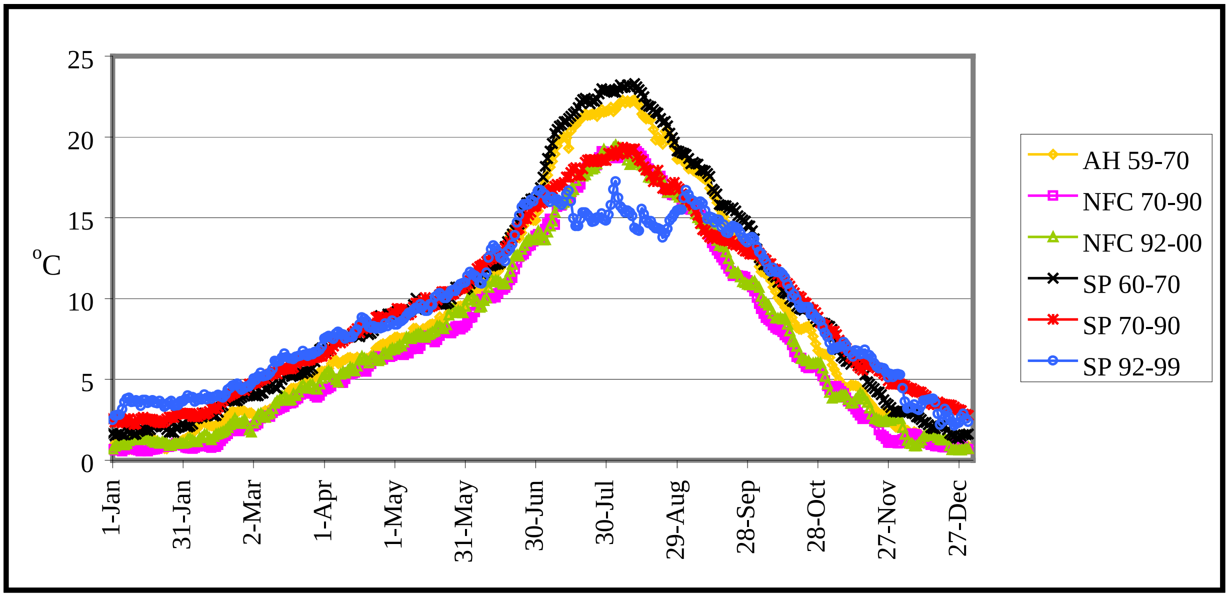

Figure 10. Average temperatures for the USGS gauging stations at Ahsahka (AH), North Fork Clearwater at Canyon Creek (NFC), and Spalding (SP) during various intervals

Table 9. Mean, maximum, and minimum temperatures for the USGS gauging stations at Ahsahka, North Fork Clearwater, and Spalding

Temperature		Ahsahka	NFC		Spalding		
		1959-1970	1970-1990	1992-2000	1960-1970	1970-1990	1992-1999
°C	Mean	8.9	7.4	7.8	9.9	9.5	9.2
	Max	22.3	19.2	19.5	23.3	19.4	17.3
	Min	0.7	0.6	0.6	1.3	2.2	2.1

Water Quality Limited Segments – §303(d)

Water quality limited segments are streams or lakes which are listed under Section 303(d) of the Clean Water Act for either failing to meet their designated beneficial uses, or for exceeding state water quality criteria. The current list of §303(d) listed segments was compiled by Idaho Department of Environmental Quality (IDEQ) in 1998, and includes 135 defined stream reaches within the Clearwater subbasin. Individual stream reaches are often listed for multiple (up to 11) parameters, making tabular summary difficult. Figure 11 illustrates the distribution of listed stream segments, and Table 10 summarizes listed segments by AU and individual pollutant. Maps delineating stream reaches listed for individual pollutants are included in Appendix B.

The Upper Selway AU lies entirely within the Selway-Bitterroot Wilderness, and is the only AU in the Clearwater subbasin without any stream segments listed as water quality limited (Table 10). The Lower Selway and Lochsa AUs also have a high portion of wilderness designation and/or inventoried roadless areas, which is reflected in a limited numbers of stream miles (11.7 and 71.1, respectively) listed on the §303(d) list relative to other AUs. Of the 71 miles of §303(d) listed stream in the Lochsa AU, 67 miles are in the mainstem Lochsa River and listed for temperature. Although temperatures in the mainstem Lochsa River often exceed state standards, beneficial uses are being met and the temperature exceedances are thought to be a regular and natural occurrence (Bugosh 1999).

Gilbert and Evermann (1895) examined temperatures in the lower mainstem Clearwater River (mouth to Potlatch Creek), and found that summer water temperature was highly correlated to air temperature. This work supports the concept that temperatures in larger rivers of the Clearwater subbasin were historically likely to naturally exceed current temperature criteria in some areas, with such exceedances dependent on localized environmental conditions.

NPDES Information

National Pollutant Discharge Elimination System (NPDES) permits are used to track point source discharges for potential impacts to water quality. Point source discharges do not generally present a substantial water quality issue within the Clearwater subbasin, with the possible exception of the Potlatch Corporation Mill located on the lower mainstem Clearwater River (Terry Cundy, Potlatch Corporation, personal communication, April 18, 2001). Using the online Permit Compliance System (U.S. Environmental Protection Agency 1999), thirty-eight facilities within the Clearwater basin were identified as having NPDES identification numbers, and all are described as active. However, only 30 have been issued permits, and of those only the one issued to the Dworshak National Fish Hatchery is defined as current.

The majority of these units are sewage treatment plants and the amount of monitoring depends on size and type. Baseline monitoring at facilities such as those at Deary, Cottonwood, and the City of Nez Perce typically includes discharge, BOD-5, pH, total suspended solids, and fecal coliforms. Residual chloride analyses are included at Bovill, Elk City, and Kooskia, while the facility at Grangeville also monitors ammonia concentrations. The largest facility in the drainage basin is the one in Lewiston, and is the only wastewater treatment plant in the area that monitors concentrations of heavy metals such as copper, lead, nickel, and zinc. The Potlatch mill in Lewiston is the only other facility in the area which monitors metals in their effluent, and it is also required to evaluate the concentrations of several organic compounds. The effluents that the fish hatcheries are required to monitor are not identified in the available information, with the exception of the Kooskia National Fish Hatchery that monitors total suspended solids and settable solids. Similarly, the requirements for several of the water supply, gold ore, and other facilities are not identified in the Permit Compliance System online system.

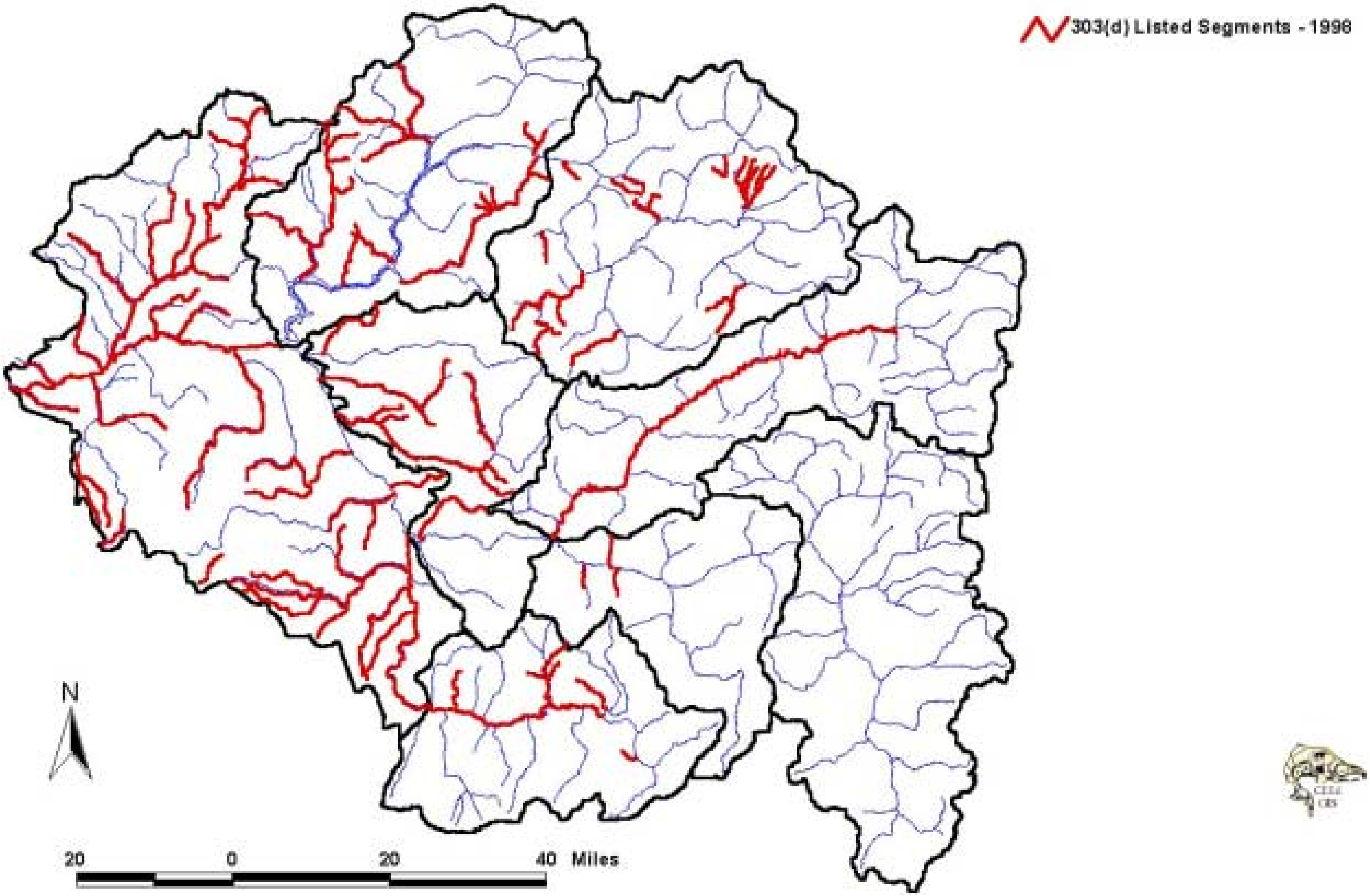

Figure 11. Distribution of water quality limited stream segments on IDEQ's 1998 303(d) list

Table 10. Miles of water quality limited streams on the 1998 §303(d) list within Clearwater subbasin AUs. Numbers in parenthesis represent total miles of stream within each AU

Parameter	Assessment Unit								Total
	Lower Clearwater	Lower North Fork	Upper North Fork	Lolo/ Middle Fork	Lochsa	Lower Selway	Upper Selway	South Fork	
	(432.1)	(149.0)	(110.6)	(101.8)	(71.1)	(11.7)	(0.0)	(45.9)	(822.2)
Temperature	32.2	0.0	0.0	22.8	67.2	0.0	0.0	29.4	151.6
Thermal Modification	269.7	55.6	8.0	74.8	0.0	0.0	0.0	0.0	408.1
Sediment	376.4	149.0	107.2	101.8	3.8	11.7	0.0	45.9	795.8
Bank Instability	0.0	0.0	3.4	0.0	0.0	0.0	0.0	0.0	3.4
Habitat Alteration	357.5	90.9	8.0	74.8	0.0	0.0	0.0	29.4	560.6
Pathogens	331.0	55.6	0.0	74.8	0.0	0.0	0.0	0.0	461.4
Fecal Coliforms	14.9	0.0	0.0	19.1	0.0	0.0	0.0	0.0	34.0
Oil/Grease	46.5	0.0	0.0	0.0	45.3	0.0	0.0	0.0	91.8
Synthetic Organics	74.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	74.2
Pesticides	74.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	74.2
Nutrients	311.6	55.6	0.0	74.8	0.0	0.0	0.0	0.0	442.0
pH	5.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.6
Dissolved Oxygen	208.8	35.3	0.0	57.9	0.0	0.0	0.0	0.0	302.1
Total Dissolved Gas	43.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	43.8
Flow	306.9	90.9	8.0	74.8	0.0	0.0	0.0	0.0	480.6

Valuable water quality monitoring data are potentially available from several of these point sources. This information may prove beneficial for development of total maximum daily loads (TMDLs) and other water quality programs within the subbasin, and should be coupled with in-stream monitoring programs.

Vegetation

Vegetation characteristics described below and in Table 11 are from the Idaho Gap Analysis Project (GAP) vegetation data (J. Michael Scott, Idaho Gap Analysis Project, unpublished data). Some of the most prevalent tree species in the subbasin are Douglas fir (*Pseudotsuga menziesii*), grand fir (*Abies grandis),* lodgepole pine (*Pinus contorta*), ponderosa pine (*Pinus ponderosa*), and western red cedar (*Thuja plicata*). Western white pine (*Pinus monticola*) and grand fir (*Abies grandis*) occur in varying successional stages and habitat types (Clearwater National Forest 1997). Ponderosa pine is found in early successional stages in the subbasin, whereas western red cedar tends to occur in later successional stages (Clearwater National Forest 1997).

Over 70% of the Clearwater subbasin is made up of forested communities (Table 11), generally classified as mesic, xeric, or subalpine. Mesic or moist conifer forests are largely found on mid-elevation montane slopes where precipitation patterns allow the formation of grand fir forests, or along river systems characterized by maritime climatic influences such as occur along the North Fork of the Clearwater River and parts of the Selway River. Under these unique climatic conditions grand fir gives way to western red cedar and hemlock (*Tsuga heterophylla*) stands. Cedar forests often contain unique plant species, including two focal plant species, crenulated moonwort (*Botrychium crenulatum*) and mountain moonwort (*Botrychium montanum*). Xeric or dry forests are characteristically dominated by ponderosa pine at the lower elevations, and grade into Douglas fir and dry site grand fir as elevation increases (Cooper et al. 1987). Subalpine fir and lodgepole pine dominate forests at middle and high elevations within the subbasin. At the very highest sites, subalpine fir stands also contain white bark pine (*Pinus albicaulus*), which is an important wildlife food source.

Shrublands and grasslands currently make up 12% of the subbasin's vegetation. The majority of the grasslands occur in the foothills and breaklands as canyon bunchgrass communities. These grasslands provide winter range for big game animals, livestock forage, and habitat for unique plant species. Associated with the canyon grasslands are two plant focal species for the subbasin, Spalding's catchfly (*Silene spaldingii*) and the broadfruit mariposa lily (*Calochortus nitidus*). Shrubland communities tend to be warm and mesic in the subbasin.

Table 11. Vegetation types in the Clearwater subbasin

Vegetation Category	% Area	Area (km^2)
Forest	71.4%	16,955.58
Agriculture	10.2%	2,425.48
Shrubland	7.7%	1,835.25
Grassland	4.0%	951.21
Other	2.3%	536.88
Subalpine/Alpine Meadow	2.1%	487.02
Riparian	1.7%	407.04
Water/Streamside	0.5%	111.11
Urban	0.1%	31.23

The Clearwater subbasin contains several unique or disproportionately important plant communities. Most notable are the prairie grasslands, wetland and riparian areas, and coastal disjunct communities. The grasslands are characterized by a rich assemblage of bunchgrasses, forbs, and shrubs (Daubenmire 1942; Davis 1952). Wetter, poorly drained sites supported camas (*Camassia quamash)* meadows with more upland sites containing either Idaho fescue (*Festuca idahoensis*) or a mixture of Idaho fescue and bluebunch wheatgrass (*Agropyron spicatum*). Camas meadows were important gathering sites for ancestral Nez Perce Indians who dug the camas bulbs and prepared them as a winter food staple. Present-day Nez Perce continue to gather these edible bulbs for subsistence and ceremonial purposes, although gathering sites are becoming scarce due to conversion of the prairie grasslands for commercial agricultural uses. Conversion to commercial agricultural uses has also contributed to the decline of native prairie forbs such as Jessica's aster (*Aster jessicae*) and Palouse goldenweed (*Haplopappus liatriformis*), both of which are focal plant species in the Clearwater subbasin.

Wetlands and riparian areas cover only a small portion of the subbasin, but offer some of the most diverse and unique habitats available. Wetlands occur as small ponds filled by spring runoff, wet meadows, springs and seeps, bogs, small lakes, and riverine and streamside riparian areas. These areas are important to the ecologic and economic welfare of the subbasin because they provide high quality wildlife habitat, water storage, flood abatement, pollution filtration, livestock forage, and water for domestic use (U.S. Geological Survey 1996). They also harbor unique plant species such as Clearwater phlox (*Phlox idahonis*), which is endemic to only a few wet meadows within the Clearwater subbasin. Impacts to wetland and riparian communities are difficult to quantify, but some estimates suggest that 56% of Idaho's wetlands have been lost since 1860 (Dahl 1990), largely due to agricultural conversion and urban development (Idaho Department of Parks and Recreation 1987). Within the Clearwater subbasin, large expanses of palustrine wetlands in the Reubens, Craigmont, and Ferdinand areas have been converted to croplands (U.S. Geological Survey 1996). Remaining wetland communities are often degraded by livestock grazing, road development, urban expansion, and altered hydrologic regimes.

Within the North Fork Clearwater River and at the confluence of the Selway and Lochsa Rivers are areas containing many plant species more typically found in the Oregon and Washington coastal rainforests. These communities have been referred to as a "refugium ecosystem" because of their unique distribution and species composition (Lichthardt and Moseley 1994). Elements from the moist coastal area intermingle with more typical Rocky Mountain species. Many species associated with this community are considered rare or sensitive (Moseley and Groves 1992). The ecosystem itself has been impacted by inundation behind Dworshak Dam, recreational development, roads, and timber harvest (Lichthardt and Moseley 1994).

Vegetation in the subbasin has changed compared to historical ranges due to fire management, land conversion, and non-native species introductions. In some parts of the subbasin, fire suppression has resulted in an absence or reduction of early seral species or communities compared to historical ranges (Thompson 1999). Timber harvest has also impacted the extent and composition of some forest types such as open ponderosa pine stands (Nez Perce National Forest 1998). The introduction of blister rust caused western white pine, previously predominant in some parts of the subbasin, to largely disappear (Clearwater National Forest 1997). Blister-resistant planting stock has the potential to return western white pine to vegetation communities to the Clearwater subbasin (Clearwater National Forest 1997).

Historically, prairie grasslands occupied large areas of the plateaus around Grangeville, Cottonwood, Nez Perce, and Weippe. Most of these grasslands and wet meadows have been lost due to conversion to agricultural grain, hay, and pasture production. A full 10% of the subbasin is currently in agricultural production which formerly was grasslands and forest (Table 11). Only small scattered parcels remain of the Camas and Weippe Prairie grasslands.

Noxious weeds have infested grasslands and transportation corridors in the subbasin (Nez Perce National Forest 1998). Table 12 summarizes the distribution of noxious weed species by county throughout the Clearwater subbasin. The most pronounced problems occur in lower elevation dry sites where Eurasian invaders have become well established. Some of the more common invaders are cheatgrass (*Bromus tectorum*), yellow starthistle (*Centaurea solstitialis*), spotted knapweed (*Centaurea maculosa*), and common crupina (*Crupina vulgaris*) (Nez Perce National Forest 1998). Noxious weeds negatively impact plant and animal biodiversity, natural ecological processes (fire, hydrology, soil development), and the quality and availability of livestock and wildlife forage (Olson 1999). They may also invade riparian areas, competing with desirable vegetation and thereby affecting aquatic habitats. Yellow starthistle is particularly problematic. Current estimates suggest that 500,000 acres of starthistle occur in Idaho with the largest infestation centered around Clearwater, Latah, Idaho, Lewis and Nez Perce Counties—the heart of the Clearwater subbasin (Jette et al. 1999). Approximately 215,000 acres of Yellow starthistle currently infests these counties (Clearwater River Basin Weed Management Area, unpublished data) and this weed is continuing to expand at an estimated rate of 6% per year (Jette et al. 1999). Eurasian watermilfoil (*Myriophyllum spicatum*) is the only plant on Idaho's Noxious Weed List not yet identified in the Clearwater subbasin. However, since this perennial waterweed grows from 4-12" per day and tolerates large variations in environmental conditions, it has the potential to severely impact the subbasin's waterways (Daniel 2001).

Nine focal plant species have been selected for the Clearwater subbasin (Table 13). These species are considered the most rare or imperiled taxa within the drainage because of habitat loss, threats, or inherent rarity. Spalding's catchfly (*Silene spaldingii*) is currently proposed for listing as threatened under the Endangered Species Act (ESA). All other focal species are considered sensitive by the USFS or BLM and are tracked by the Idaho Conservation Data Center. A complete list of rare plant species for the Clearwater subbasin can be found in Appendix C.

Fire

As an ecosystem disturbance regime, fire intensity, frequency, and size vary both spatially and temporally to define what is collectively referred to as a fire regime (Agee 1994). The impacts of fire to an ecosystem are dependent on the localized fire regime, and the exclusion of fire from fire-dependent ecosystems can alter forest composition, nutrient cycling (Mutch et al. 1993; Agee and Maruoka 1994), soil properties, erosion potential, and fish and wildlife habitat (Agee 1993; Swanston 1991).

The most important effects of fire on stream channel conditions are increased delivery of water, sediment, and debris. Increases in sediment and debris can alter channel functions and result in habitat changes which may be either detrimental or beneficial to stream ecology. Addition of large woody debris most often improves instream habitat conditions by providing cover and creating new areas suitable for fish spawning, rearing and incubation. Deposition of fine sediment may lead to decreased availability of suitable spawning habitat in some stream reaches, although much fine sediment produced in burned areas is carried out of the local area by coincidental increases in stream flow (Swanston 1991).

Table 12 Noxious weeds documented to occur in counties that are wholly or partly in the Clearwater subbasin (Idaho OnePlan 2001; University of Montana 2001).

Scientific Name	Common Name	Clearwater	Idaho	Latah	Lewis	Nez Perce	Shoshone
Aegilops cylindrica	Jointed Goatgrass			X			
Ambrosia tomentosa	Skeletonleaf Bursage					X	
Cardaria draba	Hoary Cress	X	X	X	X	X	
Carduus nutans	Musk Thistle		X			X	X
Centaurea diffusa	Diffuse Knapweed	X	X	X		X	X
Centaurea maculosa	Spotted Knapweed	X	X	X	X	X	X
Centaurea pratensis	Meadow Knapweed			X			
Cenaturea repens	Russian Knapweed		X	X	X	X	
Centaurea solstitialis	Yellow Starthistle		X	X	X	X	
Chondrilla juncea	Rush Skeletonweed		X	X		X	X
Cirsium arvense	Canada Thistle	X	X	X	X	X	X
Conium maculatum	Poison Hemlock		X	X		X	
Convolvulus arvensis	Field Bindweed		X	X		X	
Crupina vulgaris	Common Crupina	X	X		X	X	
Cytisus scoparius	Scotch Broom		X				X
Euphorbia dentata	Toothed Spurge		X				
Euphorbia esula	Leafy Spurge		X	X	X	X	
Hieracium aurantiacum	Orange Hawkweed	X	X	X	X		X
Hieracium pratense	Meadow Hawkweed	X		X			X
Hyoscyamus niger	Black Henbane			X		X	
Isatis tinctoria	Dyer's Woad		X				
Lepidium latifolium	Perennial Pepperweed					X	
Linaria dalmatica	Dalmatian Toadflax	X	X	X	X	X	X
Linaria vulgaris	Yellow Toadflax	X	X	X	X	X	X
Lythrum salicaria	Purple Loosestrife	X	X	X			
Milium vernale	Spring Millet Grass		X	X			
Nardus stricta	Matgrass			X			
Onopordum acanthium	Scotch Thistle	X	X	X	X	X	X
Senecio jacobaea	Tansy Ragwort		X				
Solanum elaeagnifolium	Silverleaf Nightshade		X				
Solanum rostratum	Buffalobur	X	X	X		X	
Sonchus arvensis	Perennial Sowthistle					X	X
Sorghum halepense	Johnsongrass		X				
Tribulus terrestris	Puncturevine		X			X	
Zygophyllum fabago	Syrian Beancaper					X	

Table 13. Focal plant species for the Clearwater subbasin

Common Name	Latin Name	Habitat
Spalding's silene	*Silene spaldingii*	North facing grasslands
Clearwater Phlox	*Phlox idahonis*	Wet meadows
Jessica's Aster	*Aster jessicae*	Prairie grasslands
Palouse Goldenweed	*Haplopappus liatriformis*	Prairie grasslands
Spacious monkeyflower	*Mimulus ampliatus*	Moist places at mid to low elevation
Salmon-flowered desert parsley	*Lomatium salmoniflorum*	Rocky outcrops at low elevation
Broadfruit mariposa	*Calochortus nitidus*	Canyon grasslands
Mountain moonwort	*Botrychium montanum*	Moist cedar-hemlock forests
Crenulate moonwort	*Botrychium crenulatum*	Moist cedar-hemlock forests

The most significant effects of fire on wildlife populations or communities are typically related to changes in habitat (Agee 1993). Species reliant on edge habitats typically benefit more immediately from fire than those reliant on contiguous forest cover based on increases in suitable habitat areas (Agee 1993). However, all wildlife species are likely to benefit from fire through either short or long-term impacts, including rejuvenation of food sources, creation of complex habitat mosaics, maintenance of plant diversity, and changes in available cover patterns. The Clearwater Elk Initiative homepage (U.S. Department of Agriculture 2000) provides substantial information on the dramatic influence of fire on Clearwater subbasin elk herds through time.

Fire history within the Clearwater subbasin has been tracked since 1870 and 1907 in the Nez Perce and Clearwater National Forests, respectively. Fire history data was obtained from the Clearwater and Nez Perce National Forests, which included information for those parts of the St. Joe and Bitterroot National Forests contained within the Clearwater subbasin. Only large fires encompassing more than 10 acres are represented in the fire history data, and no fire records were located for lands outside of the National Forest boundaries (although fires have burned areas outside the National Forest boundaries).

Since 1910, fires burned an average of approximately 238,000 acres of national forest property each decade in the Clearwater River subbasin (Table 14). Substantial portions of National Forest ground burned between 1910 and 1919, contributing to the most acreage burned in any decade within the period of record (1.48 million acres). In the Clearwater subbasin, the decadal average area burned within the Clearwater and St. Joe National Forests was approximately 138,000 acres, ranging from about 1,500 acres in the 1940s to 922,000 acres in the 1910s. During the period of record, portions of the subbasin within the Nez Perce and Bitterroot National Forests had a decadal average area burned of nearly 94,000 acres, ranging from zero in the 1950s to nearly 923,000 acres in the 1910s.

The intentional use of fire to modify ecosystems predates European settlement (Williams 1997). Native Americans were observed igniting prairie fires in the 1830s (Shinn 1980 cited in Agee 1994), and typically burned to promote diversity and sustain their many uses of local resources (Williams 1997). In contrast, European settlers typically burned to create more uniformity in the local landscape to accommodate activities such as agriculture or grazing (Williams 1997).

Active efforts to suppress fires from Pacific Northwest ecosystems began in the early 1900s (Kauffman 1990 cited in Mutch et al. 1993). Fire suppression became more efficient by about 1930, and by mid century most low to moderate intensity fires could be extinguished (Agee 1990, cited in Mutch et al. 1993). The impact of fire suppression in the Clearwater subbasin is readily evident beginning in the 1940s when for the first decade in the period of record less than 10,000 acres of National Forest land was burned in the Clearwater subbasin (Table 14). Fire suppression efforts have been curtailed to a small degree since the 1970s, but only within the wilderness portions of the subbasin (Dan Davis, Clearwater National Forest, personal communication, April 11, 2001). The degree of diminished fire suppression within the wilderness portions of the subbasin, and the impact of continued fire suppression elsewhere is evident in Figure 12.

Years of fire suppression in the subbasin have resulted in dramatically altered fire regimes (Figure 13). There has been a significant reduction in the extent of the non-lethal and mixed fire regimes. These fire regimes maintained late-seral single-layer types by thinning shade-tolerant tree species in early, mid, and late-seral multi layer types. Reductions in fire frequency have increased fuel loads and resulted in hotter burning more intense fires and a shift from non-lethal to lethal fire regimes in many areas (Quigley and Arbelbide 1997).

Table 14. Summary of area and percent of national forest lands burned in large (> 10 acre) fires within the Clearwater River subbasin by decade, and for the major fire years of 1910 and 1919

Decade	National Forest Acres Burned	National Forest % Burned[1]	Comments
1870–1879	50,809	---	Nez Perce NF Records only
1880–1889	200,579	---	Nez Perce NF Records only
1890–1899	70,338	---	Nez Perce NF Records only
1900–1909	45,856	---	Nez Perce NF Records only
1910–1919	1,522,588	41.0	
1920–1929	156,257	4.2	
1930–1939	283,008	7.6	
1940–1949	12,346	<1	
1950–1959	2,580	<1	
1960–1969	26,360	<1	
1970–1979	24,762	<1	
1980–1989	101,726	2.7	
1990–1998	82,360	2.2	Only includes 8 years of record
Decadal Average	198,428	5.3	
1910	814,975	21.9	
1919	655,028	17.6	

1 Percentages are based on current ownership and are for relative comparison only.

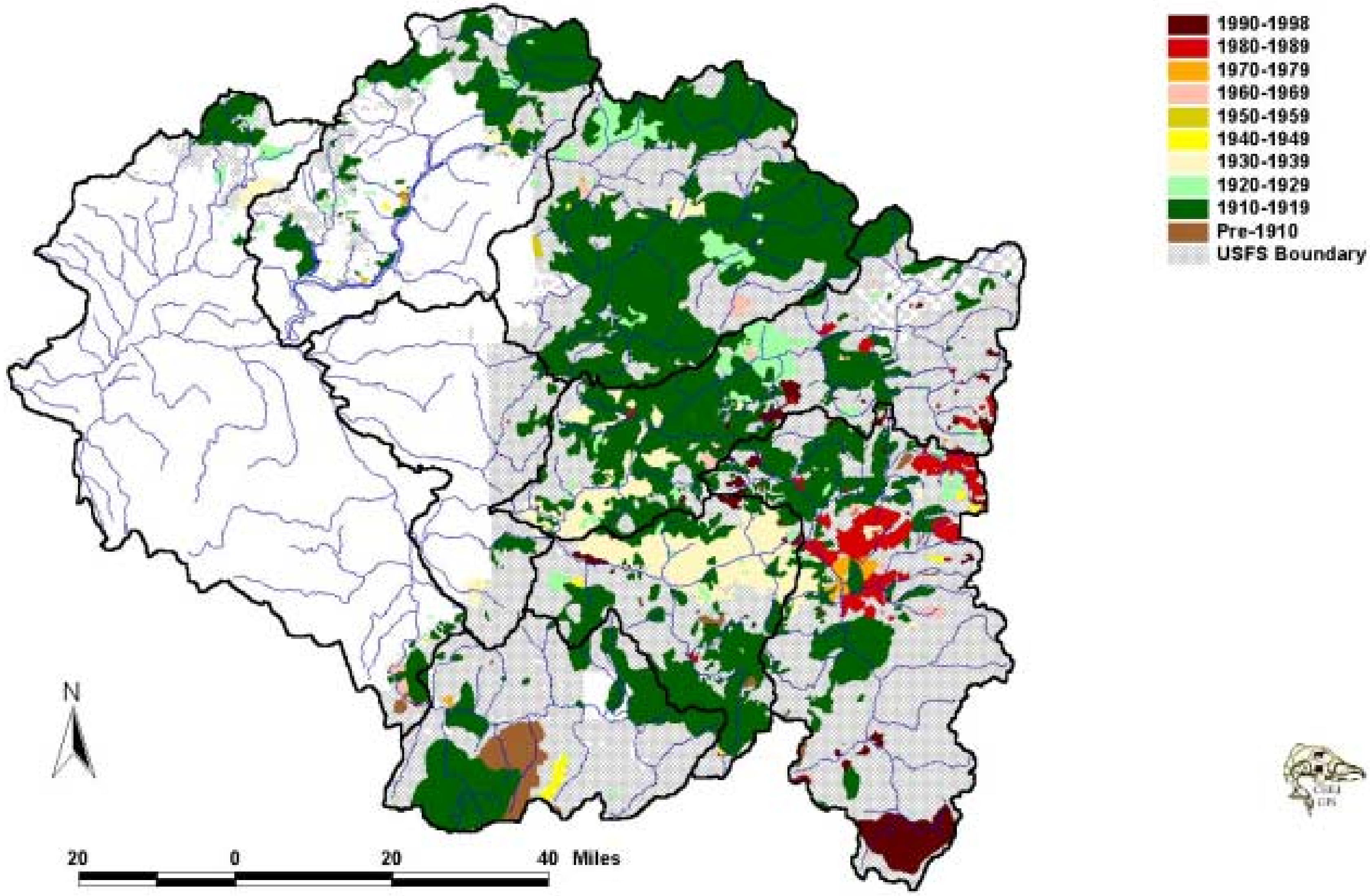

Figure 12. Decadal fire history of USFS lands within the Clearwater subbasin. Decadal information is stacked on the map, resulting in only the most recent burn period being shown

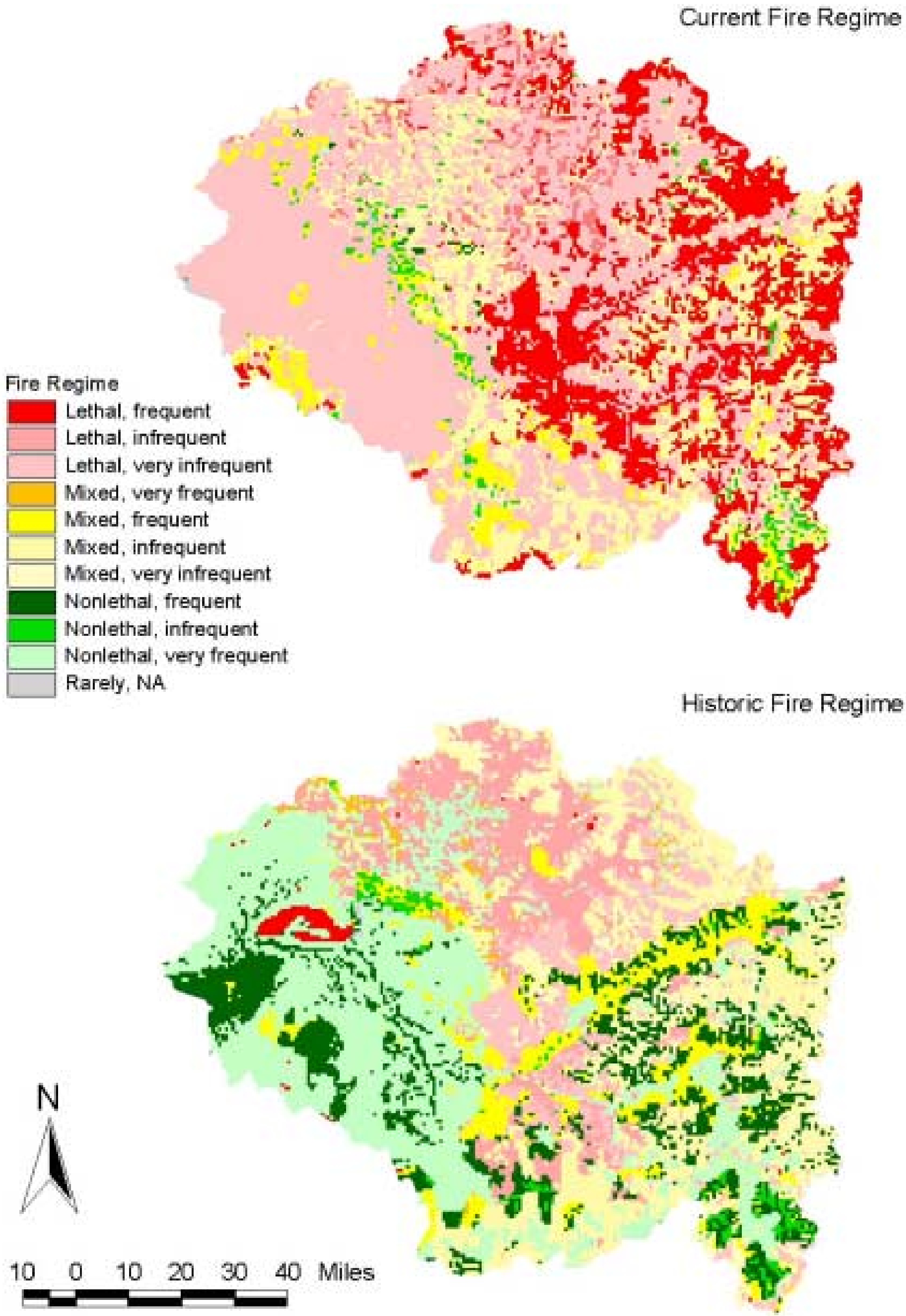

Figure 13. Historic and current fire regimes in the Clearwater subbasin

Shortened fire regimes in the grasslands can be attributed to the introduction of cheatgrass. Cheatgrass-dominated grasslands are more susceptible to fire due to their drying early in the season and their high density growth pattern which provides an unbroken flammable medium to carry fire. Once cheatgrass becomes established, the altered fire regime effectively excludes native grasses and shrubs that can take several years to decades to reestablish after fire (Quigley and Arbelbide 1997).

Population and Land Uses

More than two thirds of the total acreage of the Clearwater subbasin is evergreen forests (over four million acres), largely in the mountainous eastern portion of the subbasin. The western third of the subbasin is part of the Columbia plateau and is comprised almost entirely of crop and pastureland (Table 15; Figure 14). Most of the forested land within the Clearwater subbasin is owned by the federal government and managed by the USFS (over 3.5 million acres), but the state of Idaho, Potlatch Corporation and Plum Creek Timber Company also own extensive forested tracts (Table 16; Figure 15). The western half of the subbasin is primarily in the private ownership of small forest landowners and timber companies, as well as farming and ranching families and companies. There are some small private inholdings within the boundaries of USFS lands in the eastern portion of the subbasin. Nez Perce Tribal lands are located primarily within or adjacent to Lewis, Nez Perce, and Idaho Counties within the current boundaries of the Nez Perce reservation. These properties consist of both Fee lands owned and managed by the Nez Perce Tribe, and properties placed in trust status with the BIA. Other agencies managing relatively small land areas in the Clearwater subbasin include the NPS, BLM, USACE, and IDFG.

Demographics

An estimated population of 60,000 resides within the boundaries of the Clearwater subbasin, the majority within Nez Perce and Latah Counties. These counties are considered urban by the U.S. Census Bureau, maintaining an average population density of over 25 people per square mile. The other four counties are classified as either rural or frontier areas, with densities between 0.4-4.9 persons per square mile (McGinnis and Christenson 1996). Between 1990 and 1999 the population of the Clearwater grew by approximately 8.7% (Idaho Department of Commerce 2000; Table 17). Data compiled during the 2000 census was not yet available for use in this summary.

The perimeter of the Lower Clearwater AU includes the bulk of the population centers within the Clearwater watershed. The Lower Clearwater AU contains 19 towns with a total population of approximately 42,656. This includes the county seats of four of the six counties, and over 80% of the estimated population that reside within the Clearwater subbasin. The largest of these towns is Lewiston, with 41% of the total subbasin population of 30,597 people. The second largest is Grangeville, the county seat for Idaho County, with 3,377 people. The remaining towns within the boundaries of the Lower Clearwater AU have populations of under 1,000 people, only 1% of the total subbasin population, except for Kamiah with 1,304 people (Idaho Department of Commerce 2000).

Because county seats are centers for governmental, social, and economic activity, they consistently encompass over 30% of the total county population. They also have the highest growth rate for any of the population loci due to migration and natality. Between 1990 and 1998 all of the county seats within the incorporated counties of the Clearwater subbasin grew by at least 5% (U.S. Census Bureau 2000).

Table 15. Clearwater subbasin land use

Land Use	Acres
Evergreen forest land	4,277,815
Herbaceous rangeland	30,693
Shrub and brush rangeland	393,082
Non-forested wetland	1,123
Bare exposed rock	85,856
Lakes	2,447
Mixed rangeland	199,159
Cropland and pasture	765,926
Strip Mines	1,436
Reservoirs	17,805
Industrial	1,880
Commercial and services	2,660
Residential	6,443
Mixed urban or built-up	2,261
Other urban or built-up	368
Streams and canals	5,972
Transitional areas	251
Bare ground	2,928
Shrub and brush tundra	2,872
Mixed forest land	182,062
Deciduous forest land	3,057

Table 16. Approximate acreage owned or managed by various entities in the Clearwater subbasin.

Owner/Manager		Acreage (Rounded to nearest 100)
Federal Government		
	U.S. Bureau of Land Management	48,100
	U.S. Forest Service	3,714,700
	U.S. Army Corps of Engineers	15,700
	National Park Service	200
State Government		
	Idaho Department of Lands	300,300
	Idaho Dept. of Fish and Game	3,300
Nez Perce Tribe		
	Tribal Fee Lands	15,600
	Tribal Trust Lands	40,900
	Individual Allotments	47,000
Private Entities		
	Potlatch Corporation	415,000
	Plum Creek Timber Company	39,500
	Other Private Holdings	1,320,800

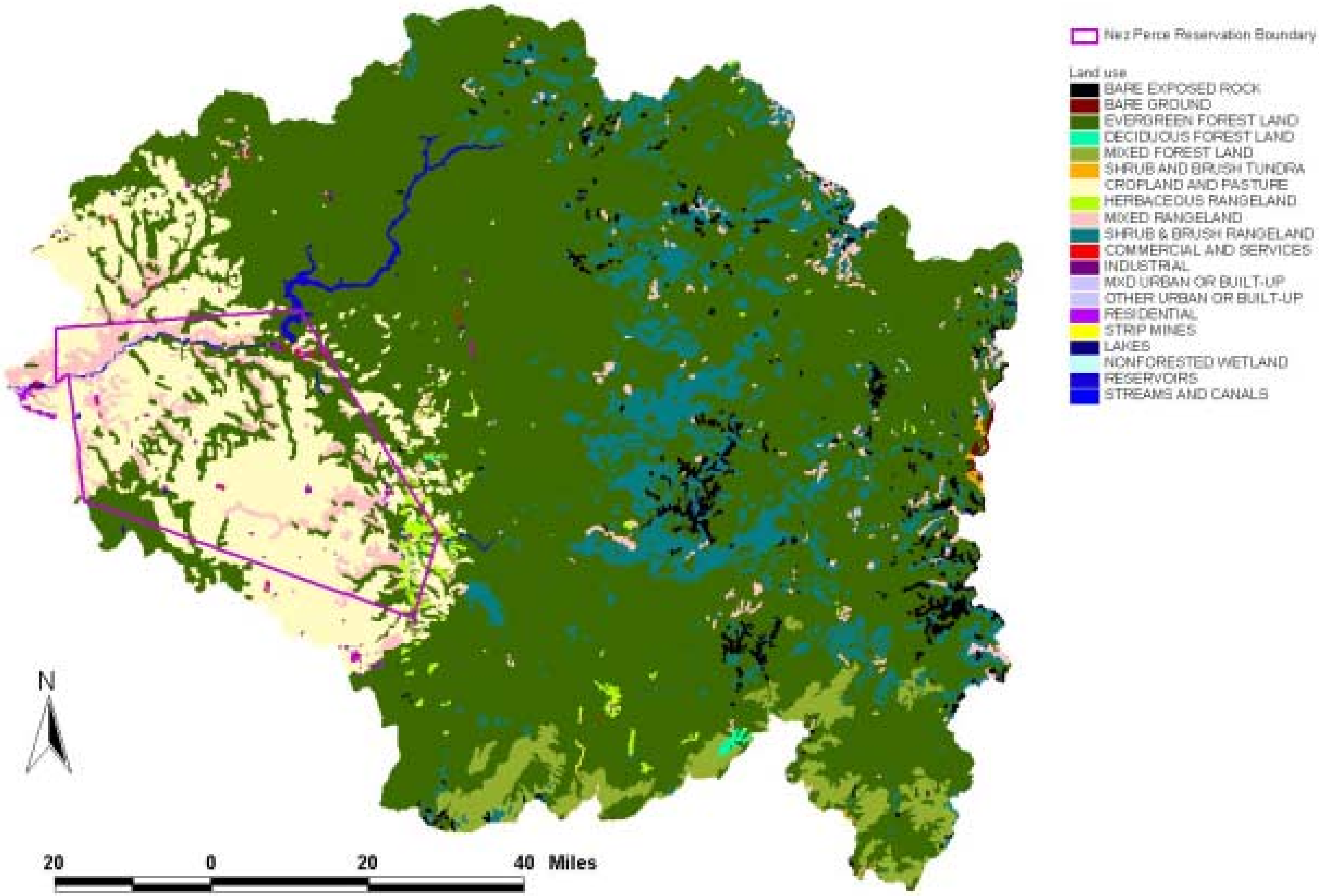

Figure 14. Clearwater subbasin land use

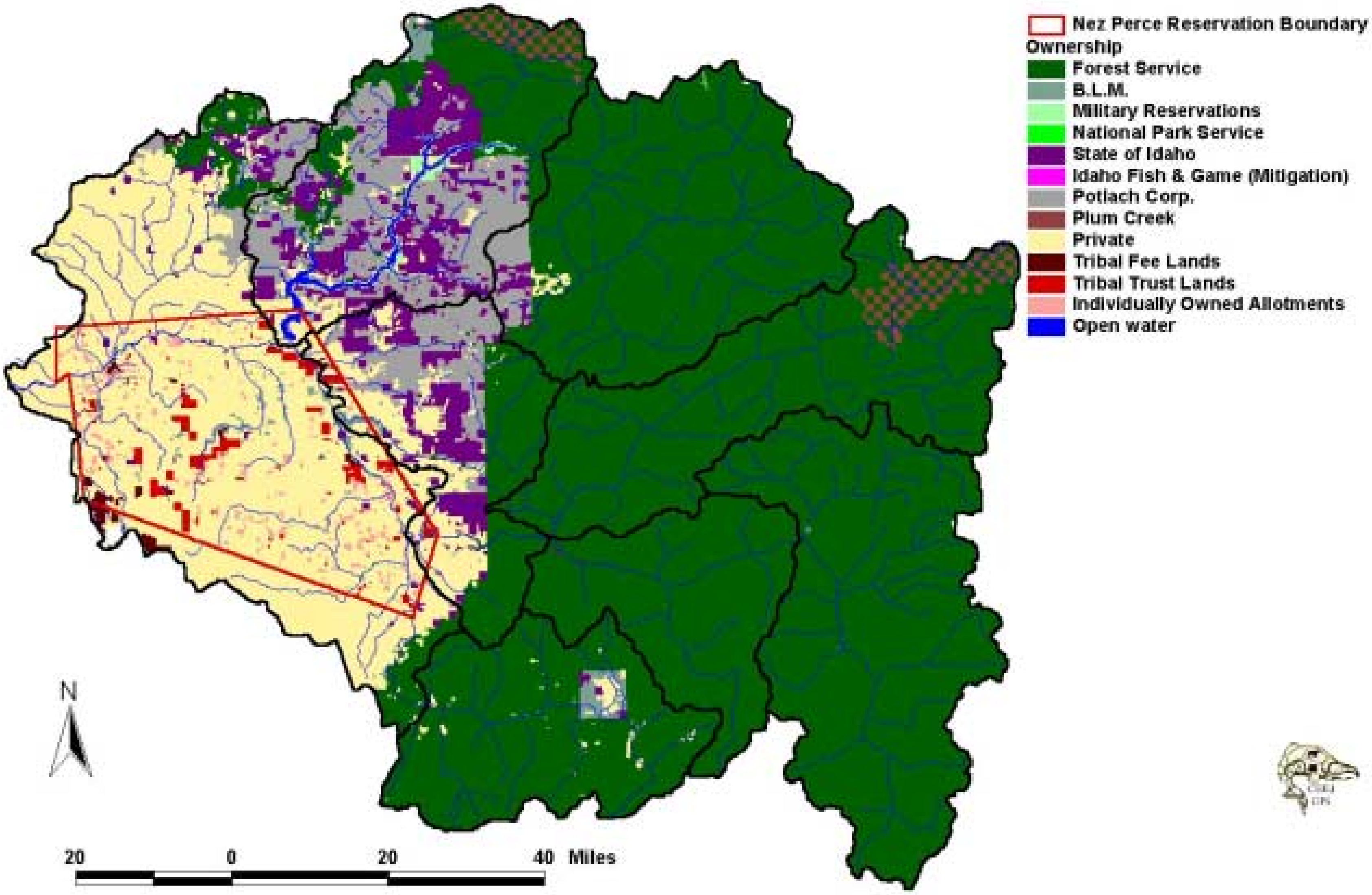

Figure 15. Clearwater subbasin land ownership

Table 17. Clearwater subbasin population trends by county (U.S. Census Bureau 2000)

County	1990	1999	# Change 1990-1999	% Change 1990-1999
Clearwater	8,505	9,359	854	10.0%
Idaho	13,768	15,030	1,262	9.2%
Latah	30,617	32,509	1,892	6.2%
Lewis	3,516	3,943	427	12.1%
Nez Perce	33,754	36,913	3,159	9.4%
State Total	1,006,734	1,251,700	244,966	24.3%

The median age of persons living in the Clearwater subbasin counties is approximately 35 years old. The distribution of races is broad, with the largest part of the minority community comprised of American Indians in all of the counties except Latah (Idaho Department of Commerce 2000).

Urban Development

Urban land uses comprise only 0.2% of the Clearwater subbasin. The largest urban area is Lewiston, which has the largest proportion of commercial, residential, and industrial site development in the subbasin. Characteristics of the Clearwater subbasin that hinder rapid urban development are its relative isolation from major transportation corridors such as an interstate or airport, a relatively large proportion of public land in the eastern portion of the subbasin, and rugged topography.

Although a minor influence so far, second homes, immigration by the affluent to rural areas for quality of life factors, and associated development could be increasing throughout the subbasin in future years. In addition, the decline of traditional economies such as forestry and agriculture will create a strong incentive for attracting urban industrial land uses to the subbasin to provide employment and revenue for local governments.

Many urban and ranchette developments in the lower Clearwater are located near streams. Septic systems, stormwater runoff, livestock management, home lawn and garden management, culverts, and roads all impact the natural resources in the area. The cumulative effects of these developments needs to be a consideration in any large scale watershed planning strategy.

Recreation

Recreation has become the dominant use of the Clearwater and Nez Perce National Forests. With the Selway Bitterroot Wilderness Area, wild and scenic rivers, world class big game hunting and trout fishing, and river rafting, the Clearwater subbasin is a recreation resource of national significance.

The steelhead sport fishery in the Clearwater Subbasin attracts anglers both from within Idaho and out-of-state, and is an important component of the local and state economy. During the 1999-2000 season 50,600 angler days (278,317 hours) were expended. Reading (1996) estimated that the average daily expenditure for steelhead anglers in the Clearwater in 1993 was $168.40. Using this figure, over $8,500,000 was generated during the 1999-2000 season.

General season chinook salmon fisheries have not been held since the 1970's. Recently, however, limited seasons were held in the Clearwater in 1997, 1998 and 2000. Almost 79,000 angler hours were expended in the two month season in 2000. Using an expansion of effort and average daily expenditure of $189.29 from the 1997 fishery (Reading 1999), $5.5 million direct expenditures and $9.5 million in economic activity occurred in the Clearwater drainage during the 2000 chinook season .

Dworshak Reservoir also provides a recreational resource of regional significance, with documented angler usage near 150,000 angler hours annually (Maiolie et al. 1993). Recreational use of Dworshak Reservoir and other recreational resources throughout the Clearwater subbasin is projected to increase dramatically in the coming decades.

Roads

Road construction is closely tied to land use patterns, and may be dictated by some uses (i.e. timber harvest) and dictate where other uses are likely to occur (i.e. recreational access). Roads on the plateau in the southwestern part of the subbasin are typically rural and access roads for modern agriculture and are easily recognized by their straight north/south and east/west alignment with right angle turns around private properties (Figure 16). Road densities are greatest in the central portions of the subbasin where logging roads predominate, commonly exceeding 3 miles/square mile and often exceeding 5 miles/square mile (Figure 17).

There is relatively little road development in the eastern part of the subbasin. The Selway-Bitterroot and Gospel-Hump Wilderness Areas contribute to the lack of road development in some areas, as does the local fire history. The distribution of logging roads in the Clearwater subbasin is notably tied to fire history, with most currently existing forest roads located in areas that did not burn during major fires of 1910 and 1917.

Timber

Industrial forestry practices have occurred in the Clearwater subbasin since the late 19th century. The first significant commercial logging began in the Clearwater in the 1880s, but did not take off on a grand scale until Fredrick Weyerhaeuser's Clearwater Timber Company began bringing logs out of the upper Clearwater country by rail to the world's largest electrically driven sawmill, built on the banks of the Clearwater River at Lewiston, Idaho in 1927 (Woods and Horstmann 1994).

Much of the federal forest land in the basin was set aside as the Bitterroot Forest Reserve in 1897. Today, the Clearwater, Nez Perce, St. Joe, and Bitterroot National Forests comprise most of the forest in the subbasin. Logging on these national forests was minimal prior to WWII: the largest cut on the Clearwater National Forest prior to 1946 was 18.0 million board feet (mbf). After the war the annual cut increased dramatically and has been at or above 100 mbf from 1959 (Cooper et al. 1987) until the 1990s.

The cut has declined through the 1990s, dropping to only 25 mbf (Craig Mitchell, Clearwater National Forest, personal communication 1998). Much of this reduction has been due to restrictions on harvest due to ESA listed salmon stocks, concerns with resident salmonids, lack of resolution on the management of remaining roadless areas on the forest, and change in Forest Service management policy. Recent timberland ownership and production by county and ownership is presented in Table 18, Table 19, Table 20, and Table 21 for the five principle counties encompassing the Clearwater subbasin (Shoshone county is excluded since only a very small proportion of the county in located in the Clearwater subbasin).

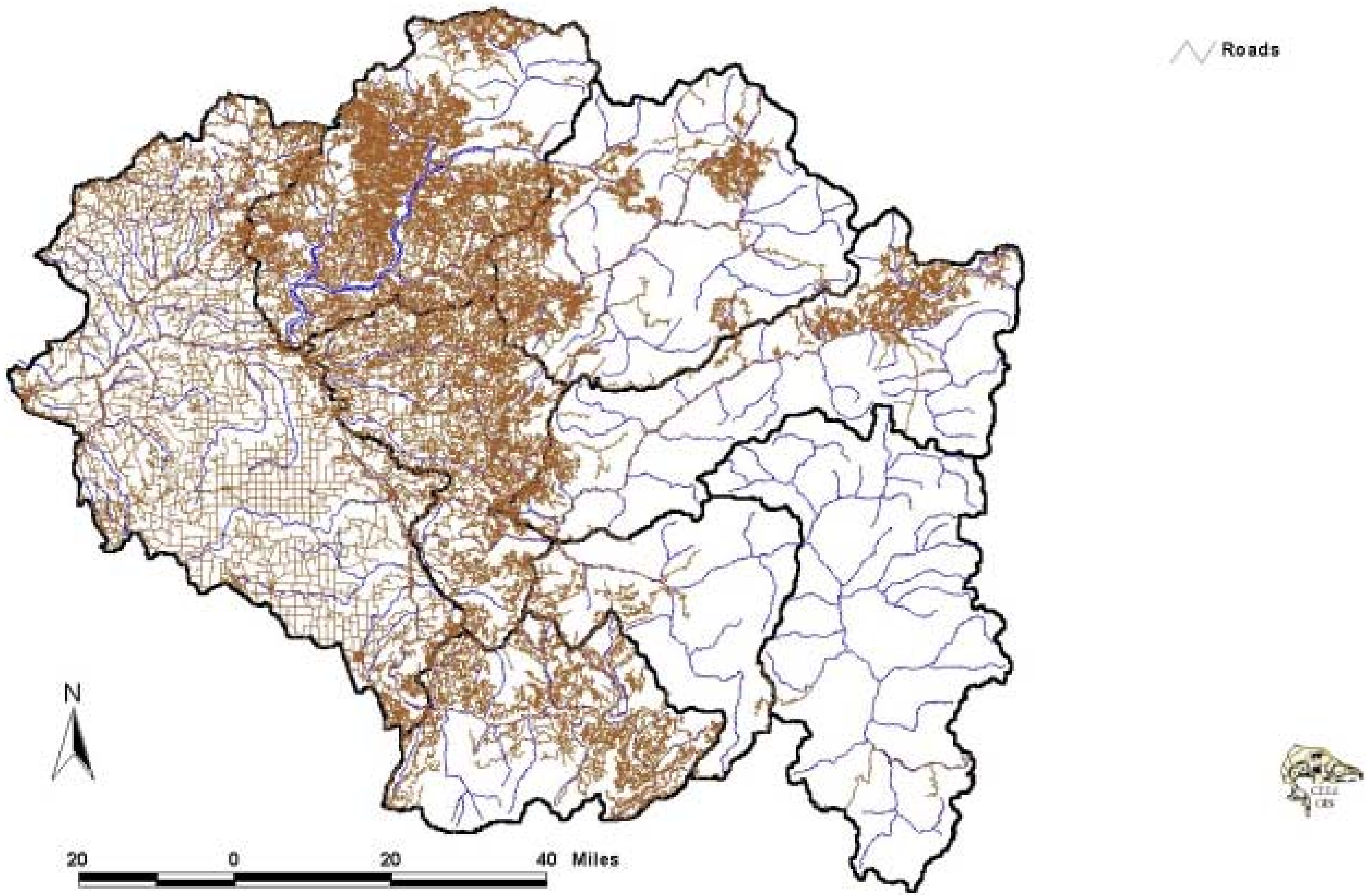

Figure 16. Road distribution throughout the Clearwater subbasin

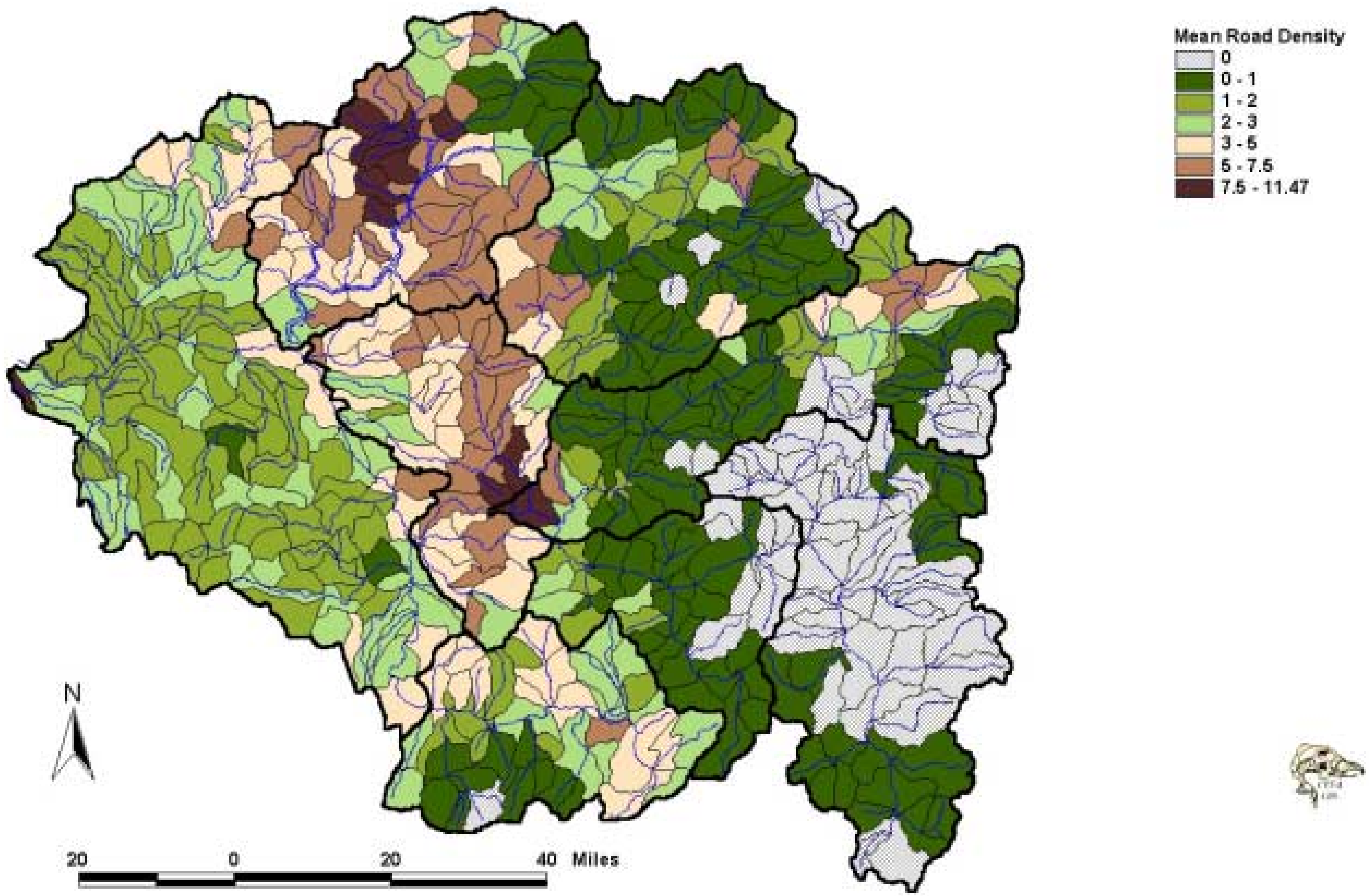

Figure 17. Mean road density within the Clearwater subbasin plotted by 6th field HUC

Table 18. Acres of timberland by county and ownership class (1991) - thousand acres (FIA Database Retrieval System 2001)

County	All Ownerships	USFS	BLM	Nez Perce Tribe	State	County and Municipality	Forest Industry	Farmer/ Rancher	Corporation	Individual	Misc. Federal
Idaho	2497	2094	53	7	66	0	53	176	6	42	0
Clearwater	1235	532	0	0	244	0	361	44	0	25	29
Latah	426	175	0	0	36	0	105	92	0	18	0
Lewis	76	0	7	11	0	0	0	58	0	0	0
Nez Perce	96	0	0	7	13	0	0	47	29	0	0
All Counties	4330	2800	60	25	359	0	518	417	35	86	29

Table 19. Timber harvest (MBF) by ownership during 1996 for the five principal counties in the Clearwater subbasin

	National Forest	Other Public Lands	Forest Industry	Other Private Lands	Total
MBF Timber Removed	149,691	115,269	285,274	163,428	713,713

Table 20. Timber harvest (MBF) by county during 1996.

	Clearwater	Idaho	Latah	Lewis	Nez Perce	Total
MBF Timber Removed	353,537	170,246	149,060	24,732	10,408	713,713

Table 21. Harvest (MBF) of various timber products by ownership removed during 1996

MBF Timber Removed	Saw Logs	Veneer Logs	Pulp Wood	Fuel Wood	Post Poles Pilings	Other Products	All Products
National Forest	88,100	5,752	11,903	11,950	2,203	9,352	117,555
Other Public Lands	66,814	7,176	22,525	612	2,515	1,375	89,659
Forest Industry	109,061	59,105	87,209	20,738	0	3,094	226,236
Other Private Lands	104,089	2,602	22,386	19,925	229	567	129,039
Total	368,064	74,636	144,024	53,225	4,940	14,387	562,489

Agriculture

Agriculture primarily affects the western third of the subbasin on lands below 2,500 feet elevation, primarily on the Camas Prairie both south and north of the mainstem Clearwater and the Palouse. Additional agriculture is found on benches along the main Clearwater and its lower tributaries such as Lapwai, Potlatch, and Big Canyon Creeks. Hay production in the meadow areas of the Red River and Big Elk Creek in the American River watershed accounts for most of the agriculture in the South Fork Clearwater AU (Clearwater Basin Bull Trout Technical Advisory Team 1998d). Total cropland and pasture in the subbasin exceeds 760,000 acres (Table 22). Table 22 indicates the scale of agricultural production in the area by county, as well as some indication of how agricultural activity has changed over a 10-year period.

Agriculture is a particularly large part of the economy in Nez Perce, Latah, Lewis, and Idaho Counties, which all have large areas of gentle terrain west of the Clearwater Mountains. Small grains are the major crop, primarily wheat and barley. Landscape dynamics, hydrology, and erosion in these areas are primarily determined by agricultural practices. In recent years programs run by NRCS have made headway in addressing some of the worst erosion problems on these lands.

The Conservation Reserve Program (CRP) as managed by NRCS assists farmland owners and operators in conserving and improving soil, water, and wildlife resources. Highly erodible and other environmentally sensitive acreage previously devoted to the production of agricultural commodities is converted to a long-term approved cover for 10 to 15 years. CRP enhances habitats, forage, and sediment delivery reduction. Signups have been occurring since the 1985 Farm Bill (Greg Schlenz, NRCS, personal communication January 3, 2001). The CRP has made improvements to over 79,000 acres within the Clearwater subbasin from 1986-2001 (U.S. Department of Agriculture 2000a; Table 23).

Grazing

Historical information on livestock grazing within the Clearwater subbasin is limited in scope and availability, pertaining almost entirely to the Clearwater National Forest. Although no information is available regarding the earliest numbers of sheep grazed, historical documentation suggests that grazing of sheep on National Forest lands began as early as the 1890s (Space 1964). Due to both increased forage available caused by fires and the end of World War I, numbers of sheep grazed within the Clearwater National Forest increased through the mid 1930s, peaking at about 33,300 in 1933. Intensity of sheep grazing declined sharply in subsequent years to 2,000 by 1949, and remained relatively consistent until the mid 1960s.

Permits for cattle grazing were not issued in the Clearwater National Forest until 1937, with 25 head permitted. By 1943, over 400 head of cattle were permitted for grazing in the Clearwater National Forest and although it was suggested that grazing pressure was too heavy even at these levels, it was considered a wartime necessity. Cattle grazing continued to increase, reaching 1,199 head by 1960 (Space 1964).

Available data on current grazing distribution is limited to allotments on public lands within the subbasin. Grazing also occurs over much of the privately owned land. Associated data on grazing intensity is limited to permitted numbers of animal unit months (AUMs) and does not necessarily reflect actual numbers of animals grazed. This lack of accurate data, especially on private lands, makes summarization of realized grazing intensity impractical for the subbasin as a whole using information on grazing allotments and associated AUMs.

Table 22. Indicators of agricultural production

Year/ County	Farms (#)	Land in Farms (ac)	Total Cropland (ac)	Pasture (ac)	Wheat (bu)	Barley (bu)	Hay (tons)	Beans (100 wt)	Cattle (#)	Grazing Perm (#)	CRP (ac)	Fertilizer (ac)	Pesti-cides (ac)	Herbi-cides (ac)
1987														
Clearwater	216	134,891	40,095	5,910	560,933	296,028	11,262	1 farm	4,852	32	429	16,581	4,798	12,354
Idaho	774	802,746	265,065	502,919	4,304,514	1,971,819	62,271	1 farm	49,736	101	5,999	114,034	21,765	66,719
Latah	644	352,777	263,759	72,141	6,595,679	2,154,124	24,232	10,629	12,385	42	4,788	158,075	93,194	125,654
Lewis	191	222,624	157,551	58,890	3,509,523	1,806,156	12,174	0	6,466	20	6 farms	112,794	48,322	75,962
Nez Perce	405	473,987	216,575	247,886	5,942,291	1,529,791	16,244	24,469	16,082	30	1,463	135,106	74,536	136,514
1997														
Clearwater	210	73,103	41,614	7,327	436,644	331,159	14,101	2,741	3,963	23	2,570	23,215	9013+	10,759
Idaho	661	193,582	225,585	429,546	3,726,933	1,738,752	73,653	2 farms	41,393	117	11,519	120,417	15,955	86,468
Latah	659	325,484	237,543	65,497	5,759,698	1,177,324	34,882	15,890	10,301	43	32,743	134,913	63,277	131,173
Lewis	182	193,582	140,160	46,629	3,497,755	1,292,117	12,191	0	4,723	15	3,697	99,868	23,339	79,263
Nez Perce	383	339,476	208,288	130,778	5,922,902	1,280,687	21,640	74,736	14,168	35	5,874	142,912	47,164	130,443
% Change														
Clearwater	-2.8	-45.8	3.8	19.3	-22.2	11.9	25.2	~300	-18.3	-28.1	499.1	40.0	~87.84	-14.8
Idaho	-14.6	-75.9	-14.9	-14.6	-13.4	-11.8	15.5	~100	-16.8	15.8	92.0	5.6	-26.7	29.6
Latah	2.3	-7.7	-9.9	-9.2	-12.7	-45.3	44.0	49.5	-16.8	2.4	583.9	-14.7	-32.1	4.4
Lewis	-4.7	-13.0	-11.0	-20.8	-0.3	-28.5	0.1	0.0	-27.0	-25.0	~516.7	-12.9	-51.7	4.3
Nez Perce	-5.4	-28.4	-3.8	-47.2	-0.3	-16.3	33.2	205.4	-11.9	16.7	301.5	5.8	-36.7	-4.4

Table 23. Clearwater subbasin CRP practices in acreage from 1986-2001 (U.S. Department of Agriculture 2000a)

County	Conservation Reserve Practice by Activity Acre								
	Established Grass	Introduced Grasses	Native Grasses	Tree Planting	Established Trees	Wildlife Habitat	Wildlife Food Plots	Filter Strips	Riparian Buffers
Clearwater	1,481.9	894.6	1,637.9	257.1	20.0	0	0	0	142.2
Idaho	8,168.6	2,590.5	441.0	623.7	454.6	2,156.1	98.9	37.2	4.0
Latah	20,284.4	16,220.3	4,973.1	1,029.4	1,259.5	677.8	30.4	84.6	25.4
Lewis	1,345.5	2,813.9	799.0	562.3	89.6	239.7	59.6	92.7	316.8
Nez Perce	1,390.4	3,191.3	700.4	214.5	5.4	3,326.9	36.7	170.5	5.6

Current grazing distribution and intensity was estimated in a relative sense for each HUC according to the percent of the total land area defined as grazeable. Using available GIS layers, the distributions of known grazing allotments and other grazeable lands (as defined in the USGS GIRAS database) were combined to estimate the actual area of lands potentially grazed on both public and private lands throughout the subbasin. The grazeable area within each 6^{th} field HUC was summarized as a percentage of the total land area (Figure 18).

Subwatersheds with the highest proportion of grazeable area (> 50%) within the Clearwater subbasin are typically associated with USFS grazing allotments in lower elevation portions of their ownership areas (Figure 18). However, the majority of lands managed by the USFS within the Clearwater subbasin are not subjected to grazing by cattle or sheep, including all or nearly all of the Upper Selway, Lochsa, and Upper and Lower North Fork AUs.

Subwatersheds outside of the Forest Service boundary typically have less than 25% of the land area defined as grazeable, although this is as much as 75% for some. Privately owned property within the subbasin typically contains a high percentage of agricultural use, with grazeable lands found only in uncultivated areas. In contrast, grazing allotments on Forest Service lands are typically large, often encompassing multiple HUCs, resulting in higher proportions of grazeable area than those contained in primarily privately owned lands.

Mining

The South Fork Clearwater drainage in particular has a complex mining history that included periods of intense placer, dredge, and hydraulic mining (Paradis et al. 1999b). Within the North Fork drainage, mining activity was widely dispersed and methods used varied by area and included dredging, hydraulics, draglines, drag shovels, and hand operations (Staley 1940).

Mining of placer and surface deposits is more often represented by mining claims than by physical mines. Mine claim density is typically indicative of relatively small-scale placer and dredging operations, and impacts of these operations are often more directly tied to streams than those of mines themselves.

Mines are distributed throughout all eight AUs in the Clearwater subbasin, with the lowest number of occurrences in the Upper and Lower Selway AUs (Figure 19) Ecological hazard ratings for mines (delineated by ICBEMP) indicate that the vast majority of mines throughout the subbasin pose a low relative degree of environmental risk. However, clusters of mines with relatively high ecological hazard ratings are located in the South Fork AU and in the Orofino Creek drainage (Lolo/Middle Fork AU).

Mining claims are most widely and densely distributed within the South Fork drainage, although substantial numbers of claims have been staked in other areas as well (Figure 20). Mining claims are also aggregated in a line extending from the upper Middle Fork and lower Lochsa River northward to Orogrande Creek, then along the upper North Fork to its headwaters including Meadow, Long, Osier, and upper Kelly Creeks. Another conglomeration of mining claims exists in the Little North Fork drainage, and includes the Foehl Creek drainage and an adjacent portion of the Little North Fork itself. Within the Clearwater basin, mining claim distribution does not correspond well with the general distribution of actual mines, although exceptions to this can be seen in the South Fork and Osier Creek (Upper North Fork) drainages. Effects of past placer mining activity, including extensive dredge spoils, are still evident, particularly in the South Fork AU.

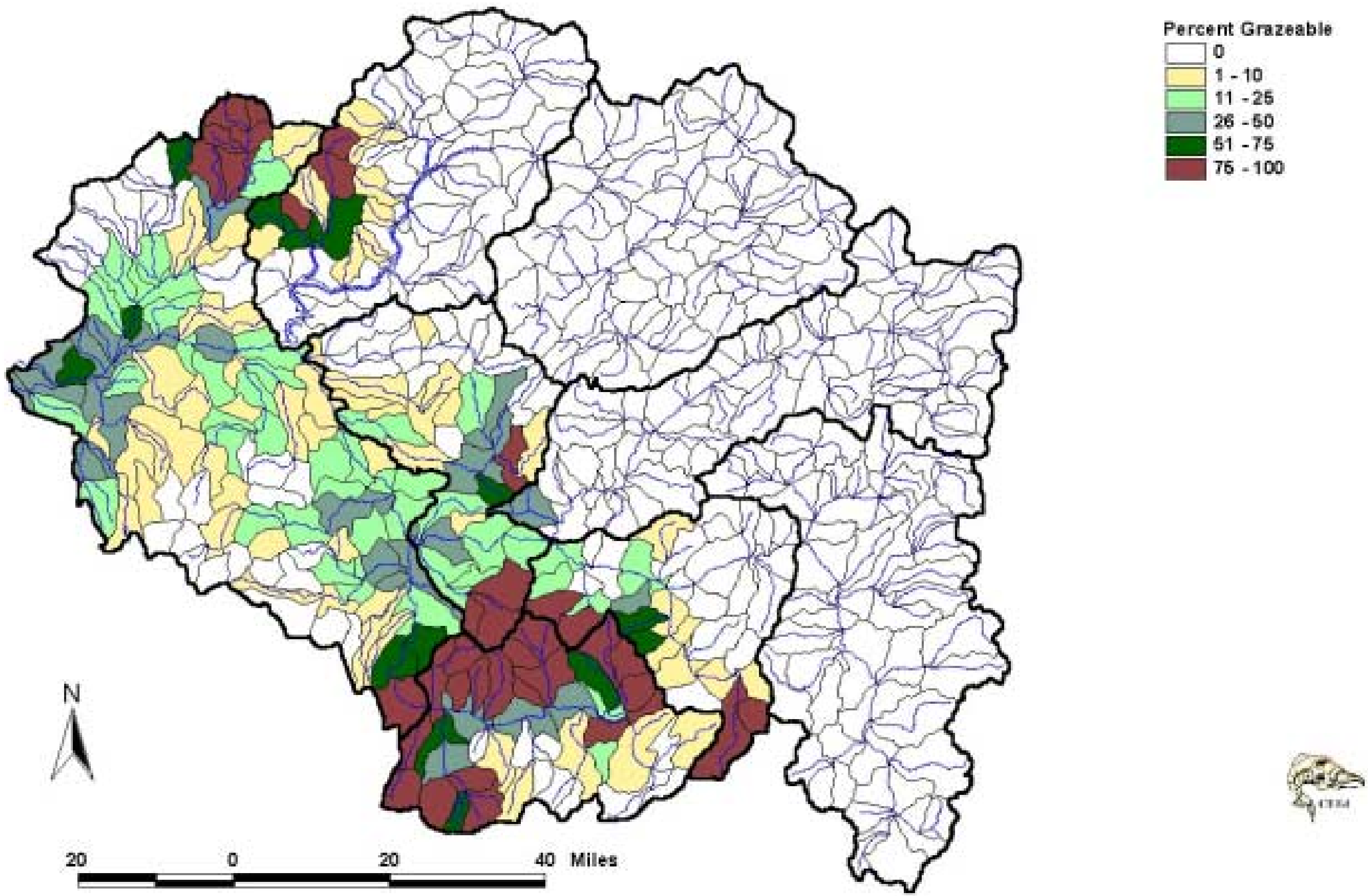

Figure 18. Spatial distribution of probable grazing activities within the Clearwater subbasin and the approximate percentage of each subwatershed defined as grazeable

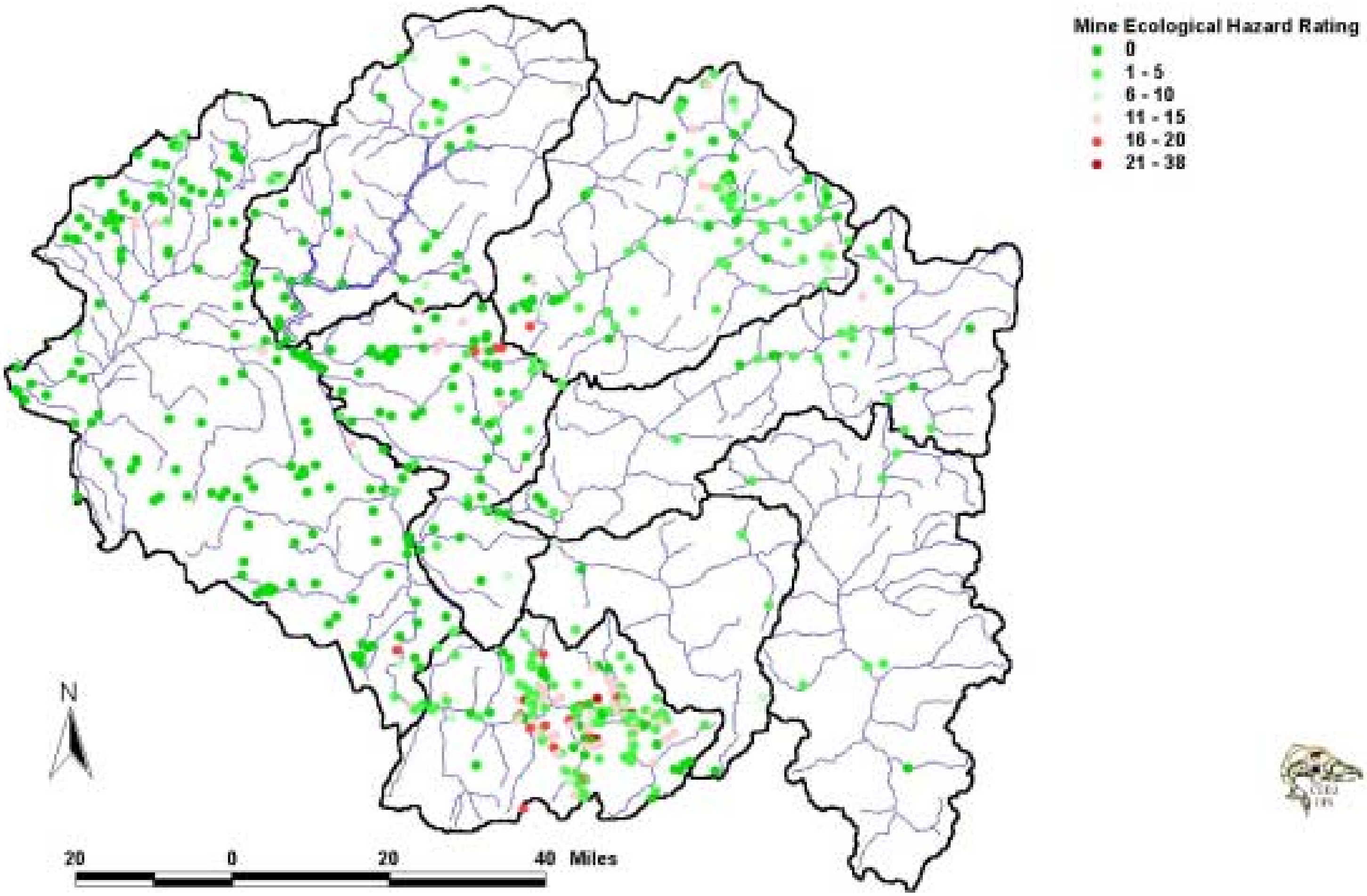

Figure 19. Mine locations throughout the Clearwater subbasin. Color codes signify relative ecological hazard of individual mines as defined by ICBEMP

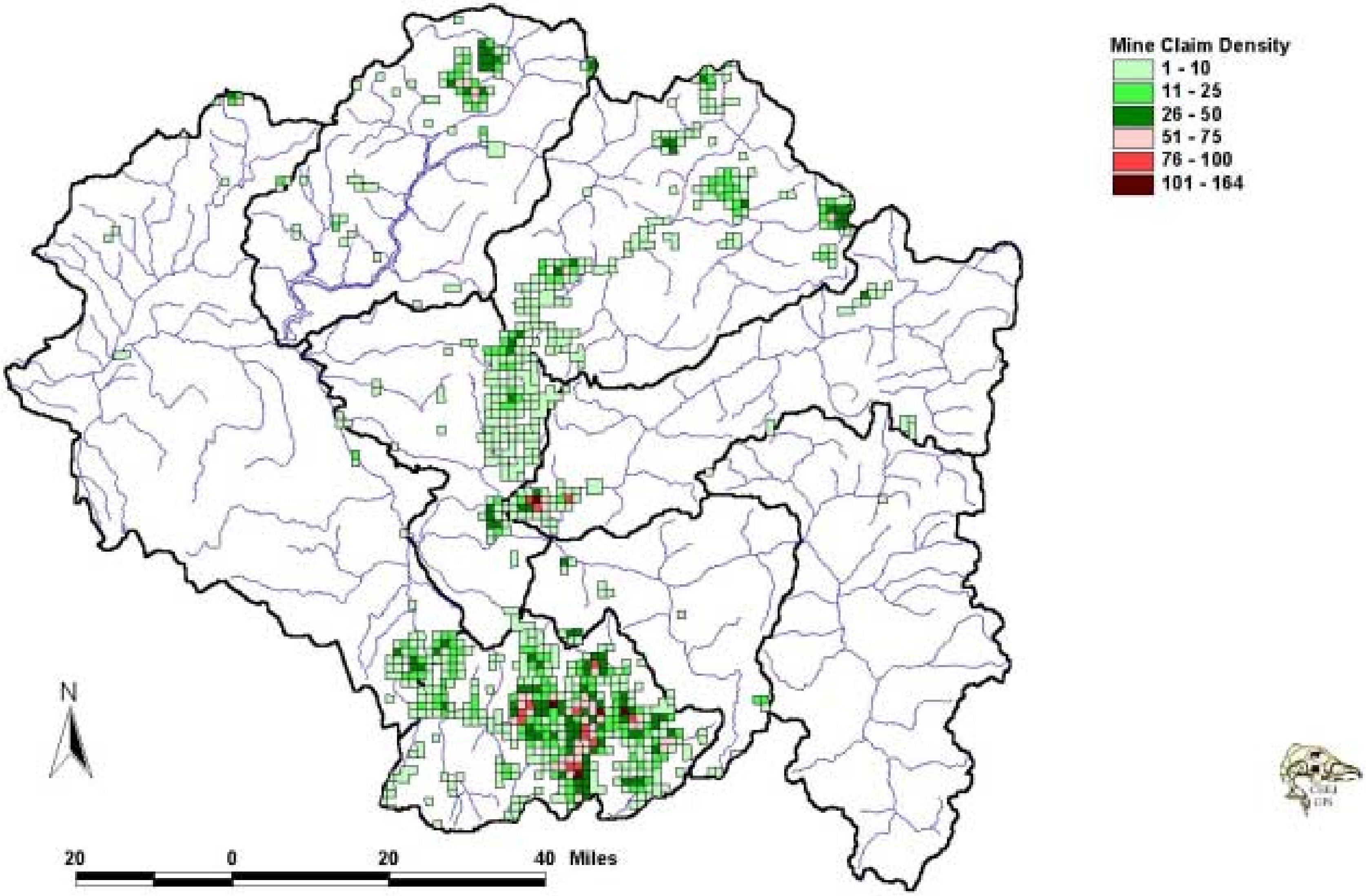

Figure 20. Mining claim distribution and density within the Clearwater subbasin

Diversions, Impoundments, and Irrigation Projects

Based on records obtained from the Idaho Department of Water Resources, 70 dams currently exist within the boundaries of the Clearwater subbasin (Figure 21). The vast majority of existing dams exist within the Lower Clearwater AU (56), although dams also currently exist in the Lower North Fork (3), Lolo/Middle Fork (5), and South Fork (6) AUs. Of the 70 dams, descriptive data concerning the size, capacity and ownership is available for only 46 (Table 24). The remainder are thought to be small earthen structures with minimal storage capacity.

The seven largest reservoirs in the subbasin provide recreational and other beneficial uses. Dworshak, Reservoir A, Soldiers Meadows, Winchester, Spring Valley, Elk River, and Moose Creek reservoirs all provide recreational fishing opportunity. Reservoir A and Soldiers Meadows Reservoir are also part of the Lewiston Orchards Irrigation District irrigation system. Capacity of other reservoirs within the Clearwater subbasin is limited to 65 acre-feet or less, and in most cases is less than 15 acre-feet (Table 24), limiting their recreational capacity.

At 219 m in height with a reservoir approximately 86 km long and a maximum depth of 194 m, Dworshak Dam is the largest straight axis concrete dam in the United States. Dworshak reservoir extends 54 miles into the North Fork Clearwater River Canyon and provides 3.453 million acre-feet of storage, making it the largest storage project within the Nez Perce Tribe ceded area and the state of Idaho (Idaho Department of Fish and Game and Nez Perce Tribe 1991; U.S. Army Corps of Engineers 1975). Located two miles above the mouth of the North Fork Clearwater River he dam blocked fish passage for anadromous fish to spawning habitat that could accommodate 109,000 steelhead trout redds and 74,000 chinook salmon redds (U.S. Fish and Wildlife Service 1962). The dam also inundated 16,970 acres of terrestrial and riverine habitats at full pool (U.S. Army Corps of Engineers 1975).

The project was authorized primarily for flood control (Mehrhoff and Sather-Blair 1985), with other purposes including power generation, commercial navigation and recreation (U.S. Army Corps of Engineers 1974). Planning for the dam and reservoir was initiated by the USACE in the 1950s. Authority for construction was contained in Public Law 87-874, Section 201 of the Flood Control Act of 1962 in accordance with House Document 403, 87th Congress, 2nd Session (U.S. Army Corps of Engineers 1975). On September 27, 1971, the river diversion tunnel was sealed and Dworshak Reservoir was formed (Hanson and Martin 1989). Filling of the reservoir was started in 1972 and power generation began in 1973 (U.S. Army Corps of Engineers 1974). The final environmental impact statement (EIS) was completed in 1985 (Hanson and Martin 1989).

The reservoir behind the dam is 86 km long at full pool. Maximum and mean depths are 194 m and 56 m, respectively. Surface area at full pool is 6,644 ha with 5,400 ha of kokanee habitat (defined as the area over 15 m deep). Drawdowns for flood control may lower the surface elevation 47 m and reduce surface area by as much as 52%. The reservoir has a mean retention time of 10.2 months and a mean annual discharge of 162 m^3/s (Falter 1982). High releases from the reservoir occur during spring run-off, during late summer when water is released for anadromous fish flows, and during the fall when the reservoir is lowered for flood control.

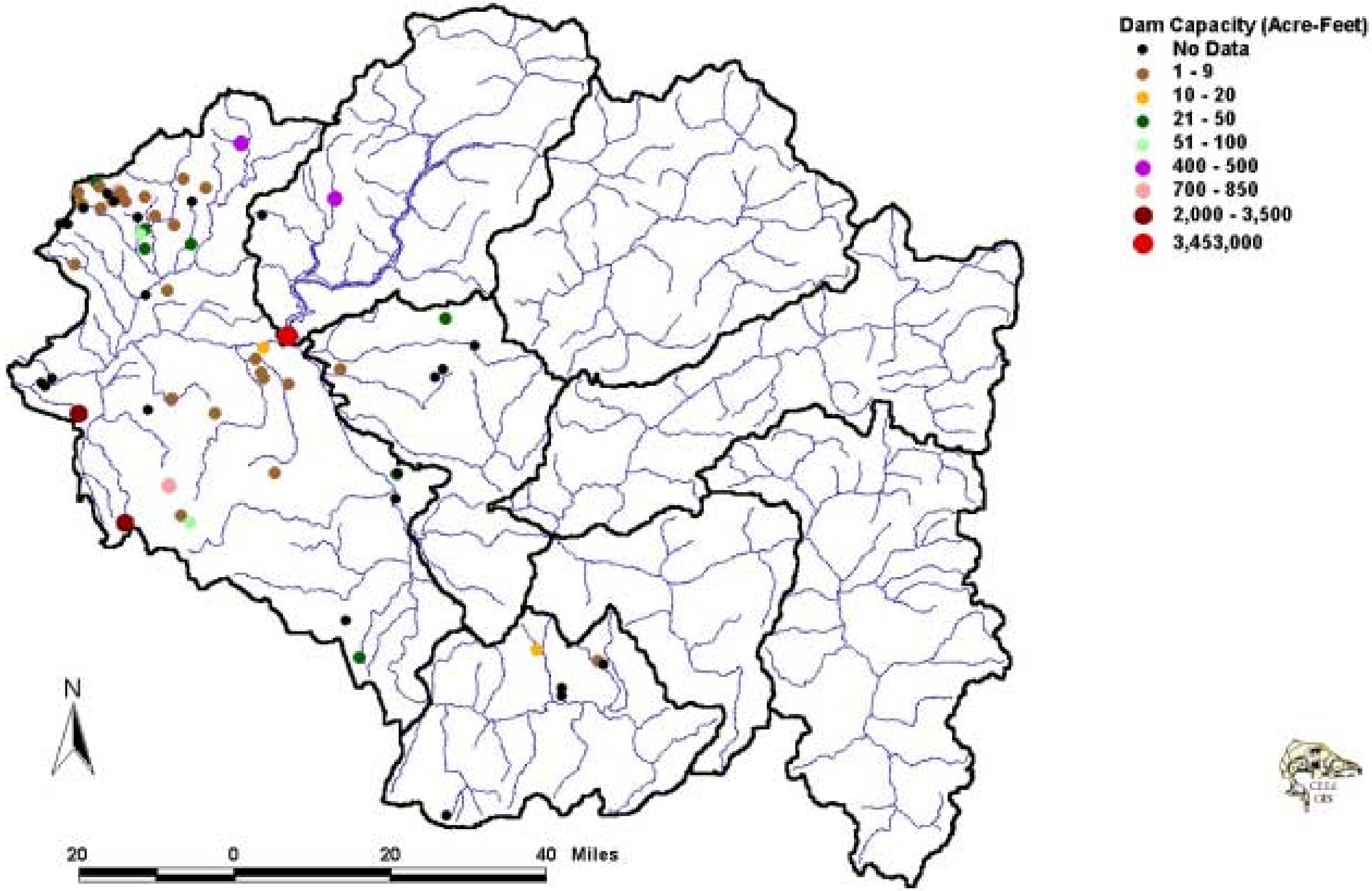

Figure 21. Location of existing dams within the Clearwater subbasin

Table 24. Information pertaining to dams located within the Clearwater subbasin, ordered by reservoir storage capacity

Dam Name	Stream	Type	Storage Capacity (Acre-ft)	Height (feet)	Reservoir Area (Acres)	Year Filled	Owner
Dworshak	N Fork Clearwater R.	Concrete	3,453,000	633.0	16,417	1973	U S Army Corps Of Engineers
Reservoir A (Manns Lake)	Sweetwater Creek (Os)	Earth	3300	57.0	145	1907	U S Bureau Of Reclamation
Soldiers Meadow	Webb Creek	Earth	2370	50.0	121	1923	U S Bureau Of Reclamation
Winchester (Lapwai Lake)	Lapwai Creek	Earth	850	36.0	98	1910	Idaho Fish And Game Department
Spring Valley	Spring Valley Creek	Earth	721	42.3	53	1962	Idaho Fish And Game Department
Elk River	Elk Creek	Earth	481	11.0	61	1951	Elk River Recreation Dist.
Moose Creek	Moose Creek	Earth	420	15.0	70	1960	Idaho Department Of Lands
Nelson	Tr-Big Bear Creek	Earth	65	13.5	9	1907	Maxine Nelson
Talmaks Campground	N Fk Willow Creek	Earth	56	7.0	10		U S Bureau Of Indian Affairs
Mud Springs [1]		Earth					US Bureau of Indian Affairs
Thompson No 1	Tr-Little Canyon Ck.	Earth	54	15.0	7	1967	Tim Craig
Arneberg	Tr-Dry Creek	Earth	45	19.0	6	1952	Arneberg Brothers
Mariposa Foundation	Tr-Pine Creek	Earth	38	19.0	7	Prop	Mariposa Foundation Inc.
Campbells Pond	Hay Creek	Earth	35	19.0	7	1939	Idaho Department of Fish and Game
Spencer	Tr-Threemile Creek	Earth	30	13.0	5	1954	Spencer Ranch Inc.
Reierson	Tr-Little Bear Creek	Earth	30	14.5	5	1901	Paul E Reierson Trust
Troy	Big Meadow Creek	Earth	25	43.0	2	1950	City Of Troy
Rundell	Tr-Tom Taha Creek	Earth	23	14.5	6	1975	Richard Duclercque
Thompson No 2	Tr-Clearwater River	Earth	11	16.0	3	1970	Clint Thompson
Newsome Creek	Tr-Newsome Creek	Earth	10	20.0	1	Prop	U S Forest Service
Ericson Creek	Ericson Creek	Earth	9	16.0	2	1975	U S Forest Service
Stauber	Tr-Little Potlatch Creek	Earth	9	14.3	3	1991	Erik Stauber
Bower	Tr-Pine Creek	Earth	9	15.0	2	Unk.	Charles Bower
Thompson	Tr-Little Canyon Creek	Earth	9	21.0	2	Unk.	George Thompson
Ruckman	Tr-Sixmile Canyon	Earth	9	15.0	2	Unk.	Edward And Thomas Ruckman

Table 24 (Continued)

Dam Name	Stream	Type	Storage Capacity (Acre-ft)	Height (feet)	Reservoir Area (Acres)	Year Filled	Owner
Carlson No 3	Tr-Big Meadow Creek	Earth	8	14.0	3	Unk.	Dave Carlson
Pfeifer	Tr-Lapwai Creek	Earth	8	15.0	1	Prop	Ronald And Judy Pfeifer
Butler	Tr-Cottonwood Creek	Earth	8	18.3	1	1950	Evelyn Bulen
Hofstrnd	Tr-Felton Creek	Earth	7	15.0	1	1996	Mark And Debra Hofstrand
Ewert (Carlson No 2)	Tr-Big Meadow Creek	Earth	6	15.0	1	Unk.	Steve Ewert
Kingery	Tr-Mt Deary Creek	Earth	6	11.4	1	1991	Peggy E Kingery
Henderson	Tr-Holes Creek	Earth	6	18.0	1	1958	Wynne Henderson
Stillman No 1	Tr-Little Canyon Creek	Earth	6	14.0	1	Unk.	Carl Stillman
Stillman No 2	Tr-Little Canyon Creek	Earth	6	16.0	1	Unk.	Carl Stillman
Bowman	Tr-Jim Ford Creek	Earth	5	11.2	1	1994	Dwight Bowman
Olson	Tr-W Fk Little Bear Ck	Earth	5	17.0	1		Lester And Nancy Morfin
Carlson No 1	Tr-Spring Valley Creek	Earth	3	12.0	1	1966	Dave Carlson
Henry	Tr-Wauncher Gulch	Earth	3	14.0	1	1969	Allen Henry
Albers	Tr-Little Canyon Creek	Earth	2	14.0	1	1979	Raymond Albers
Hokanson	Tr-Dry Creek	Earth	2	17.0	1	1972	Kenneth Hokanson
Caldwell No 1	Tr-Randal Flat Creek	Earth	2	19.0	1	1977	Delbert Caldwell
Caldwell No 2	Tr-Randal Flat Creek	Earth	2	14.0	1	Unk.	Delbert Caldwell
Feldman	Tr-Spring Valley Creek	Earth	2	16.0	1	1971	L Gene Feldman
Gilder	Tr-Spring Valley Creek	Earth	2	16.0	1	1971	Glen Gilder
Deters	Tr-Big Meadow Ck.	Earth	1	12.0	1	1978	Don Deters
Winn	Tr-Brush Creek	Earth	1	14.0	1	1971	Mrs Clarence Winn
Kerley	Tr-Dry Creek	Earth	1	12.0	1	1985	Mike Kerley

1 Mud Springs Dam is not included in the IDWR database. Information supplied by Nez Perce Tribe.

Numerous dams that have been removed from the Clearwater subbasin had substantial impacts on fisheries resources within the subbasin. Lewiston dam, constructed in 1927 on the lower Clearwater River near the present site of the Potlatch pulp mill (RM 4) and operated by Washington Water Power, virtually eliminated chinook salmon runs and substantially reduced steelhead runs into the Clearwater subbasin (Nez Perce Tribe and Idaho Department of Fish and Game 1990). Modifications were later made to Lewiston Dam to facilitate fish passage, and the dam was removed in 1973 as part of the Lower Granite Lock and Dam Project.

A low-head hydroelectric diversion dam on the North Fork Moose Creek (Upper Selway AU) thought to be a partial barrier for anadromous species was removed in the mid 1960s (Nez Perce Tribe and Idaho Department of Fish and Game 1990). A dam constructed by Washington Water Power in 1910 on the lower South Fork Clearwater (RM 22) near the town of Harpster blocked anadromous salmon species from the South Fork Clearwater River. The dam formed a complete barrier to fish migration, and anadromous salmonids were excluded from the upper watershed from 1911 to 1935 and from 1949 until 1963, when the dam was removed (Paradis et al. 1999b). A fish ladder was installed in the dam in 1935 and was destroyed in 1949 by high flows (Paradis et al. 1999b). Murphy and Metsker (1962) reported that steelhead were able to pass over the dam from 1935-1949, but Siddall (1992) reported that the dam failed to pass significant numbers of fish during this period.

The Dewey Dam was built in about 1895 on the South Fork Clearwater River about 0.1 miles above the mouth of Mill Creek (Gerhardt 1999). The dam washed out after only a few years. The Dewey Dam was approximately 6-8 feet high and there is no known documentation of fish passage conditions.

The Kooskia Flower Mill Dam located on the Clearwater River about one mile above the mouth of the South Fork Clearwater River was built prior to 1910 and was in place until some time in the 1930's (Gerhardt 1999). The dam is estimated to have been about 6 feet high, and although fish passage is not documented, it has been suggested that upstream migration of anadromous salmonids was probably not impaired by this structure (Gerhardt 1999).

Dams in the Clearwater subbasin have also had an effect on resident fishes such as bull trout and cutthroat trout. Free movement was blocked, resulting in fragmentation of metapopulations, especially for the North Fork Clearwater River. The impact due to this is not known (Jody Brostrom, Idaho Department of Fish and Game, personal communication, March 30, 2001).

Small scale irrigation, primarily using removable instream pumps, is relatively common for hay and pasture lands scattered throughout the lower elevation portions of the subbasin, but has not been quantified. The only large scale irrigation/diversion system within the Clearwater subbasin is operated by the Lewiston Orchards Irrigation District within the Lower Clearwater AU. The District's irrigation water supply depends on surface water runoff from the Sweetwater Creek drainage, a tributary to Lapwai Creek. Water is stored in three reservoirs, and delivered through a system of canals and natural streams (Morrison Knudsen Corporation 1992). The storage reservoirs include two man-made reservoirs (Reservoir A and Soldiers Meadows) and one natural lake (Lake Waha). Water is diverted from Soldiers Meadows, Lake Waha, and Sweetwater Creek to Reservoir A through Webb Creek Canal, Lake Waha Feeder Canal, Sweetwater Canal, and Sweetwater and Webb Creeks.

Protected Areas

Approximately 47% of the Clearwater subbasin is designated as having some degree of protected status, the majority of which is designated as either inventoried roadless or wilderness area (Table 25). Wild and scenic river corridors and research natural areas are each present in seven of eight AUs in the Clearwater subbasin. Other less abundant protected areas include wilderness study areas, areas of critical environmental concern (presented by ICBEMP without definition), special interest areas, and areas maintained by the National Park Service.

The vast majority of protected areas are in the eastern half of the subbasin (Figure 22), and on lands managed by the U.S. Forest Service. Of eight AUs in the Clearwater subbasin, four have 75% or more of their total land area included in protected areas; the entire Upper Selway AU is protected, and the Upper North Fork, Lochsa and Lower Selway AUs each have at least 75% of their land area designated as protected (Table 25).

Inventoried roadless areas account for the largest proportion of protected area within the Clearwater subbasin, accounting for 51% of all protected areas. Inventoried roadless areas consist of over 2,200 mi^2, or roughly 24% of the Clearwater subbasin. Roadless areas are primarily located in the Upper North Fork, Lochsa, and Lower Selway AUs.

Portions of the Selway-Bitterroot and Gospel Hump Wilderness exist within the Clearwater subbasin, contributing substantially to the total protected area. The Selway-Bitterroot Wilderness encompasses portions of the upper and lower Selway and Lochsa AUs. The Gospel Hump Wilderness extends into the southern edge of the South Fork AU. Combined, the two wilderness areas encompass approximately 1,950 mi^2 within the Clearwater subbasin, accounting for 21% of the total land area and nearly 45% of the total protected area.

Table 25. Approximate area (mi^2) within each AU with various forms of protected status. Numbers in parenthesis represent approximate percent of total land area

Assessment Unit	Inventoried Roadless	Wilderness Areas	Wilderness Study Area	Wild and Scenic River Corridor	Areas of Critical Environmental Concern	Research Natural Area (RNA)	RNA in Wilderness Area	Special Interest Area	National Park Service	Total
Lower Clearwater	0.0	0.0	0.0	15.9 (0.7)	0.0	0.0	0.0	0.0	0.2 (0.0)	16.2 (0.8)
Lower North Fork	215.4 (18.7)	0.0	5.8 (0.5)	19.2 (1.7)	4.2 (0.4)	6.6 (0.6)	0.0	0.2 (0.0)	0.0	251.4 (21.8)
Upper North Fork	962.1 (74.4)	0.0	0.0	0.0	0.0	2.6 (0.2)	0.0	0.0	0.0	964.7 (74.6)
Lolo / Middle Fork	46.1 (6.0)	0.0	0.0	12.2 (1.6)	5.8 (0.8)	0.7 (0.1)	0.0	0.2 (0.0)	0.0	65.1 (8.4)
Lochsa	514.2 (43.7)	369.3 (31.4)	0.0	38.7 (3.3)	0.0	4.9 (0.4)	1.5 (0.1)	0.0	0.0	928.6 (78.8)
Lower Selway	343.8 (51.9)	216.2 (32.6)	0.0	21.4 (3.2)	0.0	13.2 (2.0)	0.0	0.0	0.0	594.6 (89.8)
Upper Selway	50.1 (3.7)	1,266.8 (94.1)	0.0	30.8 (2.3)	0.0	1.3 (0.1)	0.0	0.0	0.0	1,349.0 (100.0)
South Fork	81.1 (10.2)	101.3 (12.8)	0.0	14.3 (1.8)	0.1 (0.0)	1.6 (0.2)	1.1 (0.1)	0.0	0.0	199.4 (25.1)
Totals	2,212.8	1,953.7	5.8	152.5	10.1	30.9	2.5	0.5	0.2	4,369.0 (46.7)

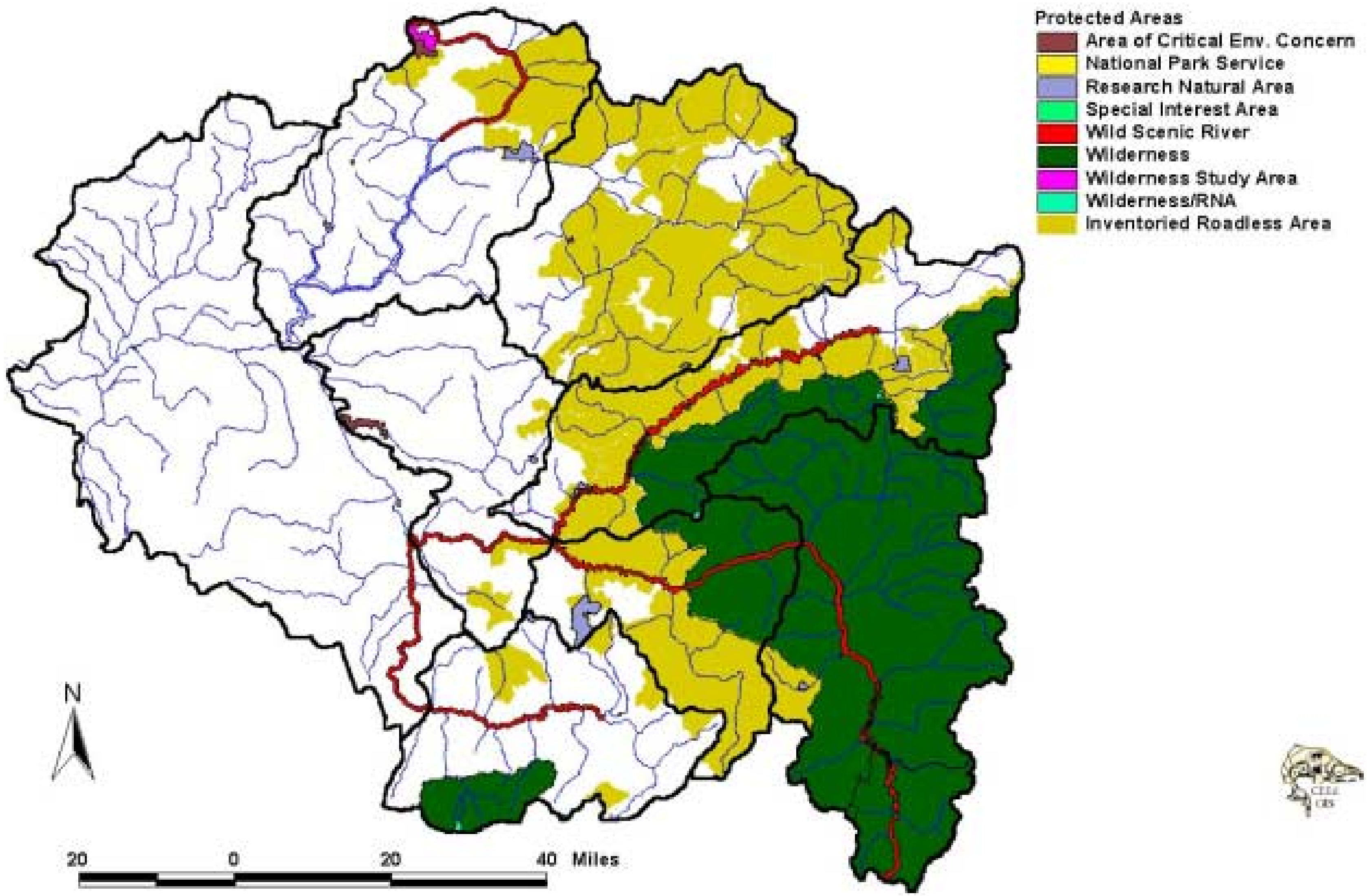

Figure 22. Protected areas within the Clearwater subbasin

Fish and Wildlife Resources

Fish Status

There are currently more than 30 species of fish inhabiting the Clearwater subbasin, including 19 native species, two of which have been reintroduced (Table 26). Salmonids and cyprinids are most numerous, representing 10 and 6 species, respectively. Exotic species within the subbasin are generally introduced sport or forage species, and include primarily centrarchids, ictalurids, and salmonids.

Five fish species have been chosen as focal species in this summary: chinook salmon (*Oncorhynchus tshawytscha*), steelhead trout (*Oncorhynchus mykiss* subspecies), westslope cutthroat trout (*Oncorhynchus clarki lewisi*), bull trout (*Salvelinus confluentus*) and brook trout (*Salvelinus fontinalis*). Focal species may serve as indicators of larger communities, and are listed by federal and/or state agencies as species of concern or, in the case of brook trout, have the potential to negatively impact other selected species. In addition, focal species had adequate data available for species status, distribution, and habitat use to aid future decision-making.

Information is also provided for additional species of interest for which only limited data exists, redband trout (*Oncorhynchus mykiss* subspecies), Pacific lamprey (*Lampetra tridentata*) and coho salmon (*Oncorhynchus kisutch*). Although species status is discussed, data limitations for these species prohibits substantial consideration of limiting factors and distribution or condition of existing habitat areas.

The resident fishery in Dworshak Reservoir is also considered a substantial fishery resource in the Clearwater subbasin. The Dworshak Reservoir fishery involves multiple species, and is addressed as a single fishery rather than as a large number of individual species.

Distribution and status information was compiled for the five focal species using 23 data sources. Sources included regional, state, and localized databases, recent agency publications and assessments, and personal interviews with regional biologists. For the purpose of starting with consistent and subbasin-wide distribution and status information for each species, GIS layers were obtained from the most recent (2000) updates to the ICBEMP database. The ICBEMP layers were then modified using data from the other 22 sources. In making revisions to the ICBEMP data layers, a list of rules was applied to ensure consistent consideration of sources (based on data age, etc…) and resolution of conflicting data sources (i.e. presence vs. absence).

Chinook Salmon

Two chinook salmon ESUs are recognized by the National Marine Fisheries Service (NMFS) under the Endangered Species Act, spring/summer and fall chinook salmon. For the purpose of this document, three life history forms of chinook salmon will be discussed; spring, fall, and early-fall chinook salmon. Early-fall chinook salmon are distinguished by the Nez Perce Tribe (Hesse and Cramer 2000) as "fish that spawn principally in October, and would have a life history similar to that of summer chinook salmon in the mid-Columbia (October spawning and subyearling smolts), but not to the Snake River summer chinook salmon (late August-early September spawning and yearling smolts)." Early fall chinook are not recognized or described by other management agencies. The historical summary of life-history/run timing of summer chinook salmon in the Clearwater River subbasin is described in Richards (1967) and Nez Perce Tribe and Idaho Department of Fish and Game (1990).

Table 26. Fish species inhabiting the Clearwater subbasin

Species – Common Name	Scientific Name	Origin
Pacific Lamprey	*Lampetra tridentata*	Native
Chinook Salmon (Spring)	*Oncorhynchus tshawytscha*	Reintroduced
Chinook Salmon (Fall)	*Oncorhynchus tshawytscha*	Native / Reintroduced
Steelhead/Rainbow/Redband Trout	*Oncorhynchus mykiss*	Native / Exotic [1]
Coho Salmon	*Oncorhynchus kisutch*	Reintroduced
Kokanee	*Oncorhynchus nerka*	Exotic
Westslope Cutthroat Trout	*Oncorhynchus clarki lewisi*	Native
Bull Trout	*Salvelinus confluentus*	Native
Brook Trout	*Salvelinus fontinalis*	Exotic
Golden Trout	*Salmo aguabonita*	Exotic
Arctic Grayling	*Thymallus arcticus*	Exotic
Mountain Whitefish	*Prosopium williamsoni*	Native
Tiger Muskie	*Esox lucius x masquinongy*	Exotic
Carp	*Cyprinus carpio*	Exotic
Northern pikeminnow	*Ptychocheilus oregonensis*	Native
Chiselmouth	*Acrocheilus alutaceus*	Native
Peamouth	*Mylocheilus caurinus*	Native
Longnose Dace	*Rhinichthys cataractae*	Native
Speckled Dace	*Rhinichthys osculus*	Native
Redside shiner	*Richardsonius balteatus*	Native
Largescale sucker	*Catostomus machrocheilus*	Native
Bridgelip Sucker	*Catostomus columbianus*	Native
Channel catfish	*Ictalurus natalis*	Exotic
Black Bullhead	*Ictalurus melas*	Exotic
Brown bullhead	*Ictalurus nebulosus*	Exotic
Sandroller	*Percopsis transmontana*	Native
Smallmouth bass	*Micropterus dolomieu*	Exotic
Largemouth bass	*Micropterus salmoides*	Exotic
Bluegill	*Lepomis macrochirus*	Exotic
Pumpkinseed	*Lepomis gibbosus*	Exotic
Black crappie	*Pomoxis nigromaculatus*	Exotic
Yellow Perch	*Perca flavescens*	Exotic
Mottled Sculpin	*Cottus bairdi*	Native
Shorthead sculpin	*Cottus confusus*	Native
Paiute sculpin	*Cottus beldingi*	Native
Torrent sculpin	*Cottus rhotheus*	Native

1 Includes exotic resident rainbow trout

Indigenous chinook salmon in the Clearwater River subbasin were eliminated by Lewiston Dam (Schoen et al. 1999; U.S. Fish and Wildlife Service 1999; Murphy and Metsker 1962). However, naturalized populations of spring chinook salmon have been re-established in some portions of the subbasin as a result of reintroduction efforts (Schoen et al. 1999; Larson and Mobrand 1992). Reintroduction efforts for fall chinook salmon were considered unsuccessful (Hoss 1970), and existing fall chinook salmon runs in the Clearwater subbasin may have resulted from re-colonization from Snake River stock(s). Fall chinook salmon in the Clearwater River are considered part of a single genetically similar aggregate upstream of Lower Granite Dam and describe as one evolutionarily significant unit (Waples et al. 1991).

Historical status

Sources suggest that spring, summer (Simpson and Wallace 1982), and fall (Clearwater National Forest 1997; Nez Perce Tribe and Idaho Department of Fish and Game 1990; Columbia Basin Fish and Wildlife Authority 1991) chinook were likely present within the mainstem Clearwater River prior to 1900. The U.S. Fish and Wildlife Service (1999) claim it is reasonable to assume that fall chinook spawning occurred within the lower Clearwater River prior to dam construction on the Snake River.

Historical numbers of chinook salmon entering the Clearwater River subbasin are assumed to be substantial, but no documentation on actual numbers is available (Nez Perce Tribe and Idaho Department of Fish and Game 1990). Chapman (1981) modeled “pristine production” of chinook salmon (race not clearly defined, presumably spring and fall) from the Clearwater subbasin, estimating that 1.5 million smolts were produced resulting in 87,433 adults returning to the mouth of the Columbia River annually. The majority of historical chinook salmon production was thought to occur in major tributary systems of the Clearwater River (North, South, and Middle Forks), with less than 10% of total production in the mainstem reach (Clearwater National Forest 1997). Within the mainstem portion of the Clearwater River, the most substantial production of spring chinook salmon probably occurred in the Lolo and Potlatch Creek drainages (Clearwater National Forest 1997; Clearwater Basin Bull Trout Technical Advisory Team 1998b).

Spring Chinook Salmon

Spring chinook salmon within the Clearwater subbasin are excluded from the ESU encompassing other spring/summer stocks throughout the Snake River basin, but represent an important effort aimed at restoring an indigenous fish population to an area from which they had been extirpated. Efforts to reestablish spring chinook salmon in the subbasin were extensive and have previously been summarized by Nez Perce Tribe and Idaho Department of Fish and Game (1990), Cramer and Neeley (1992), and Cramer (1995), and Bowles and Leitzinger (1991). Currently hatchery spring chinook are released for harvest mitigation and to supplement natural production (Nez Perce Tribe and Idaho Department of Fish and Game 1990; Idaho Department of Fish and Game 2001b)

Re-introduction of spring chinook salmon following removal of the Lewiston Dam has resulted in naturally reproducing runs in Lolo Creek, and mainstems and tributaries of the Lochsa, Selway, and South Fork Clearwater Rivers (Larson and Mobrand 1992). Founding hatchery stocks used for spring chinook salmon re-introductions were primarily obtained from the Rapid River Hatchery (Kiefer et al. 1992; Nez Perce Tribe and Idaho Department of Fish and Game 1990). Initially however, spring chinook stocks imported for restoration came from Carson, Big White, Little White or other spring chinook captured at Bonneville dam (Nez Perce

Tribe and Idaho Department of Fish and Game 1990). Genetic analyses confirm that existing natural spring chinook salmon in the Clearwater River subbasin are derived from reintroduced Snake River stocks (Matthews and Waples 1991).

Spring chinook salmon enter the Columbia River and begin spawning migrations during April and May, reaching the Clearwater subbasin from April through July (Nez Perce Tribe and Idaho Department of Fish and Game 1990). Spring chinook salmon indigenous to the Snake River basin tend to spawn earlier and higher in elevation than summer (early-fall) and fall races (Chapman et al. 1991). Spawning of spring stocks typically occurs in tributaries and headwater streams in August and September. Eggs hatch in December with emergence complete by April (Nez Perce Tribe and Idaho Department of Fish and Game 1990; U.S. Fish and Wildlife Service 1999). Spring chinook salmon remain in freshwater for one year, migrating to the ocean in the spring of their second year, typically from March through June (U.S. Fish and Wildlife Service 1999; Walters et al. 2001). Nearly all adult spring and summer chinook that return to the Snake River basin result from fish that smolted as yearlings in April-May (Matthews and Waples 1991).

Although spring chinook salmon smolt as yearlings, in-basin migrations as fry or parr are not uncommon. Fry dispersal was well documented in the Selway River during studies of chinook salmon re-introductions (Cramer 1995). A second downstream migration of spring chinook salmon in the upper portion of the rearing areas again occurs in the fall as juveniles seek suitable winter habitat (Hesse et al. 1995; Walters et al. 2001).

Little is known about the distribution of Snake River spring chinook salmon in the ocean, because few are ever caught in ocean fisheries. Analyses of Coded-Wire Tag (CWT) recoveries from Snake River spring chinook salmon during the intensive ocean fisheries of the 1980's indicated that harvest rate of these fish in the ocean was less than 1% (Berkson 1991).

Distribution of spring chinook salmon to the North Fork Clearwater River is blocked by Dworshak Dam, and with the exception of the mainstem migration corridor, they are absent from the Lower Clearwater AU (Figure 23). The current distribution of spring chinook salmon within the Clearwater subbasin includes the Lolo Creek drainage and all major drainages above the confluence of the Middle and South Forks of the Clearwater River. Relatively contiguous distributions of spring/summer chinook salmon exist in the Lolo/Middle Fork, South Fork, and Upper and Lower Selway AUs. Spring/summer chinook salmon are absent from many tributaries in the Lochsa River drainage, but found in Pete King and Fish Creeks, and most tributaries above (and including) Warm Springs Creek.

Spring chinook salmon are classified as "present – depressed" in all areas of the Clearwater subbasin where status information is available (Figure 23). Aerial surveys of spring chinook salmon redds in the Clearwater subbasin have been conducted since 1966. Data has been collected from established reaches on an annual basis in both natural production areas as well as areas where production is regularly influenced by hatchery releases of chinook salmon. Table 27 illustrates trends in chinook salmon redds counted by aerial surveys (summarized by AU) since 1966. Additional redd count information is also presented for spring chinook salmon in Nez Perce Tribal Hatchery Monitoring and Evaluation streams and for Idaho Supplementation Studies streams (Table 28).

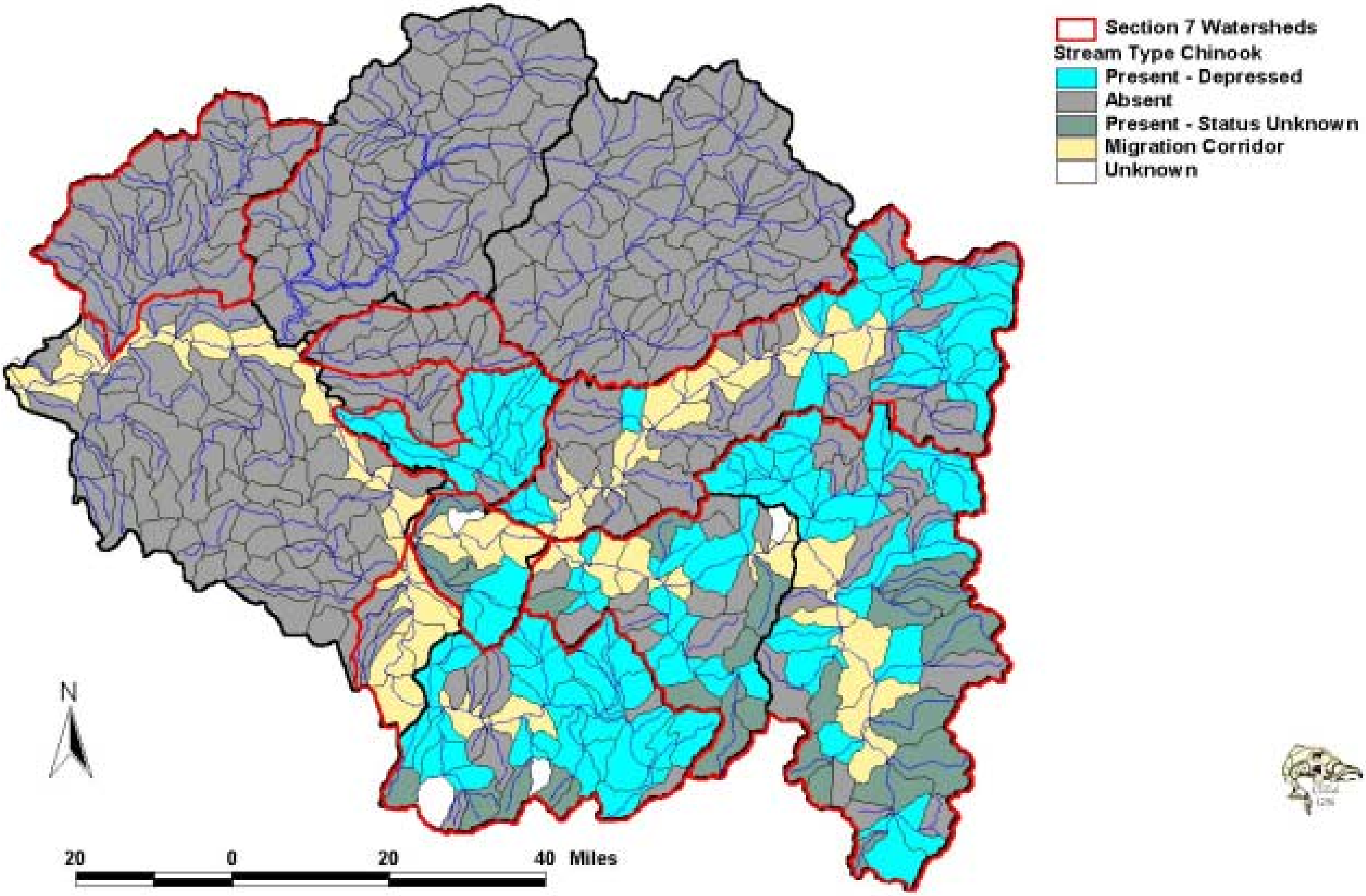

Figure 23. Known distribution and relative status of spring chinook salmon in the Clearwater subbasin. Red lines delineate consultation watersheds defined under Section 7 of the ESA

Table 27. Clearwater River subbasin spring chinook salmon traditional trend aerial redd counts, 1966-2000

Year	South Fork Clearwater [1]	Lochsa River [2]	Selway River [3]		Clearwater subbasin Index Areas Combined
1966	---	---	44		44
1967	---	0	29		29
1968	---	15	27		42
1969	---	112	84		196
1970	---	34	98		132
1971	---	1	77		78
1972	---	63	232		295
1973	---	60	347		407
1974	17	28	97		142
1975	59	35	31		125
1976	33	62	94		189
1977	88	66	141		295
1978	77	62	161		300
1979	27	18	30		75
1980	46	26	55		127
1981	75	52	65		192
1982	112	51	54		217
1983	113	13	44		170
1984	87	37	49		173
1985	130	61	15		206
1986	109	41	56		206
1987	143	36	63		242
1988	110	51	62		223
1989	53	17	22		92
1990	78	20	35		133
1991	6	15	23		44
1992	98	41	29		168
1993	209	77	61		347
1994	17	11	19		47
1995	6	10	9		25
1996	44	37	11		92
1997	242	75	18[4]		335
1998	64	21	34		119
1999	5	1	12		18
2000	154	35	84[5]		273

1 South Fork Clearwater counts in Red, American, Crooked Rivers and Newsome Creek; Newsome Ck had 280 excess adult outplants during 1997 and 362adults, 125 jacks excess adult outplants during 2000.
2 Lochsa River counts in Brushy Fork and Crooked Fork Cks; 100 excess adult outplants White Sands Ck in 2000.
3 Selway River counts in Bear, Moose, White Cap, Running creeks and mainstem between Bear Creek and Thompson Flat
4 Excess Rapid River stock adult chinook (514) outplanted in Selway River Magruder Corridor, 1997. Count taken before outplant.
5 Excess Dworshak stock adult chinook (872) outplanted in Selway River Magruder Corridor, 2000.

Table 28. Summary of spring chinook salmon redds counted and redds per kilometer for Idaho Supplementation Studies (ISS) and Nez Perce Tribal Hatchery (NPTH) streams 1991-2000

AU Stream Name	Year	Stream Length Sampled (km)	Redds Counted	Number of Redds per kilometer	Program
Lolo / Middle Fork AU					
Clear Cr	2000	20.2	30	1.5	ISS
	1999	16.1	0	0	ISS
	1998	18.5	2	0.11	ISS
	1997	18.5	17	0.92	ISS
	1996	16.1	3	0.19	ISS
	1995	16.1	0	0.00	ISS
	1994	16.1	1	0.06	ISS
	1993	16.1	7	0.43	ISS
	1992	16.1	1	0.06	ISS
Eldorado Cr[1]	2000	3.5	0	0.00	NPTH
	1999	3.5	0	0.00	NPTH
	1998	3.5	0	0.00	NPTH
	1997	3.5	0	0.00	NPTH
	1996	3.5	0	0.00	NPTH
	1995	3.5	0	0.00	NPTH
	1994	3.5	0	0.00	NPTH
	1993	3.5	2	0.57	NPTH
	1992	3.5	0	0.00	NPTH
Eldorado Cr[3]	2000		1		NPTH
	1999	2.0	0	0.00	NPTH
	1998	13.3	0	0.00	NPTH
	1997	1.3	0	0.00	NPTH
Lolo Cr[1]	2000	18.3	98[g]	5.36	NPTH
	1999	18.3	9	0.49	NPTH
	1998	18.3	26	1.42	NPTH
	1997	18.3	110[b]	6.01	NPTH
	1996	16.7	21	1.26	NPTH
	1995	16.7	6	0.36	NPTH
	1994	16.7	7	0.42	NPTH
	1993	16.7	23	1.38	NPTH
	1992	16.7	19	1.14	NPTH
Lolo Cr[3]	2000		10		NPTH
	1999	41.5	1	0.02	NPTH
	1998	3.2	0	0.00	NPTH
	1997	23.5	29	1.23	NPTH
	1996	41.5	0	0.00	NPTH
Musselshell Cr[3]	2000		0	0.00	NPTH
	1999	8.8	0	0.00	NPTH
	1998	8.8	0	0.00	NPTH
	1997	8.8	1	0.11	NPTH
	1996	8.8	1	0.11	NPTH

Table 28 (Continued)

AU Stream Name	Year	Stream Length Sampled (km)	Redds Counted	Number of Redds per kilometer	Program
Lolo / Middle Fork AU (continued)					
Yoosa Cr[1]	2000	4.4	2	0.45	NPTH
	1999	4.4	0	0.00	NPTH
	1998	4.4	5	1.14	NPTH
	1997	4.4	0	0.00	NPTH
	1996	4.4	0	0.00	NPTH
	1995	4.4	0	0.00	NPTH
	1994	4.4	0	0.00	NPTH
	1993	4.4	1	0.23	NPTH
	1992	4.4	0	0.00	NPTH
Lochsa AU					
Bear (Papoose) Cr	1996	3	7	2.33	ISS
	1995	3	1	0.33	ISS
	1994	3	0	0.00	ISS
	1993	3	15	5.00	ISS
	1992	3	10	3.33	ISS
Big Flat Cr	2000	4.8	0	0	ISS
	1999	NC	NC	NC	ISS
	1998	NC	NC	NC	ISS
	1997	4.8	7	1.46	ISS
	1996	1.5	0	0.00	ISS
	1995	5.8	0	0.00	ISS
	1994	NC	NC	NC	ISS
	1993	6	3	0.50	ISS
	1992	8	8	1.00	ISS
Brushy Fork Cr	2000	12.6	16	1.27	ISS
	1999	12.6	3	0.24	ISS
	1998	12.6	19	1.51	ISS
	1997	20.7	75	3.62	ISS
	1996	21.5	5	0.23	ISS
	1995	14	5	0.36	ISS
	1994	21.5	0	0	ISS
	1993	18.1	25	1.38	ISS
	1992	14	7	0.50	ISS
Colt Killed Cr	2000	50.2	2	0.04	ISS
	1999	40.6	0	0	ISS
	1998	40.6	0	0.03	ISS
	1997	35.7	22	0.6	ISS
	1996	6.8	0	0.00	ISS
	1995	2.6	0	0.00	ISS
	1994	NC	NC	NC	ISS
	1993	7	2	0.29	ISS
	1992	11.5	3	0.26	ISS

Table 28 (Continued)

AU Stream Name	Year	Stream Length Sampled (km)	Redds Counted	Number of Redds per kilometer	Program
Lochsa AU (continued)					
Crooked Fork Cr	2000	18	100	5.56	ISS
	1999	18	8	0.44	ISS
	1998	19	17	0.94	ISS
	1997	19	118	6.2	ISS
	1996	21.5	76	3.53	ISS
	1995	19	4	0.21	ISS
	1994	21.5	0	0	ISS
	1993	28	10	0.36	ISS
	1992	29.5	11	0.37	ISS
Fishing (Squaw) Cr	1996	6	1	0.17	ISS
	1995	6	0	0.00	ISS
	1994	6	0	0.00	ISS
	1993	6	0	0.00	ISS
	1992	6	1	0.17	ISS
Pete King Cr	2000	8.0	2	0.3	ISS
	1999	8.0	0	0	ISS
	1998	8.0	0	0	ISS
	1997	8.0	4	0.13	ISS
	1996	8.0	0	0.00	ISS
	1995	8.0	0	0.00	ISS
	1994	8.0	0	0.00	ISS
	1993	8.0	0	0.00	ISS
	1992	8.0	0	0.00	ISS
Lower Selway AU					
Meadow Cr[2]	2000	68.0	18[h]	0.26	NPTH
	1999	68.0	3	0.04	NPTH
	1998	68.0	5	0.07	NPTH
	1997	68.0	146[c]	2.15	NPTH
	1996	68.0	0	0.00	NPTH
	1995	68.0	0	0.00	NPTH
	1994	68.0	3	0.04	NPTH
Upper Selway AU					
White Cap Cr	2000	19.8	8	0.40	ISS
	1999	12.9	0	0	ISS
	1998	19.8	4	0.20	ISS
	1997	19.8	0	0	ISS
	1996	19.8	3	0.15	ISS
	1995	19.8	0	0	ISS
	1994	19.8	2	0.10	ISS
	1993	19.8	6	0.30	ISS
	1992	19.9	2	0.10	ISS

Table 28 (Continued)

AU Stream Name	Year	Stream Length Sampled (km)	Redds Counted	Number of Redds per kilometer	Program
South Fork AU					
American River	2000	34.6	129	3.72	ISS
	1999	34.6	1	0.03	ISS
	1998	34.6	112	3.23	ISS
	1997	34.6	311	8.99	ISS
	1996	34.6	9	0.26	ISS
	1995	34.6	0	0	ISS
	1994	34.6	9	0.26	ISS
	1993	34.6	209	6.04	ISS
	1992	33.3	5	0.15	ISS
Crooked River	2000	21.9	93	4.25	ISS
	1999	21.9	1	0.05	ISS
	1998	21.9	30	1.43	ISS
	1997	21.9	62	2.96	ISS
	1996	21.9	6	0.18	ISS
	1995	21.9	0	0	ISS
	1994	21.9	4	0.18	ISS
	1993	21.9	54	2.47	ISS
	1992	21.9	54	2.47	ISS
	1991	21.9	4	0.18	ISS
Newsome Cr	2000	15.1	46[i]	3.05	NPTH
	1999	15.1	0	0	NPTH
	1998	15.1	32	2.12	NPTH
	1997	15.1	67[d]	4.44	NPTH
	1996	15.1	4	0.26	ISS
	1995	15.1	0	0	ISS
	1994	15.1	0	0	ISS
	1993	15.1	55[e]	3.64	ISS
	1992	15.1	2	0.13	ISS
Red River	2000	40.1	235	5.86	ISS
	1999	39.6	14	0.35	ISS
	1998	44.2	93	2.10	ISS
	1997	44.2	344	7.78	ISS
	1996	34.1	41	1.20	ISS
	1995	43.0	17	0.40	ISS
	1994	43.0	23	0.53	ISS
	1993	38.5	69	1.79	ISS
	1992	43.0	44	1.02	ISS
	1991	23.6	6	0.25	ISS

1 includes index reaches surveyed by ground counts
2 includes index reaches surveyed by ground and aerial counts
3 includes expanded reaches surveyed by ground and/or aerial counts
b 474 adults were outplanted from Dworshak National Fish Hatchery
c 601 adults were outplanted from Rapid River Fish Hatchery
d 280 adults were outplanted from Rapid River Fish Hatchery
e 250 adults were outplanted from Rapid River Fish Hatchery
f 300 adults were outplanted from Rapid River Hatchery
g 531 adults were outplanted from Dworshak National Fish Hatchery
h 399 adults were outplanted from Clearwater Hatchery and Dworshak National Fish Hatchery
i 500 adults were outplanted from Clearwater and Rapid River hatcheries

Spring chinook salmon carrying capacity was estimated for each sub-watershed in which spawning and rearing is known to occur (Figure 24). Estimates are based on data downloaded from the Streamnet website (Pacific States Marine Fisheries Commission 2001) which was originally produced using the smolt density model developed in 1989 as part of the Northwest Power Planning Council Presence/Absence database. The smolt density model estimates potential smolt capacity accounting for both the amount of available habitat and the relative quality of that habitat within a given stream reach.

Based on NWPPC data, spring chinook carrying capacity estimates for individual subwatersheds are variable throughout all AUs with little discernable pattern with regard to high or low production areas. Estimates ranged from 205 to 147,015 smolts per subwatershed (Figure 24). The highest estimates by AU were associated with the Upper Selway (approximately 1.2 million) and Lochsa AUs (approximately 900,000; Table 29). The lowest spring chinook smolt carrying capacity estimates at the AU scale are associated with the Lower Clearwater and Lower North Fork AUs where available habitat is most limited (Table 29). Only two miles of the North Fork Clearwater River are accessible below Dworshak dam, and use of the lower Clearwater AU by chinook is limited to mainstem reaches. Based on NWPPC data, the estimated carrying capacity for spring chinook salmon in the entire Clearwater subbasin is 3,491,240 smolts.

Chapman (1981) used a different approach to estimate production (not carrying capacity) of chinook salmon smolts from the Clearwater subbasin under pristine conditions. Chapman (1981) estimated potential smolt production based solely on the amount of available habitat and, since he was considering pristine production, included potential production from areas no longer utilized by chinook salmon (including the North Fork Clearwater and Potlatch River drainages). Chinook salmon smolt production from the Clearwater subbasin was estimated by Chapman (1981) to be 2,428,696. Chapman's data suggests that the Lower Clearwater and Upper and Lower North Fork AUs were historically substantial producers of chinook salmon, accounting for roughly 70 percent of chinook salmon smolt production from the Clearwater subbasin.

Table 29. Estimated spawning/rearing area, total carrying capacity (smolt) and average percent of carrying capacity (parr) realized between 1985 and 1997 for spring chinook salmon within each Clearwater subbasin AU

Assessment Unit	Usable Area [1] (stream miles)	Estimated Capacity (# smolts)	Avg. percent realized [2] (85-97) (Idaho Dept. of Fish and Game 1999a)
Lower Clearwater	78.7	62,296	0
Lower North Fork	2.0	7,628	Unknown
Upper North Fork	Not Accessible	--	--
Lolo/Middle Fork	154.5	311,794	14
Lochsa	278.9	919,444	6
Lower Selway	146.1	408,892	3
Upper Selway	301.8	1,217,129	1
South Fork	291.8	564,057	23
Subbasin Total	1,253.6	3,491,240	14

1 Excludes reaches used only for migration purposes.

2 Derived from Parr Monitoring Database and presented for comparative purposes. No direct link has been established between parr and smolt production.

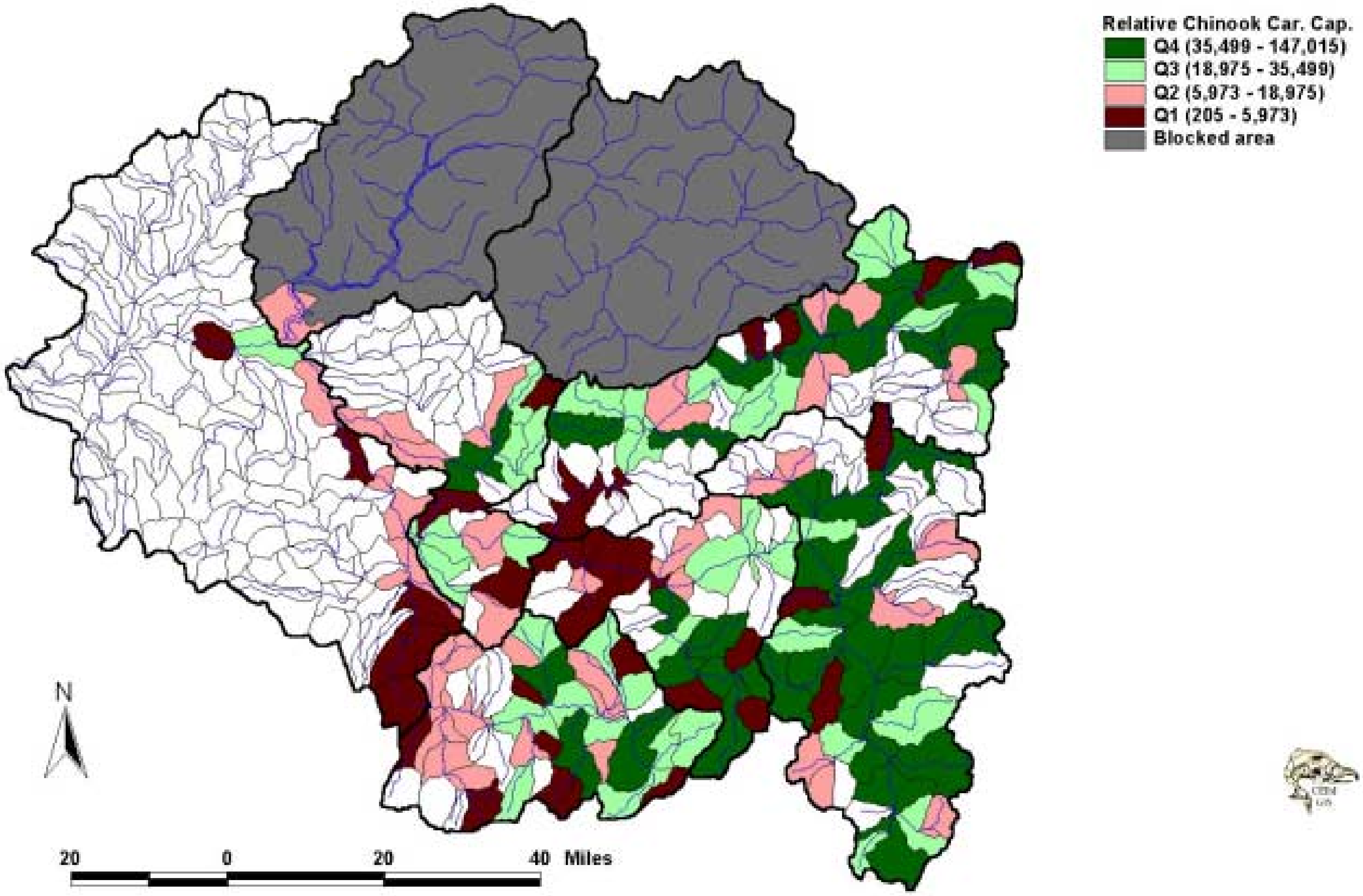

Figure 24. Estimated carrying capacity of spring chinook smolts based on usable area and habitat quality within each subwatershed. Estimates are grouped into quartiles (Q1-Q4), with an equal number of subwatersheds in each

Direct comparison of Chapman's (1981) production estimates with the NWPPC carrying capacity estimates (i.e. comparison of historic vs. current condition) is not appropriate. The two databases were developed to represent different spatial and temporal areas, the methods used vary substantially, as does the general intent of each (production vs. carrying capacity).

Fall Chinook Salmon

Natural recolonized and re-introduced fall chinook salmon within the Clearwater subbasin are part of the Snake River evolutionarily significant unit (ESU) as defined by the ESA. As such, fall chinook salmon within the Clearwater subbasin represent an important metapopulation within the Snake River ESU. Maintenance and function of fall chinook salmon metapopulation dynamics within the Clearwater subbasin itself will play an important role in recovery of the Snake River ESU.

Fall chinook salmon reintroduction efforts in the Clearwater subbasin began in 1960. A total of 6,733,000 fall chinook were reintroduced by the IDFG into the upper Clearwater subbasin from 1960-1967, mainly through eyed-egg plants in artificial spawning channels along the Selway River near the Fenn Ranger Station (Richards 1968). Counts of fall chinook at the Lewiston Dam increased from three in 1962 to a high of 122 in 1966, and back down to 90 in 1969. Due to insignificant returns of fall chinook, the original re-introduction program was terminated in 1968 (Hoss 1970).

Fall chinook salmon begin spawning migrations during August or September and reach the Clearwater subbasin from September through December. Spawning of fall chinook salmon in the Clearwater River subbasin occurs principally in the mainstem below the confluence with the North Fork Clearwater River (Arnsberg and Connor 1992; Garcia et al. 1999). However, spawning adults have been observed throughout the mainstem Clearwater River, and in the lower portions of the mainstem South Fork Clearwater River (Figure 25). Emergence of fall chinook salmon typically occurs in early April and May in the Clearwater River (Arnsberg and Statler 1995). Fall chinook salmon outmigration typically occurs from the Clearwater subbasin from June through August (U.S. Fish and Wildlife Service 1999).

Peak spawning of fall chinook salmon in the Clearwater subbasin was originally in November, but there have been an increasing number of redds counted in October, even as early as October 5 (Garcia et al. 1999). Fall chinook salmon redds have been counted each year since 1988 by helicopter in the mainstem Clearwater River (Arnsberg and Connor 1992; Arnsberg and Statler 1995) and have recently increased from a range of 4-36 during 1988-1995, to 78 in 1998 and 184 in 1999 (Table 30). Fall chinook redds decreased slightly in the subbasin to 172 in 2000, with eight redds observed in the mainstem above the North Fork Clearwater confluence and one redd found in the South Fork Clearwater River. This was the highest number of redds observed in the Clearwater River subbasin above the North Fork than in all previous years combined since 1988. Hatchery fish released in the Clearwater River first returned as adults in 1999, with 43% of carcasses in 1999, and 60% of carcasses in 2000 determined to be hatchery fish (Bill Arnsberg, Nez Perce Tribal Fisheries, personal communication). Nearly all carcasses collected in 2000 were found in a spent state, therefore, it appears that supplementation fish are contributing to natural reproduction (Bill Arnsberg, Nez Perce Tribal Fisheries, personal communication, April 20, 2001).

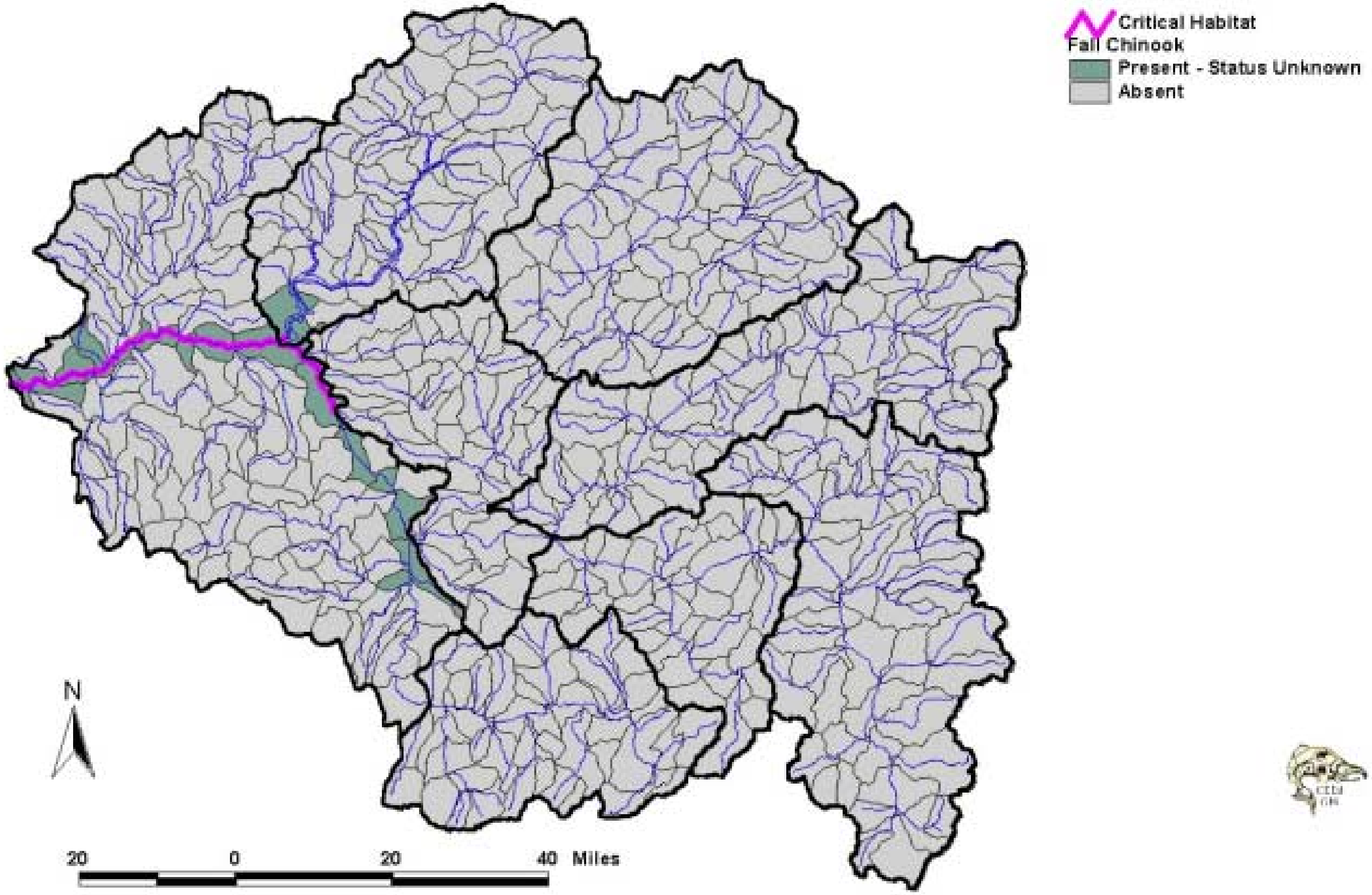

Figure 25. Known distribution of spawning habitat utilized by fall chinook salmon in the Clearwater subbasin. Heavy pink line indicates designated critical habitat for fall chinook salmon

Table 30. Number of fall chinook salmon redds observed by aerial surveys in the Clearwater River Subbasin, 1988-2000

Year	Clearwater (Rm 0-41)	Clearwater (Rm 41-74)	N.F. Clearwater	S.F. Clearwater
1988	21	--	--	--
1989	10	--	--	--
1990	4	--	--	--
1991	4	--	--	--
1992	25	1	0	0
1993	36	0	0	0
1994	30	0	7	0
1995	20 [1]	0	0	0
1996	66	0	2	1
1997	58	0	14	0
1998	78	0	0	0
1999	179	2	1	2
2000	163	8	0	1

1 A flood event during peak spawning prevented an accurate redd count in the Clearwater subbasin for 1995.

No status designations were found regarding fall chinook salmon in the Clearwater subbasin. However, between 1988 and 1997 fall chinook redds counted in the Clearwater River accounted for 25% of all fall chinook redds observed above Lower Granite Dam (Garcia 1998, cited in U.S. Fish and Wildlife Service 1999). The proportion of fall chinook redds above Lower Granite Dam observed in the Clearwater River has increased since 1993 (U.S. Fish and Wildlife Service 1999).

Arnsberg and Connor (1992) used the Instream Flow Incremental Methodology (IFIM) to quantify the amount of fall chinook spawning habitat available in the lower Clearwater River. Based on habitat suitability criteria alone, 95,000 redds was given as an estimated capacity. This was thought to be a liberal estimate, since IFIM tends to overestimate spawning habitat in large rivers (Shrivell 1990) and other hydraulic and biological factors that may influence spawning selection were not measured (Arnsberg and Connor 1992). However, spawning habitat is not a limiting factor for fall chinook recovery in the lower Clearwater based on the vast amount of suitable habitat measured and the number of redds documented within and around these measured sites since redd counts began in 1988 (Bill Arnsberg, Nez Perce Tribal Fisheries, personal communication, April 20, 2001).

As a consequence of cold winter water temperatures, the early life history timing of fall chinook salmon in the Clearwater River occurs on the latest schedule of all present-day Snake River stocks. Many young Clearwater River fall chinook salmon do not reach smolt size or migrate seaward during the first year of life because growth is out of synchronization with environmental cues such as photoperiod (Connor et al. 2001). In some years, releasing cool water from Dworshak Reservoir for summer flow augmentation could cause juvenile fall chinook salmon to hold over an extra year in freshwater by markedly reducing water temperatures thus disrupting water temperature cues that prompt offshore movement (Connor et al. 2001).

Early Fall Chinook Salmon

The Nez Perce Tribe uses the term early-fall chinook salmon to refer to fish that spawn principally in October, and would have a life history similar to that of “summer” chinook salmon in the mid-Columbia (October spawning and subyearling smolts), but not to the Snake River summer chinook salmon (late August-early September spawning and yearling smolts). Temperature data indicate that late September and early-October would be the most favorable spawning times in much of the Clearwater River subbasin, whereas spawning before or after that time might lead to high egg mortality from thermal stress in many years (Arnsberg and Statler 1995; Cramer 1995). Hatchery records in the Grande Ronde subbasin in the early 1900's indicate that spawning of chinook salmon extended from early September all of the way through October (Van Dusen 1903 and 1905). Evermann (1896) presented data on catches and spawning of chinook salmon in the Snake River indicating that peak spawning occurred during middle October in 1894.

There are no known populations of early-fall chinook salmon remaining in the Snake River basin that spawn through October, but temperature data indicate that late September and early October would be the favorable spawning times in the lower Selway, Lochsa, South Fork Clearwater, and mainstem Clearwater (above the North Fork confluence) rivers (Arnsberg and Statler 1995). Because of Dworshak Reservoir on the North Fork of the Clearwater River, temperature of the mainstem Clearwater River below the North Fork is 2-5^0C cooler during July-September and 1-2^0C warmer during November through March than the mainstem above the North Fork (Arnsberg and Connor 1992), and is therefore the only section of river in the Clearwater River subbasin suited to November spawning chinook salmon (Cramer 1995). Cramer (1995) presented evidence that spawning of chinook salmon, in order to coincide with thermal optimums for egg survival, must occur sufficiently early in the fall for eggs to develop to eyeing before water temperatures drop below 4-5^0C, but sufficiently late in the year that water temperatures have dropped below the upper tolerance limits of freshly spawned eggs (approximately 14^0C). These temperature conditions would be met by spawning that occurs between late September through mid-October for most streams of the subbasin at elevations below 770 m (2,500 ft). Although the October spawning segment of the run has been nearly eliminated, the genetic potential to reproduce it may still be contained in the genome, and could be re-expressed through natural selection or selective breeding with Snake River stock.

The juvenile life history of chinook salmon that spawned in October was not documented, and can only be deduced. Cramer (1995) concluded that the race of October-spawning chinook salmon would likely have smolted as subyearlings, because high stream temperatures at the elevation they were adapted to would have promoted rapid growth in the spring, but stressful rearing conditions during the summer. October spawning chinook salmon in the mid-Columbia smolt primarily as subyearlings. Most likely, early-spawning fall chinook salmon to be developed in the Clearwater River from the Lyons Ferry stock will be predominantly subyearling migrants. Additionally, their migration patterns in the ocean and vulnerability to ocean fisheries are also likely to parallel those of Lyons Ferry fall chinook salmon.

Since the historical presence of early fall chinook salmon in the Clearwater subbasin is inferred, no status designations or carrying capacity estimates have been made. However, on-going research by the Nez Perce Tribe could be used to estimate carrying capacity. It is anticipated that when the research is concluded, this information will be available.

Two satellite facilities of the Nez Perce Tribal Hatchery on the lower South Fork Clearwater River and the lower Selway River (near Fenn Ranger Station) will initiate the restoration of early-fall chinook salmon to the Clearwater subbasin. The stock will be developed by selecting early spawners from Snake River fall chinook broodstock at Lyons Ferry Hatchery and capture of fish spawning in the Clearwater River (Ed Larson, Nez Perce Tribe, personal communication, May 11, 2001).

Steelhead Trout

Summer run steelhead trout in the Clearwater subbasin are listed as threatened under the ESA. Both A-run and B-run steelhead trout exist in the Clearwater subbasin and are included in the Snake River ESU of steelhead trout (Busby et al. 1996). A-run steelhead occupy the lower Clearwater, including the Middle Fork Clearwater and Lower South Fork Clearwater rivers and tributaries (Kiefer et al. 1992). B-run steelhead occupy the Lochsa, Selway, and upper South Fork Clearwater rivers, and were extirpated by Dworshak Dam on the North Fork Clearwater River (Kiefer et al. 1992). B-run steelhead have been documented from only two subbasins in the Columbia River system, the Clearwater and Salmon (Nez Perce Tribe and Idaho Department of Fish and Game 1990). A-run steelhead trout from the Clearwater subbasin have typically spent one year in saltwater environments; B-run steelhead trout will have spent 1-3 years in saltwater environments before returning to spawn, with over 90 percent having spent two years (W. Miller, U.S. Fish and Wildlife Service, personal communication, March 5, 2001). Due to differing lengths of ocean residence, differentiation of the two forms of Clearwater steelhead trout can be based on size with B-run fish averaging 75-100 mm larger than A-run fish (Columbia Basin Fish and Wildlife Authority 1991). In addition, B run steelhead enter the Columbia River later in the year than A run and benefit from the extra ocean time to rear, resulting in a 2 ocean A-run fish being smaller than a 2 ocean B-run fish (W. Miller, U.S. Fish and Wildlife Service, personal communication, April 20, 2001).

Historical Status

Mallett (1974) estimated that 55% of all Columbia River steelhead trout historically originated from within the Snake River basin, of which the Clearwater subbasin made up a substantial component. Over 43,000 steelhead were counted at Lewiston Dam near the mouth of the Clearwater River during the 1962-63 run year (Miller 1987) and historic runs may have ranged as high as 40,000 - 60,000 steelhead annually (W. Miller, U.S. Fish and Wildlife Service, personal communication, March 5, 2001). Wild steelhead trout historically occupied all major drainages and a majority of the tributaries within the Clearwater subbasin. However, no documentation of historic distributions specific to the Lochsa or Selway River systems could be located.

The upper half of the South Fork Clearwater watershed maintained a historically strong population of steelhead trout (Nez Perce National Forest 1998). Spawning habitat in the South Fork Clearwater occurred primarily in the lower canyon portions of mainstem tributaries such as Newsome Creek, American River, Red River, Crooked River, and low gradient reaches along the mainstem South Fork Clearwater River (Nez Perce National Forest 1998; Paradis et al. 1999b). Historic spawning distributions of steelhead trout also likely included Tenmile, Johns, Meadow, and Mill creeks (Jody Brostrom, Idaho Department of Fish and Game, personal communication March 30, 2001). Low order streams and accessible headwater portions of high order streams provided early rearing habitat (Nez Perce National Forest 1998).

The South Fork Clearwater River may have historically maintained a genetically unique stock of steelhead trout within the Clearwater subbasin, but hatchery supplementation has since clouded the lines of genetic distinction between stocks throughout the subbasin (Nez Perce

National Forest 1998). Robin Waples (In a letter to Sharon Kiefer, Idaho Department of Fish and Game, August 25, 1998) found that steelhead trout in Johns and Tenmile creeks are genetically most similar to fish originating from the Selway River system, suggesting that some genetic difference may have existed historically within the South Fork Clearwater drainage. A statewide genetic analysis is currently being conducted using DNA markers, and may provide more information on past and current genetic distinctions between steelhead trout stocks in the Clearwater subbasin (Byrne 2001).

The North Fork Clearwater provided substantial amounts of spawning and rearing habitat for steelhead trout prior to the construction of Dworshak Dam in 1969, which blocked 26% of Clearwater subbasin habitat from anadromous fish (Nez Perce Tribe and Idaho Department of Fish and Game 1990). An estimated 50 to 60 percent of the steelhead entering the Clearwater River spawned in the North Fork Clearwater River and its tributaries (Miller 1987). Similar to the South Fork, the mouths of the larger North Fork tributaries were likely the primary spawning areas, while the accessible headwater sections of the tributaries provided habitat for rearing and resident rainbow/redband trout populations (Clearwater National Forest 1999). In addition to spawning and rearing, mainstem habitat was used for migration and overwintering.

Historical spawning and rearing habitat in the Selway River occurred throughout the subbasin. Lower portions of mainstem tributaries hosted overwintering habitat for juveniles, while the upper portions provided rearing habitat.

Current Status

Steelhead trout ascend the Columbia River between May and October, and generally arrive at the mouth of the Clearwater River in the fall (September-November). Adult steelhead trout remain in the large pools of the mainstem Clearwater or Snake Rivers or in Lower Granite Reservoir through the winter. This timing is different than before the Snake River dams were built, when the majority of the fish arrived to Lewiston dam in March-May (Whitt 1954). Spawning of B-run steelhead trout in the Clearwater subbasin occurs from mid-March through early June, with emergence during June and July. A-run steelhead spawn from February through early May, with emergence from mid-April through May (Nez Perce Tribe and Idaho Department of Fish and Game 1990). The majority of juveniles rear for two years in freshwater with subsequent outmigration from March through May.

The only remaining steelhead trout runs in the Clearwater subbasin with limited or no hatchery influence occur in the Lochsa and Selway River systems (B-run) and lower Clearwater River tributaries (A-run; Busby et al. 1996; Idaho Department of Fish and Game 2001b). Steelhead trout in other portions of the subbasin have been heavily influenced by hatchery stocking, with the majority originating from Dworshak National Fish Hatchery (Nez Perce Tribe and Idaho Department of Fish and Game 1990). Steelhead trout production at Dworshak National Fish Hatchery is made up entirely of B-run steelhead trout.

Steelhead trout are widely distributed throughout the Clearwater subbasin, using at least a portion of all accessible watersheds (5^{th} code HUCs; Figure 26). Excluding areas blocked by Dworshak Dam, subwatersheds (6^{th} code HUCs) currently not being used by steelhead trout are typically singular, scattered, and associated with low order tributaries. Clusters of 6^{th} code HUCs are not currently used by steelhead trout in Orofino and Jim Ford Creeks (Lolo/Middle Fork AU) where a passage barrier exist in the lower mainstem of each creek (Johnson 1985; Clearwater Soil and Water Conservation District 1993), and the headwaters of the White Sands Creek drainage (Lochsa AU). The relatively contiguous distribution of steelhead trout throughout the subbasin suggests a potentially high degree of connectivity exists.

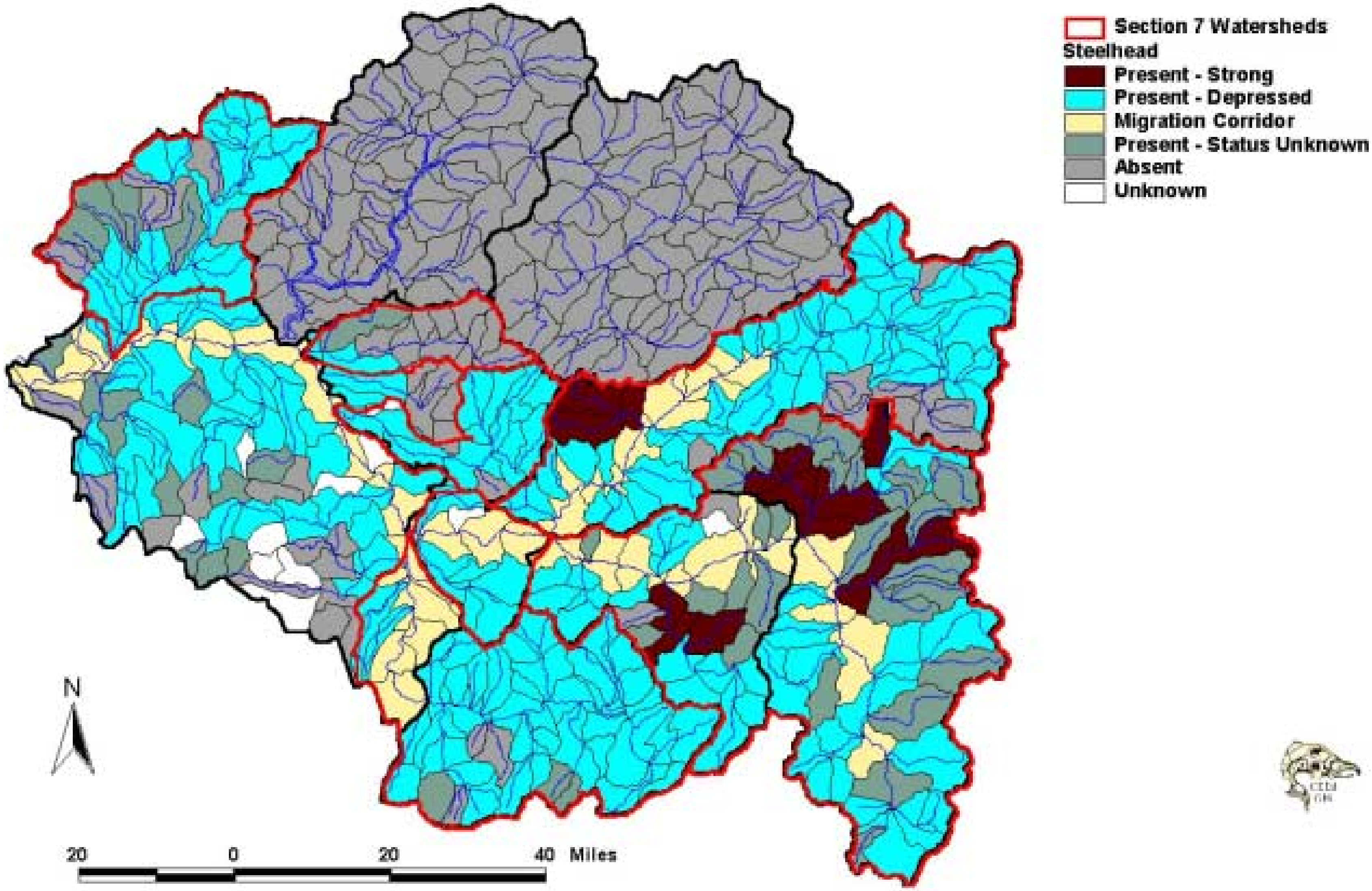

Figure 26. Known distribution and relative status of steelhead in the Clearwater subbasin. Red lines delineate consultation watersheds defined under Section 7 of the ESA

Status and distribution of A-run steelhead in lower Clearwater River tributary streams was described by Kucera et al. (1983), Fuller et al. (1984), and Johnson (1985). No adult steelhead abundance estimates are available for tributaries in lower Clearwater AU, although an experimental weir was operated on weekdays in Big Canyon Creek in 1995 (U.S. Fish and Wildlife Service and Nez Perce Tribe 1997). Quantification over time of B-run adult steelhead escapement to individual tributaries or spawning aggregates is limited to four locations in the Clearwater River subbasin where adult weirs are operated; Clear Creek (Middle Fork Clearwater River), Fish Creek (Lochsa River), Red River and Crooked River (South Fork Clearwater). Some additional information is available from the hatchery facility at Powell (Lochsa River). Adult steelhead abundance information in the Selway River system is comprised of angler survey data collected during the 1950s, catch in the Selway Falls fish ladder during the mid 1990s, and steelhead caught and radio-tagged below Selway Falls in 1998. Unfavorable environmental/stream conditions during the spawning season preclude conducting accurate spawning ground surveys for steelhead in the Clearwater subbasin although attempts have been made and limited data does exist (Table 31).

Wild A-run steelhead trout within the Clearwater subbasin occurs only in the lower mainstem tributaries (Rich et al. 1992), South Fork Clearwater tributaries up to Butcher Creek, and Maggie Creek in the Middle Fork Clearwater (Nez Perce Tribe and Idaho Department of Fish and Game 1990). The Potlatch River and East Fork Potlatch River are considered important streams for production of wild A-run steelhead trout because of their accessibility in relation to the mainstem Clearwater (A. Espinosa, personal communication 1999). Wild A-run steelhead trout also occur in Big Canyon, Cottonwood, Lapwai, Mission, Bedrock, and Jacks Creeks (Clearwater National Forest 1997; U.S. Fish and Wildlife Service and Nez Perce Tribe 1995; Kucera and Johnson 1986), with Big Canyon and Cottonwood creeks as the primary aggregates based on available habitat and observed juvenile densities (U.S. Fish and Wildlife Service and Nez Perce Tribe 1997). No hatchery outplanting of A-run steelhead trout has occurred within the Clearwater subbasin, and interbreeding of A-run and hatchery produced B-run steelhead trout is thought to be minimal due to differences in spawn timing (U.S. Fish and Wildlife Service and Nez Perce Tribe 1997). Habitat problems in A-run streams include high soil erosion rates, high bedload movement rates, altered channel morphology and riparian areas, variable streamflows with severely limited late summer flows, and high summer temperatures in lower tributary reaches (Kucera and Johnson 1986; Nez Perce Tribe and Idaho Department of Fish and Game 1990).

Steelhead trout status is present–depressed throughout the majority of their range in the Clearwater subbasin (Figure 26). Designations of present–strong for steelhead trout are only noted in Fish and Hungery Creeks (Lochsa AU), the lower portions of Meadow Creek (Lower Selway AU), and portions of Moose and Bear Creeks (Upper Selway AU; Figure 26). The Lochsa and Selway River systems have been identified as refugia areas for steelhead trout (Thompson 1999) based on location, accessibility, habitat quality, and number of roadless tributaries.

Recent trend information related to steelhead populations in the Clearwater subbasin consists primarily of weir counts. Table 32 presents available information on adult steelhead collections at various weir sites within the subbasin.

Table 31. Aerial steelhead redd counts in Clearwater subbasin streams, 1990-2000

AU Stream	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
South Fork AU											
Crooked R.	219	50	20	4	3	4	0	0	0	NC	NC
Red River	2	NC	NC	5	6	6	2	0	1	NC	NC
Lochsa AU											
Lochsa R	5	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Colt Killed Cr	12	7	20	NC	12	3	3	7	3	NC	NC
Storm Cr	11	0	3	NC	3	8	1	0	1	NC	NC
Crooked Fk Cr	33	7	10	NC	8	11	1	6	2	NC	NC
Fish Cr	9	0	3	NC	5	5	NC	NC	NC	NC	NC
Hungery Cr	2	0	NC	NC	NC	NC	NC	NC	NC	NC	NC
Selway AU											
Mainstem	NC	NC	NC	NC	NC	1	NC	NC	0	NC	NC
Bear Cr	15	2	4	NC	6	8	2	2	2	NC	NC
EF Moose Cr	NC	NC	NC	NC	3	6	6	5	5	NC	NC
Running Cr	0	0	NC	NC	NC	NC	NC	NC	NC	NC	NC
Whitecap Cr	4	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC

Table 32. Adult steelhead returning to weirs, Clearwater subbasin, 1990-2000

	Fish Creek		Crooked River		Red River		Powell		Clear Creek	
Year	Wild	Hatchery	Wild	Hatchery	Wild	Hatchery	Wild	Hatchery	Wild	Hatchery
1990	ND	ND	17	32	ND	ND	50	1	5	11
1991	ND	ND	5	44	ND	ND	ND	ND	ND	25
1992	105	0	19	34	ND	ND	32	1	13	45
1993	267	0	17	32	ND	ND	0	0	24	200
1994	70	0	5	1	ND	ND	0	0	43	303
1995	32[a]	0	15	2	ND	ND	1	0	48	421
1996	32 [a]	0	2	1	ND	ND	0	0	24	385
1997	21 [a]	0	5	0	0	0	2	0	61	450
1998	75	0	2	0	0	0	ND	ND	18	235
1999	72 [a]	0	3	7	0	0	ND	ND	53	722
2000	26	0	6	10	0	0	ND	ND	17	320

(a) Weir was breached by high flows and debris, so counts don't represent total escapement

According to the IDFG's parr monitoring database, steelhead trout parr densities in the Clearwater subbasin averaged approximately 27% of the estimated carrying capacity between 1985 and 1997 (Idaho Department of Fish and Game 1999a; Table 33). Monitoring surveys included in the database indicate the highest relative densities of steelhead trout in the Lower Selway, Lower Clearwater, and Lochsa AUs where the average percentages of carrying capacity were 46, 38, and 38%, respectively. Lesser percentages of estimated carrying capacity are being realized in the Upper Selway (12%), Lolo/Middle Fork (23%), and South Fork (25%) AUs.

Carrying Capacity

The carrying capacity for steelhead trout was estimated for each subwatershed in which spawning and rearing is known to occur (Figure 27). Estimates are based on data downloaded from the Streamnet website (Pacific States Marine Fisheries Commission 2001) which was originally produced using the smolt density model developed in 1989 as part of the Northwest Power Planning Council Presence/Absence database.

Estimates of carrying capacity for steelhead smolts ranged from 31 to 54,708 with the highest subwatershed estimates associated with the Lochsa (approximately 482,000) and Upper Selway AUs (approximately 488,000). The lowest steelhead smolt carrying capacity estimates at the AU scale are associated with the Lolo/Middle Fork and Lower Clearwater AUs and the Lower North Fork AU where available habitat is limited by the presence of Dworshak Dam (Table 33).

Table 33. Estimated spawning/rearing area, total carrying capacity (smolt) and average percent of carrying capacity (parr) realized between 1985 and 1997 for steelhead trout within each Clearwater subbasin AU

Assessment Unit	Usable Area [1] (stream miles)	Estimated Capacity (# smolts)	Avg. percent realized [2] (85-97) (Idaho Dept Fish and Game 1999a)
Lower Clearwater (A-run)	525.5	184,746	38
Lower North Fork	2.0	4,709	Unknown
Upper North Fork	Not Accessible	--	--
Lolo / Middle Fork	263.7	135,419	23
Lochsa	437.3	482,182	37
Lower Selway	241.8	238,978	46
Upper Selway	563.7	487,849	12
South Fork	389.2	201,358	25
Subbasin Total	2,423.2	1,735,259	27

1 Excludes reaches used only for migration purposes
2 Derived from Parr Monitoring Database and presented for comparative purposes. No direct link has been established between parr and smolt production.

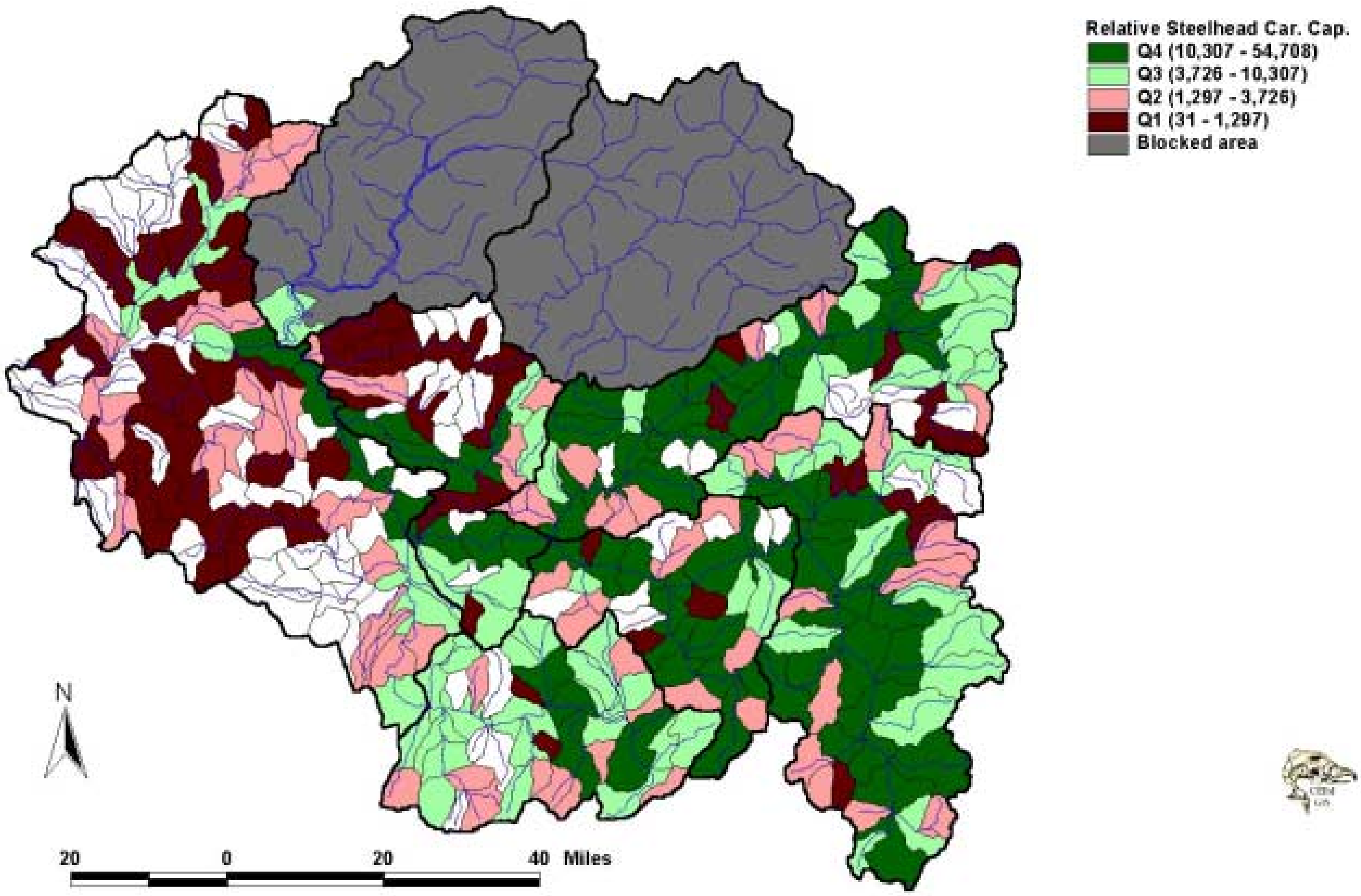

Figure 27. Estimated carrying capacity of steelhead trout smolts based on usable area and habitat quality within each subwatershed. Estimates are grouped into quartiles (Q1-Q4), with an equal number of subwatersheds in each

Coho Salmon

Coho salmon are believed to have historically migrated to and spawned in the Clearwater subbasin (Fulton 1970 cited in Nez Perce Tribe and Idaho Department of Fish and Game 1990). The NPT Office of Legal Counsel documented the historical presence of 'cuhlii or kallay' (coho) in their language and records this species as having been present throughout the Clearwater subbasin (Ed Larson, Nez Perce Tribe, personal communication, May 11, 2001). However, coho runs throughout the Snake River basin were officially declared extinct in 1986. In the Clearwater subbasin, poor passage facilities at the Lewiston Dam (constructed in 1927) are generally accepted as having caused extirpation of coho salmon runs (Nez Perce Tribe and Idaho Department of Fish and Game 1990). Efforts were made by the Idaho Department of Fish and Game to reintroduce coho salmon to the Clearwater subbasin between 1962 and 1968, but were curtailed due to lack of success.

The Nez Perce Tribe currently has a reintroduction program underway for coho salmon in the Clearwater subbasin. Three primary factors may constrain success of coho production in the Clearwater during reintroduction: stock selection, habitat availability, and out-of-subbasin mortality related to dams and fisheries (Nez Perce Tribe and Idaho Department of Fish and Game 1990).

Coho salmon spawn in October over gravel/cobble-sized substrate where there is a fairly swift current. Fry emergence generally occurs between March-April, after which time they will reside in freshwater for one to two years. In fresh water, the diet of juvenile coho consists of aquatic insects and zooplankton (Simpson and Wallace 1982).

Historical Status

Coho salmon were likely present within the larger mainstem Clearwater tributaries, and depending on the amount of flow, accessed habitat in some of the smaller tributaries for spawning and rearing (Clearwater National Forest 1997). Specifically, the Potlatch River, Fish Creek and Lolo Creek, likely provided habitat for spawning and rearing of historic coho populations (Clearwater National Forest 1997; A. Espinosa personal communication 1999). Reviews of historical documents and interviews of residents by Johnston (1993, cited in Clearwater National Forest 1997) support the fact that the Potlatch River contained historical runs of chinook, steelhead and coho during the late 1800's and early 1900's. Run presence was likely a function of migration corridor connectivity, habitat suitability and water temperatures.

The lower South Fork Clearwater River was considered as supporting runs of coho salmon, however this documentation is largely anecdotal (Paradis et al. 1999b). The Idaho Department of Fish and Game has records of eyewitness accounts of historic coho runs in the Clearwater River (Richards 1967). The Nez Perce Tribe, through testimony of elders and review of historic literature, have identified several streams that historically supported populations of coho salmon in the Clearwater River subbasin (P. Kucera, Nez Perce Tribe, personal communication, March 8 2001).

The only recorded counts of coho salmon entering the Clearwater River were made at Lewiston Dam following reintroduction efforts by the Idaho Department of Fish and Game. Lewiston Dam counts, which were sporadic at best, ranged from 325 fish in 1968 to as low as 9 adults in 1972 (Table 34).

Clearwater basin coho supplementation projects were initiated in 1962 by IDFG under the auspices of the Columbia River Fisheries Department Program (Nez Perce Tribe and Idaho Department of Fish and Game 1990). Over 11 million eggs were planted into two controlled-flow hatching channels on the Red River and Crooked River within the South Fork subbasin (Nez Perce Tribe and Idaho Department of Fish and Game 1990). Fry releases occurred within mainstem channels and South Fork tributaries, although subsequent adult escapement rates were poor. The project was discontinued in 1968 because of the poor return rates, however, coho were still being counted over the dam up until its removal in 1972-73 (Nez Perce Tribe and Idaho Department of Fish and Game 1990).

Table 34. Number of coho salmon counted over the Lewiston Dam from 1965-1972 (Simpson and Wallace 1982)

Run Year	Coho Salmon Counted
1965	21
1966	115
1967	43
1968	325
1969	31
1970	40
1971	61
1972	9

Current Status

Reintroduction of coho salmon in the Clearwater River subbasin was initiated in 1995 by the Nez Perce Tribe. Broodstock from Willard and Eagle Creek National Fish Hatcheries in Oregon has been used to stock eyed eggs, fry, parr, and smolts into tributaries of the lower mainstem Clearwater and South Fork Clearwater rivers. Stocking locations and life stages have varied across years, with the Potlatch River, Lapwai Creek, Mission Creek, Quartz Creek, Cottonwood Creek, Big Canyon Creek, Orofino Creek, Lolo Creek, Meadow Creek (Selway), and Meadow Creek (South Fork Clearwater) being supplemented at least once. Primary efforts have been focused in Lapwai Creek, Potlatch River, Eldorado Creek (Lolo), and Meadow Creek (Selway River) with parr and smolt outplants (Table 35).

Post-release survival and life history traits are being monitored. Representative groups of parr and smolt releases have been coded-wire tagged and PIT tagged. Subsequent tag detection and recovery is being used to establish baseline emigration survival and smolt-to-adult return rate survival estimates.

Adult escapement abundance is being monitored at Lower Granite Dam, Lapwai Creek, Potlatch River, Clear Creek, Meadow Creek (Selway), and Dworshak National Fish Hatchery ladder. Adult escapement counts at Lower Granite Dam since 1997 have range from 12 to 1,089 (Table 36). Tributary specific returns have fluctuated across years with streams receiving smolt outplants generally having the highest return number. The Dworshak National Fish Hatchery has capture up to 190 adults even though fish are not released there (rearing does occur at the hatchery). Aerial and ground spawning ground surveys for coho salmon have been conducted with only a limited number of redds being observed in Lapwai Creek, Potlatch River, and Meadow Creek (Selway). Age of adult at return is predominately 2-ocean with a small percentage of jacks (1-ocean). The Nez Perce Tribe is currently in the process of developing a localized coho salmon brood stock from adult returns to the Clearwater River subbasin to support reintroduction efforts. To date no tribal or sport harvest season has occurred, however incidental capture during steelhead season is likely.

Table 35 Stocking summary of parr and smolt coho salmon releases since 1995 into Clearwater River tributaries

Location	1995	1998	1999	2000
Lapwai Creek	--	244,640 smolt	290,176 smolt	267,102 smolt
Potlatch River	142,456 parr	231,076 smolt 175,000 parr	276,682 smolt 175,000 parr	267,166 smolt
Orofino Creek	49,849 parr	--	--	--
Eldorado Creek (Lolo)	94,777 parr	125,000 parr	125000 parr	124,470 parr
Clear Creek	--	218,501 smolt	245,168 smolt	280,750 smolt
Meadow Creek (South Fork Clearwater)	--	--	--	148,578 parr
Meadow Creek (Selway)	335,145 parr	150,000 parr	150,000 parr	149,300 parr

Table 36 Coho salmon adult escapement counts at Lower Granite Dam and tributary specific weir sites from 1997 to 2000.

	1997		1998		1999		2000	
	Adults	Jacks	Adults	Jacks	Adults	Jacks	Adults	Jacks
Lower Granite Counts	94	10	10	2	271	29	1033	56
Total Weir Counts			--	--	189	6	487	98

Pacific Lamprey

Pacific lamprey are considered an endangered species by the state of Idaho (Idaho Department of Fish and Game 2001b). Throughout their range in the Columbia River Basin, Pacific lampreys have declined to only a remnant of their pre-1940's populations. Lower Snake dam counts numbered over 30,000 in the late 1960's, but have declined to less than 500 fish in recent years. Currently, an estimated 3% of the lamprey that pass Bonneville Dam are counted at Lower Granite Dam (Close 2000). Based on adult lamprey observations at Lower Granite Dam the current status in the Clearwater subbasin is thought to be extremely depressed (Columbia Basin Fish and Wildlife Authority 1999).

Pacific lamprey in Idaho are threatened by dams on the Snake and Columbia Rivers, stream alteration, and ammocoete harvest by bait fishermen according to a status review by the Idaho Chapter of the American Fisheries Society (cited in Paradis et al. 1999b). Because they spend extended periods in freshwater, Pacific lamprey are especially vulnerable to degraded stream conditions including sedimentation due to land disturbance, and water quality limitations that impact diatom (food) production in nursery streams (Paradis et al. 1999b).

General life history and habitat descriptions can be found in several sources which are summarized in Close (2000). Migration of adult lampreys into fresh water typically occurs from May through September, with spawning the following March or April. Hatching occurs 2-3 weeks following fertilization. Following hatching, ammocoetes burrow into mud where they remain for 5 or more years before transforming to adults. As juveniles, Pacific lamprey feed primarily on diatoms and desmids. Following transformation, lampreys migrate to the ocean and become parasitic, attaching themselves to fish and consuming blood and body fluids from their prey (Simpson and Wallace 1982).

Historical Status

One of the earliest documented occurrences of Pacific lamprey in Idaho was in the Snake River near Lower Salmon Falls, and downstream near Lewiston (Gilbert and Evermann 1895). Culturally important to native tribes (Columbia River Inter-Tribal Fish Commission 1996a), they were also popular for use of their oily flesh and as sturgeon bait (Gilbert and Evermann 1895). Ecologically, they are an important food for white sturgeon, and the carcasses of spawned adults provide nutrients to tributaries that also rear salmon and steelhead (Kan 1975).

It is thought that Pacific lamprey formerly migrated to all streams accessible to salmon and steelhead (Simpson and Wallace 1982) suggesting that they were present in all major drainages in the Clearwater subbasin. Sightings of and parasitism by Pacific lamprey in Dworshak Reservoir declined rapidly after impoundment (Simpson and Wallace 1982), suggesting that they may not have residualized in the North Fork Clearwater AUs. Lamprey were collected in Dworshak Reservoir as late as 1989 (16 years after impoundment), but have not been seen after this date (Melo Maiolie, Idaho Department of Fish and Game, personal communication, April 20, 2001).

Current Status

Pacific lamprey populations in the eastern half of the Clearwater subbasin are limited to the mainstem Clearwater River and larger accessible tributaries, including the Potlatch and Lolo Creek drainages (U.S. Bureau of Land Management 2000). Lapwai, Big Canyon, Orofino, Lolo and Lawyer Creek may also be used by Pacific lamprey (U.S. Bureau of Land Management 2000). According to Schoen et al. (1999), Pacific lamprey utilize the Lochsa River drainage although no information on their distribution within the system is provided. Hammond (1979) studied larval lamprey biology on the Potlatch River, and presented limited information on juvenile lamprey in Lolo Creek and the Clearwater River. Ammocoetes have been caught in recent years in smolt traps on Lolo Creek (NPT), Red River (Idaho Department of Fish and Game 1998a), the Clearwater River (Idaho Department of Fish and Game, Unpublished Data) and the Selway River near O'Hara Creek (Idaho Department of Fish and Game, Unpublished Data). They are thought to occur in the American River system as well (Paradis et al. 1999b). A life history study currently being conducted in the South Fork Clearwater documented lamprey rearing in Red River and the mainstem South Fork (Cochnauer and Claire 2001). A recent biological assessment of the Lower Selway River (Thompson 1999) did not document the presence of Pacific lamprey in that area, although they have been observed at rkm 70 in recent years (Tim Cochnauer, Idaho Department of Fish and Game, personal communication, March 30, 2001).

Potential factors affecting declines include problems with habitat and the migratory corridor (Close et al. 1995). Ammocoete abundance may be affected by water temperature and other physical characteristics during early development (Young et al. 1990 cited in Stone et al.

2001). Availability and accessibility of suitable spawning habitat may limit the amount of reproduction that occurs within a basin. Factors influencing survival of early life history stages may be critical to determining recruitment to the population (Houde 1987).

Within the Clearwater basin, limiting factors include habitat disturbance. Low flows, poor riparian conditions and resultant high water temperatures reduce the quality and quantity of adult spawning and juvenile rearing areas (Close 2000). Because of their spending extended periods in freshwater, Pacific lamprey are especially vulnerable to degraded stream conditions including sedimentation due to land disturbance, and water quality limitations that impact diatom (food) production in nursery streams (Paradis et al. 1999b).

Out of the subbasin, the major limiting factors for ammocoetes and macrothalmia are passage and bypass mortalities at facilities on mainstem Snake and Columbia dams as well as migration delays through the reservoirs (Hammond 1979). For adults, the primary limiting factor is higher water velocities in the adult fish ladders and migration system. Adults have extreme difficulty negotiating the fish ladder weir orifices (T. Bjornn cited in Close 2000).

The Columbia Basin Lamprey Technical Workgroup (Close 2000), Close et al. (1995) and the Idaho Department of Fish and Game (1996 and 2001b) state that basic distribution, life history and population status are urgently needed to fully understand this species and to begin intensive management before extinction occurs and supplementation programs are implemented. Understanding the cause of decline through various data gathering and research efforts will be critical to implementing effective restoration actions for Pacific lamprey in the Columbia River Basin (Close et al. 1995).

Redband (Rainbow) Trout

Redband trout are thought to represent the resident form of steelhead trout in areas where they coexist (or coexisted historically) although the subspecies also exists in areas outside the historic range of steelhead trout (Behnke 1992). Redband trout are considered a species of special concern by the American Fisheries Society and the state of Idaho, and are classified as a sensitive species by the U.S. Forest Service and Bureau of Land Management (Quigley and Arbelbide 1997).

Although redband trout likely existed historically throughout the Clearwater subbasin (Quigley and Arbelbide 1997), little is known about the current distribution or status of redband trout populations in the subbasin. One reason for the lack of information is the inability to differentiate juvenile steelhead and resident redband trout phenotypically, and coexistence of the two subspecies throughout most of the Clearwater subbasin complicates efforts to gather information on redband trout population(s).

Hybridization of redband trout and stocked rainbow trout is common (Quigley and Arbelbide 1997), and often leads to questions over the genetic integrity of existing redband trout population(s). In the North Fork Clearwater drainage, where steelhead trout have been excluded by Dworshak dam, potential hybridization with stocked rainbow trout leaves the current distribution of redband trout in question. Methodology using DNA markers does exist to differentiate redband trout from the common coastal rainbow stocks that have been used for hatchery stocking. There is a need to identify the genetic integrity of redband populations in the Clearwater subbasin in areas that have been naturally or artificially blocked, heavily or sparsely stocked, and where they are sympatric with or isolated from steelhead.

Westslope Cutthroat Trout

Westslope cutthroat trout are currently listed as federal and state (Idaho) species of concern and sensitive species by the USFS and BLM. The subspecies has been proposed for listing under the ESA in some portions of its range. The historic range of westslope cutthroat trout has been reduced substantially (Rieman and Apperson 1989), and the existence of relatively strong population(s) throughout north-central Idaho may provide an important component to regional recovery efforts.

Westslope cutthroat trout exhibit resident, fluvial, and adfluvial life histories within the Clearwater subbasin (Thompson 1999; Weigel 1997). Westslope cutthroat mature at approximately five years of age, with fish in some areas spawning at three or four years (Simpson and Wallace 1982). Spawning typically occurs in April and May, with emergence during June and July. Migratory behaviors in cutthroat trout are seasonal in nature and associated with finding suitable spawning or wintering habitat (Bjornn and Mallett 1964). Westslope cutthroat trout are highly dependent upon substrate conditions for overwintering survival, particularly in headwater streams. Overwintering occurs in large deep pools or within crevices and interstitial spaces in the substrate in streams without adequate pools (Paradis et al. 1999a; Meehan and Bjornn 1991).

Three primary factors have been identified which have contributed to the decline of westslope cutthroat populations: species introductions, angling mortality, and habitat disruption (Quigley and Arbelbide 1997). Hybridization with exotic trout is considered the greatest threat to the conservation of native westslope cutthroat trout in northern Idaho and Montana (Allendorf and Leary 1988, cited in Weigel 1997). Both westslope and yellowstone cutthroat have been stocked in most of the AUs in the past although, since the late 1970's, only westslope cutthroat have been stocked, and then only in mountain lakes (Jody Brostrom, Idaho Department of Fish and Game, personal communication, April 22, 2001).

Evolution of cutthroat trout has occurred with a variety of salmonid species, and habitat segregation is common when cutthroat trout coexist with other salmonids (Thompson 1999; Pratt 1984; Hansen 1977). Hybridization with rainbow trout is common in some areas where the species coexist, while in other areas coexistence occurs with minimal hybridization (Behnke 1992). Behnke (1992) stated that areas exist within the Clearwater subbasin where essentially pure native westslope populations are relatively common. More recent investigations by Weigel (1997) suggest that introgression between westslope cutthroat trout and introduced rainbow trout in the North Fork Clearwater River may be widespread and substantial in some areas. Weigel (1997) also located genetically pure westslope cutthroat trout stocks within the higher elevations of the study area. Weigel and Statler (2001) indicated that genetic introgression with rainbow trout was detected in about 2/3 of the sites sampled in the North Fork Clearwater basin (1/3 low introgression, 1/3 moderate introgression). Current methodology precludes the ability to distinguish between hatchery influenced and natural introgression of rainbow trout into cutthroat trout populations. However, Liknes and Graham (1988) indicated that westslope cutthroat trout and steelhead/rainbow trout in the Clearwater drainages evolved sympatrically without significant hybridization. The mechanisms that limit the potential for hybridization between those two species include aggressive spawning behavior and spatial separation between spawning sites (Liknes and Graham 1988). There is no baseline genetic data on natural introgression of rainbow trout into populations of the North Fork Clearwater River (Jody Brostrom, Idaho Department of Fish and Game, personal communication, March 30, 2001). It is also unknown what effect Dworshak dam and the removal of the anadromous component had on the degree of natural introgression in the North Fork Clearwater drainage. There is a need to document natural or hatchery influenced introgression in cutthroat trout populations in the Clearwater subbasin so that remaining populations can be protected and managed.

Westslope cutthroat trout are highly susceptible to angling pressure and angling mortality has contributed to declines in the status of westslope cutthroat throughout their range (Behnke 1992). However, many populations have been shown to respond to restrictive angling regulations (Nez Perce National Forest 1998) with increased survival, abundance, and size (Bjornn and Johnson 1978, cited in Behnke 1992).

Effects of habitat disruption on westslope cutthroat trout populations are similar to those on other salmonid species. Extensive land use activities have led to population declines by increasing stream temperatures, decreasing the quality and quantity of suitable gravel and cover, and fragmenting existing populations. A strong association with roadless and wilderness areas suggests a substantial vulnerability to habitat alterations (Quigley and Arbelbide 1997).

Historic Status

Westslope cutthroat trout were historically the dominant salmonid in streams of northern and central Idaho (Behnke and Wallace 1986, cited in Nez Perce National Forest 1998), although documentation of status and distribution is limited. In the Lower Clearwater and Lolo/Middle Fork AUs, westslope cutthroat trout were likely abundant throughout the headwaters of mainstem tributaries, with limited use of the mainstem Clearwater River (Clearwater National Forest 1997). The upper reaches of both the Potlatch River and Lolo Creek historically maintained healthy populations of westslope cutthroat trout according to the Clearwater National Forest (1997), although Duff (1996) suggests that the Potlatch River did not historically support the subspecies. The majority of the South Fork AU was identified as a historic stronghold for westslope cutthroat (Nez Perce National Forest 1998). Past distribution and status of the subspecies within the Upper and Lower Selway AUs is thought to have been similar to current conditions, although large fluvial forms may have been more abundant historically (Thompson 1999). In the Upper and Lower North Fork AUs, westslope cutthroat trout populations are thought to have been historically strong (Liknes and Graham 1988). No information was found on the historic status of westslope cutthroat trout populations in the Lochsa River drainage, although they were thought to exist throughout (Duff 1996).

Current Status

Strong populations of westslope cutthroat trout currently exist in only about 11% of their historical Idaho range (Rieman and Apperson 1989). Westslope cutthroat trout are widespread in all portions of the Clearwater subbasin except the Lower Clearwater AU and are considered present–strong throughout the majority of their current range (Figure 28).

Available status information indicates that westslope cutthroat trout populations throughout the Upper North Fork, Lochsa, Upper and Lower Selway AUs are typically present-strong with the exception of a few tributaries or tributary systems. Data collected by IDFG suggest that the population of westslope cutthroat trout within the Selway River subbasin has experienced slight declines in the abundance of large fluvial individuals over the past two decades, but is still considered stable (Thompson 1999). Smolt traps operated in the Lochsa AU (Fish Creek and Crooked Fork Creek) regularly catch juvenile westslope cutthroat (Idaho Department of Fish and Game 1998a; Byrne 2001). Westslope cutthroat tagged at the Fish Creek trap have been recaptured in later years, suggesting that the Lochsa is an important rearing area and the Fish Creek population is not entirely resident (Byrne 2001).

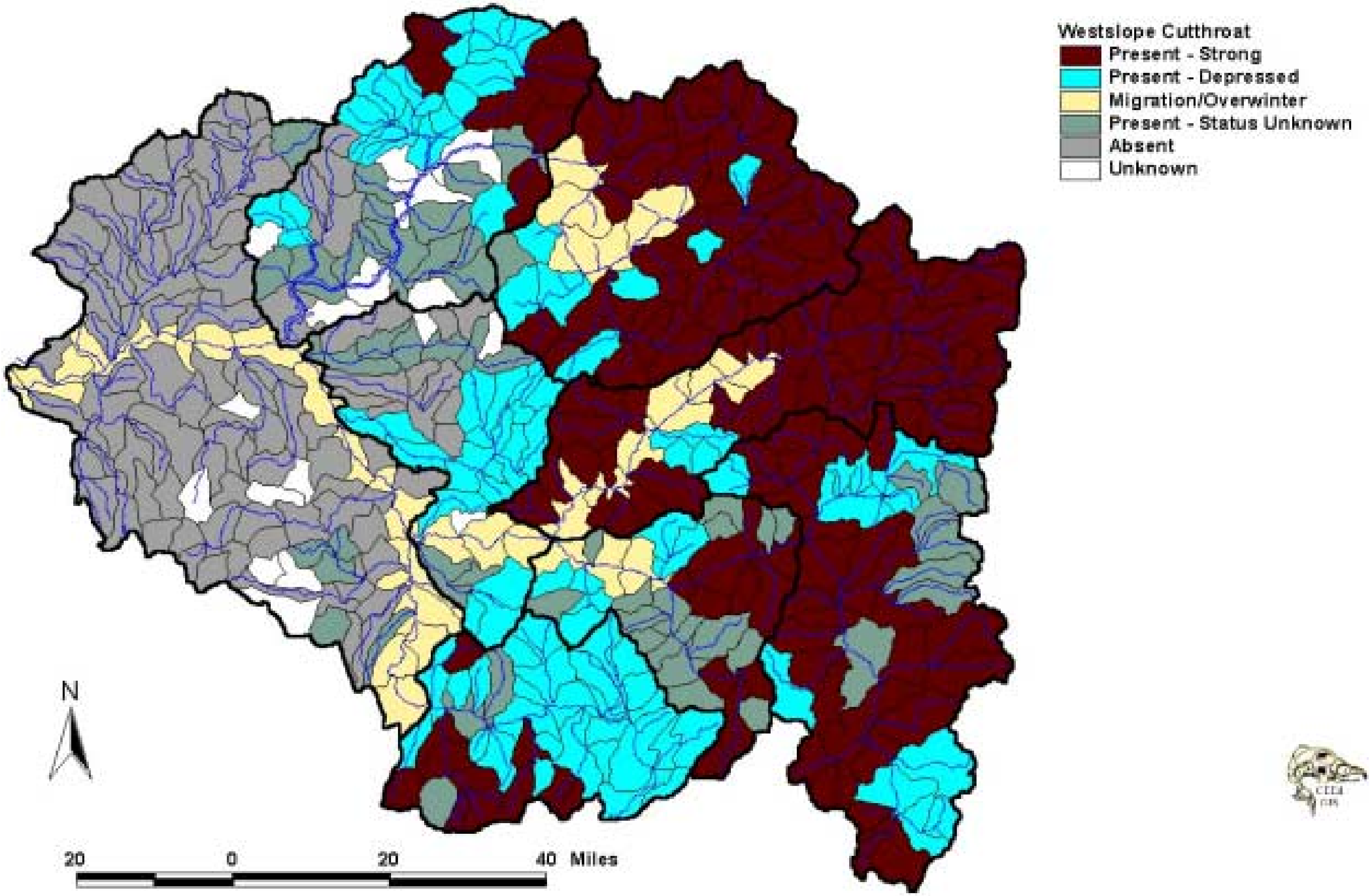

Figure 28. Known distribution and relative status of westslope cutthroat trout in the Clearwater subbasin

Westslope cutthroat trout are considered absent from the vast majority of tributaries in the Lower Clearwater AU, although rare sightings have occurred in some tributaries. Based on the frequency and distribution of sightings in the Lower Clearwater AU, westslope cutthroat trout that have been documented in most drainages are likely strays or dispersing juveniles from other areas within the subbasin. Only 15 were sampled during Gas Bubble Trauma monitoring between 1995-1999 (Cochnauer 1999).

In the Lolo/Middle Fork AU, westslope cutthroat trout are absent from Jim Ford Creek but present in all other major drainage systems. Westslope cutthroat trout are defined as present–depressed in all areas of the Lolo/ Middle Fork AU where status information is available.

In the Lower North Fork AU, westslope cutthroat trout are absent from the Elk Creek drainage but present in all other major drainages. Little status information is available in areas other than the Little North Fork Clearwater, where status designations are relatively evenly divided between present–depressed and present–strong.

Although widely distributed, westslope cutthroat trout are present–depressed through the majority of their range in the South Fork AU. Designations of present–strong within the South Fork AU are limited to Johns and Tenmile Creeks and the headwater reaches of Mill and Meadow Creeks and Crooked River. The Nez Perce National Forest (1998) describes the distribution of cutthroat trout within the South Fork drainage as similar to historical, with remaining stronghold areas closely associated with roadless/wilderness areas.

The Idaho Department of Fish and Game has taken steps to protect wild trout, including cutthroat, in the past 30 years. Most streams that contain westslope cutthroat trout have a restrictive sport fishing regulation, and the season is opened after the fish are believed to have spawned. Only sterile rainbow trout are used for most stocking to prevent hybridization with wild trout.

Bull Trout

The current distribution of bull trout within the Columbia River basin occupies about 44% of the estimated historic range, with the core remaining distribution in the central Idaho mountains, including the Clearwater River subbasin (Nez Perce National Forest 1998). Bull trout were listed under the ESA as threatened in Idaho in June 1998 (63 FR 31647). Concern over declines in bull trout abundance and distribution led to the development of a statewide conservation plan by the state of Idaho in 1996 (Batt 1996). Major goals of this plan include identification and maintenance of critical bull trout habitats, implementation of recovery strategies aimed at both abundance and habitat, and establishment of key watersheds to achieve stable or increasing populations and maximize potential for recovery. Under this plan, 10 watersheds in the Clearwater River subbasin were identified as key watersheds for bull trout conservation (Table 37). Bull trout were closed to sport fishing harvest in 1994. The extent and impact of tribal harvest on bull trout populations is not known.

Bull trout exhibit adfluvial, fluvial, and resident life history patterns within the Clearwater subbasin. Fluvial and resident bull trout populations have been commonly cited throughout the current range of bull trout in the Clearwater subbasin (Paradis et al. 1999b; Thompson 1999). The only suspected adfluvial bull trout population within the Clearwater subbasin is associated with Fish Lake in the Upper North Fork AU (Clearwater Basin Bull Trout Technical Advisory Team 1998c). Although bull trout in fish lake are assumed to be adfluvial in origin, no radiotagged bull trout were documented entering the lake but one spawned in the outlet, Lake Creek (Schriever and Schiff 2001). Fifty bull trout PIT-tagged in Fish Lake did not move out of the lake during summer and fall months suggesting that the Fish Lake population may be resident. Size of fish captured in the lake support this contention, as does the fact that mature females were also captured. Further research is ongoing to define the status of the Fish Lake bull trout population.

Bull trout have more specific habitat requirements than other salmonids (Batt 1996). Strong bull trout populations are associated with a high degree of channel complexity, including woody debris and substrate with clear interstitial spaces (Batt 1996). Temperature is a critical habitat element for bull trout, which may experience considerable stress in temperatures over 15°C (Pratt 1992, cited in Clearwater Basin Bull Trout Technical Advisory Team 1998c; Batt 1996). Optimum temperatures for incubation and rearing have been cited between 2 and 4°C and 7 and 8°C, respectively (Rieman and McIntyre 1993). Other habitat parameters of particular importance to bull trout populations include channel stability, substrate composition, cover, and migratory corridors (Rieman and McIntyre 1993).

Table 37. List of key watersheds within the Clearwater subbasin identified in the state of Idaho's Bull Trout Conservation Plan (Batt 1996)

Key Watershed	Description
North Fork Clearwater	The North Fork of the Clearwater River from Dworshak Reservoir upstream to Kelly Creek
Little North Fork Clearwater	The Little North Fork of the Clearwater River upstream of Dworshak Reservoir
Weitas Creek	Entire Weitas Creek Drainage, tributary to the North Fork of the Clearwater River
Kelly Forks	The entire North Fork of the Clearwater River drainage from the mouth of Kelly Creek upstream
South Fork of the Clearwater	The entire South Fork of the Clearwater drainage upstream from the Meadow Creek drainage
Lochsa River	The entire Lochsa River drainage
Meadow Creek	Selway River upstream from mouth of Lochsa River encompassing entire Meadow and Gedney Creek drainages
Selway River, Middle	The Selway River encompassing the Mink Creek, Marten Creek, Three Links Creek, Petibone Creek, Bear Creek and Bad Luck Creek drainage
Moose Creek	The entire Moose Creek drainage, tributary to the Selway River
Selway River, Upper	The Selway River encompassing the White Cap Creek, Indian Creek, Clearwater Creek, Swet Creek, Deep Creek, and Selway River headwaters

Historical Status

The entire Clearwater subbasin lies within the native range of bull trout (Meehan and Bjornn 1991). However, historic abundance and trend data are scarce because bull trout were considered a nuisance species (Clearwater Basin Bull Trout Technical Advisory Team 1998a, 1998b, 1998c, 1998d), with few records of their status maintained.

The Nez Perce National Forest (1998) states that historic distribution of fishes in the South Fork Clearwater were probably similar to current distributions, although the status of existing stocks (including bull trout) has declined significantly. This report also indicates that migratory (fluvial) bull trout were likely found throughout the South Fork Clearwater subbasin, with concentrations in mainstem tributaries. Historic abundance and distribution information for bull trout in other areas of the Clearwater River basin is rare or nonexistent (Clearwater Basin Bull Trout Technical Advisory Team 1998a, 1998b, 1998c, and 1998d), and existing records do not allow for interpretation of historical distribution or abundance at the subbasin scale. In addition, the connectivity of bull trout populations between assessment units is not known.

Current Status

Bull trout are distributed throughout most of the large river and associated tributary systems within the Clearwater subbasin (Figure 29). Relatively contiguous distributions of bull trout exist in the South Fork, Selway, and Upper North Fork AUs. Although bull trout are widely distributed in the Lochsa River AU, they are absent from many tributary systems in the lower half of the Lochsa drainage. Bull trout are sparsely distributed in the Lolo/Middle Fork AU, using the mainstem reaches of Lolo Creek and upper reaches of Clear Creek for spawning/rearing, and the Middle Fork Clearwater River for migration.

The Lower North Fork AU contains bull trout in portions of the North Fork Clearwater and Little North Fork Clearwater Rivers upstream of Dworshak Reservoir. Bull trout also occupy Dworshak Reservoir, and spawner size in some tributaries of the North Fork Clearwater River suggest that some bull trout spend extensive amounts of time feeding in the reservoir (A. Espinosa, personal communication, 1999). Current research has caught adult bull trout in Dworshak Reservoir, and through use of radio-tags, has documented their migration into headwater tributaries of the North Fork Clearwater River to spawn (Schriever and Schiff 2001) and return to the reservoir for overwintering.

With the exception of the mainstem Clearwater River, bull trout are essentially absent from the Lower Clearwater AU (Figure 29). Occasional documentation of bull trout has occurred in Lower Clearwater tributaries, but such sightings are regarded as random occurrences associated with juvenile dispersal. Bull trout may regularly use the mainstem Clearwater River. Recent sampling events directed at monitoring gas bubble trauma in the mainstem Clearwater River have regularly collected adult bull trout (Cochnauer 1999) and the trap at the base of Dworshak Dam catches subadult and adult bull trout every year in the spring. Dworshak Dam has likely fragmented the Clearwater subbasin bull trout population, and it is not known whether fish in the lower Clearwater have come from Dworshak Reservoir (Schriever and Schiff 2001).

Interpretation of bull trout status throughout the Clearwater subbasin is complicated by a lack of available information in many areas. Where status information is available, bull trout are most commonly designated as “present–depressed” (Figure 29). Designations of “present–strong” are assigned to 18 subwatersheds in the subbasin. Of seven AUs utilized by bull trout for purposes other than migration, five contain at least one subwatershed where bull trout are designated as present-strong. These include the Lower North Fork, Lochsa, Upper and Lower Selway, and South Fork AUs. Of 10 key watersheds defined for bull trout by the state of Idaho within the Clearwater subbasin, six contain areas where bull trout status is defined as present–strong in at least one subwatershed. The Nez Perce National Forest (Paradis et al. 1999b) states that connectivity between the Lochsa and Selway subbasins is high, and that regular exchange of bull trout between these areas is likely. Bull trout are also thought to use the Middle Fork Clearwater River (Paradis et al. 1999a).

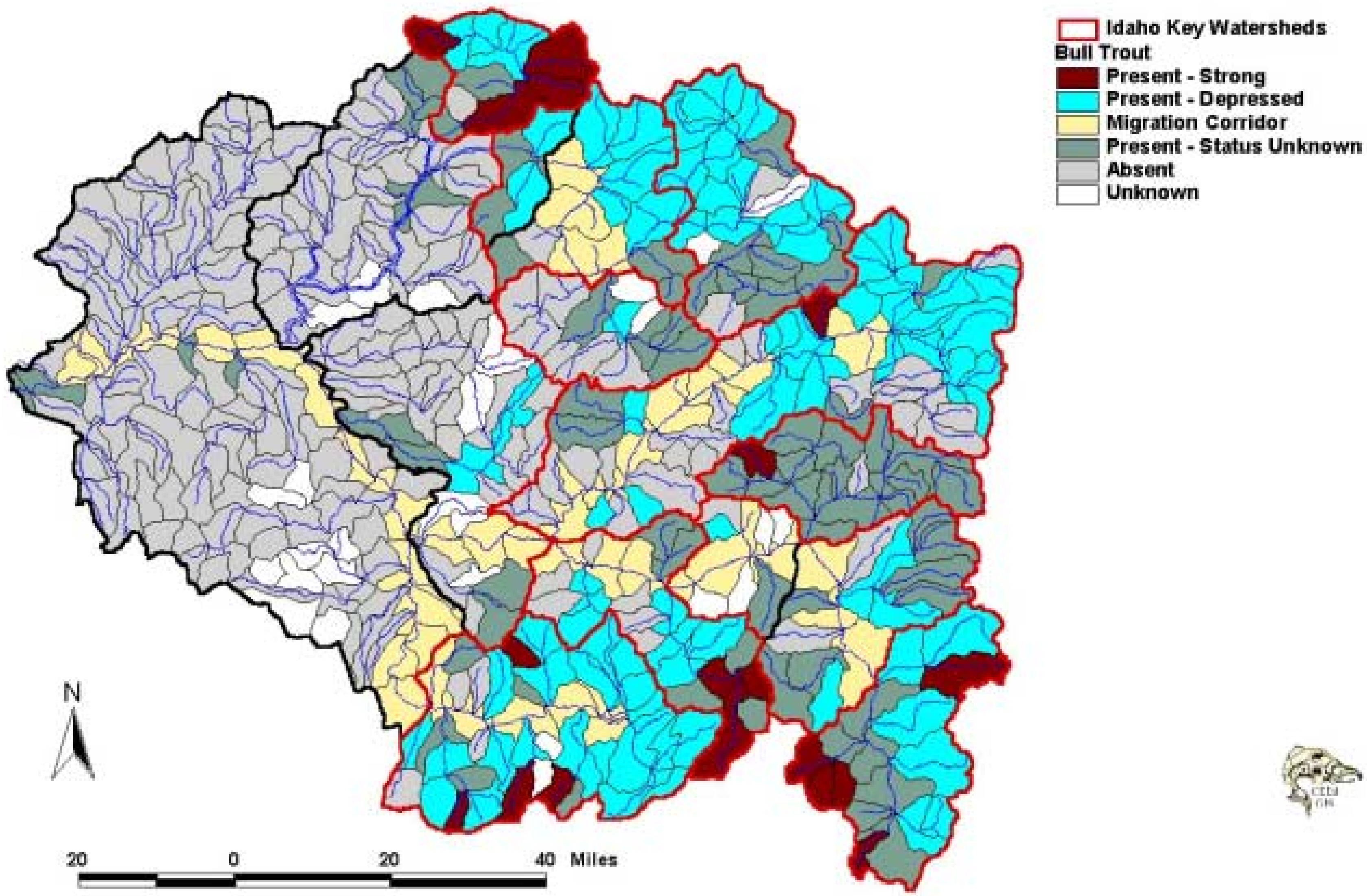

Figure 29. Known distribution and relative status of bull trout in the Clearwater subbasin. Red lines delineate key watersheds defined in the Idaho Bull Trout Conservation Plan

Based on available status information, contiguous areas with defined (or apparent potential for) strong bull trout subpopulations exist in the Little North Fork Clearwater drainage (Lower North Fork AU), the upper reaches of Meadow Creek in the Lower Selway AU, and portions of the Upper Selway AU. Strong subpopulations of bull trout in the South Fork AU are scattered and limited to headwater portions of Johns, Newsome, and Tenmile Creeks and Crooked and Red Rivers.

The South Fork AU has the most comprehensive data known about bull trout in the Clearwater subbasin. A multi-year study documented juvenile distribution in most major tributaries and headwater streams within the AU (Idaho Department of Fish and Game 2001c). The anadromous weir operated at Crooked River has captured subadult and adult bull trout since the early 1990s. From 1993-1999 an average of 16 were caught (range 0-32 fish; Idaho Department of Fish and Game 2001c). Fish captured at this weir in 1998 and implanted with radiotags show that bull trout migrate over 25 miles from the middle reach of the mainstem South Fork Clearwater River to spawn in Crooked River. In addition, juvenile bull trout captured in smolt traps have been implanted with PIT-tags, and recapture data shows movement within and between tributaries in the South Fork AU (Idaho Department of Fish and Game 2001c).

The Selway River supports a significant metapopulation of fluvial bull trout that are widely distributed through the subbasin in variable densities (Thompson 1999). The subbasin also supports widely distributed resident populations in some upper tributary reaches (Thompson 1999). The Selway population is thought to contain “thousands of individuals” and be fluctuating around an equilibrium but not growing (Thompson 1999).

The only subpopulation of bull trout defined as present–strong in the Lochsa AU is in Squaw Creek. Squaw Creek contains both resident and fluvial stocks of bull trout, with some of the most significant known bull trout habitat within the Lochsa drainage. An estimated 81 adults returned to spawn in Squaw Creek in 1997 and 1998 (Schoen et al. 1999). Based on the quantity of suitable habitat in Squaw Creek, this population size is considered low to moderate (Schoen et al. 1999).

Brook Trout

Brook trout are indigenous to eastern North America and have been introduced throughout the western states. Brook trout have been introduced in areas throughout the Clearwater River subbasin (Nez Perce National Forest 1998; Thompson 1999) beginning as early as 1936. Recent records indicate that the state of Idaho has not stocked brook trout in the Clearwater subbasin since 1984. Figure 30 shows the documented current distribution and relative status of brook trout population(s) within the Clearwater subbasin.

Introductions and subsequent spread of brook trout to many areas within the Clearwater subbasin may threaten the status of bull trout populations in areas of their coexistence. Hybridization of bull trout and brook trout is a common problem where populations overlap, and hybrids are often sterile (Clearwater Basin Bull Trout Technical Advisory Team 1998d). Brook trout will outcompete bull trout in degraded streams (Clearwater Basin Bull Trout Technical Advisory Team 1998a), although the opposite may be true in very cold streams (less than 10^0C; Adams and Bjornn 1994, cited in Clearwater Basin Bull Trout Technical Advisory Team 1998a). Currently methods are being tested in the Clearwater subbasin to remove brook trout from mountain lakes and adjacent tributaries where they are threats to bull trout (Murphy et al.2001) There is also a statewide bonus harvest limit for brook trout (currently ten brook trout) in addition to the general limit. In the Clearwater subbasin this applies

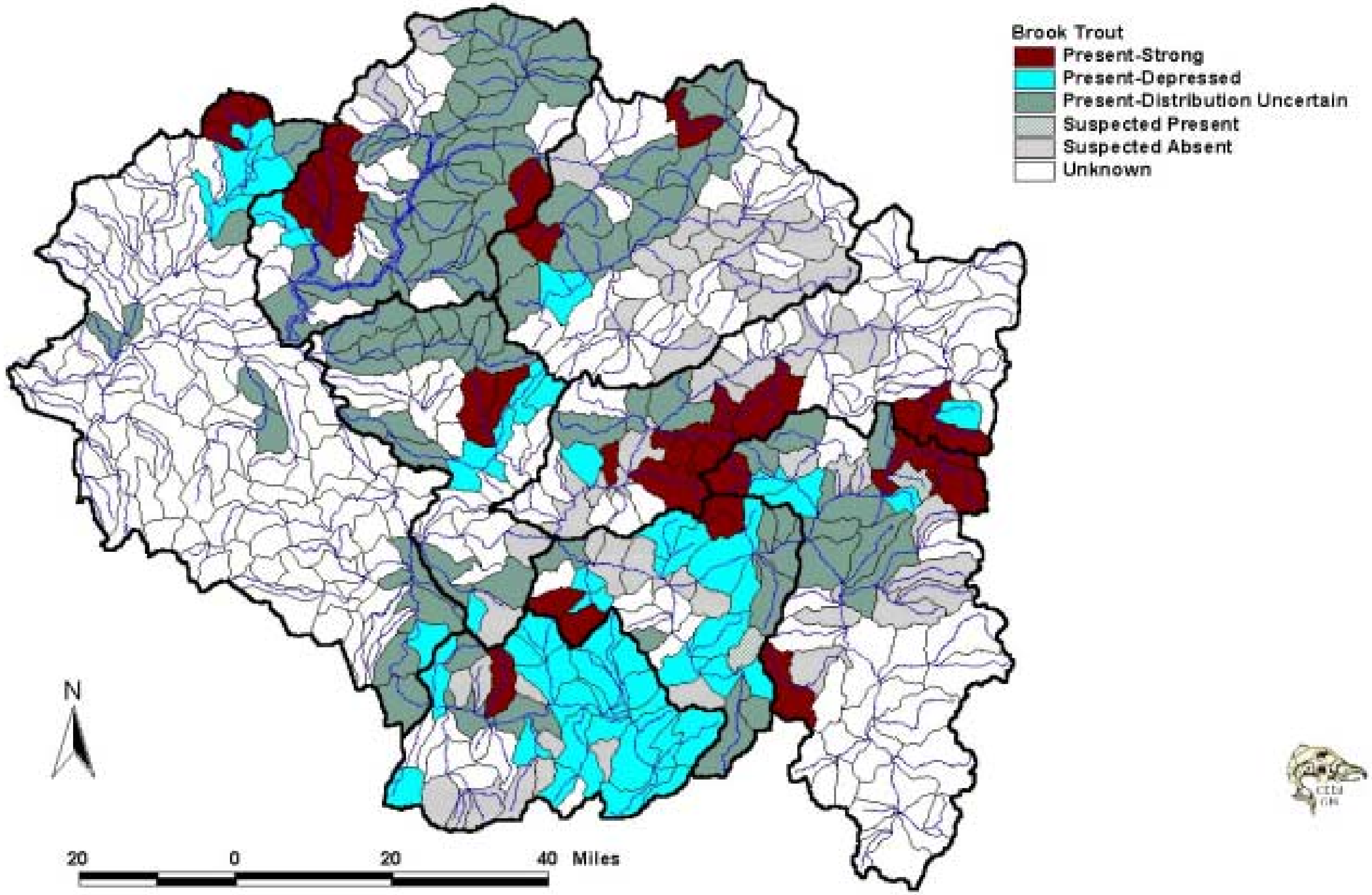

Figure 30. Known distribution and relative status of brook trout in the Clearwater subbasin

to all waters except Elk Creek. There are no cutthroat or bull trout in Elk Creek, and the brook trout attain a large size and are highly sought after by anglers.

Brook trout may also displace westslope cutthroat trout from some native habitat (Behnke 1992). Griffith (1988, cited in Behnke 1992) stated that brook trout are more likely to displace cutthroat trout from lower gradient stream reaches, whereas cutthroat trout are likely to outcompete brook trout in areas of higher gradient.

Brook trout typically mature by age two or three, and rarely exceed six years of age (Simpson and Wallace 1982). Spawning usually occurs during late September and October, and the young emerge during April and May. Brook trout most often construct redds in gravel, but if groundwater upwelling is sufficient, they may spawn on sand or silty bottoms (Meehan and Bjornn 1991).

Dworshak Reservoir Resident Fishery

The Idaho Department of Fish and Game, U.S. Army Corp of Engineers, U.S. Fish and Wildlife Service and Nez Perce Tribe work together to provide and manage a fisheries program for Dworshak Reservoir (Idaho Department of Water Resources 2000). The program recognizes the importance of optimizing the kokanee fishery, enhancing the smallmouth bass fishery, stocking rainbow trout, and managing native species such as bull trout and westslope cutthroat trout (Idaho Department of Water Resources 2000).

Dworshak Dam blocked upstream fish passage to all but the lower 1.9 miles of the North Fork Clearwater River drainage. Dworshak hatchery was constructed to mitigate the resultant loss of steelhead production area(s). In addition, the USACE has the legal responsibility to mitigate the effects of lost fishing opportunity resulting from construction of Dworshak Dam and Reservoir on the North Fork Clearwater River. Mitigation was originally defined as 100,000 pounds of hatchery reared fish annually, a goal which has only been reached three times since 1972. Annual stocking rates in Dworshak Reservoir have averaged 38,500 pounds over the past 25 years, and less than 15,000 pounds in the past 10 years (Idaho Department of Water Resources 2000).

Originally the Dworshak Reservoir fishery was comprised primarily of rainbow trout stocked as part of a federal fisheries mitigation requirement. From 1972 through 1980, rainbow trout dominated the fishery in Dworshak Reservoir, with angler use averaging about 88,000 hours annually (Idaho Department of Water Resources 2000). Smallmouth bass and kokanee were subsequently introduced to the reservoir, and by the 1980s, kokanee had replaced rainbow trout as the dominant fishery (Idaho Department of Water Resources 2000).

Kokanee are a landlocked form of sockeye salmon which are not native to the Clearwater subbasin. Kokanee were first stocked into Dworshak Reservoir in 1972 (Horton 1980). Four sources of fish were initially used, but the early spawning strain from Anderson Ranch Reservoir, Idaho now populates the reservoir (Winans et al. 1996). These fish spawn during September in tributary streams as far as 140 km above the reservoir. They reach maturity primarily at age 2, although age 1 and age 3 spawners were occasionally found. Adults range in size from 200 to 400 mm in total length depending on density in the reservoir, but generally average 300 mm during spawning (Maiolie and Elam 1995).

Kokanee provide a highly desirable and popular fishery in Dworshak Reservoir. They are unique in their ability to build to high population numbers in this drawdown reservoir environment. Winter water releases from Dworshak Dam result in entrainment of kokanee, and a high degree of annual fluctuation in population levels of kokanee (Idaho Department of Water Resources 2000). Summer water releases result in substantially less kokanee entrainment because fish are more active and tend not to be congregated near the dam (Idaho Department of Water Resources 2000). In years when their numbers are good, kokanee have provided fisheries with harvests of over 200,000 fish per year (Mauser et al. 1989). Kokanee abundance within the reservoir, however, fluctuates very widely (as much as 50 fold) due to entrainment losses into the dam (Figure 31). Kokanee spawner counts also fluctuate widely with the change in reservoir populations and entrainment loss (Table 38).

Entrainment losses limit the kokanee population in Dworshak Reservoir. Currently, strobe lights are being tested near Dworshak Dam as a method to reduce kokanee entrainment, and results are promising. Strobe light testing at off-site locations was successful and statistically significant reductions in densities of kokanee were found near the lights (Maiolie et al. 1999a; Maiolie et al. 1999b).

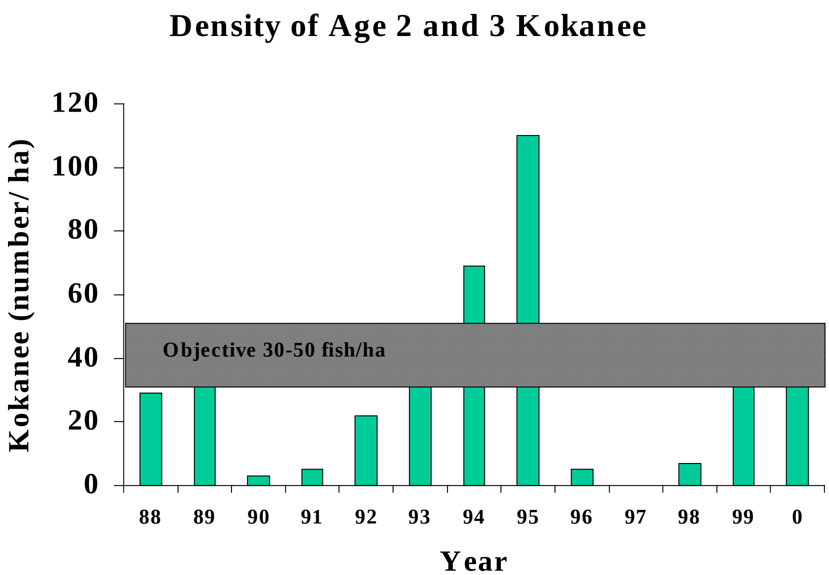

Figure 31. Abundance of age 2 and age 3 kokanee in Dworshak Reservoir, Idaho, from 1988 to 2000. Note the wide fluctuations in the population both above and below the objective to optimize the fishery

Table 38. Number of spawning kokanee observed in Dworshak Reservoir tributaries, 1981-2000

Year	Number of Spawning Kokanee
1981	8,070
1982	10,576
1983	2,451
1984	12,200
1985	20,000
1986	NC
1987	6,348
1988	21,820
1989	19,985
1990	15,456
1991	5,995
1992	13,192
1993	39,221
1994	31,424
1995	36,480
1996	2,569
1997	144
1998	678
1999	11,320
2000	4465

Success and consistency of the smallmouth bass fishery is also defined largely by the operational effects of Dworshak Dam and a general lack of productivity in the reservoir (Idaho Department of Water Resources 2000). Water level fluctuations in the reservoir also have eliminated successful spawning of redside shiners, substantially reducing forage availability for smallmouth bass (Idaho Department of Water Resources 2000). Smallmouth bass in Dworshak Reservoir have the slowest growth rate of any regional population, due primarily to a lack of forage, and the smallmouth bass fishery currently produces only limited harvest opportunity (Idaho Department of Water Resources 2000).

Rainbow trout stocking in Dworshak Reservoir has had mixed results, and in years of low kokanee abundance rainbow trout comprise the majority of consumptive fishing opportunity (Idaho Department of Water Resources 2000). Hatchery reared rainbow trout also dominate the creel of shoreline anglers in the reservoir (Idaho Department of Water Resources 2000). Beginning in 2000, all hatchery rainbow stocked in the reservoir are sterile to minimize risk of hybridization with native cutthroat trout and redband trout (Jody Brostrom, Idaho Department of Fish and Game, personal communication, May 7, 2001).

Wildlife Status

The Clearwater subbasin is inhabited by approximately 340 terrestrial wildlife species (Appendix D). The list of wildlife species present in the subbasin is based upon GIS data concerning wildlife ranges from ICBEMP (Appendix A). Species present on the list can be year-round residents of the subbasin or transients who inhabit the subbasin for only small portions of their migration period or life cycle. Most of the species diversity in the subbasin results from the presence of over 200 bird species (Appendix D). In addition to birds, there are approximately 73 mammal, 13 amphibian, and 13 reptile species present in the subbasin.

There are 37 species of concern in the Clearwater subbasin (Table 39). These species are listed as threatened, endangered, candidate, sensitive, of concern, or of special concern by the United States Fish and Wildlife Service (USFWS), the state of Idaho, the Bureau of Land Management (BLM), or the United States Forest Service Region 1 (USFS Region 1). Five species in the Clearwater subbasin are considered endangered or threatened at the state or federal level; they are the gray wolf (*Canis lupus*), the American peregrine falcon (*Falco peregrinus anatum*), the bald eagle (*Haliaeetus leucocephalus*), the lynx (*Lynx canadensis*), and the grizzly bear (*Ursus arctos horribilis*).

Seventeen species have been identified as focal species within the Clearwater subbasin. These species were chosen because of their ability to serve as indicators of larger communities, as representatives of larger wildlife guilds, as management species, or because of their own status as species of special concern. Many of the focal species are tracked by the Idaho Conservation Data Center (CDC). Occurrences of focal species tracked by the CDC are presented below. The information presented contains reported occurrences, many of which have not been documented. For some species, the number of reported occurrences seems exceptionally high to scientists familiar with the species and the subbasin. For other species, the number of reported occurrences seems exceptionally low, perhaps due to people not tending to report sitings for certain species.

Forest Carnivores

Fisher

The fisher (*Martes pennanti*) is a solitary, territorial, medium-sized carnivore that preys upon birds and small or medium-sized mammals like the snowshoe hare (Nez Perce National Forest 1998; Marshall et al. 1996; Powell 1993). It is the only species that regularly kills porcupines (Powell 1993). The fisher has been documented to occur in the subbasin (Nez Perce National Forest 1998), with over 170 reported fisher occurrences in the subbasin. The earliest reported observation occurred in 1882. The fisher is a management indicator species for the Nez Perce National Forest. Fisher populations across the United States were declining in the early 1900s (Powell 1993). Trapping and logging are two major ways humans have contributed to fisher decline and extirpation in Idaho (Groves et al. 1997a; Ruggiero et al. 1994; Powell 1993). Fishers from British Columbia were successfully reintroduced to north-central Idaho in the early 1960s to help control the porcupine population (Groves et al. 1997a; Powell 1993). Fishers are now distributed throughout almost all of their historical range in the Clearwater (Buskirk et al. 1994).

Table 39. State, federally listed or candidate wildlife, Clearwater subbasin (ICDC 2000; U.S. Fish and Wildlife Service 2000a; Idaho Department of Fish and Game 1991c)

Species		Idaho State	U.S. Forest Service	BLM	Federal
Accipiter gentilis	Northern Goshawk	Species of Concern Undetermined	Sensitive	Sensitive	N/A
Aegolius funereus	Boreal Owl	Species of Concern Priority	N/A	Sensitive	N/A
Bartramia longicauda	Upland Sandpiper	Species of Concern Peripheral	N/A	Sensitive	N/A
Bufo boreas	Western Toad	Species of Concern Undetermined	Sensitive	Sensitive	Species of Concern
Canis lupus	Gray Wolf	Endangered	N/A	N/A	Endangered
Chlidonias niger	Black Tern	Species of Concern Priority	N/A	N/A	N/A
Coccyzus americanus	Yellow-billed Cuckoo	Species of Concern Peripheral	N/A	Sensitive	N/A
Cypseloides niger	Black Swift	N/A	N/A	Sensitive	N/A
Diadophis punctatus	Ringneck Snake	Species of Concern Undetermined	N/A	Sensitive	N/A
Euderma maculatum	Spotted Bat	Species of Concern Undetermined	N/A	Sensitive	N/A
Falco peregrinus anatum	American Peregrine Falcon	Endangered	N/A	N/A	N/A
Gavia immer	Common Loon	Species of Concern Priority	Sensitive	N/A	N/A
Glaucidium gnoma	Northern Pygmy-owl	Species of Concern Undetermined	N/A	N/A	N/A
Gulo gulo	Wolverine	Species of Concern Priority	Sensitive	Sensitive	N/A
Haliaeetus leucocephalus	Bald Eagle	Endangered	N/A	N/A	Threatened
Histrionicus histrionicus	Harlequin Duck	Species of Concern (Game) Priority	Sensitive	Sensitive	N/A
Lanius ludovicianus	Loggerhead Shrike	Species of Concern Priority	N/A	Sensitive	Species of Concern
Lynx canadensis	Lynx	Species of Concern (Game)	N/A	Sensitive	Threatened
Martes pennanti	Fisher	Species of Concern Priority	Sensitive	Sensitive	N/A
Myotis ciliolabrum	Western Small-footed Myotis	N/A	N/A	Sensitive	N/A
Myotis evotis	Long-eared Myotis	N/A	N/A	Sensitive	N/A

Table 39 (Continued)

Species		Idaho State	U.S. Forest Service	BLM	Federal
Myotis thysanodes	Fringed Myotis	Species of Concern Undetermined	N/A	Sensitive	N/A
Myotis volans	Long-legged Myotis	N/A	N/A	Sensitive	N/A
Myotis yumanensis	Yuma Myotis	N/A	N/A	Sensitive	N/A
Numenius americanus	Long-billed Curlew	N/A	N/A	Sensitive	Species of Concern
Oreortyx pictus	Mountain Quail	Species of Concern Priority	Sensitive	Sensitive	Species of Concern
Otus flammeolus	Flammulated Owl	Species of Concern Undetermined	Sensitive	Sensitive	N/A
Picoides albolarvatus	White-headed Woodpecker	Species of Concern Peripheral	Sensitive	Sensitive	N/A
Picoides arcticus	Black-backed Woodpecker	Species of Concern Undetermined	Sensitive	Sensitive	N/A
Picoides tridactylus	Three-toed Woodpecker	Species of Concern Undetermined	N/A	Sensitive	N/A
Plethodon idahoensis	Coeur d'Alene Salamander	Species of Concern Priority	Sensitive	Sensitive	N/A
Rana luteiventris	Spotted Frog	Species of Concern Undetermined	N/A	Sensitive	Candidate
Rana pipiens	Northern Leopard Frog	Species of Concern Priority	Sensitive	Sensitive	Species of Concern
Sitta pygmaea	Pygmy Nuthatch	Species of Concern Undetermined	N/A	Sensitive	N/A
Synaptomys borealis	Northern Bog Lemming	Species of Concern Peripheral	Sensitive	N/A	N/A
Strix nebulosa	Great Gray Owl	Species of Concern Undetermined	N/A	Sensitive	N/A
Ursus arctos horribilis	Grizzly Bear	Threatened	N/A	N/A	Threatened

Fisher habitat preference changes with season, age, and sex of the individual (Marshall et al. 1996). Fishers avoid open areas (Buskirk et al. 1994; Powell 1993)and have a preference for structurally complex areas with continuous forested overhead cover (Nez Perce National Forest 1998; Marshall et al. 1996; Powell 1993). Fisher habitat also has multiple canopy layers including understory shrubs and large amounts of woody debris (Nez Perce National Forest 1998). Old-growth grand fir and subalpine fir stands are used by the fisher in Idaho (Powell 1993). Some studies have concluded that riparian zones are also important for fishers in Idaho (Ruggiero et al. 1994). A study by Jones and Garton (cited in Buskirk et al. 1994) in the southern part of the subbasin found that fishers preferred old-growth and mature forest stands in the summer, but that in the winter had no preference for or against these types of stands.

Wolverine

The wolverine (*Gulo gulo*) is a solitary carnivore and scavenger that eats small or medium-sized mammals, carrion, birds, insects, fish, roots, and berries (Csuti et al. 1997; Stuebner 1997). In Idaho, wolverines are distributed from the state's northern border to the South Fork of the Boise River (Ruggiero et al. 1994). There have been forty-five wolverine observations reported to the CDC in the subbasin. One third of the wolverine reports have occurred since 1990, mirroring a general increase in sitings in Idaho since the 1960s (Edelmann and Copeland 1998).

Wolverines need large areas containing denning sites for home ranges (Csuti et al. 1997). Places used for dens include caves, rock crevices, and fallen trees (Magoun and Copeland 1998; Csuti et al. 1997). Denning sites need to have at least one-meter deep snow cover throughout the denning period (Magoun and Copeland 1998). Wolverines usually inhabit areas that have little human influence and are far away from human-disturbed areas (Groves et al. 1997a; Ruggiero et al. 1994). In Idaho, wolverines inhabit mountainous areas (Ruggiero et al. 1994).

Ponderosa Pine Dependent

Flammulated Owl

The flammulated owl (*Otus flammeolus*) is a small, nocturnal, insectivorous owl (Groves et al. 1997b; Marshall et al. 1996). Common food sources during the breeding season are grasshoppers, beetles, and moths (Nez Perce National Forest 1998; Marshall et al. 1996). The flammulated owl is a documented nesting species in Idaho (Groves et al. 1997b). Population trends are not known for flammulated owls in the Clearwater (Groves et al. 1997b). A site in the Nez Perce National Forest surveyed in 1992 had a population density of 0.25-0.98 owls/40 hectares (Groves et al. 1997b). Most vegetation plots associated with owl locations at this site were dominated by ponderosa pine and Douglas fir (Groves et al. 1997b). In the study by Groves et al. (1997b), flammulated owls were not detected along the South Fork Clearwater River. Flammulated owls have been documented in the Granite Creek drainage of the South Fork Clearwater (Nez Perce National Forest 1998). The Idaho Conservation Data Center (CDC) has four reported occurrences of flammulated owl in the subbasin.

Habitats containing flammulated owls tend to be ponderosa pine and Douglas fir stands with multiple canopy layers (Groves et al. 1997b). The stands tend to be open forests with grassland and dense forest patches (Marshall et al. 1996).

White-Headed Woodpecker

The white-headed woodpecker (*Picoides albolarvatus*) is a medium-sized woodpecker whose diet is primarily composed of pine seeds and insects (Marshall et al. 1996; Ligon 1973). Because of their poor excavating abilities, white-headed woodpeckers usually nest in snags with decayed wood (Marshall et al. 1996). Nests are often built in ponderosa pine snags, but nests in other tree species and locations have been observed (Marshall et al. 1996). Two occurrences of white-headed woodpeckers in the subbasin have been reported to the Idaho CDC.

Habitat preferences for the white-headed woodpecker are similar to those for the flammulated owl. The white-headed woodpecker prefers open, mature or old stands of ponderosa pine or mixed conifer forests containing ponderosa pine (Nez Perce National Forest 1998; Groves et al. 1997a; Marshall et al. 1996). Large diameter ponderosa pine trees are a habitat requirement for white-headed woodpeckers (Marshall et al. 1996). Bull et al. (1986) found that white-headed woodpeckers only used larger diameter (>25 cm DBH) ponderosa pine trees in ponderosa pine forest types for foraging.

Black-Backed Woodpecker

The black-backed woodpecker (*Picoides arcticus*) is a medium-sized woodpecker known to occur in the Lochsa Subbasin, the Clearwater National Forest, and the Bitterroot National Forest (Nez Perce National Forest 1998; Marshall et al. 1996). Surveys conducted in the South Fork Clearwater River failed to detect black-backed woodpeckers, but the species can be hard to detect (Nez Perce National Forest 1998). There has been one occurrence of the black-backed woodpecker in the subbasin reported to the CDC. The species' diet contains large amounts of bark and wood-boring beetle adults and larvae (Nez Perce National Forest 1998; Marshall et al. 1996). Foraging typically occurs on live or recently dead (<2 year) lodgepole pine trees (Bull et al. 1986).

Black-backed woodpeckers require habitats with dead or dying trees that contain adult beetles or their larvae (Nez Perce National Forest 1998). Stands inhabited by black-backed woodpeckers tend to be old growth lodgepole pine (*Pinus contorta*) or recently burned forests with standing dead trees (Nez Perce National Forest 1998; Groves et al. 1997a). Research by Bull et al. (1986) indicates that this species requires recently dead (<5 years) small diameter trees for nesting (<50 cm DBH). Habitat for black-backed woodpeckers is primarily in the eastern portion of the subbasin and along the South Fork of the Clearwater (Groves et al. 1997a).

Mountain Quail

Mountain Quail populations have been declining for many decades. They now only occupy a fraction of their former distribution in western Idaho (Sands et al. 1998). Mountain quail nesting is often associated with open-canopied forests. Forest succession in these types during the last 75 or more years may have played a significant role in reducing the suitability of these habitats to support mountain quail. It is well documented that many of these forests have undergone a gradual canopy closure as a result of decreased fired frequencies. This is especially true for the dry interior Douglas fir and ponderosa pine forest types that were previously dominated by an open stand of mature ponderosa pines (Sands et al. 1998).

Late Seral

Northern Goshawk

The northern goshawk range spreads through large parts of North America (Marshall et al. 1996). In northern Idaho, the species is uncommon or rare (Nez Perce National Forest 1998).

Three occurrences of goshawk nest sites have been reported in the subbasin. Surveys in the Dworshak study area in 2000 did not locate goshawk nests but did detect goshawks at 5 sites (Bowers and Nadeau 2000). Goshawks prey upon small birds and mammals (Marshall et al. 1996).

Northern goshawks inhabit coniferous forests in Idaho and require three kinds of habitats - nest areas, post-fledgling family areas, and foraging areas (Nez Perce National Forest 1998; Graham et al. 1994). Mature or old growth timber tends to be selected for nest sites (Nez Perce National Forest 1998). Post-fledgling family habitat should contain mid-seral forested stands; forest openings with a herbaceous layer; and large trees, downed logs, and snags (Graham et al. 1994). Foraging habitat combines the prey species' habitat with areas that allow for goshawks to hunt and capture prey (Graham et al. 1994). Northern goshawks tend to hunt from perches (Groves et al. 1997a). Timber harvest may reduce northern goshawk distribution (Groves et al. 1997a).

Early Seral

Lynx

Lynx are felids that prey upon small mammals with a strong preference for snowshoe hares (Nez Perce National Forest 1998). Little information on lynx populations in the subbasin exists, beyond 39 occurrences reported to the CDC in the subbasin (Nez Perce National Forest 1998). One documented record involved a lynx trapped in Earthquake Basin in 1991 and another record involved a sighting near Lightning Creek (Nez Perce National Forest 1998). Lynx are uncommon in Idaho and their abundance correlates to snowshoe hare and prey species abundance (Groves et al. 1997a; Ruggiero et al. 1994).

Lynx in Idaho inhabit Engelmann spruce (*Picea engelmannii*) and subalpine fir (*Abies lasiocarpa*) forests containing adequate denning and foraging sites (Nez Perce National Forest 1998). Old growth sites are needed to provide the hollow logs or rootwads used for denning (Nez Perce National Forest 1998). Early seral forested stands containing lodgepole pine, subalpine fir, and Engelmann spruce are needed by lynx for foraging habitat (Nez Perce National Forest 1998). These early seral stands are prime habitat for snowshoe hares and can be created by disturbances such as fire, logging, windthrow, and disease (Ruggiero et al. 1994). The different denning and foraging habitat needs result in the species requiring a mosaic of different-aged forest stands (Nez Perce National Forest 1998; Groves et al. 1997a).

Grizzly Bear

Grizzly bears are large omnivores that eat a variety of plants and animals (U.S. Fish and Wildlife Service 1993; LeFranc et al. 1987). Some food sources are used throughout the year, whereas others are used on a more seasonal basis (LeFranc et al. 1987). Grass and sedge species are eaten throughout the year (LeFranc et al. 1987). In the winter, grizzly bears' diet includes ungulates, ground squirrels, and some larger animals (U.S. Fish and Wildlife Service 1993). In the summer in the Selkirk Mountains, a study found that grizzly bears ate substantial amounts of huckleberries (Groves et al. 1997a). Whitebark pine seeds are an important summer food source discovered through a Yellowstone study (Groves et al. 1997a). Before European settlement, grizzly bears inhabited areas west of the Mississippi stretching from Alaska to central Mexico (U.S. Fish and Wildlife Service 1993). Today, grizzly bears are known to exist in five areas of the continental 48 states, none of which are in the subbasin (U.S. Fish and Wildlife Service 1993). There is a possibility that grizzlies still inhabit the Selway-Bitterroot area of the subbasin, but there is not substantive evidence for grizzlies in the area (U.S. Fish and Wildlife Service

1993). The process of reintroducing grizzly bears into the Selway-Bitterroots has already begun. Under the proposed plan, grizzlies would be reintroduced and designated as a nonessential experimental population (U.S. Fish and Wildlife Service 2000). The plan initially is to relocate grizzlies only into the Selway-Bitterroot Wilderness Area (U.S. Fish and Wildlife Service 2000). This plan is currently under litigation, the outcome of which remains in question (Jim Caswell, Idaho Office of Species Conservation, personal communication April 11, 2001).

Grizzly bears require large habitat areas. Home ranges for grizzly bears can be as large as hundreds of square miles or as small as 20 square miles (U.S. Fish and Wildlife Service 1993). Habitat links between grizzly bear populations are important for maintaining genetic diversity (U.S. Fish and Wildlife Service 1993). Roaded habitat can mean three things for grizzlies: effectively decreasing grizzly habitat available if roads are avoided by grizzlies, habituating grizzlies to humans, and increasing grizzly vulnerability to poachers or illegal mortality (U.S. Fish and Wildlife Service 1993). In Yellowstone, berry and pine seed availability impact grizzly bear population size (Groves et al. 1997a).

Gray Wolf

The gray wolf, the largest member of the dog family (Mivart 1890), historically was distributed throughout most of Idaho with stable populations (Kaminski and Hansen 1984). Wolf packs were first recorded in 1812 in the Clearwater River drainage and were distributed from the Canadian border south (U.S. Fish and Wildlife Service 1987). Federal and public control efforts essentially eliminated wolves from the west, including Idaho in the 1930's (Kaminski and Hansen 1984). Wolves were reintroduced in 1995 and 1996 into Idaho under the 10(j) section of the Endangered Species Act which designated wolves as an experimental nonessential. This permits wolves to be managed to minimize conflicts and meet public concerns (Mack and Laudon 1998). The identified goal of wolf recovery is to establish 10 breeding pairs in each of the recovery areas for three years in a row. The recovery areas include Central Idaho, the Greater Yellowstone Ecosystem and Northwest Montana (U.S. Fish and Wildlife Service 1994). Idaho met its recovery goal in 1998 and in 1999 with ten identified breeding pairs but dropped to nine pairs in 2000 (Mack and Laudon 1998; Mack 2001). Delisting can begin when all the recovery areas have met the recovery goal. In the Clearwater Basin, four known wolf packs occur. The Marble Mountain pack maintains a territory in the Marble Creek drainage which is in the Panhandle National Forest (Mack 2001). A small portion of their most southeastern territory lies with the sub-basin. The Kelly Creek wolf pack has produced pups since 1996. They have maintained a territory largely within the roadless areas of the Clearwater and Lolo National Forests (Mack 2001). The Big Hole pack produced their first litter in 1998 and maintains a home-range on the Idaho/Montana border. The last known wolf pack within the basin is the Selway pack. The Selway group produced their first litter in 1996. Their territory is within the Selway Bitterroot Wilderness, the Bitterroot and the Nez Perce National Forests and includes the high elevation mountainous country between the main Salmon and Selway rivers (Mack and Laudon 1998).

The basic unit of wolf populations is the pack; a cohesive group of two or more individual wolves traveling, hunting, feeding and resting together throughout most of the year. Wolves eat larger game animals such as deer, elk, moose, and mountain goat, all of which inhabit the Clearwater (Nez Perce National Forest 1998; Marshall et al. 1996). Packs usually have 5 to 8 members and require large home ranges with enough food to support the group (Marshall et al. 1996). Gray wolf habitat is high quality big game habitat with mesic meadows for denning (Nez Perce National Forest 1998). Additionally, gray wolf habitat should have small human populations and low likelihood of human-wolf interactions (Groves et al. 1997a).

Wetland

Western Toad

The western toad (*bufo boreas*) feeds on small invertebrates such as ants, spiders, and beetles (Csuti et al. 1997). The species is distributed throughout the subbasin (Groves et al. 1997a). Asherin and Orme's (1978) surveys along the lower Clearwater and Dworshak found the western toad to be one of the two most abundant amphibians in the area. Surveys conducted in 2000 in the Dworshak study area located western toads at 6 sites (Bowers and Nadeau 2000). In parts of the western United States, there seems to be a declining population trend for the species (Groves et al. 1997a).

The western toad is able to inhabit a variety of communities including grasslands, woodlands, and forests (Csuti et al. 1997). The species will also inhabit disturbed habitat such as irrigation canals (Csuti et al. 1997). Suitable habitat must contain a water source for breeding (Csuti et al. 1997).

Coeur d'Alene Salamander

The Coeur d'Alene salamander (*Plethodon idahoensis*) is a lungless salamander that occurs in the Idaho panhandle, Montana and British Columbia (Wilson et al. 1997). According to the Idaho CDC, there have been 40 recorded occurrences of the Coeur d'Alene salamander in the Clearwater subbasin. Wilson et al. (1997) identified even more historic and recently found localities of the salamander along the North Fork Clearwater River, the Lochsa River, and the Selway River. Nine localities were located on the Selway and five were located on the Lochsa (Wilson et al. 1997). More than 30 localities were located on the North Fork of the Clearwater (Wilson et al. 1997). Surveys conducted in the Dworshak study area in 2000 found 3 adult and 10 juvenile salamanders in 11 different drainages (Bowers and Nadeau 2000).

The Coeur d'Alene salamander inhabits temperate mesic forests in areas near water sources (Wilson et al. 1997). More specific components of its habitat are fractured bedrock or rock outcroppings and moist areas like springs, seeps, and riparian areas (Wilson et al. 1997; Cassirer et al. 1994). Rock outcroppings are used as retreats by the salamander (Wilson et al. 1997). The species does not seem to occur above the elevational boundary where subalpine forests begin (Wilson and Larsen 1998; Wilson et al. 1997). The North Fork of the Clearwater is one of the four core areas inhabited by the species (Cassirer et al. 1994). The Selway River localities are at the southern edge of the species' distribution in Idaho (Cassirer et al. 1994).

Managed Species

Elk

Elk are a significant wildlife component in the subbasin, both for recreational and economic reasons. The elk population has changed in number more than any other wildlife species in the Clearwater (Space 1964). Archaeological evidence from digs in the Clearwater River basin suggests that elk have inhabited this area for more than 10,000 years (Clearwater National Forest 1999). In the late 1800s and early 1900s, elk abundance and distribution in the Clearwater was slim and scattered. The already scattered and sometimes sparse populations were impacted in the 1860s when thousands of gold miners took advantage of the unlimited hunting in some areas (Clearwater National Forest 1999). Several extensive wildfires between 1910 and 1934 removed expanses of overstory and opened up a large forage area. Portions of the area were declared a wildlife reserve, allowing the elk to respond to this increase in forage. The subbasin's elk population grew to over 36,000 elk (U.S. Department of Agriculture 2000). By 1935, elk were becoming so plentiful, that the Clearwater Forest grazing report stated that elk were depleting their winter range. Although there is no documentation, forest personnel suspect that the elk population reached its peak in 1948. The severe winter of 1948-1949 greatly reduced the population size and since then hunting pressure has kept the population below the suspected 1948 peak (Space 1964). From 1954 to 1957 the Idaho State Fish and Game Department conducted a Game and Range study of the Clearwater that indicated a significant increase in the population (Space 1964). In 1976 hunting restrictions were enacted that only permitted bull hunting (U.S. Department of Agriculture 2000). This allowed for an increase in population that continued for about 15 years (U.S. Department of Agriculture 2000), until the subbasin's elk population declined in the 1990s (U.S. Department of Agriculture 2000). In 1997, a significant drop occurred in the elk populations within certain parts of the subbasin when deep snow covered elk winter range (U.S. Department of Agriculture 2000). Recent data shows the Clearwater elk populations are in decline.

Elk habitat consists of summer and winter range. Both areas must have enough plant material available for forage during the season they are inhabited. Generally, winter range is located at lower elevations than summer range and has less snow cover. The kinds of plant material eaten by elk include grasses, forbs, and the tips of twigs from some woody vegetation (Csuti et al. 1997). Elk need early seral communities or shrubfields that have adequate levels of forage (Clearwater National Forest 1999). The large-scale fires that occurred early in this century to the benefit of elk habitat have been followed by nearly 50 years of fire suppression and forest succession. This has resulted in widespread habitat change as early seral stands have been replaced by closed canopy more densely forested summer habitats, smaller forest patches are replaced by larger less diverse homogeneous stands, and winter range shrubfields become senescent. The amount of early seral vegetation in the North Fork Clearwater has declined from a historic average of 35-45 percent to approximately 14 percent (Clearwater National Forest Files 1999, cited in Servheen and Bomar 2000). Throughout the subbasin, the amount of early seral communities and shrubfields has declined with the lack of major disturbance and successional processes continuing on the sites burned in the early 1900s (Clearwater National Forest 1999). Reintroducing fire to the ecosystem on a large scale will benefit a large number of wildlife species dependent on early seral stages of forest succession, including elk. Elk inhabit the Dworshak Reservoir year round and use the area as a winter range (Asherin and Orme 1978). The upper end of the reservoir, especially Smith Ridge, was found to be an important spring calving area by the Department of Fish and Game (Asherin and Orme 1978).

Extirpated or Nearly Extirpated Species in Idaho

Bighorn Sheep

Rocky Mountain bighorn sheep (*Ovis candensis canadensis*) used to be abundant in central Idaho and the Idaho Rocky Mountains (Smith 1954). As EuroAmericans were settling the region, three large bighorn sheep population reductions occurred (Smith 1954). In the 1870s, it is hypothesized that a scabies epidemic killed a large number of sheep (Smith 1954). Scabies combined with a harsh winter caused a population decline around 1890 (Smith 1954). A third population decline occurred around 1910 (Smith 1954). Other factors that contributed to population declines and extirpation in some portions of Idaho were hunting, domestic livestock competition, and human disturbance to habitat (Smith 1954). In 1954, a small area east of the southern end of the Selway River was the only area known to be inhabited by bighorn sheep in the subbasin (Smith 1954).

Present bighorn sheep habitat contains cliffs and steep canyons (Smith 1954). But there is reliable information that historically bighorn sheep inhabited valley and prairie areas far away from breaklands they inhabit today (Smith 1954). Currently, habitat is available in scattered portions of the subbasin (Groves et al. 1997a). Grazing competition limits the number of bighorn sheep that can inhabit the subbasin (Groves et al. 1997a).

Sharp-tailed Grouse

Sharp-tailed grouse (*Tympanuchus phasianellus*) no longer inhabit the subbasin. The Audubon Christmas Bird Count and the North American Breeding Bird Survey both did not detect sharp-tails in the subbasin but did detect them in southern Idaho and in Montana (Deeble 2000).

Sharp-tailed grouse inhabit areas that have a mosaic of grasses, shrubs, and some deciduous trees (Deeble 2000). The subspecies Columbian sharp-tailed grouse prefers mesic shrub-steppe communities and grasslands (Deeble 2000). Many of the grasslands in the subbasin have been converted to agricultural uses. Habitat loss has contributed to the decline in the species throughout its range (Deeble 2000).

Sandhill Crane

Sandhill cranes (*Grus canadensis*) that inhabit Idaho are migratory, nesting in Idaho and wintering in regions south of Idaho (Larsen and Nordstrom 1999). The species is an omnivore and its diet contains grains, invertebrates, amphibians, and small mammals (Larsen and Nordstrom 1999). Little is known about the history of sandhill cranes in the subbasin. The species did occur in the subbasin before European settlement (Thwaites 1959). When Lewis and Clark were camped near Kamiah they noted that sandhill cranes were abundant in the area (Thwaites 1959). Today the species does not occur in the subbasin, but does inhabit parts of southern Idaho (Groves et al. 1997a).

Sandhill crane habitats are open wetland areas with good visibility (Larsen and Nordstrom 1999). Nesting sites are often in emergent wetland vegetation (Larsen and Nordstrom 1999). Agricultural fields in grain production are also used by sandhill cranes, primarily for feeding (Larsen and Nordstrom 1999).

Fish Habitat Areas and Quality

Anadromous Species

Due to the significant loss of mainstem habitat, function, and direct and indirect mortalities associated with the Federal Columbia River hydropower system (FCRPS), tributary habitat has become more critical to the survival and recovery of listed anadromous species throughout the Columbia basin. Due to direct and indirect effects of the FCRPS, NMFS has directed in its ESA 2000 BIOP that tributary habitat improvements are required as part of off-site mitigation activities of the U.S. Army Corps of Engineers, the U.S. Bureau of Reclamation, and the Bonneville Power Administration for continued operation. The potential for habitat-based off-site mitigation within the Clearwater subbasin is affected by the Dworshak Dam blockage of the North Fork Clearwater River system, and by expanses of pristine habitats in wilderness and other protected areas.

In the Clearwater subbasin, steelhead trout and fall chinook salmon are listed as threatened under the Endangered Species Act (ESA) and have had critical habitats designated by the National Marine Fisheries Service (NMFS). Spring chinook salmon within the Clearwater subbasin have been excluded from the ESA listing for Snake River spring/summer chinook and therefore have no designated critical habitat areas. While subpopulations of spring chinook salmon are distributed throughout the subbasin, they are not listed under the ESA because the current natural runs are primarily the result of the past reintroduction programs (Nez Perce Tribe and Idaho Department of Fish and Game 1990; Columbia River Inter-Tribal Fish Commission 2000). Critical habitat as defined by NMFS includes all waterways, substrate and adjacent riparian zones below longstanding, naturally impassable barriers. Riparian zones are defined as those areas within a horizontal distance of 300 feet from the normal line of high water of a stream channel or from the shoreline of a standing body of water. Indian lands are excluded from designated critical habitats.

For steelhead trout, critical habitat within the Clearwater subbasin includes all accessible river reaches and excludes areas above Dworshak Dam and any longstanding, naturally impassable barriers in existence for at least several hundred years. Current documentation of naturally impassable barriers is lacking. Attempts have been made to document natural barriers (Murphy and Metsker 1962), but incomplete records and subsequent modification or elimination of many barriers has precluded documentation of those that currently exist.

Designated critical habitat within the Clearwater subbasin for fall chinook salmon includes the Clearwater River from its confluence with the Snake River upstream to its confluence with Lolo Creek, the North Fork Clearwater River from its confluence with the Clearwater River upstream to Dworshak Dam, and all other river reaches presently or historically accessible to fall chinook salmon in the Lower Clearwater and Lower North Fork Clearwater (below Dworshak Dam) 4^{th} code HUCs.

Habitat quality for spring chinook salmon and steelhead trout was estimated in a relatively comprehensive manner throughout the subbasin during development of the Northwest Power Planning Council Presence/Absence Database. Habitat quality ratings were compiled by stream reach and are qualitative and species specific. Habitat quality for each species was rated as excellent, good, fair or poor. Stream reach ratings of habitat quality were subsequently summarized within each applicable 6^{th} field HUC by assigning numerical values to each rating, and calculating the weighted average for each HUC using segment length as the weighting variable.

Very little habitat within the Clearwater subbasin has been defined as excellent for spring chinook salmon. Excellent habitat is typically limited to the highest elevation headwater streams within the Lochsa and Upper Selway AUs (Figure 32). However, if not blocked by Dworshak Dam, the Upper and Lower North Fork AUs would provide substantial amounts of excellent spring chinook habitat (Mallett 1974). The U.S. Fish and Wildlife Service (1962) found that headwater streams in the North Fork Clearwater basin , prior to blockage by Dworshak Dam, provided excellent spawning and rearing habitat for anadromous fish, including spring chinook salmon. Good and fair spring chinook salmon habitat is widely intermixed and found throughout the majority of the usable mainstem and tributary reaches of the Lochsa, South Fork, and Upper and Lower Selway AUs. Poor habitat conditions for spring chinook are typically associated with lower mainstem reaches of major tributaries (Lolo Creek, Lochsa, Selway and South Fork Clearwater Rivers) and the mainstem Clearwater River.

Prior to blockage by Dworshak Dam, habitat in the North Fork Clearwater provided excellent steelhead spawning and rearing habitat that supported 60% of the spawning activity in the Clearwater subbasin (U.S. Fish and Wildlife Service 1962). Of the remaining habitat in the subbasin, excellent steelhead trout habitat characterizes the vast majority of the available habitat in the Upper Selway AU, and the majority of tributary habitats within the Lower Selway and Lochsa AUs (Figure 33). The mainstem Lochsa River and mainstem Selway River above the wilderness boundary provide 'good' steelhead trout habitat, as do most of the tributary systems within the South Fork AU. Within the South Fork AU, 'excellent' steelhead trout habitat is associated with drainages originating within the Gospel Hump Wilderness Area: Johns Creek, Tenmile Creek, and the uppermost reaches of Crooked River. The Lower Clearwater and Lolo/Middle Fork AUs are most typically characterized by fair to poor steelhead habitat throughout. Notable exceptions are Big Canyon Creek and portions of Lolo Creek which are characterized as "good" steelhead trout habitat.

Resident Species

Bull trout have more specific habitat requirements than other salmonids. Strong bull trout populations are associated with a high degree of channel complexity, including woody debris and substrate with clear interstitial spaces. The amount of habitat complexity or cover required to maintain strong bull trout population(s) cannot however, be quantified (Batt 1996).

Temperature is a critical habitat element for bull trout, which may experience considerable stress in temperatures over 15^0 C (Pratt 1992 cited in Clearwater Basin Bull Trout Technical Advisory Team 1998a; Batt 1996). Optimum temperatures for incubation and rearing have been cited between 2 and 4^0 C and 7 and 8^0 C, respectively (Rieman and McIntyre 1993). Other habitat parameters of particular importance to bull trout populations include channel stability, substrate composition, cover, and migratory corridors (Rieman and McIntyre 1993).

Ten bull trout key watersheds within the Clearwater subbasin were defined in the State of Idaho Bull Trout Conservation Plan (Batt 1996) based in part on the following habitat characteristics: key watersheds must provide all critical bull trout habitat elements and are selected from the best available habitat with the best opportunity to be restored to high quality. Key watersheds defined for bull trout within the Clearwater subbasin are summarized in Section 1B (Table 37 and Figure 29).

Specific habitat areas of critical importance to westslope cutthroat trout have not been defined within the Clearwater subbasin. Based on the current distribution and status of westslope cutthroat trout (Figure 28, Section 1B), it is presumed that the majority of the subbasin provides adequate habitat for maintenance of relatively strong population(s) of westslope cutthroat trout.

The construction of Dworshak Dam and Reservoir eliminated about 717,000 square yards of spawning habitat within the pool area that was suitable for resident trout and anadromous fish (U.S. Fish and Wildlife Service 1962). This habitat loss is likely to have affected both bull trout and westslope cutthroat trout populations.

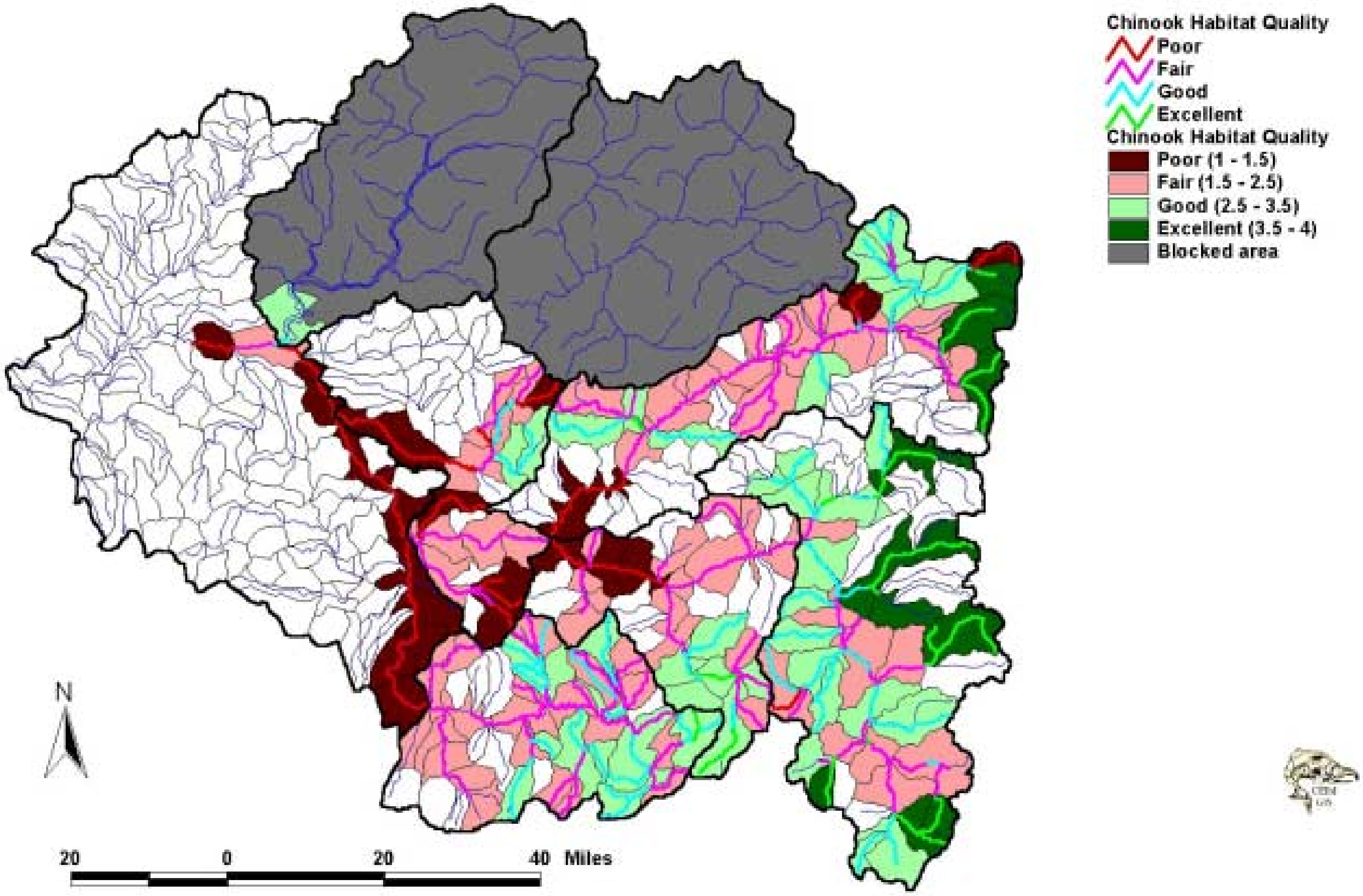

Figure 32. Habitat quality for spring chinook salmon as defined by NWPPC's presence absence database (stream reaches) summarized by subwatershed

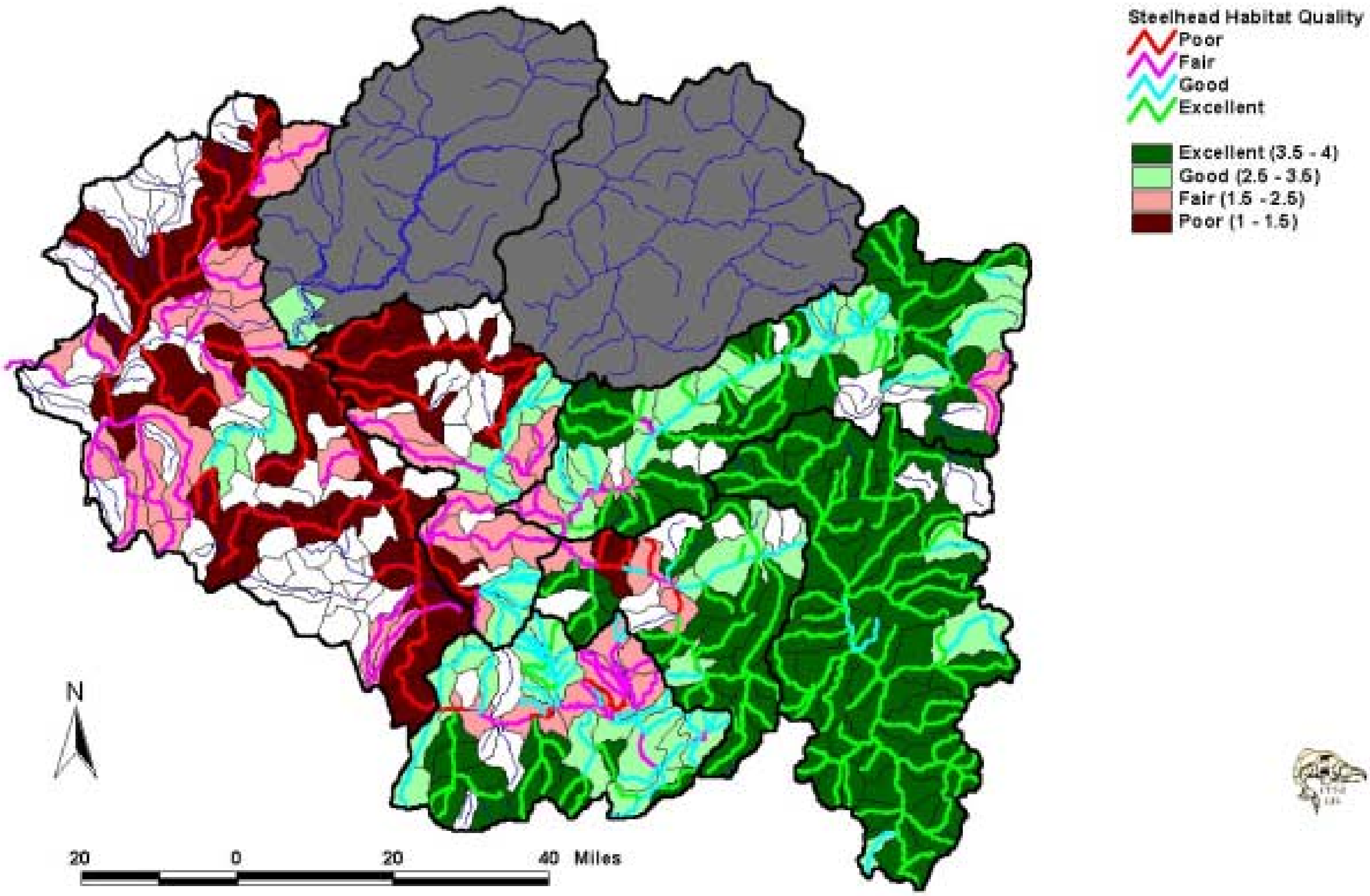

Figure 33. Habitat quality for steelhead trout as defined by NWPPC's presence absence database (stream reaches) summarized by subwatershed

Wildlife Habitat Areas and Quality

The subbasin contains a mixture of habitats largely defined by the dominant vegetation. Eleven general kinds of wildlife habitat exist in the subbasin (Table 40). Not all cover types fit into this classification system, such as urban lands, barren lands, and lands covered perennially by ice and snow. These cover types may provide habitat for some wildlife species, but they will not be discussed because of either the very small area they cover in the subbasin or because they are not significant habitat areas for focal wildlife species. Additional discussion of topics regarding wildlife habitat occur in: the vegetation section of the general description (plant communities and noxious weeds), the wildlife status section (habitat needs of focal species), and wildlife section of limiting factors (habitat quality issues).

Descriptions of habitat in the Clearwater are based on GIS data about vegetative cover. GIS data is from two sources: the GAP vegetation project for Idaho and the Interior Columbia Basin Ecosystem Management Project (ICBEMP). Both data sets are considered because of the advantages each offers.

The GAP data maps vegetation cover type at a relatively fine scale and consequently shows more accurately the spatial organization and location of different cover types. The GAP data shows a mosaic of cover types available for wildlife in most of the subbasin. Exceptions are the large parts of the hills and plateaus landform in the western portion of the subbasin covered solely by agricultural cover (Figure 34). GAP data has been developed to describe current vegetation cover type only. Another benefit of the GAP data set is that it has more specific cover types. Over 40 cover types are classified for the Clearwater subbasin in the GAP data set (Table 41).

The ICBEMP maps are based on 1-kilometer pixels and are limited to describing coarse-scale vegetation types. ICBEMP developed both current and historic vegetation cover layers, although they are at lower resolution than the GAP current vegetation cover layer (Figure 35; Figure 36). The ICBEMP layers enable comparisons to be made between current and historical (circa 1900) vegetative habitat availability. Large changes in vegetation cover have occurred in broad vegetative communities since 1900 (Figure 35; Figure 36). Grassland communities such as Agropyron bunchgrass and Fescue bunchgrass that historically covered a large part of the western section of the subbasin have been largely eliminated by land conversion to agriculture (Table 42). The small remaining plots of these communities are generally not visible at the coarse scale used in the ICBEMP vegetation layers. Other vegetation changes include the disappearance of western white pine due to blister rust and the elimination of large wetland systems (Figure 36). ICBEMP has also developed a structural stage layer, which will be discussed at the end of this section on wildlife habitat.

Table 40. The eleven wildlife habitat types within the Clearwater subbasin (modified from ICBEMP)

Wildlife Habitat Type	
Cropland/Hay/Pasture	Native Bunchgrasses
Douglas Fir	Ponderosa Pine
Engelmann Spruce/Subalpine Fir	Shrub or Herb/Tree Regeneration
Grand Fir/White Fir/Western Red Cedar	Wetlands
Lodgepole Pine	Whitebark Pine
Mountain Hemlock	

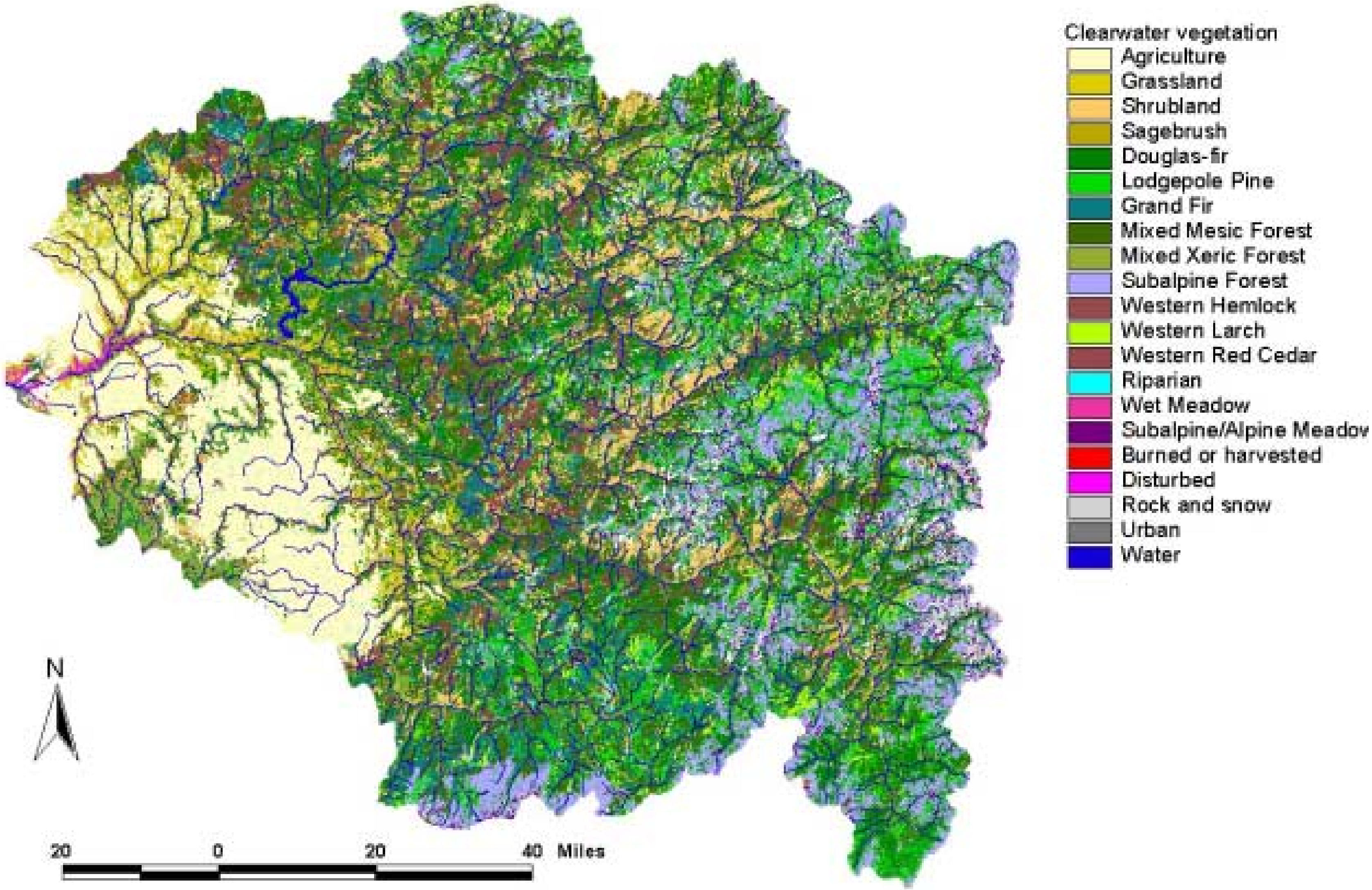

Figure 34. Current (1993) vegetation cover types in the Clearwater subbasin (GAP layer)

Table 41 Vegetation cover types in the subbasin developed by the Idaho GAP project.

Vegetation Cover Type	Area (km^2)	% Area
Mixed Mesic Forest	3,483.71	14.67%
Agriculture	2,425.48	10.22%
Douglas-fir	1,973.32	8.31%
Warm Mesic Shrubs	1,816.38	7.65%
Lodgepole Pine	1,630.90	6.87%
Grand Fir	1,565.28	6.59%
Mixed Subalpine Forest	1,525.63	6.43%
W. Red Cedar/Grand Fir Forest	1,281.34	5.40%
Douglas-fir/Grand Fir	1,188.74	5.01%
Ponderosa Pine	1,093.20	4.60%
Foothills Grassland	889.53	3.75%
Douglas-fir/Lodgepole Pine	550.72	2.32%
Subalpine Fir	548.48	2.31%
Montane Parkland/Subalpine Meadow	486.15	2.05%
Mixed Xeric Forest	478.95	2.02%
Western Red Cedar	399.95	1.68%
Exposed Rock	388.13	1.63%
W. Larch/Douglas-fir	302.82	1.28%
Engelmann Spruce	269.97	1.14%
W. Larch/Lodgepole Pine	167.23	0.70%
Mixed Barren Land	143.68	0.61%
Shrub Dominated Riparian	129.49	0.55%
Western Larch	109.02	0.46%
Water	106.61	0.45%
Western Hemlock	102.33	0.43%
Needleleaf Dominated Riparian	95.33	0.40%
Mixed Needleleaf/Broadleaf Forest	94.31	0.40%
W. Red Cedar/W. Hemlock Forest	90.95	0.38%
Graminoid or Forb Dominated Riparian	77.07	0.32%
Disturbed Grassland	61.68	0.26%
Cottonwood	49.92	0.21%
Mixed Riparian (Forest & Non-forest)	43.04	0.18%
Mixed Whitebark Pine Forest	38.13	0.16%
Needleleaf/Broadleaf Riparian	35.36	0.15%
Urban	31.23	0.13%
Curlleaf Mountain Mahogany	15.60	0.066%
Broadleaf Dominated Riparian	14.42	0.061%
Mixed Non-forest Riparian	12.35	0.052%
Perennial Ice, Snow	5.07	0.021%
Subalpine Fir/Whitebark Pine	4.87	0.021%
Shoreline and Stream Gravelbars	4.49	0.019%
Subalpine Pine	3.42	0.014%
Standing Dead or Burnt Timber	2.37	0.010%
Black Sagebrush Steppe	2.10	0.009%
Alpine Meadow	0.88	0.004%
Mountain Big Sagebrush	0.80	0.003%
Wyoming Big Sagebrush	0.32	0.001%
Rabbitbrush	0.03	0.0001%
Basin & Wyoming Big Sagebrush	0.03	0.0001%

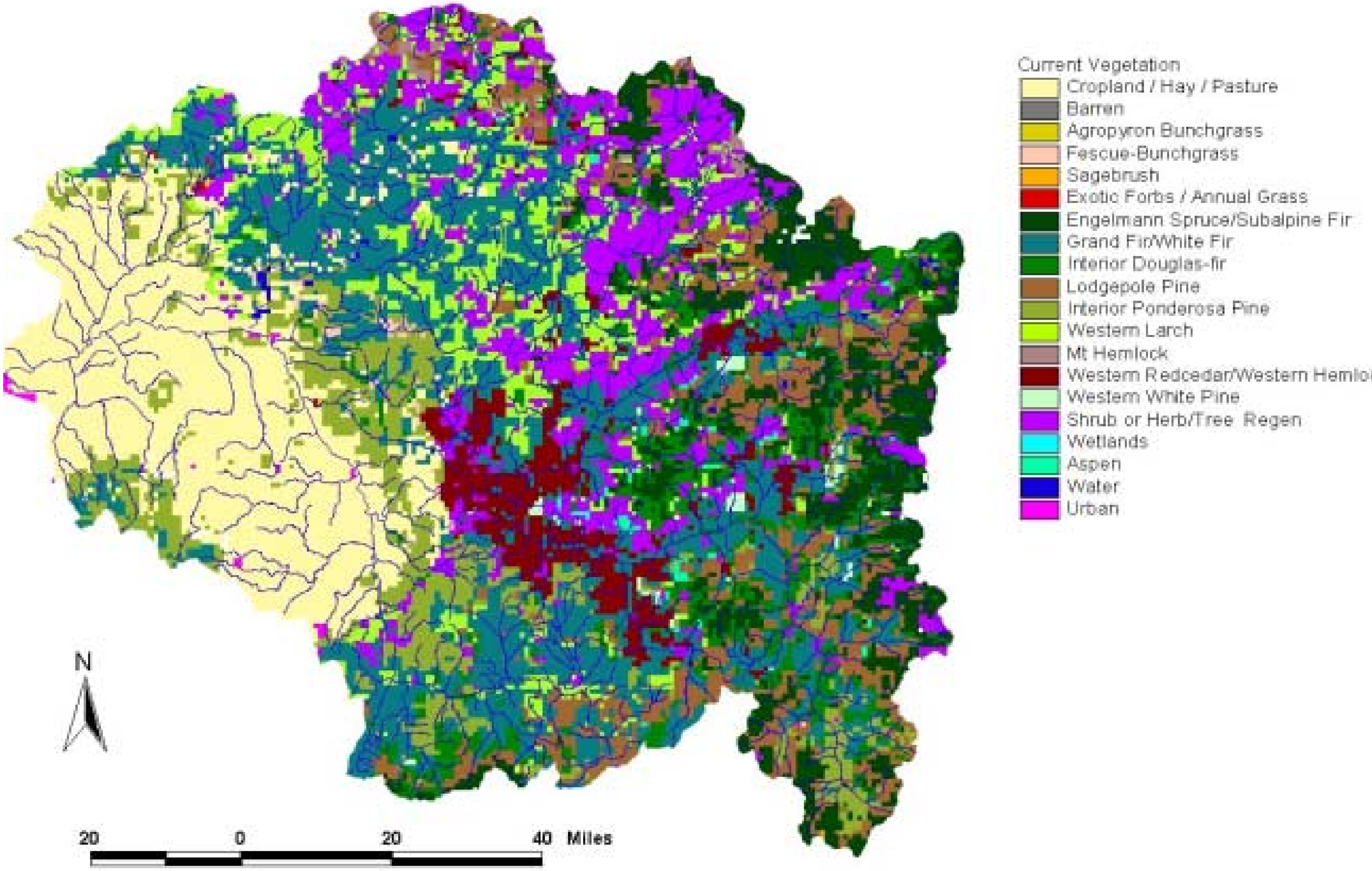

Figure 35. Current (1990) vegetation cover types in the Clearwater subbasin (ICBEMP layer)

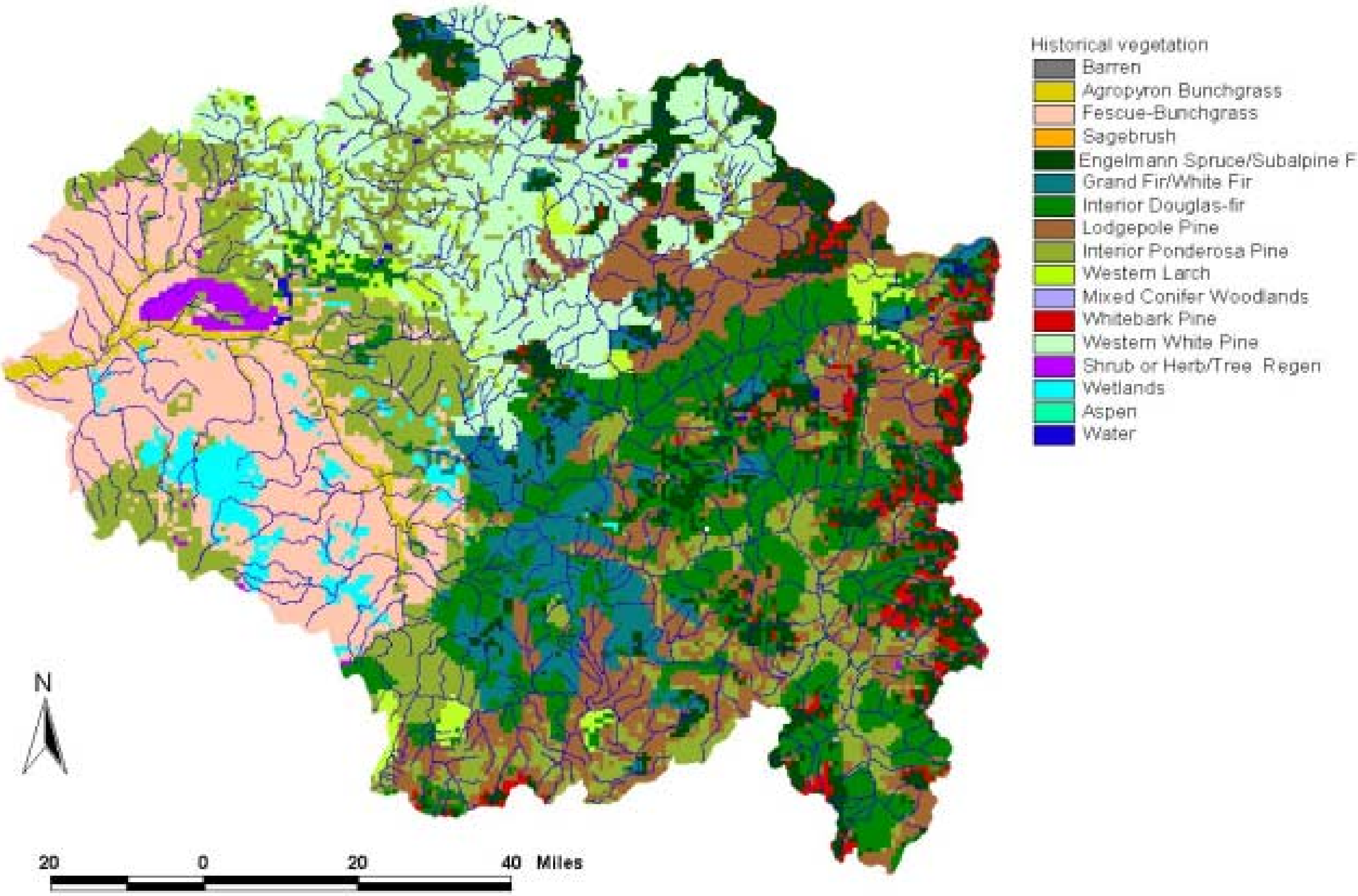

Figure 36. Vegetation cover types in the Clearwater subbasin circa 1900 (ICBEMP layer)

Grand Fir/White Fir/Western Red Cedar

This kind of habitat includes mesic forests dominated by grand fir, white fir, western red cedar, or western white pine. Mesic forests currently cover slightly over a quarter of the subbasin (Table 41; Table 42) and historically covered 20% of the subbasin (Table 42). With the arrival of blister rust, grand fir/white fir communities have increased their range to areas previous containing western white pine (Figure 35; Figure 36). Western red cedar communities grade into grand fir communities with decreasing moisture and shade (Cooper et al. 1991). The mesic forest habitats contain greater floristic diversity than other forest habitat in the subbasin (Cooper et al. 1991). The cedar forests provide habitat for two focal plant species: crenulated moonwort (*Botrychium crenulatum*) and mountain moonwort (*B. montanum*). The fisher uses the grand fir/white fir/western red cedar habitat. Fishers tend to use areas with some of the following components: old-growth grand fir, continuous overhead cover, woody debris, and structural complexity.

Douglas Fir

Douglas fir and mixed conifer forests currently cover 7% of the subbasin (Table 42). This is over a 50% loss in this kind of habitat compared to historic vegetation (Table 42). Douglas fir stands occur on sites with moisture regimes intermediate to the higher moisture environment occupied by grand fir communities and the lower moisture environment occupied by ponderosa pine communities (Cooper et al. 1991). Douglas fir stands with multiple canopies are one of two kinds of stands regularly inhabited by the flammulated owl (Groves et al. 1997b).

Table 42. Changes in vegetative coverage in the Clearwater subbasin based on ICBEMP data

Cover Type Name	Historic Coverage (km^2)	% Historic Cover of Subbasin	Current Coverage (km^2)	% Current Cover of Subbasin	Change from Historic Cover (km^2)
Grand Fir/White Fir/Western Red Cedar	4771	19.69%	6567	27.10%	+1796
Ponderosa Pine	4201	17.34%	2205	9.10%	-1996
Douglas-fir	3801	15.69%	1763	7.28%	-2038
Native Bunchgrasses	3799	15.68%	75	0.31%	-3724
Lodgepole Pine	3528	14.56%	2086	8.61%	-1442
Engelmann Spruce/Subalpine Fir	2131	8.79%	2124	8.77%	-7
Western Larch	680	2.81%	1933	7.98%	+1253
Wetlands	572	2.36%	10	0.04%	-562
Whitebark Pine	493	2.03%	23	0.09%	-470
Shrub or Herb/Tree Regen	195	0.80%	2575	10.63%	+2380
Water	43	0.18%	43	0.18%	0
Barren	14	0.06%	14	0.06%	0
Aspen	1	0.00%	86	0.35%	+85
Cropland/Hay/Pasture	0	0.00%	4532	18.70%	+4532
Exotic Forbs/Annual Grass	0	0.00%	12	0.05%	+12
Mt Hemlock	0	0.00%	142	0.59%	+142
Urban	0	0.00%	38	0.16%	+38

Ponderosa Pine

Estimates of current ponderosa pine cover range from 4.6% to 9.1% of the subbasin (Table 41; Table 42). Either estimate of current ponderosa pine cover shows less ponderosa pine available than was historically present (Table 42). Ponderosa pine habitat is very important for three of the wildlife focal species: flammulated owl, white-headed woodpecker, and black-backed woodpecker (Nez Perce National Forest 1998; Groves et al. 1997a; Marshall et al. 1996).

Engelmann Spruce/Subalpine Fir

The Engelmann spruce and subalpine fir cover type occurs on 8.8% of the subbasin (Table 42). The amount of this habitat available today is very similar to what was available historically. This kind of habitat exists in colder and higher elevation portions of the subbasin (Cooper et al. 1991). Lynx, a focal wildlife species, utilize Engelmann spruce and subalpine fir habitat, requiring a matrix of young and old stands to provide both denning and foraging habitat (Nez Perce National Forest 1998).

Whitebark Pine

Whitebark pine communities historically covered 2% of the subbasin, but today cover even less area (Table 42). Today roughly 0.10-0.15% of the subbasin contains whitebark pine communities (Table 41; Table 42). Whitebark pine is found on high elevation sites, where it is an important food source for wildlife.

Lodgepole Pine

Lodgepole pine habitat is found at middle and high elevation sites in the subbasin. Available lodgepole pine habitat has decreased from 14.6% of the subbasin historically available to 8.6% of the subbasin currently available (Table 42). Old growth lodgepole pine stands provide habitat for black-backed woodpeckers (Nez Perce National Forest 1998). Early seral stands containing lodgepole pine provide foraging habitat for lynx (Nez Perce National Forest 1998).

Mountain Hemlock

Mountain hemlock habitat occurs in 0.6% of the subbasin currently and was not a recognized habitat historically (Table 42). This type of habitat occurs in high elevation, subalpine environments and is restricted to portions of the subbasin north of southern part of the Middle Fork Clearwater watershed (Cooper et al. 1991).

Native Bunchgrasses

Native bunchgrass habitat historically covered 15.7% of the subbasin (Table 42). Today, little of this habitat remains. Native bunchgrass habitat has had the largest decrease in area of the 11 habitat groups (Table 42). Estimates of native grassland cover range from 0.3% to 4.0% of the subbasin (Table 41; Table 42). Remnant grasslands are often small in size, so the GAP current cover of 4.0% is likely more accurate than ICBEMP's coarse-scale estimate although neither database is well suited for examining very small areas. Native bunchgrass communities provide habitat for three focal plant species: Spalding's catchfly (*Silene spaldingii*), Jessica's aster (*Aster jessicae*), and Palouse goldenweed (*Haplopappus liatriformis*). Rocky Mountain bighorn sheep and sharp-tailed grouse inhabit grassland habitat.

Cropland/Hay/Pasture

Both GAP and ICBEMP identify an agricultural cover class as covering the second largest amount of area in the subbasin. The GAP agriculture cover type covers 10.2% of the subbasin and the ICBEMP cropland/hay/pasture cover type covers 18.7% of the subbasin (Table 41; Table 42). Much of the land currently in agricultural cover types previously was in the native bunchgrass cover type. Some wildlife species inhabit agricultural areas. One focal species, the western toad, is able to inhabit agricultural areas so long as they contain a water source such as an irrigation canal (Csuti et al. 1997).

Wetlands

Riparian and wetland habitat is extremely important for many wildlife species. The ICBEMP data shows a decrease in wetland habitat from 2.36% of the subbasin historically to 0.04% of the subbasin currently (Table 42). The finer scale GAP data, though, shows slightly less than 2% current wetland or riparian cover. Wetlands are an essential component of habitat for two focal species—the western toad and the Coeur d’Alene salamander. Open wetland areas could provide habitat for an extirpated focal species, the sandhill crane.

Shrub or Herb/Tree Regeneration

The regeneration cover class historically only covered 0.8% of the subbasin; today it covers 10.6% of the subbasin. Regen habitat provides forage for wildlife species. Early seral communities and shrubfields provide forage areas required by elk. Regenerating forests with abundant forage also can provide habitat for prey species like snowshoe hare. Predators, like lynx, can then use young seral stands as hunting habitat.

Structural Stage

Many wildlife species rely on food sources, den sites, nest sites, or shelter sites associated with specific structural stages of vegetation communities. A variety of species require old growth forests as a part of their habitat due to the high numbers of snags and large amounts of woody debris found in these late successional stands. Almost all of the landforms have had declines in old growth multi-strata and single-strata stands (
Figure 37). There has also been a decline in early seral forests. Changes in the amount of available habitat in early seral forest stages impact wildlife species such as elk and deer that use these areas for forage. Large increases have occurred in mid-seral forest stages such as understory reinitiation and the stem exclusion closed canopy forest structures (
Figure 37). Many grasslands in the lower Clearwater have been converted to agricultural lands, especially in the hills and plateaus landform. Both plants and wildlife species native to the subbasin’s grasslands have been impacted by the conversion of native grasslands to agricultural uses. Shrublands have increased in most of the subbasin, with the largest increases occurring along the North Fork Clearwater.

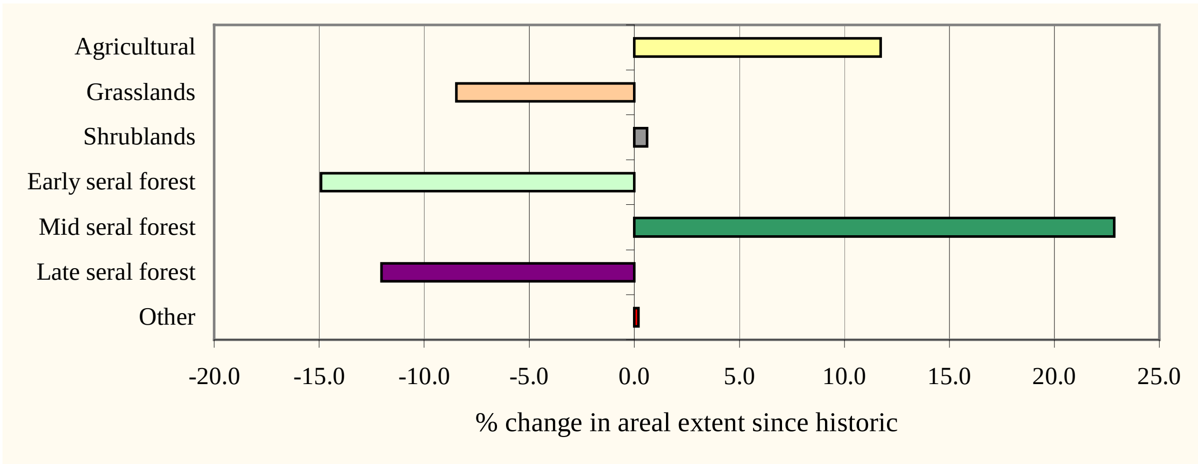

Figure 37. The percent change in area covered by specific structural stages from 1900 to 1995 for the Clearwater subbasin

Watershed Assessment

Four primary types of documents are addressed in this section: watershed assessments, biological assessments, TMDLs, and broad scale plans for resource management within the Clearwater subbasin. Watershed assessments provide information for planning and implementation. Biological assessments most often address potential impacts of proposed land use activities on sensitive species. TMDLs are required water bodies listed as impaired on the §303(d) list. The TMDL process includes a watershed assessment, and potentially a load allocation and implementation plan. Planned assessments are listed at the end of this section in Table 43 (Watershed Assessments) and Table 44(TMDLs).

Watershed Assessments

Clearwater National Forest. (2000). Eldorado Creek – Ecosystem Assessment at the Watershed Scale (EAWS). Lochsa Ranger District.

Clearwater National Forest. (1999). Lower North Fork of the Clearwater Subbasin Ecosystem Analysis at the Watershed Scale: Elk Creek and Long Meadow Watersheds.
This analysis characterizes the human, aquatic, riparian, and terrestrial conditions, processes, and interactions on National Forest lands to estimate impacts of management activities and provide guidance for potential activities. It describes cumulative watershed conditions, trends, potential project areas, and potential amendments to Forest plans.

Clearwater National Forest. (1999). North Fork Big Game Habitat Restoration on a Watershed Scale (BHROWS): Watersheds within the North Fork Clearwater River Subbasin. North Fork Ranger District.

Clearwater National Forest and Nez Perce Tribe. (1998). A Watershed Analysis for the Area from Squaw to Papoose Creeks. Lochsa Ranger District, Powell Unit.
Pertains to Papoose Creek, Wendover Creek, Badger Creek, and Squaw Creek.

Clearwater National Forest. (1997). Lost Postman Planning Area – Watershed Analysis. Lochsa Ranger District.
Pertains to Post Office Creek, Weir Creek, Indian Grave Creek and Lost Creek.

Clearwater National Forest. (1997). Clearwater Subbasin Ecosystem Analysis at the Watershed Scale. Orofino, ID.
Pertains to Lolo Creek, Orofino Creek, and the Potlatch River watersheds

Clearwater National Forest. (1997). Potlatch River Above Bovill Ecosystem Analysis at the Watershed Scale. Palouse Ranger District.

Clearwater National Forest. (1996). North Lochsa Face Landscape and Watershed Assessment – draft. June 27, 1996. Lochsa Ranger District.
Pertains to Pete King Creek, Canyon Creek, Deadman Creek, and Fish Creek

Jones, R. M.; J. Mital and P.K. Murphy. (1997). Watershed Sensitivity: Clearwater National Forest. Clearwater National Forest. Orofino, Idaho.

Jones, R. M. and P. K. Murphy. (1997). Watershed Condition: Clearwater National Forest. This report determines watershed conditions for 278 roaded and unroaded watersheds with Forest Plan water quality objectives. Orofino, Idaho.

Latah Soil and Water Conservation District. (1987). Little Potlatch Creek Planning Phase Final Report.
This report contains the findings and recommendations of the Little Potlatch Creek Water Quality Planning Project. Information gathered during the study indicated that erosion within the watershed, especially from agricultural lands, is degrading water quality.

Lewis Soil Conservation District. (1986). Mission-Lapwai Watershed Planning Project Final Report.
This report summarizes results of the watershed planning efforts made through the Idaho Agriculture Water Quality Program.

Maiolie, M., D. Statler, and S. Elam. (1993). Dworshak Dam Impact Assessment and Fish Investigation of Trout, Bass, and Forage Species.

Natural Resources Conservation Service. (1994). Bedrock Creek Watershed Assessment. Lewiston, Idaho.

Natural Resources Conservation Service. (2000). Lapwai Creek Watershed Assessment. Lewiston, Idaho.

Nez Perce National Forest. (2001). Meadow Face Ecosystem Analysis at the Watershed Scale. Clearwater Ranger District. Grangeville, Idaho.

Nez Perce National Forest. (1999). Selway and Middle Fork Landscape Assessment. Grangeville, Idaho.

Nez Perce National Forest. (1999). Newsome Creek Landscape Assessment. Grangeville, Idaho.

Nez Perce National Forest. (1998). South Fork Clearwater River Landscape Assessment Vol. I and II. Grangeville, Idaho.
This assessment characterizes the historic and current ecological and social conditions in the South Fork Clearwater, and provides a context for future forest management decisions on national forest lands. The assessment focuses on the diversity, distribution, and abundance of plant and animal species, watershed conditions, transportation systems, and human uses and trends.

Nez Perce Soil and Water Conservation District. (1998). Confined Animal Feeding Operation Inventory and Analysis. Lewiston, Idaho.
Animal feeding operations were inventoried on all watersheds in the lower Clearwater subbasin. Each watershed was ranked for the potential for water quality impacts from livestock. Parameters evaluated included access to water, livestock density, numbers of livestock, waste management practices, buffers, and soil types.

Nez Perce Soil and Water Conservation District. (1986). Pine Creek Watershed Planning Project report. Lewiston, Idaho.
The report outlines general treatment needs and resource concerns within the watershed.

Nez Perce Tribe. (1998). Unified Watershed Assessment and Watershed Restoration Priorities. Clean Water Action Plan. Lapwai, Idaho.

Schriever, E. and D. Nelson. 1996. Potlatch River Basin Fisheries Inventory. Latah, Clearwater and Nez Perce Counties, Idaho. Report to Latah Soil and Water Conservation District. Idaho Department of Fish and Game. Lewiston, Idaho.
This report summarizes the distribution and abundance of fish species in the Potlatch River drainage. It is a companion document to the Potlatch River Basin habitat surveys conducted by the NRCS and other agencies for the Latah Soil and Water Conservation District.

USDA-Natural Resources Conservation Service. (1995). Cottonwood Creek Initial Assessment – Nez Perce County, Idaho. Moscow, Idaho.
The report summarizes information obtained through literature reviews and reconnaissance level inventories. The report recommends further study.

USDA-Natural Resources Conservation Service. (1994). Preliminary Investigation Report for the Potlatch River – Latah, Clearwater and Nez Perce Counties, Idaho. Moscow, Idaho.
This assessment identifies and assesses watershed resource problems, develops potential solutions, and evaluates their relative impacts and cost efficiency.

USDA – Natural Resources Conservation Service. (1992). Middle Potlatch Creek Initial Assessment. Moscow, Idaho.

The report summarizes information obtained through literature reviews and reconnaissance level inventories.

USDA – Natural Resources Conservation Service. (1992). Lewiston Orchards Irrigation District Initial Assessment. Lewiston, Idaho.
The report summarizes information obtained through literature reviews and reconnaissance level inventories. Further study is recommended.

USDA – Natural Resources Conservation Service. (1992). Orofino Creek Initial Assessment. Orofino, Idaho.
The report summarizes information obtained through literature reviews and reconnaissance level inventories.

USDA-Natural Resources Conservation Service. (1992). Bedrock Creek Watershed Plan – Environmental Assessment. Orofino, Idaho.
This report outlines resource problems and treatments needed for water quality and fisheries habitat improvement.

USDA – Natural Resources Conservation Service, Nez Perce and Clearwater Soil and Water Conservation Districts. (1989). Preauthorization Report for the Bedrock Creek Watershed. Lewiston, ID.
The plan contains a summary of the resource data collected during 1985. Conclusions identify a significant sediment load in the stream.

USDA – Natural Resources Conservation Service. (1988). Preauthorization Report for the Mission-Lapwai Creek Watershed. Lewiston, Idaho.
The report contains a summary of resource data collected during 1988. Conclusions indicate improvements needed for fish habitat.

Wertz, L. and J. Kinney. (1994). Beneficial use reconnaissance project: Potlatch River watershed. Water quality summary report no. 31. Idaho Department of Environmental Quality. Lewiston, Idaho.

Biological Assessments

Bransford, S. (2001). *Newsome Creek Watershed Improvement Project (Draft)*. Nez Perce Tribe and Nez Perce National Forest. Grangeville, ID.
This draft biological assessment has been prepared in compliance with section 7 of the ESA and National Forest Regulations. It includes determinations for Newsome Creek threatened, endangered and sensitive plant, wildlife and fish species and the effects of activities on these species.

Bureau of Land Management. (2000). *Clearwater River, North Fork Clearwater River, and Middle Fork Clearwater River Subbasins: Biological Assessment of Ongoing and Proposed Bureau of Land Management Activities on Fall Chinook Salmon, Steelhead Trout, Bull Trout, and BLM Sensitive Species*. Cottonwood, ID:

National Marine Fisheries Service and U.S. Fish and Wildlife Service. (2000). *Unlisted Species Analysis and Section 10 findings for issuance of an ESA Section 10 Incidental Take Permit to the Plum Creek Timber Company for the Native Fish Habitat Conservation Plan.*

Paradis, W. J.; Lentz, H. S.; Blair, S.; Lake, L. and Cochrane, A. (1999). *Clear Creek Biological Assessment*. Nez Perce National Forest.
This document assesses the effects of ongoing and proposed Forest Service activities on Snake River steelhead, bull trout, and fall chinook salmon as required under Section 7 of the ESA. It also examines impacts on westslope cutthroat trout, spring chinook salmon, and interior redband trout. It includes discussion of the biology, status, and effects of activities on Clear Creek gray wolf, bald eagle, lynx, and federally listed plants.

Paradis, W. J.; Lentz, H. S.; Blair, S.; Lake, L. and Cochrane, A. (1999a). *Middle Fork Clearwater River Face Drainages Biological Assessment*. Nez Perce National Forest.
This Section 7 biological assessment examines status and potential impacts for threatened and endangered plant and wildlife species, including westslope cutthroat trout, fall chinook salmon, spring chinook salmon, and Pacific lamprey in the Middle Fork Clearwater.

Paradis, W. J.; Lentz, H. S.; Mays, D.; Blair, S. and Lake, L. (1999b). *South Fork Clearwater River Biological Assessment*. Nez Perce National Forest.
This Section 7 biological assessment examines status and potential impacts on threatened and endangered plant and wildlife species, including westslope cutthroat trout, fall chinook salmon, spring chinook salmon, and Pacific lamprey in the South Fork Clearwater.

Schoen, D.; Jones, R. M. and Murphy, P. K. (1999). *Section 7 Watershed Biological Assessment Lochsa River Drainage Clearwater Subbasin: Determination of Effects of Ongoing Activities Based on the Matrix of Pathways and Indicators of Watershed Condition for Steelhead Trout, Fall Chinook Salmon and Bull Trout*. Clearwater National Forest.
This Section 7 assessment outlines Forest Service activities and potential impacts on stream morphology, fish habitat, and riparian condition for all Lochsa River tributaries.

Thompson, K. L. (1999). *Biological Assessment: Lower Selway 4th Code HUC. Fish, Wildlife and Plants*. Nez Perce National Forest, Moose Creek Ranger District.

USDA – Natural Resources Conservation Service. (1996). *Supplemental Watershed Protection Plan-Environmental Assessment – Bedrock Creek Watershed – Clearwater and Nez Perce Counties, Idaho*. Lewiston, Idaho.
This plan describes accelerated implementation of best management practices (BMPs) to improve water quality and fisheries habitat on non-irrigated cropland and riparian zones adjacent to Bedrock Creek. It includes discussion of hydrology, riparian zones, threatened and endangered species, erosion and sedimentation, water quality, wildlife, identified problems, and pollutant sources.

Watershed Scale Plans

Clearwater Soil and Water Conservation District. (1986). *Bedrock Creek and the North Corridor of the Clearwater Watershed*.

The plan identifies critical areas for treatment, outlines specific BMPs, and estimates costs and environmental impacts for improving water quality and fish habitat..

Clearwater National Forest. (1998). *West Fork Potlatch Draft Environmental Impact Statement.*

Clearwater Soil and Water Conservation District. (1993). *Agricultural Pollution Abatement Plan Lolo/Ford's Creek Watershed- Final Planning Report.*

Columbia River Inter-Tribal Fish Commission. (1996a,b). *Wy-Kan-Ush-Mi Wa-Kish-Wit: Spirit of the Salmon. Vol. II: Subbasin Plans*.
This plan discusses the legal and political context of fish recovery in the Columbia Basin. The plan makes recommendations specific to each subbasin and identifies problems impacting fish, and ongoing and recommended actions for the Columbia River anadromous fish.

Idaho Department of Fish and Game. (2001b). Fisheries Management Plan 2001-2006. Idaho Department of Fish and Game, Boise, Idaho.
This plan describes IDFG intentions to provide fishing opportunities as mandated by law (Idaho Code 36-103). It also describes IDFG fisheries policies, goals and objectives. This includes a discussion of limiting factors and proposed corrective measures.

Lewis Soil Conservation District. (1988). Idaho State agricultural water quality program for Little Canyon Creek. Nezperce, ID

Natural Resources Conservation Service. (1995). *Big Canyon Creek Environmental Assessment Final Planning Report.*

Nez Perce Soil and Water Conservation District. (1988). *Pine Creek Project for the Idaho State Water Quality Program.*
The plan identifies treatment to reduce sheet/rill erosion on non-irrigated cropland.

Nez Perce Soil and Water Conservation District. (1995). *Big Canyon Creek Environmental Assessment.* Lewiston, Idaho.
The plan identifies treatment and costs for problems involving stream temperature, nutrients, sediment, low summer flows, and bacteria.

Nez Perce Soil and Water Conservation District. (2000). *Resource Conservation Plan*.
This plan identifies conservation problems and needs within the Nez Perce Soil and Water Conservation District. Resource concerns addressed include water quality and fish habitat.

USDA – Natural Resources Conservation Service. (2000). *Supplemental Watershed Protection Plan – Environmental Assessment for the Lapwai Creek Watershed*.
The plan identifies treatment and costs for problems involving stream temperature, nutrients, sediment, low summer flows, and bacteria.

U.S. Forest Service. (1987a). *Clearwater National Forest Plan*. Orofino, ID:
This plan guides all natural resource management activities and establishes management standards for administration of the Clearwater National Forest. It describes resource management practices, production, and availability and suitability of lands for wildlife, threatened and endangered species, fisheries, range, timber, water quality, roads, riparian areas, and cultural resources management.

U.S. Forest Service. (1987b). *Nez Perce National Forest Plan*. Grangeville, ID:
This Forest Plan guides natural resource management activities and establishes standards for administration of the Nez Perce National Forest. It describes resource management practices, production, and availability and suitability of lands for wildlife, threatened and endangered species, fisheries, range, timber, water quality, roads, riparian areas, and cultural resources management.

TMDLs

Bugosh, N. (1999). *Lochsa River Subbasin Assessment*. Lewiston, ID: Idaho Department of Environmental Quality.
This assessment of available habitat, fish, and temperature data for the Lochsa River concludes that water quality supports designated beneficial uses. It reports that subbasin fish and other aquatic biota are adapted to naturally high stream temperatures, and recommends delisting upper Canyon Creek and the Lochsa River from the 303(d) list of water quality impaired streams.

Dechert, T.; Baker, K. and Cardwell, J. (2000). *The Upper North Fork of the Clearwater River Subbasin Assessment and TMDL*. Lewiston: Idaho Department of Environmental Quality.

Idaho Department of Environmental Quality; Nez Perce Tribe, and Environmental Protection Agency. (2000). *Cottonwood Creek Total Maximum Daily Load (TMDL)*. Boise: Prepared for the Cottonwood Creek Watershed Advisory Group.

Idaho Department of Environmental Quality. (1999). *Jim Ford Creek Total Maximum Daily Load (TMDL).*

Winchester Lake Watershed Advisory Group. (1999). *Winchester Lake and Upper Lapwai Creek Total Maximum Daily Load (TMDL).*

Planned Assessments

Table 43. Planned watershed assessments within the boundaries of the Clearwater subbasin

Assessment Area/Name	Agency	Anticipated Completion
Lower Clearwater AU		
Lapwai Creek Watershed Assessment	Nez Perce Tribe	2001
Big Canyon Creek Watershed Assessment	Nez Perce Tribe	2001
Cottonwood Creek Preliminary Investigation	USDA - NRCS	2001
Potlatch River Basin Study	USDA - NRCS	2002
Lindsay Creek Initial Resource Assessment	Nez Perce Soil and Water Conservation District	2001
Jacks Creek Initial Resource Assessment	Nez Perce Soil and Water Conservation District	2001
Pine Creek Final Project Report	Nez Perce Soil and Water Conservation District	2001
Hatwai Creek Watershed Preliminary Investigation	Nez Perce Soil and Water Conservation District	2002
Lolo / Middle Fork AU		
Lolo Creek	Nez Perce Tribe	2002-2004
Clear Creek-EAWS	Nez Perce NF	2001
Lochsa AU		
Crooked Fork Drainage-EAWS (Crooked to Colt Killed Creeks)	Clearwater NF / Nez Perce Tribe	2001
Lower Selway AU		
Stillman Falls-EAWS	Nez Perce NF	2002
North Selway Face-EAWS	Nez Perce NF	2003
O'Hara - Goddard-EAWS	Nez Perce NF / Nez Perce Tribe	2003
South Fork AU		
Newsome Creek-EAWS	Nez Perce NF / Nez Perce Tribe	2001
Red River-EAWS	Nez Perce NF / Nez Perce Tribe	2002
Crooked River-EAWS	Nez Perce NF / Nez Perce Tribe	2002

Table 44. TMDLs scheduled for completion by the Idaho Department of Environmental Quality

Watershed	Anticipated Completion
South Fork Clearwater River	2001
Middle Fork Clearwater River	2002
Lower North Fork Clearwater River	2002
Clearwater River	2003

Fish Limiting Factors

Five tiers of information have been considered for review of limiting factors to fish populations in the Clearwater subbasin, with each differing in relative scale and species considerations:

1. Regional documentation of non-species specific factors limiting production of resident and anadromous fish in the subbasin as a whole;
2. Past subbasin specific research documents and current professional judgement of species specific factors limiting populations in individual AUs within the subbasin;
3. Information compiled by the Northwest Power Planning Council as part of the subbasin planning process for review of reach specific limiting factors related to spring chinook and steelhead;
4. The 1998 §303(d) list compiled by IDEQ of reach specific factors limiting beneficial use(s), including cold water biota and/or salmonid spawning;
5. Potential connectivity/passage issues related to road culverts are addressed based on the potential to impact all species of fish throughout the subbasin.

Hatchery influences to fish populations are not addressed here as limiting factors due to the debatable and often site specific nature of hatchery influences to existing fish stocks. It is widely accepted that hatchery supplementation of wild fish stocks has the potential to adversely impact the genetic or biological integrity of existing stocks (Busby et al. 1996; Evans et al. 1997; U.S. Fish and Wildlife Service and Nez Perce Tribe 1995). However, the degree of impact is often site specific and dependent on numerous factors including stocking densities and distribution, and the status of existing wild/natural stocks. Interactions of hatchery and wild anadromous fish stocks within the Clearwater subbasin have been investigated and potentially negative impacts to wild stocks have been suggested (U.S. Fish and Wildlife Service and Nez Perce Tribe 1995 and 1997). However, such impacts have not been clearly defined in the Clearwater subbasin.

Subbasin Scale – Regional Sources

Primary factors limiting resident salmonid populations within the boundaries of the Clearwater subbasin include hybridization with exotic species and impacts of land management activities on hydrology, sedimentation, habitat distribution and complexity, and water quality (Columbia Basin Fish and Wildlife Authority 1999). In addition, bull trout and other resident and anadromous fish may be limited by reductions in available forage, aquatic macroinvertebrate biomass and taxonomic richness, and reduced growth rates due to loss of anadromous fish production and the nutrients that carcasses provide (Columbia Basin Fish and Wildlife Authority 1999, Piorkowski 1995, Minakawa 1997, Wipfli et al. 1998). Another significant limiting factor to resident fish populations is the loss of 53 miles of resident salmonid spawning habitat inundated by Dworshak Reservoir (Dave Statler, Nez Perce Tribe, personal communication, April 20, 2001).

At the subbasin scale, anadromous fish production in the Clearwater subbasin is limited by three primary factors: 1) adult escapement of salmon and steelhead is currently limited by out-of-subbasin factors (e.g.. dams and ocean conditions) and is insufficient to fully seed available habitat; 2) habitat carrying capacity and fish survival have been reduced within the subbasin by land management activities which impact hydrology, sedimentation, habitat distribution and complexity, and water quality (Columbia Basin Fish and Wildlife Authority 1999); and 3) Dworshak Dam blocks access to habitat that once produced up to 60% of steelhead and provided excellent spawning and rearing habitat for spring chinook salmon, and is a limiting factor at the subbasin scale

It is generally accepted that hydropower development on the lower Snake River and Columbia River is the primary cause of decline and continued suppression of Snake River salmon and steelhead (Idaho Department of Fish and Game 1998a; Columbia Basin Fish and Wildlife Authority 1991; Northwest Power Planning Council 1992; National Marine Fisheries Service 1995 and 1997; National Research Council 1995; Williams et al. 1998). However, less agreement exists about whether the hydropower system is the primary factor limiting recovery (Marmorek et al. 1998). This limiting factor keeps yearly effective population size low, and increases genetic and demographic risk of localized extinction.

Adult escapement of anadromous species remains low even given significant hatchery production/reintroduction efforts. Low adult abundance has resulted in stocking at variable rates between years, depending on the availability of brood fish (Walters et al. 2001). Smolt-to-adult return rates (SAR), from smolts at the uppermost dam to adults returning to the Columbia River mouth, averaged 5.2% in the 1960s before hydrosystem completion and only 1.2% from 1977-1994 (Petrosky et al. in press; Figure 38). This is below the 2%-6% needed for recovery (Marmorek et al. 1998).

In contrast to the decline in SAR, numbers of smolts per spawner from Snake River tributaries did not decrease during this period, averaging 62 smolts per spawner before hydrosystem completion and 100 smolts per spawner afterward (Petrosky et al. in press; Figure 38). In this summary both spawner escapement and smolt yield are measured at the uppermost mainstem dam (currently Lower Granite). The increase in smolts per spawner was due to a reduction in density dependent mortality as spawner abundance declined. Accounting for density dependence, there was a modest decrease in smolts per spawner from Snake River tributaries over this period, but not of a magnitude to explain the severe decline in life-cycle survival (Petrosky et al. in press).

The dams cause direct, indirect, or delayed mortality, mainly to emigrating juveniles (Idaho Department of Fish and Game 1998a; Nemeth and Kiefer 1999). As a result of this increased mortality, Snake River spring and summer chinook declined at a greater rate than downriver stocks, coincident with completion of the federal hydropower system (Schaller et al. 1999). Schaller et al. (1999) concluded that factors other than hydropower development have not played a significant role in the differential decline in performance between upriver and downriver stocks. The Snake River stocks above eight dams survived one-third as well as downriver stocks migrating through 3 dams (Schaller et al. 1999; Deriso *in press*) for this time period, after taking into account factors common to both groups. The additional decline in productivity of upriver stocks relative to downriver stocks indicates this portion of the mortality is related to factors unique to upriver stocks. Patterns of Pacific Decadal Oscillation and salmon production would indicate that poor ocean conditions existed for Columbia River salmon after the late 1970s (Hare et al. 1999). However, the natural fluctuations of ocean productivity affecting all Columbia River stocks, in combination with mortality as a result of the hydrosystem, appear to have caused the severe declines in productivity and survival rates for the Snake River stocks. Temporal and spatial patterns of hatchery release numbers did not coincide with the differential changes in survival rates between upriver and downriver stocks (Schaller et al. 1999). Harvest rates were drastically reduced, in the early 1970s, in response to declines in upriver stream-type chinook abundance. Given that changes in smolts per spawner cannot explain the decreases in SAR or overall survival rates for Snake River stocks, it appears the altered migration corridor has had a strong influence on the mortality that causes these differences in stock performance.

The SAR and smolt per spawner observations (Figure 38) indicate that the overall survival decline is consistent primarily with hydrosystem impacts and poorer ocean (out-of-subbasin factors), rather than large-scale impacts within the subbasins between the 1960s and present (Schaller et al. 1999; Petrosky et al. in press). Because the smolt per spawner data represent aggregate populations from a mix of habitat qualities throughout the Snake River basin, and are from a period after development, they do not imply there is no room for survival improvement within the Salmon, Clearwater, Grande Ronde and Imnaha subbasins. However, because of limiting factors outside the subbasin, and critically reduced life-cycle survival for populations even in pristine watersheds, it is unlikely that potential survival improvements within the Snake River subbasins alone can increase survival to a level that ensures recovery of anadromous fish populations.

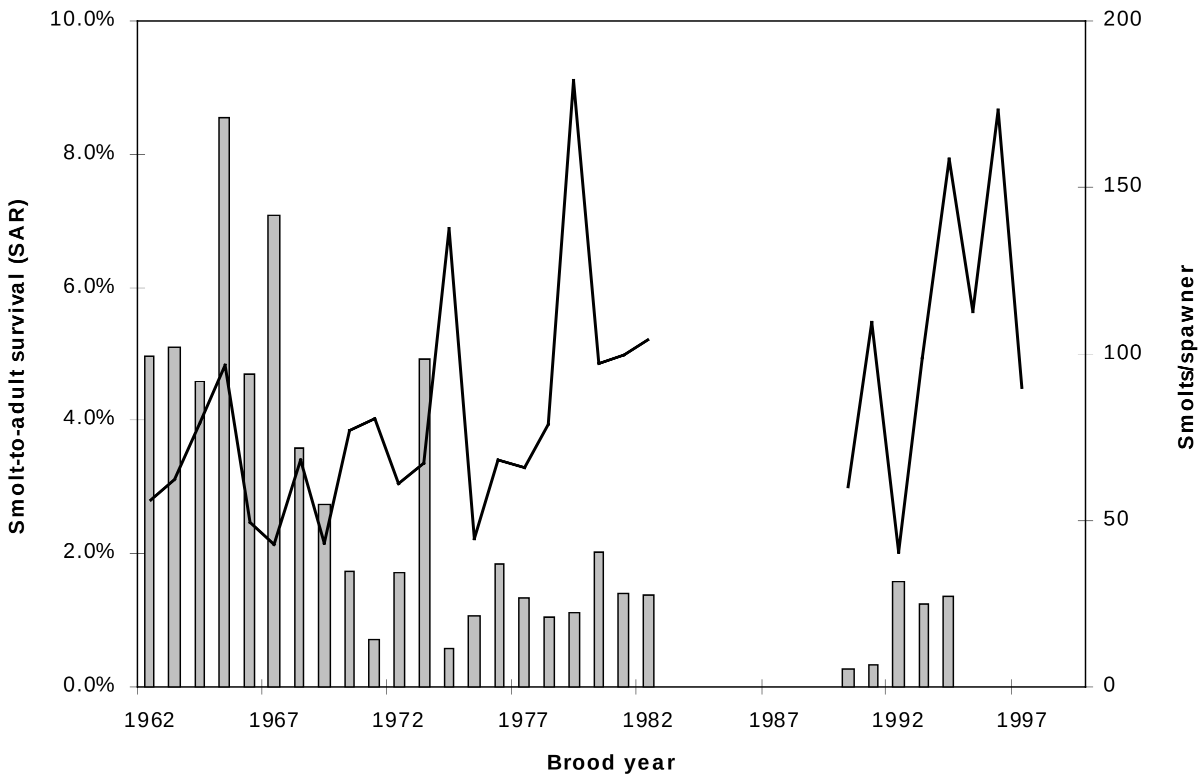

Figure 38. Smolt-to-adult survival rates (bars; SAR) and smolts/spawner (solid line) for wild Snake River spring and summer chinook. The SAR describes survival during mainstem downstream migration back to returning adults; smolts per spawner describes freshwater productivity in upstream freshwater spawning and rearing areas (From Petrosky et al. in press)

Assessment Unit Scale – Local Sources

Numerous sources were reviewed for documentation of limiting factors t at scales similar to the defined assessment units (Appendix E). Note that factors limiting local fish production or survival may differ from those defined across broader scales, and that limiting factors in a given location may vary between species. The information presented in Table 45 attempts to address these issues by summarizing limiting factors over areas of intermediate size (assessment units) and for individual fish species. It does not address factors found to limit fish production or survival in individual streams or stream reaches.

In order to rectify different reporting methods from the sources reviewed, limiting factor designations were standardized in some cases. This process particularly effects the categories of sediment, watershed disturbance, habitat degradation, and connectivity. Within the context of Table 45**,** the definitions of these categories are

- Sediment = Natural and/or elevated sediment loading from undefined sources
- Watershed Disturbance = Upland disturbances such as mining, timber harvest and roading, including instream sedimentation resulting from defined upland sources (i.e., roads)
- Habitat Degradation = Riparian or instream habitat loss or disturbance
- Connectivity / Passage = All forms of population fragmentation including physical, chemical, or thermal barriers

Documentation of limiting factors is influenced by limited information in some areas and for some species (e.g. few limiting factors specific to westslope cutthroat trout have been defined at the landscape level within the Clearwater subbasin). The approach is intended to provide a relative picture of limiting factors within, not necessarily between, each assessment unit. For example, documented temperature and sediment limitations in the Lower Selway AU are most likely related to natural regimes (Thompson 1999). In contrast, temperature limitations in the Lower Clearwater AU are likely due to a combination of natural and altered conditions, including low elevation, low degree of natural shading, agricultural impacts to runoff, water withdrawals, and Dworshak Dam operations.

Subwatersheds, streams or stream reaches throughout the subbasin may realize limitations due to factors not documented here. Proposals directed at addressing such factors should supply additional information as necessary to justify the project(s). Additional information may come from finer scale assessments or research, be based on results of recent or ongoing studies, or unpublished information sources.

Table 45. Limiting factors defined by species and AU during previous research or assessments (X) or through professional judgment (P) in the Clearwater subbasin

AU/Species	Temperature	Base Flow	Flow Variation	Sediment	Instream Cover	Watershed Disturbances[1]	Habitat Degradation[2]	Exotics / Introgression	Harvest[3]	Connectivity/ Passage[4]
Lower Clearwater										
Bull Trout	X	X	X						X	X
Westslope Cutthroat	X		X			X				
Steelhead	X	X	X	X		X	X	X		X
Chinook	X	X		X		X	X			X
Pacific Lamprey										
Lower North Fork										
Bull Trout	X			X		X	X	X	X	X
Westslope Cutthroat	X			X		X	X	X	X	X
Steelhead	--	--	--	--	--	--	--	--	--	--
Chinook	--	--	--	--	--	--	--	--	--	--
Pacific Lamprey										
Upper North Fork										
Bull Trout	X			X		X		X	X	
Westslope Cutthroat				X		X	X	X	X	
Steelhead	--	--	--	--	--	--	--	--	--	--
Chinook	--	--	--	--	--	--	--	--	--	--
Pacific Lamprey										
Lolo / Middle Fork										
Bull Trout	X			X	X	X	X		X	
Westslope Cutthroat	X		X	X	X	X	X		X	
Steelhead	X	X		X	X	X				
Chinook				X	X	X	X			
Pacific Lamprey	P			P		P	P			P
Lochsa										
Bull Trout	X			X	X	X	X	X	X	
Westslope Cutthroat	X			X	X	X	X	X	X	
Steelhead	X			X	X	X	X			X
Chinook	X			X	X	X	X			X
Pacific Lamprey										
Lower Selway										
Bull Trout	X						X	X	X	
Westslope Cutthroat	X			X				X	X	
Steelhead	X			X						
Chinook	X									
Pacific Lamprey										

Table 45 (Continued)

Upper Selway										
Bull Trout							X	X	X	
Westslope Cutthroat				P				X	X	
Steelhead	P			P						X
Chinook										X
Pacific Lamprey										
South Fork										
Bull Trout	X			X	X	X	X	X	X	X
Westslope Cutthroat	X			X	X	X	X	X	X	X
Steelhead	X			X	X	X	X	X	X	
Chinook	X			X	X	X	X			
Pacific Lamprey	X			P		P	P			P
Dworshak Reservoir Resident Fishery										
Kokanee			X[5]							
Smallmouth Bass							X			
Redside Shiner							X			

1 Includes upland disturbances such as mining, timber harvest and roading.
2 Includes riparian, instream habitat loss and disturbance or reservoir drawdowns (smallmouth bass).
3 Sport harvest of bull trout is not permitted in the subbasin, although poaching and some tribal harvest of the species may occur.
4 Includes passage barriers or other forms of population fragmentation.
5 Entrainment as influenced by flow variations through Dworshak Dam.

Dworshak Dam

The construction of Dworshak Dam was a limiting factor to several resident fish populations. The dam replaced part of the North Fork of the Clearwater River, and numerous tributaries, with a reservoir environment. Idaho Department of Fish and Game estimated that 200 km of river and stream habitat was lost. Based on densities of fish in other areas, this habitat could have supported 264,000 mountain whitefish, 110,000 cutthroat trout, 6,700 bull trout, 256,000 redside shiners, 93,000 suckers, 44,000 longnose dace, 4,400 northern pikeminnow, 27,000 sculpins and an unknown number of redband trout. The Department estimated 14,800 m^2 of stream habitat was inundated by the reservoir in first to fourth order tributaries and, an additional 962 ha of habitat was inundated in tributaries and the North Fork of the Clearwater River that were larger than fourth order (Idaho Department of Fish and Game, unpublished data).

The dam also blocked resident fish from using habitat above and below the dam site. The splitting of habitat into discontinuous areas could increase the risk of extinction for fish above and below the dam.

The current operation of Dworshak Dam is a limiting factor to fish populations within Dworshak Reservoir. Drawdowns of the reservoir can be a much as 47 m and reduce the surface area by 52% thus reducing habitat for fish populations. Drawdowns also prevent the establishment of productive littoral areas around the shorelines of the reservoir, which affects near-shore feeding species.

Kokanee are the best-adapted species for this fluctuating reservoir since they occupy the pelagic, offshore, areas and spawn in tributary streams. Their densities have exceeded 100 adult kokanee per hectare, and harvest of kokanee by anglers has exceeded 200,000 fish in some years. Their population's biggest limiting factor has been entrainment into Dworshak Dam. For example in the spring of 1996, Idaho Department of Fish and Game estimated that 1.3 million kokanee were entrained, which reduced the kokanee population in the reservoir by 95%. These losses impacted the kokanee sport fishery for the next three years. Fickeisen and Geist (1993) noted that the principle bottleneck to the population appeared to be the entrainment losses of fish through the dam.

Reservoir operations also limit smallmouth bass populations. Fluctuating water levels during incubation have resulted in desiccation of nests and limited beds of aquatic vegetation that provide habitat for production of food needed by age 1 to age 4 fish (Fickeisen and Geist 1993).

Stream Reach Scale – NWPPC Data

Constraints to production of chinook salmon and steelhead trout in the Clearwater subbasin were delineated for individual stream reaches during the prior subbasin planning process (Nez Perce Tribe and Idaho Department of Fish and Game 1990). Fourteen individual constraints were defined for steelhead trout, and twelve for chinook salmon in the Clearwater subbasin, any of which may inhibit spawning, rearing or migration of these species.

One major weakness of this database is its failure to address constraints in areas not currently being used by anadromous species at the time the data was compiled. It does not address constraints in areas of substantial historical distribution (e.g., the Potlatch River for chinook salmon), and did not delineate potential constraints in areas that might be made accessible to either species in the future. Addressing these issues would require considerable time to replicate the methods and analyses used in developing the original database, and has therefore not been attempted.

Strength(s) of the database include that constraints to chinook salmon and steelhead trout have not likely changed much in the past 10 years, except in very localized areas with significant restoration efforts. The database should therefore still provide a good understanding of current constraints to anadromous production in the Clearwater subbasin.

As defined in the NWPPC database, spring chinook salmon production in the Clearwater subbasin is predominantly constrained by steep gradient (520 stream miles) and sedimentation (411 stream miles; Table 46). Steep gradient is the primary constraint (in terms of stream miles impacted) to chinook production in the Upper Selway AU, and also important in the Lochsa, Lower Selway, and South Fork AUs. The Lochsa AU is also notably impacted by habitat constraints including lack of high quality pools and poor instream cover. Sedimentation is the principle constraint in the Lolo/Middle Fork and South Fork AUs. Constraints to spring chinook salmon production for individual stream reaches throughout the Clearwater subbasin are presented in Appendix F.

Table 46. Summary of stream miles where spring chinook use is constrained by various factors in the Clearwater subbasin (defined by NWPPC and downloaded from Streamnet.org). Numbers in parenthesis represent the estimated total stream miles with habitat suitable for spawning, rearing, and/or migration by spring chinook

	Assessment Unit								
Constraint	Lower Clearwater	Lower North Fork	Upper North Fork	Lolo / Middle Fork	Lochsa	Lower Selway	Upper Selway	South Fork	Total
	(111.8)	(2.0)	(0.0)	(154.5)	(278.9)	(146.1)	(301.8)	(291.8)	(1,286.7)
Large Stream Size	78.3	2.0	---	7.1	68.8	40.0	13.0	15.8	225.0
Steep Gradient	0.0	0.0	---	59.2	107.5	74.8	176.9	101.5	520.1
Temperature	93.6	0.0	---	76.6	28.8	19.1	0.0	13.1	231.3
Sedimentation	39.5	0.0	---	146.9	22.6	3.5	15.1	183.7	411.3
Gravel Quantity	0.0	0.0	---	0.0	71.9	0.0	0.0	0.0	71.9
Blocked Passage	0.0	0.0	---	0.0	28.7	21.4	85.4	4.7	140.2
Impeded Passage	0.0	0.0	---	0.0	47.2	0.0	0.0	0.0	47.2
Poor Instream Cover	0.0	0.0	---	11.3	77.3	0.0	0.0	64.4	153.0
Lack of High Quality Pools	0.0	0.0	---	0.0	117.4	0.0	0.0	0.0	117.4
Bank Degradation	0.0	0.0	---	0.0	0.0	0.0	0.0	6.2	6.2
Channelization	0.0	0.0	---	0.0	0.0	0.0	0.0	14.6	14.6
Dewatering	0.0	0.0	---	11.3	0.0	0.0	0.0	0.0	11.3

The four principle factors constraining steelhead trout production in the Clearwater subbasin are sedimentation (965 stream miles), temperature (520 stream miles), dewatering (374 stream miles), and blocked or impeded passage (451 stream miles; Table 47). These four factors, with the addition of the mainstem Clearwater River's large stream size, also represent the principle constraints to steelhead trout in the Lower Clearwater AU. Important constraints to steelhead trout production vary considerably between other AUs. Sedimentation is an important constraint to steelhead trout production in the Lolo/Middle Fork and South Fork AUs, although temperature is also an important concern in the Lolo/Middle Fork AU. Instream habitat forming processes appear to present constraints to steelhead trout in the Lochsa AU, resulting in concern over lack of high quality pools, limited gravel quantity, and poor instream cover. In the Selway River AUs, steelhead trout population(s) are constrained predominantly by large stream size (Lower Selway AU) and blocked passage (Upper Selway AU). Constraints to steelhead trout production for individual stream reaches throughout the Clearwater subbasin are presented in Appendix F.

Stream Reach Scale - §303(d)

The majority of streams within the Clearwater subbasin have designated beneficial uses defined by IDEQ which include salmonid spawning and/or cold water biota. The IDEQ maintains the §303(d) list for stream reaches with impaired beneficial uses. These stream reaches and the associated pollutants have been summarized in the water quality section of this report, and individual stream reaches listed under §303(d) for impairment are mapped in Appendix B.

Passage / Connectivity - Road Culverts

The degree to which connectivity limits fish migration and production within the Clearwater subbasin is thought to be underrepresented by existing data and reports. No data source exists which accurately documents known or potential barriers to fish migration within the Clearwater subbasin in a useable and widespread format. Particularly lacking are records of culvert conditions in relation to fish passage, which is thought to be a substantial issue throughout the Clearwater subbasin. Although data is regularly collected on culvert conditions during a variety of field surveys, the data often are not available in the detail and format necessary to map the locations of surveyed culverts.

In the absence of available information regarding culvert locations and condition, we constructed an index of culvert abundance by overlaying the road (1:24,000) and stream (1:100,000) coverages. Points of intersections were defined, and likely represent a reasonable estimate of the relative (not actual) distribution and density of culverts throughout the Clearwater subbasin (Figure 39).

Table 47. Summary of stream miles where steelhead trout use is constrained by various factors in the Clearwater subbasin (defined by NWPPC and downloaded from Streamnet.org). Numbers in parenthesis represent the estimated total stream miles with habitat suitable for spawning, rearing, and/or migration by steelhead trout

	Assessment Unit								
Constraint	Lower Clearwater	Lower North Fork	Upper North Fork	Lolo / Middle Fork	Lochsa	Lower Selway	Upper Selway	South Fork	Total
	(525.5)	(2.0)	(0.0)	(263.7)	(437.3)	(241.8)	(563.7)	(389.2)	(2,423.2)
Large Stream Size	78.3	2.0	---	7.1	68.8	40.0	11.5	15.8	223.4
Steep Gradient	0.0	0.0	---	26.8	62.0	10.2	15.2	45.2	159.8
Temperature	342.2	0.0	---	116.8	28.8	19.1	0.0	13.1	520.0
Sedimentation	434.5	0.0	---	201.7	73.7	9.1	8.5	237.6	965.0
Gravel Quantity	0.0	0.0	---	0.0	145.1	0.0	0.0	0.0	145.1
Blocked Passage	94.2	0.0	---	66.1	52.6	27.0	84.7	4.7	329.3
Impeded Passage	51.2	0.0	---	0.0	57.7	0.0	13.3	0.0	122.2
Poor Instream Cover	38.8	0.0	---	11.3	83.4	0.0	0.0	70.9	204.4
Lack of High Quality Pools	16.3	0.0	---	40.1	185.5	0.0	0.0	0.0	241.9
Bank Degradation	19.8	0.0	---	0.0	0.0	0.0	0.0	2.0	21.7
Channelization	52.4	0.0	---	3.2	0.0	0.0	0.0	14.6	70.1
Dewatering	301.2	0.0	---	73.1	0.0	0.0	0.0	0.0	374.3
Poor Diversions	24.4	0.0	---	0.0	0.0	0.0	0.0	0.0	24.4
Chemicals	18.6	0.0	---	0.0	0.0	0.0	0.0	0.0	18.6

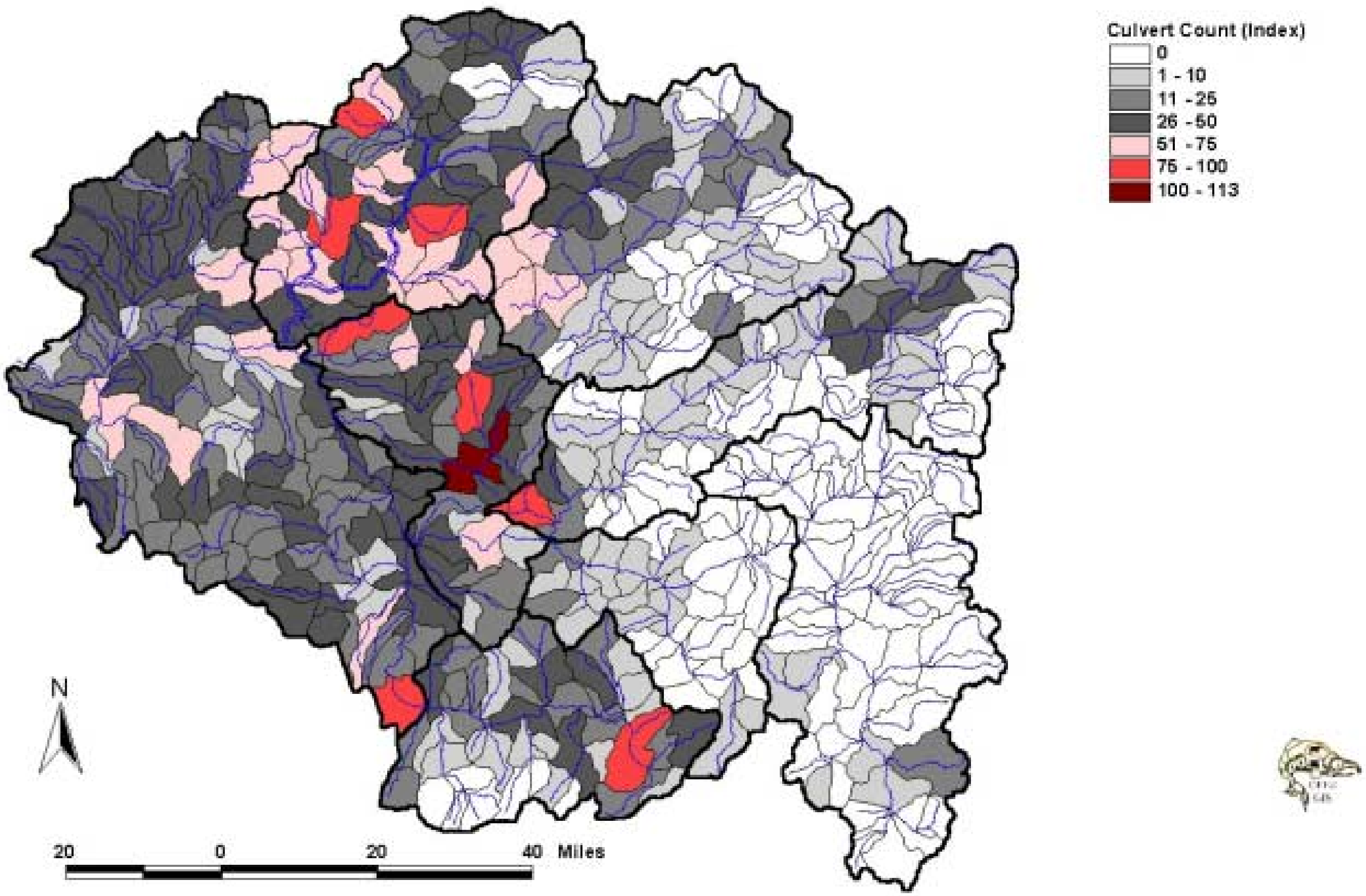

Figure 39. Estimated number of culvert locations (stream-road crossings) by 6th field HUC throughout the Clearwater subbasin

The Idaho Department of Lands has estimated that over 50% of existing culverts may pose either a partial or complete barrier to fish migration (J. Dupont, IDL, personal communication, February 6, 2001). Based on this information, it is reasonable to assume that the greatest potential for fish passage issues related to culverts is coincidental with areas of greatest culvert density. However, information presented in Figure 39 should be used only as a guide for planning culvert surveys or data collection. Additional information will be needed to define the impacts of culverts to fish populations. Such information will include fish distributions and seasonal habitat use, culvert design and construction, and availability and quality of fish habitat upstream.

It is important to note the potentially beneficial aspects of fish passage barriers in some areas. Although passage barriers are most typically considered to have negative impacts, they may be important mechanisms in limiting the spread of exotic species and subsequent introgression with native species of concern including bull trout and westslope cutthroat trout.

Wildlife Limiting Factors

Eight factors are considered to be the most limiting to wildlife populations in the Clearwater subbasin. Addressing these factors provides the greatest potential for improving wildlife habitat in the Clearwater subbasin and preserving its wildlife species. The limiting factors are interconnected, and addressing one may result in improvements in others. The primary factors limiting wildlife populations in the subbasin include

- Loss of ponderosa pine habitats
- Loss of prairie grassland habitats
- Riparian degradation
- Noxious weeds
- Loss of late successional forests
- Loss of early successional forests
- Fragmentation through human construction
- Reduction in nutrient inputs

Loss of ponderosa pine

Timber harvest and fire suppression have reduced the prevalence of ponderosa pine forests in the region (Quigley and Arbelbide 1997). Since ponderosa pine is a valuable timber species, large mature stands were among the first to be harvested after European settlement. Fire suppression further reduced the extent of ponderosa pine in the subbasin. The thick bark of ponderosa pine allows it to withstand ground fires better than the thin-barked true firs. In areas with a short fire return interval, firs never have an opportunity to become established. Fire suppression allows the shade-tolerant fir species time to establish in the understory of ponderosa pine forest. In the continued absence of fire these species eventually become dominant when the canopy becomes dense enough that the shade-intolerant ponderosa pine seedlings cannot survive (Johnson et al. 1994). A comparison of the coarse scale historic vegetation (~1900) with the current vegetation layer compiled by ICBEMP indicates that Ponderosa pine coverage in the subbasin has declined by 1,996 km^2 (Table 42). This decline has probably reduced the suitability of the subbasin for ponderosa pine dependent wildlife including flammulated owl, white-headed woodpecker, and black-backed woodpecker.

Loss of prairie grasslands

The vast ranges of fescue and Agropyron bunchgrasses that used to dominate the lowland areas of the subbasin have been almost completely converted to agricultural areas. A comparison of the coarse scale historic vegetation with the current vegetation layer compiled by ICBEMP indicates that native bunchgrass coverage in the subbasin has declined by 3724 km^2 (Table 42). Native bunchgrasses now comprise less than 1% of the coverage represented in the historic ICBEMP layer. This gives a rough idea of the magnitude of loss that has occurred on the subbasins grassland ecosystems but the data is too coarse to be used to identify and prioritize prairie remnants for protection.

A recent collaborative effort between the Bureau of Land Management, Cottonwood Resource Area, and the Palouse Land Trust, established protection priorities for 308 Palouse or Canyon grassland remnants in Idaho, Oregon and Washington. Prioritization was based on the size of the remnant, its proximity to other remnants, the rarity of species and other community elements, and remnant quality. Nine of the twenty sites identified as having a high conservation value are located in the lower Clearwater subbasin (Weddell and Lichthardt 1998).

Native grasslands in the Columbia basin are thought to have evolved under less intense grazing pressure than those in the Great Plains region of the country; this made them more susceptible to damage when Euro-American settlers introduced large herds of sheep and cattle during the late 1800s and early 1900s. Removal of the original perennial grass cover left the soil vulnerable to erosion by wind and water, altered hydrologic regimes,and aided grassland colonization by annual grasses and noxious weeds (Quigley and Arbelbide 1997; Black et al. 1997). All known prairie remnants in the region are influenced by exotic species. Dobler et al. (1996) found a negative correlation between the abundance of many native bird species and exotic grass coverage on Washington's shrub steppe grasslands. The massive loss of prairie grasslands in the subbasin has contributed to the decline of many grassland dependent species and the extirpation of the sharp-tailed grouse (Deeble 2000).

Riparian degradation

Riparian areas contain higher wildlife species diversity and abundance, than any other habitat type. The unique characteristics present in healthy riparian areas that contribute to this diversity include structural complexity, connectivity with other ecosystems, abundance of food and water, and a moderate microclimate (Knutson and Naef 1997). Reductions in the size, quality, and connectivity of riparian habitats in the Clearwater subbasin have reduced their ability to support wildlife populations and to protect aquatic habitats.

Research conducted on an 875-ha area near Viola Idaho, just outside the northwestern edge of the subbasin illustrates the magnitude of riparian disturbance in the area. A comparison of aerial photos of the study area showed a 61% decline in riparian vegetation between 1940 and 1989. Riparian vegetation corridors shrank to thin, broken patches, and the shrub vegetation component virtually disappeared. Even more significant conversions of riparian areas to fields and pastures are thought to have occurred between 1880 and 1940 but this conversion is not quantifiable. Impacts of a similar scale probably occurred throughout the lowland areas of the subbasin as they underwent conversion to agriculture (Black et al. 1997).

Road construction and livestock grazing have impacted the quality of remaining riparian habitats in the subbasin. Roads are commonly constructed parallel to stream and river courses for scenic reasons and ease of construction. The construction of these roads results in the removal of riparian vegetation and alters the development of meanders, side channels, and attached wetlands that provide important habitat for fish and aquatic wildlife. Cattle spend 20-

30% more time in riparian areas than elsewhere on their range because of the abundant forage, availability of water, and protection from the elements, magnifying their impacts on these habitats (Knutson and Naef 1997).

Noxious weeds

The introduction of non-native plant and animal species to the Clearwater basin has reduced the subbasin's ability to support its native wildlife and plant species. Introduced plants in the subbasin often outcompete native plant species and alter ecological processes, reducing habitat suitability (Quigley and Arbelbide 1997). The designation "noxious" is applied to the most destructive of these invaders. Thirty-six introduced plant species are recognized as noxious in the state of Idaho, of these 35 have been documented in the five counties partially contained in the Clearwater subbasin (Table 12).

The Clearwater Basin Weed Coordinating Committee is a multi-agency working group charged with developing management objectives and strategies to reduce the spread of non native plant species in the Clearwater subbasin (Clearwater National Forest 1999). They have established management objectives that help prioritize noxious weed control efforts (Table 48).

The majority of the noxious weed infestations in the Clearwater subbasin occur in localized patches; two notable exceptions are yellow star thistle and spotted knapweed. Both of these invader species are native exotic plants from the Mediterranean that have thrived in the subbasin due to similarities in climate between the two locations (Quigley and Arbelbide 1997). Yellow-star thistle has been documented to occur on 183,000 acres within the low elevation grassland habitats of the subbasin. Despite control efforts yellow-star thistle continue to expand at an estimated rate of 6% per year (Jette et al. 1999). Spotted knapweed is known to occur on 19,000 acres of the subbasin, primarily along streams (Figure 40). Introduced plant species have been documented to reduce wildlife habitat suitability. Spotted knapweed infested range in Montana was used by elk 98% less frequently than an adjacent uninfested area (Sheley and Petroff 1999). Because it completes its growth and dries early in the season, Cheatgrass provides less nutrition to herbivorous wildlife species than native species (Quigley and Arbelbide 1997).

Table 48. Noxious weed management objectives and priorities in the Clearwater subbasin

Weed Species	Management Objective	Treatment Priority
diffuse knapwood	eradicate	1
dalmatian toadflax	eradicate	1
yellow toadflax	eradicate	1
yellow starthistle	contain	2
orange hawkweed	contain	2
meadow hawkweed	contain	2
common crupina	contain	2
spotted knapweed	reduce	3
Canada thistle	reduce	3
field bindweed	custodial	4
sulfur cinquefoil	custodial	4

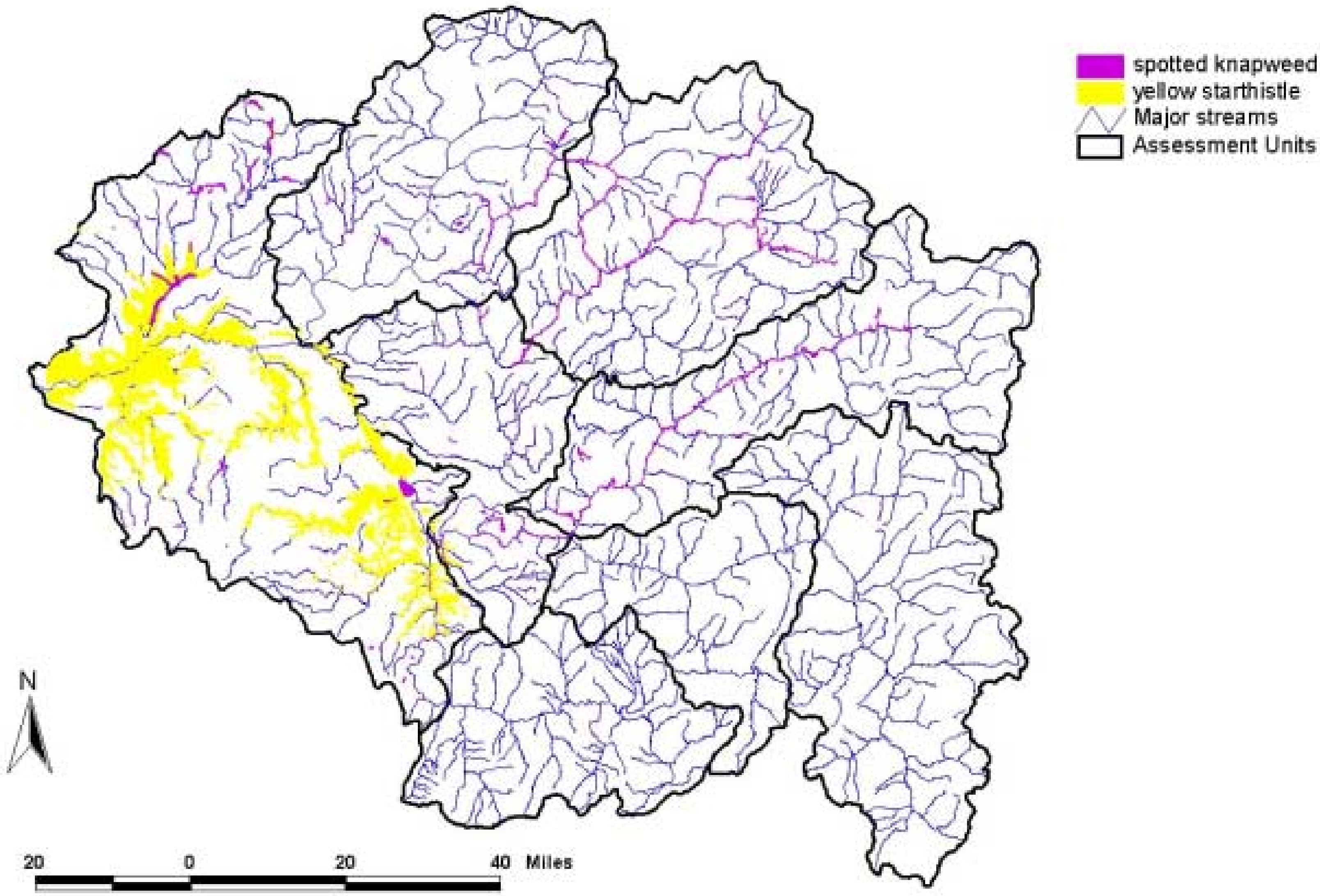

Figure 40. Distributions of yellow starthistle and spotted knapweed in the Clearwater subbasin

Loss of late successional

A comparison of the coarse-scale historic and current structural stage GIS layers developed by ICBEMP indicates that old multi and single strata forests have declined from a coverage of 4,123 km^2 around 1900 to 888 km^2 recently (Figure 41;Figure 42). The reduction in mature forest types in the subbasin and across the Columbia basin as a whole has been primarily attributed to timber harvest (Quigley and Arbelbide 1997). A reduction in the prevalence of mature stands is particularly common in cover types like ponderosa pine that have been selectively harvested.

Snags and downed wood are structural elements, common in mature forests, with significant importance to wildlife. The prevalence of these elements has been reduced in the region through the removal of older trees that might soon die and create snags, fire suppression, and increased access to these elements during salvage harvest or fire wood collection (Wisdom et al. 2000).

Loss of early successional

A comparison of the coarse-scale historic and current structural stage GIS layers developed by ICBEMP indicates that coverage in the subbasin of stand initiation forests, and young multi-strata forests has declined from a coverage of 7,193 km^2 around 1900 to 3,005 km^2 recently (Figure 41;Figure 42). The extent of early-seral habitat was probably even greater after the occurrence of huge fires in 1910 and 1919 (Table 14) but has been declining since. The resulting reductions in forage have reduced the suitability of the subbasin to many wildlife species including big game species. Elk habitat quality reflects the balance between the availability of the cover and forage. Elk populations in the North Fork of the Clearwater reached their peak in the 1950s. North Fork elk populations in 1998 were approximately half their numbers in 1989 (Clearwater National Forest 1999). Reductions in prey base have reduced the suitability of the subbasin to predators such as the wolf and lynx, which rely on early successional stage dependent prey (Wisdom et al. 2000).

As early succession and late successional forests in the subbasin have decreased a corresponding increase has occurred in the prevalence of mid-seral forests in the subbasin. These forests tend to be dominated by shade tolerant species including Douglas-fir and grand fir. Fire suppression has increased the tree density and fuel loads in these forests over what was present historically. This increases the likelyhood that when fire does occur, it will be an intense stand replacing fire. Higher stand densities have increased the susceptibility of forests in the subbasin to insects and disease (Quigley and Arbelbide 1997).

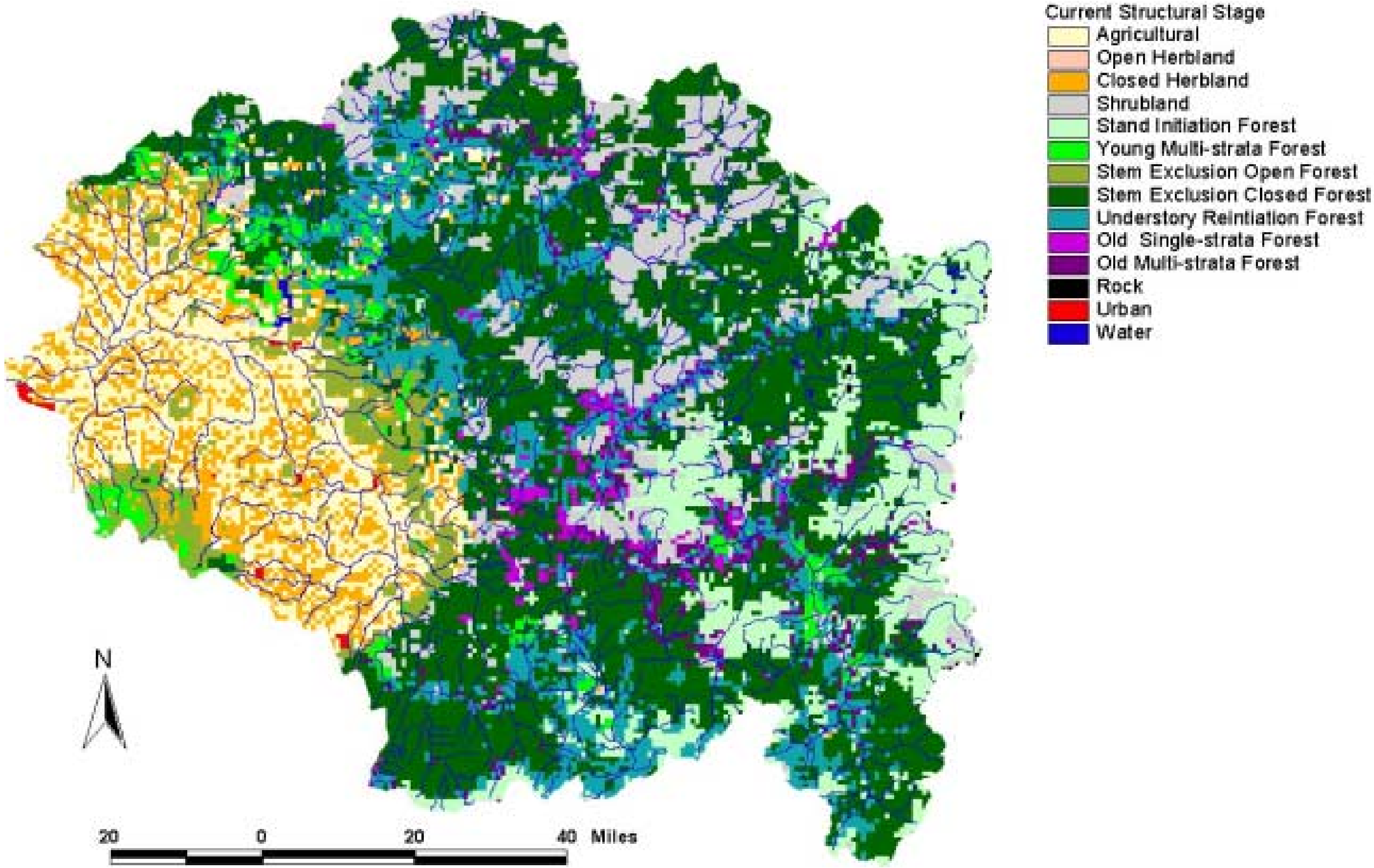

Figure 41. Current structural stage within the Clearwater subbasin (ICBEMP)

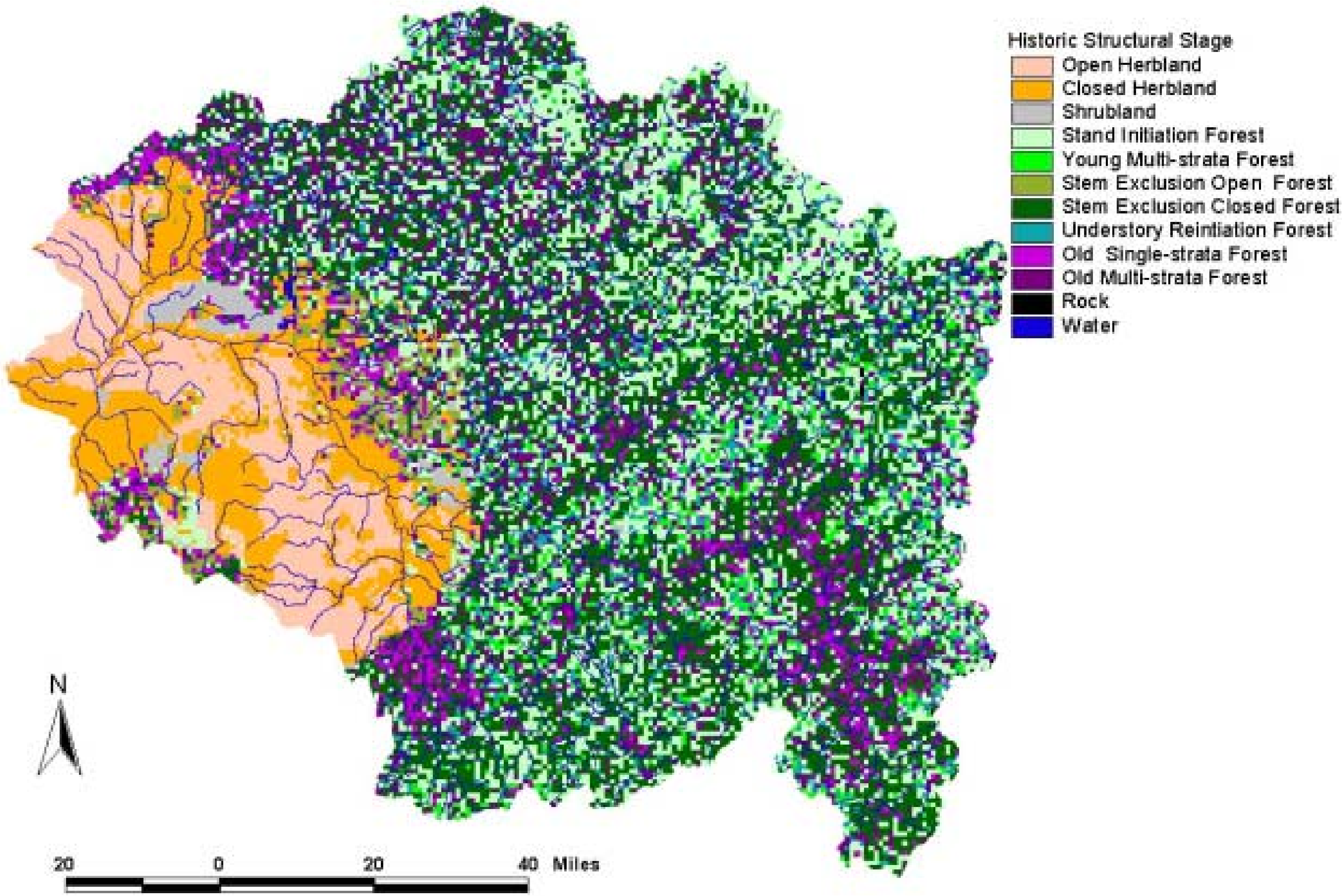

Figure 42. Historic structural stage within the Clearwater subbasin (ICBEMP)

Fragmentation through human construction

Human construction of roads, dams and buildings has reduced the availability of wildlife habitat in the subbasin and resulted in fragmentation between habitat patches. Wildlife management in the subbasin seeks to mitigate for and reduce the impacts of these constructions.

Roads

The transportation system of the Clearwater subbasin is a potential limiting factor to wildlife populations. More than 65 species of terrestrial vertebrates in the interior Columbia River basin have been identified as being negatively affected by road-associated factors (Wisdom et al. 2000). Road-associated factors can negatively affect habitats and populations of terrestrial vertebrates both directly and indirectly (Table 49). Increasing road densities can reduce big game habitat effectiveness or increase vulnerability to harvest. Motorized access facilitates firewood cutting and commercial harvest, which can reduce the suitability of habitats surrounding roads to species that depend on large trees, snags, or logs (U.S. Forest Service 2000). Roads aid in the spread of noxious weeds and can facilitate the spread of species into otherwise unsuitable habitat. For instance, coyotes have been shown to negatively effect lynx populations through competition for prey; roads allow coyotes access to areas where they would otherwise be excluded by snow depths. Roads increase the amount of edge habitat in the landscape, increasing habitat suitability for edge dependent species like the brown-headed cowbird. Populations of reptiles which using roads for thermal regulation, wide ranging forest carnivores, and migrating amphibians are particularly vulnerable to the effects of road mortality. Wisdom et al. (2000) identified 13 factors consistently associated with roads damaging to terrestrial vertebrates.

Inundation

Of past and existing dams in the Clearwater subbasin, Dworshak dam has had by far the greatest impacts to wildlife resources. At 219 m in height and forming a reservoir approximately 86 km long and 194 m deep, Dworshak dam, located two miles above the mouth of the North Fork Clearwater River is the largest straight axis concrete dam in the United States. Dworshak reservoir extends 54 miles into the North Fork Clearwater River Canyon. It provides over 3.4 million acre-feet of storage, making it the largest storage project within the Nez Perce Tribe ceded territory and the state of Idaho (Idaho Department of Fish and Game and Nez Perce Tribe 1991; U.S. Army Corps of Engineers 1975). Dworshak dam inundates 16,970 acres of terrestrial and riverine habitats at full pool (U.S. Army Corps of Engineers 1975).

The greatest single impact of the Dworshak project on wildlife is the loss of approximately 15,000 acres of deer and elk winter range due to inundation (U.S. Army Corps of Engineers 1975). This range was generally located along the river and up to an elevation of about 2,700 feet (U.S. Army Corps of Engineers 1975). The reservoir lake level is at 1,600 feet (Mehrhoff and Sather-Blair 1985). The habitat flooded was most capable of supporting animals during periods of stress caused by adverse winter weather conditions (Norberg and Trout 1958).

The principal cover types lost to the construction and operation of Dworshak Dam and Reservoir were open coniferous (7,300 acres), dense coniferous (6,100 acres), brush (1,190 acres), grass (510 acres), agricultural crops (170 acres), and riverine (1,700 acres; U.S. Fish and Wildlife Service 1962). Additional habitat was lost due to the development of recreational facilities and habitat displacement by project facilities.

Table 49. Thirteen road-associated factors with deleterious impacts on wildlife (Wisdom et al. 2000)

Road-associated Factor	Effect of Factor in Relation to Roads
Snag reduction	Reduction in density of snags due to their removal near roads, as facilitated by road access
Down log reduction	Reduction in density of large logs due to their removal near roads, as facilitated by road access
Habitat loss and fragmentation	Loss and resulting fragmentation of habitat due to establishment and maintenance of road and road right-of-way
Negative edge effects	Specific case of fragmentation for species that respond negatively to openings or linear edges created by roads
Over-hunting	Nonsustainable or nondesired legal harvest by hunting as facilitated by road access
Over-trapping	Nonsustainable or nondesired legal harvest by trapping as facilitated by road access
Poaching	Increased illegal take (shooting or trapping) of animals as facilitated by road access
Collection	Collection of live animals for human uses (e.g., amphibians and reptiles collected for use as pets) as facilitated by the physical characteristics of roads or by road access
Harassment or disturbance at specific use sites	Direct interference of life functions at specific use sites due to human or motorized activities, as facilitated by road access (e.g. increased disturbance of nest sites, breeding leks or communal roost sites)
Collisions	Death or injury resulting from a motorized vehicle running over or hitting an animal on the road
Movement Barrier	Preclusion of dispersal, migration or other movements as posed by a road itself or by human activities on or near a road or road network
Displacement or avoidance	Spatial shifts in populations or individual animals away from a road or road network in relation to human activities on or near a road or road network
Chronic negative interaction with humans	Increased mortality of animals due to increased contact with humans, as facilitated by road access

Urban Sprawl

Urban land uses comprise only approximately 0.2% of the Clearwater subbasin but the extent and impact of this land use is increasing. Between 1990 and 1999 the population of the Clearwater grew by approximately 8.7% (Idaho Department of Commerce 2000; Table 17). Most of this population growth occurred in Lewiston and other established population centers in the Lower Clearwater AU (U.S. Census Bureau 2000). However, alteration of the global economy by the technological revolution has allowed people to live and work in increasingly remote areas not connected to an urban center (Black et al. 1997).

Increases in development result in habitat fragmentation, increases in roads, and loss of security. Low elevation big game winter range is particularly vulnerable to urban encroachment. Long-term capability of the habitat to support big game and other wildlife species is permanently reduced. Humans living in previously wild areas also results in significant predation on native fauna by pets, particularly free-ranging cats. Cats can kill large numbers of small animals impacting both the populations of these species and their predators (Knutson and Naef 1997). Free-ranging dogs chase deer and elk and can impact other wildlife species. Poorly constructed fences associated with rural subdivisions in important wildlife habitats can disrupt wildlife movements or result in direct mortality to individual animals. Because most of the upper 2/3 of the subbasin is publicly owned the lower 1/3 is most at risk for increased development. This area contains more than 40% of the ponderosa pine habitats identified in the GAP vegetation layer and nearly all remaining prairie grasslands, for this reason land acquisition and the development of stewardship programs have been identified as needs for the protection of both of these habitats.

Reduction in nutrient inputs

Spawning salmon populations form an important link between the aquatic, riparian, and terrestrial communities. Reductions in the anadromous salmon runs in the subbasin may have reduced the subbasins ability to support wildlife. Anadromous salmon help to maintain ecosystem productivity and may be regarded as a keystone species. Salmon runs input organic matter and nutrients to the trophic system through multiple levels and pathways including direct consumption, excretion, decomposition, and primary production. Wildlife derive nutrition from salmon through direct consumption in the form of predation, parasitism, or scavenging of the live spawner, carcass, egg, or fry life stages. Carcass decomposition and the particulate and dissolved organic matter released by spawning fish deliver nutrients to primary producers which also provide sustenance to wildlife (Cederholm et al. 2000). Cederholm et al. (2000) identified nine wildlife species that have (or historically had) a strong consistent relation ship with salmon; of these the common merganser, harlequin duck, osprey, bald eagle, Caspian tern, black bear, and northern river otter occur in the Clearwater subbasin. Eighty-three other wildlife species were identified as having a recurrent or indirect relation ship with salmon, and many of these also occur in the Clearwater subbasin (Cederholm et al. 2000).

Artificial Production

A general overview of artificial production facilities located within the boundaries of the Clearwater subbasin is presented in Table 50. More detailed information on artificial production facilities follows.

Idaho Department of Fish and Game

The Idaho Department of Fish and Game operates Clearwater Fish Hatchery, located at the mouth of the North Fork Clearwater River. Clearwater Fish Hatchery was authorized and constructed under the Lower Snake River Compensation Program (LSRCP), and is the newest LSRCP hatchery program in the Snake River basin (The overall Snake River basin LSRCP program is described in U.S. Fish and Wildlife Service 2001a). The hatchery was completed and became operational in 1990. The implementation of the Clearwater Fish Hatchery program was guided by the following management objectives: 1) restore and maintain natural spawning populations, 2) re-establish historic recreational and tribal fisheries, 3) establish total adult returns that meet LSRCP goals, 4) operate the hatchery programs so that genetic and life history characteristics of hatchery fish mimic wild fish, and 5) minimize impacts on resident stocks of game fish. The IDFG strongly emphasizes maintaining selective fisheries with the steelhead and chinook salmon programs. Clearwater Fish Hatchery also produces steelhead and chinook salmon juveniles for release as part of the Idaho Supplementation Studies (chinook salmon) and Steelhead Supplementation Studies projects occurring in the basin. The Clearwater Fish Hatchery salmon and steelhead artificial production programs conform to statewide fisheries policies and management goals identified in the 2001-2006 Fisheries Management Plan (Idaho Department of Fish and Game 2001b).

Clearwater Fish Hatchery serves only incubation and early rearing functions for steelhead and chinook salmon. All juvenile production is released off site. Dworshak National Fish Hatchery supplies fertilized B-run steelhead eggs for the Clearwater Fish Hatchery steelhead program. Adult spring chinook salmon trapping and spawning, and juvenile fish final rearing and release are conducted at the hatchery’s three satellite facilities. The Powell satellite, located on the Lochsa River was completed in 1989. Red River (completed in 1986) and Crooked River (completed in 1990) satellites are located in the South Fork Clearwater River basin. Juvenile-fish pond capacities at each of the satellite facilities are 334,000 at Powell 334,000 at Red River, and 700,000 at Crooked River. The chinook salmon total juvenile release target of 1.3695 million fish was intended to return about 12,000 adult spring chinook salmon back to the LSRCP project area (above Lower Granite Dam). The steelhead total juvenile release target of 2.8 million smolts (8 fish per pound) was intended to return about 14,000 adult steelhead back to the LSRCP project area above Lower Granite Dam.

An extensive monitoring and evaluation program documents hatchery practices and evaluates the success of the hatchery programs at meeting LSRCP mitigation objectives, IDFG management objectives, and monitors and evaluates the success of supplementation programs. The IDFG-LSRCP hatchery monitoring and evaluation program identifies hatchery rearing and release strategies that will allow the LSRCP program to meet its mitigation requirements and improve the survival of hatchery fish while avoiding negative impacts to natural (including listed) populations. In some cases, particularly in light of ESA requirements and Idaho Supplementation Study (ISS) plans, hatcheries may be used to enhance naturally reproducing populations.

Table 50. Description of production programs utilized within the Clearwater subbasin

Stock	Intent	Initial Broodstock	Operating Broodstock	Adult Collection/ Holding	Central Facility (Incubation / rearing)	Acclimation and release sites	Status	Funding Source
Chinook - S	Harvest / Mitigation	Little White/ Leavenworth/ Rapid River	Dworshak	Dworshak	Dworshak NFH/ Kooskia NFH	Dworshak N.F. Clearwater	Ongoing	LSRCP
Chinook - S	Supplement-ation (ISS)	Rapid R., Crooked R., Red R., Powell., Kooskia	Rapid R., Crooked R., Red R., Powell., Kooskia	Red R, Crooked R., Powell, Kooskia	Clearwater Hatchery, Kooskia NFH	Upper Red and Crooked rivers, Clear Cr., Pete King Cr, Fishing (Squaw) Cr., Bear (Papoose) Cr., Colt Killed Cr., Big Flat Cr	Ongoing	LSRCP
Chinook - S	Supplement-ation	Rapid River	Rapid River Dworshak	Yoosa, Newsome, Mill Cks	Nez Perce Tribal Hatchery (under construction)	Yoosa, Newsome, Mill Creeks – Ponds; Meadow, Boulder, Warm Springs - direct	Step 3 (5/3/99)	NWPPC
Chinook - S	Harvest / Mitigation	Carson/ Rapid River	Kooskia	Kooskia / Dworshak	Dworshak, Kooskia NFH	Kooskia at Clear Creek	Ongoing	USFWS
Chinook - F	Supplementati on	Snake R. @ Hells Canyon Dam	Lyons Ferry	Lyons Ferry	Lyons Ferry; FCAP Project	Big Canyon, Clearwater R.	Ongoing	BPA/LSRCP
Chinook - F	Supplement-ation	Lyons Ferry	Local	N. Lapwai, Lukes Gulch	Sweetwater Springs and NPTH	Cedar Flats/Selway R, mainstem Clearwater R. N. Lapwai, Lukes Gulch/ S.F. Clearwater R.	Step 3 (5/3/99)	NWPPC
Steelhead	Harvest/ Mitigation	Dworshak – North Fk. Clearwater B-run	Dworshak	Dworshak	Dworshak NFH	mainstem-direct, SF and MF	Ongoing	USACE
Steelhead	Harvest / Mitigation	Dworshak – North Fk. Clearwater B-run	Dworshak	Dworshak	Clearwater Hatchery	SF and MF Clearwater,	Ongoing	LSRCP
Steelhead	Supplementatio n	Dworshak – North Fk. Clearwater B-run	Dworshak	Dworshak	Clearwater Hatchery and Dworshak and Hagerman NFHs	Lolo, Mill, Newsome, Meadow Crks, American, Red and Crooked R. / Dworshak direct	Ongoing -2002	LSRCP / USACE
Coho	Re-Introduction	Eagle Creek, Bonneville,	Creating Broodstock w/ Adult Returns	Kooskia,Dworsha k,Potlatch R., Lapwai, Crk.	Dworshak,Clear-water, Sweetwater, NPTH	Sweetwater Springs, Kooskia, Potlatch R., Meadow/Lolo/Lapwai Cks	Ongoing	NWPPC

To properly evaluate this compensation effort, adult returns to facilities, spawning areas, and fisheries that result from hatchery releases are documented. IDFG's LSRCP program requires the cooperative efforts of the Hatchery Evaluation Study, the Harvest Monitoring Project, and the Coded Wire Tag Laboratory program. The Hatchery Evaluation Study evaluates and provides oversight of certain hatchery operational practices, e.g., brood stock selection, size and number of fish reared, disease history, and time of release. Hatchery practices are assessed in relation to their effects on adult returns and recommendations for improvement of hatchery operations will be made. Continuous coordination between the Hatchery Evaluation Study and IDFG's BPA-funded supplementation research project is required because these programs overlap in several areas, including juvenile outplanting, brood stock collection, and spawning (mating) strategies. LSRCP hatchery production will play a substantial role in IDFG's supplementation research.

The Harvest Monitoring Project provides comprehensive harvest information for evaluating the success of the LSRCP in meeting adult return goals. The number of hatchery and wild/natural fish in overall returns to the project area in Idaho are estimated, and data on the timing and distribution of hatchery and wild stocks are collected and analyzed to develop LSRCP harvest management plans. Harvest data provided by the Harvest Monitoring Project are coupled with hatchery return data to provide an estimate of returns from LSRCP releases. Coded-wire tags continue to be used extensively to evaluate fisheries contribution of representative groups of LSRCP production releases. However, most of these fish serve experimental purposes as well, e.g.., for evaluation of hatchery-controlled variables such as size, time, and location of release, rearing densities, and so on.

More detailed information on the Clearwater Fish Hatchery steelhead and chinook salmon programs is contained in Appendix G, Draft Hatchery and Genetic Management Plan (HGMP) – Clearwater Fish Hatchery. A complete HGMP for the program will be submitted to NMFS in 2001.

Nez Perce Tribe Department of Fishery Resource Management

Nez Perce Tribe Resident Fish Substitution Program

The goal of this program is to substitute resident fisheries in confined ponds as partial mitigation for loss of anadromous fisheries resulting from construction of Dworshak Dam. This program does not operate a hatchery, nor does it propagate species or populations in a hatchery. Hatchery products are used in the execution of the project, however, and it is within that context that the Hatchery and Genetic Management Plan (HGMP) is provided for the program (Appendix H).

Nez Perce Tribal Hatchery

The Nez Perce Tribal Hatchery mitigates for the loss of naturally-reproducing salmon in the Clearwater River subbasin. The overall goal is to produce and release fish that will survive to adulthood, spawn in the Clearwater River subbasin and produce viable offspring that will support future natural production and genetic integrity. Several underlying purposes of fisheries management will be maintained through this program:

- Protect, mitigate, and enhance Columbia River subbasin anadromous fish resources
- Develop, reintroduce, and increase natural spawning populations of salmon within the Clearwater River subbasin
- Provide long-term harvest opportunities for Tribal and non-Tribal anglers within Nez Perce treaty lands within four generations (20 years) following project completion

- Sustain long-term fitness and genetic integrity of targeted fish populations
- Keep ecological and genetic impacts to non-target populations within acceptable limits
- Promote Nez Perce Tribal management of Nez Perce Tribal hatchery facilities and production areas within Nez Perce treaty lands (Bonneville Power Administration et al. 1997)

Previous reports that describe the NPTH program include:

- Nez Perce Tribal Hatchery Master Plan and Appendices (Larson and Mobrand 1992)
- Genetic Risk Assessment of the Nez Perce Tribal Hatchery Master Plan (Cramer and Neeley 1992)
- Selway Genetic Resource Assessment (Cramer 1995)
- Supplement to the Nez Perce Tribal Hatchery Master Plan (Johnson et al. 1995).
- Monitoring and Evaluation Plan for the Nez Perce Tribal Hatchery (Steward 1996).
- Nez Perce Tribal Hatchery Program Final Environmental Impact Statement (Bonneville Power Administration et al. 1997)
- Hatchery Genetic Management Plan (Kincaid 1998)
- Nez Perce Tribal Hatchery Benefit Risk Analysis (Columbia River Inter-Tribal Fish Commission 1999)
- Nez Perce Tribal Hatchery Monitoring and Evaluation Action Plan (Hesse and Cramer 2000)

In the Nez Perce Tribal Hatchery Master Plan restoration of spring, summer and fall chinook are the principle management strategy proposed by Larson and Mobrand (1992). The Nez Perce Tribe Office of Legal Counsel has released a group of documents which are a part of the Snake River Basin Adjudication instream flow claims in which Tribal members and others substantiate the fishery resources used historically and presently by the Nez Perce Tribe (Marshall 1998; Greiser 1998; Slickpoo 1989; Carter 1998; Whitman 1998; Oatman 1998; Axtell 1998; Crow 1998). These documents along with Reiser (1998) substantiate the present of anadromous and resident species that historically occurred in the Clearwater subbasin prior to dams, irrigation, and other commercial practices leading to their demise. Based on these documents, species which would constitute an all species, stock and population approach to recovery and restoration for the Clearwater River subbasin would include

- Spring Chinook Salmon
- Summer Chinook Salmon
- Fall Chinook Salmon, to include an “early”-type
- A-type (run) Steelhead Salmon
- B-type (run) Steelhead Salmon
- Coho Salmon
- Sturgeon
- Pacific Lamprey
- Resident species including bull trout, westslope cutthroat trout, suckers, etc.

While projects and plans for the immediate recovery of all these species will not be included in this document, it is important to note their historic presence for future planning and to include each species need in future years as the ecosystem is recovered.

Fall Chinook Acclimation Project, Big Canyon Acclimation Site

Initial design and funding occurred under a 1995 Congressional grant organized by Senator Hatfield wherein the U.S. Oregon process provided oversight and direction to the U.S. Army Corps of Engineers to construct facilities. This program designed and constructed three acclimation facilities above Lower Granite Dam to aid in restoring natural spawning Snake River fall chinook. The Nez Perce Tribe operates and maintains three satellites developed since 1996, 2 on the Snake River and 1 at Big Canyon Creek - Clearwater River confluence. Each satellite acclimates and releases smolts reared at Lyons Ferry Hatchery. Up to 150,000 yearling smolts are acclimated and released each year. Often sub-yearling smolts, up to 1.8 million have also been acclimated and released by dividing them between the 3 satellite facilities. All fish are marked for identification as emigrants and as adult returns the are allowed to ascend above Lower Granite Dam to spawn naturally. Present adult response indicates a major increase in redd counts and smolt emigration counts. The goals and objectives of this program are identical to those shown under Nez Perce Tribal Hatchery project above.

Nez Perce Clearwater Coho Restoration Project

Project started because State and Federal agencies in U.S. Oregon PAC (Production Advisory Committee) identified surplus coho eggs that were not being used for production. A portion of the project is linked to NMFS Mitchell Act Program calling for restoration of coho stocks for the Tribes up-river of Bonneville Dam. Initial funding was created from BIA 638 budget at the Nez Perce Tribe. Mitchell Act funding occurred in 1999 and 2000. BPA as authorized by NWPPC has provided planning funds in 1998 to present. Additional BIA funds have maintained supplies and transport costs for the past 3 years. Joint inkind support by USFWS, IDFG and NPT has provided personnel and allowed on-job training for NPTH staff while this facility is being constructed. In 1994, PAC having 10-14 million surplus eggs; received a request from the Nez Perce Tribe for 800,000 eyed-eggs to be imported annually. This project has expanded to provide annually up to 450,000 coho parr produced at Clearwater Hatchery, 280,000 coho smolts reared at Dworshak with acclimation and release at Kooskia Hatchery. In addition, 570,000 Mitchell Act, USFWS, smolts are imported and direct released each year to help build the Clearwater Coho run where they are divided and released at Lapwai Creek and Potlatch River, approximately half at each stream. A multi-phased approach is proposed to enhance the recovery of this species in a Master Plan being re-written at this time. Adult returns from this program have occurred in 1997, 1998, 1999, and 2000. Broodstock from returning adults has been incorporated to replace the out of basin egg take in 1999 and 2000 and has provide 3/8ths and 5/8ths of the eggs needed in 1999 and 2000, respectively. The 2001 adult returns are anticipated to provide all the egg-import needs and perhaps act to partially replace the smolt broodstock import needs. Completion of the Clearwater Coho Master Plan is anticipated to occur in conjunction with the Provincial Review and Subbasin Summary process being conducted by the NWPPC. The goals and objectives of this program are identical to those shown under Nez Perce Tribal Hatchery project above.

U.S. Fish and Wildlife Service

Dworshak National Fish Hatchery - Summer Steelhead Program

Dworshak National Fish Hatchery (NFH) is located at the confluence of the North Fork and the main stem of the Clearwater River near Ahsahka, Idaho. Construction of the hatchery was included in the authorization for Dworshak Dam and Reservoir (Public Law 87-847, October 23, 1962) to mitigate for losses of steelhead (*Oncorhynchus mykiss*) caused by the dam and reservoir. The hatchery was designed and constructed by the U.S. Army Corps of Engineers (USACE) and has been administered and operated by the U.S. Fish and Wildlife Service since the first phase of construction was completed in 1969. At that time, the hatchery had 25 ponds on a single reuse system and 59 other ponds on single-pass water. In 1972, a second phase of construction placed all ponds on three reuse systems with the option of operating on either reuse or single-pass. The hatchery began using only single-pass for the oldest system (25 ponds) in 1986. Present production is 2.3 million smolts at an average size of 200mm in length.

The North Fork Clearwater River summer steelhead stock maintained by Dworshak NFH is unique. As a result of the irrevocably blocked habitat behind Dworshak Dam, there are currently no remaining natural populations occurring in the North Fork Clearwater River. Recent collections of rainbow trout in tributaries of the North Fork Clearwater River above the dam show genetic profiles very close to the genetic profile of steelhead returning to the hatchery. Genetic analysis indicates that Dworshak B-run steelhead more closely resemble the North Fork rainbow trout than any other rainbow trout or steelhead collected in Idaho. The stock has been included as part of the Snake River steelhead ESU identified by the NMFS under the Endangered Species Act (ESA), but is not needed for recovery.

At maturity, males and females of this particular stock of "B" run steelhead average about 91 cm (36 inches) and 82 cm (33 inches) in length, respectively. Spawning stock is comprised of three age classes; I-, II-, and III-"salt" fish. This nomenclature refers to the number of complete years fish have spent in salt water. Fish are actually two years older than this system indicates, as they are reared for one year in the hatchery and spend another year migrating to and from the ocean.

Most "B" run steelhead enter the Columbia River in August through September, usually later than the smaller "A" run fish. The Clearwater "B" run steelhead may reach the Snake and Clearwater rivers in the fall, then over-winter until their final run into the hatchery. Some of the fish actually arrive at Dworshak NFH in the fall. The Dworshak NFH fish ladder and trap is operated during the fall to insure inclusion of sufficient early arriving steelhead (~500 adults) into the hatchery gene pool. The ladder is then reopened from February through April to capture broodstock from the mid and late portions of the run.

The Dworshak NFH steelhead program has the potential to affect listed A-run steelhead and Snake River fall chinook salmon in several ways: 1) predation; 2) competition; 3) adverse behavioral interactions; 4) disease transmission; 5) alteration of the gene pool; (6) harvest and/or (7) facility operation and maintenance. Although some potential exists for the program to affect listed species, the USFWS has concluded that any affect would not be significant. In addition, the USFWS continues to evaluate and improve the production program to produce the healthiest and most physiologically fit smolts at release in order to minimize residualization and potential interactions with listed species.

Releases of steelhead smolts from Dworshak NFH began in 1970 with the first hatchery-produced adults returning in 1972. The 1999-2000 return marked the 28th year that artificially spawned North Fork Clearwater River steelhead have returned to Dworshak NFH. The adult return goal for Dworshak NFH is 20,000 adults to the Clearwater River. Table 51 summarizes the Dworshak NFH steelhead returns to the Clearwater River from 1972-2000. Table 52 summarizes the numbers of smolts released, the numbers of adults that returned by age, and the smolt to adult rate of return from 1980-1998.

Dworshak National Fish Hatchery - Rainbow Trout Program

To mitigate for the lost resident sports fishery in the North Fork Clearwater River after the construction of Dworshak Dam, the U.S. Army Corps of Engineers and the U.S. Fish and Wildlife Service agreed that 100,000 pounds of rainbow trout would be reared at Dworshak NFH for stocking in Dworshak Reservoir annually. During the early years rainbow were produced at Dworshak NFH and stocked directly into the reservoir. Numbers and pounds of fish stocked has varied over the years, but 100,000 pounds per year has never been stocked. The rainbow trout are from sources outside the state of Idaho and concerns were recently raised that hatchery rainbow trout stocked into Dworshak Reservoir could ascend into the North Fork of the Clearwater River and hybridize with native cutthroat trout. This issue and additional concerns regarding the cost/benefit ratio of stocking rainbow trout into Dworshak Reservoir is under review by the agencies; the Idaho Department of Fish and Game, Nez Perce Tribe, USFWS, and USACE. Currently, some of the rainbow are raised at Hagerman NFH and released into reservoirs in southern Idaho. In replacement, the Idaho Department of Fish and Game releases a quantity of rainbow trout into Dworshak Reservoir from a disease free hatchery, and in recent years the trout have been sterile. In addition to rainbow, the USFWS in the early years stocked other species such as small mouth bass and kokanee salmon into Dworshak. Kokanee are now the primary sport fish in the reservoir and are primarily self-sustaining. A history of early stocking of resident fish in Dworshak Reservoir is provided in Table 53.

Kooskia National Fish Hatchery - Spring Chinook Program

Kooskia NFH was authorized by Congress (75 Statute 255) in August 1961 and was built by U.S. Fish and Wildlife Service (USFWS) to raise spring chinook salmon. The program called for releases of spring chinook salmon smolts into the Clearwater River Basin to mitigate for fish losses from federal water development projects in the Columbia River Basin. Kooskia NFH is located about 1.5 miles southeast of Kooskia, Idaho, near the confluence of Clear Creek and Middle Fork of the Clearwater River and is funded by the U.S. Fish and Wildlife Service.

The Kooskia NFH spring chinook salmon program was started using a wide variety of stocks from the Lower Columbia River and Rapid River State Fish Hatchery. However, from 1973 through 1980, smolt releases had a very strong Carson stock influence. Egg transfers of Carson type stock from Dworshak NFH in 1985 and 1986 resulted in smolt releases in 1987 and 1988 that were a mixed stock, referred to as Clearwater stock (Table 54). Since the Kooskia NFH program already had stock made up primarily of Carson derivatives, the resultant program (1989 and later) is still considered a Carson type stock, and is referred to as Kooskia stock. Length frequency data, ocean age class at return time information, and allele frequencies all support a distinction between Dworshak and Kooskia stocks.

Table 51. Number of steelhead returning to Dworshak NFH, estimates of hatchery fish harvested, and total hatchery returns to the Clearwater River, Idaho, 1972-2000 (1972-73 to 1983-84 data from Pettit 1985).

Return[1]	Number Back to Dworshak NFH	Estimated Clearwater Sport Harvest[2]	Estimated Clearwater Tribal Harvest[3]	Unharvested Clearwater Hatchery Fish[4]	Total Hatchery Fish Returning to Clearwater River
1972-73	9,938	2,068	-	0	12,006
1973-74	7,910	2,320	-	0	10,230
1974-75	1,698	N.S.[5]	290	0	1,988
1975-76	1,858	N.S.	430	0	2,288
1976-77	3,100	N.S.	410	0	3,510
1977-78	12,272	14,000	(1000)[6]	0	27,272
1978-79	4,939	4,610	(500)	0	10,049
1979-80	2,519	N.S.	1,250	300	4,069
1980-81	1,968	4,510	(1000)	500	7,978
1981-82	3,054	1,665	(1000)	0	5,719
1982-83	7,672	13,967[7]	(1,500)	0	23,139
1983-84	3,284	6,500	(500)	100	11,384
1984-85	14,018	19,410	(1,500)	2,700	37,628
1985-86	4,462	7,240	1,471	1,800	15,002
1986-87	5,286[8]	15,679	4,210	3,000	28,175
1987-88	3,764	8,766	1,478	2,000	16,008
1988-89	6,041	11,332	1,242	3,700	22,315
1989-90	10,630	27,952	1,710	3,650	43,943[9]
1990-91	7,876	12,973	1,211	2,250	24,147
1991-92	3,700	10,416	1,326	1,650	17,092
1992-93	7,900	19,351	1,184	3,368	31,803
1993-94	3,757	14,063	675	1,457	17,096
1994-95	1,394	5,953	730	1,307	9,384
1995-96	4,480	2,139	992	1,315	9,106
1996-97	2,980	4,926	513	779	9,198
1997-98	3,601	7,611	145	479	11,836
1998-99	5,419	8,773	1,007	1,137	16,335
1999-00	2,882	7,177	1,000	720	11,775

[1]Return year is from October through May.
[2]Unless otherwise noted, estimates of sport harvest in the Clearwater River taken from Idaho Department of Fish and Game annual reports.
[3]Unless otherwise noted, estimates of tribal harvest in the Clearwater River were taken from Nez Perce Tribe Department of Fishery Resource Management annual reports.
[4]Based on return percentage back to hatchery to calculate returning II-salts from upstream releases.
[5]N.S., no sport fishing season.
[6]( ) guesstimate on tribal harvest by author.
[7]Pettit IDFG, Lewiston, Idaho (personal communication) included an additional 2,000 fish in harvest from Snake River for a total of 15,967.
[8]Ladder was closed for several days due to high number of returns; not a total hatchery return figure.
[9]We believe the sport estimate of 27,953 is about 8,000 too high and the total number of Dworshak steelhead to the Clearwater River was in the range of 32,000 to 35,000.

Table 52. Return vs. release numbers for summer steelhead at Dworshak NFH, release years 1980-1998

Release Year	Smolts Released	Returns				Rack Return %
		I-Salt	II-Salt	III-Salt	Total	
1980	2,666,085	400	6,613	652	7,665	0.2875
1981	1,930,047	124	1,538	1,219	2,881	0.1493
1982	2,108,319	1,094	12,679	403	14,176	0.6724
1983	1,259,110	120	3,359	239	3,718	0.2953
1984	1,208,319	700	8,318	119	9,137	0.7562
1985	1,035,573	431	3,487	317	4,235	0.4090
1986	1,239,541	168	5,296	215	5,679	0.4582
1987	1,206,580	428	9,896	314	10,638	0.8817
1988	1,432,125	487	7,339	250	8,076	0.5639
1989	1,073,900	218	3,132	162	3,512	0.3270
1990	1,466,664	313	7,349	153	7,815	0.6699
1991	1,192,503	389	3,543	76	4,008	0.3361
1992	1,224,101	61	1,270	71	1,331	0.1087
1993	1,217,990	48	4,005[1]	83	4,136	0.3396
1994	1,153,417	384	2,537	38	2,959	0.2565
1995	1,213,577	349	3,308	87	3,744	0.3085
1996	1,377,435	253	4,976	69	5,298	0.3846
1997	1,361,034	356	2,225			
1998	1,228,944	588				

1 Does not include twenty unmeasured fish.

Table 53. Dworshak Reservoir rainbow trout stocking history, 1972-2000

Year	Number	Weight(lbs.)	Size (#/lb.)	Stock	Hatchery
1972	1,043,506	99,917		Unknown	Dworshak
1973	2,554,170	134,808		Unknown	Dworshak
1974	1,070,260	19,075		Unknown	Dworshak
1975	917,856	114,301		Unknown	Dworshak
1976	763,286	64,133		Unknown / WY	Dworshak / Hagerman
1977	1,162,670	34,217		Unknown	Dworshak
1978	25,936	13,412		Unknown	Dworshak
1979	1,313,524	92,541		Unknown	Dworshak
1980	1,616,245	36,052		Unknown	Dworshak
1981	861,429	87,049		Ennis / Ca	Dworshak
1982	153,956	34,940		Unknown	Dworshak
1983	574,255	58,503	9.8	Unknown	Dworshak
1984	67,561	27,285	2.5	Unknown	Dworshak
1985	120,000	40,000	3.0	Unknown	American Falls / Mackay
1986	156,773	14,388	10.9	Shasta	Hagerman
1987	93,856 80,400	3,755 1,340	25.0 132.0	Kamloops Unknown	Hagerman Grace
1988	294,906	28,120	10.5	Arlee & Shasta	Hagerman
1989	245,380	23,202	10.6	Arlee & Shasta	Hagerman
1990	222,026	14,350	15.5	Arlee & Shasta	Hagerman
1991	NONE				
1992	101,186	2,844	35.6	Arlee & Shasta	Kooskia
1993	195,760	9,732	20.1	Arlee & Shasta	Kooskia
1994	NONE				
1995	17,700	5,900	3.0	Kamloops	Nampa
1996	30,500	8,350	3.7	Kamloops	Nampa
1997	40,000	10,592	3.8	Hayspur	Clearwater
1998	28,640	8,183	3.5	Mixed	Hayspur
1999	150,155	49,150	3.1	Kamloops	Nampa
2000	132,630	44,665	3.0	T9 sterile	Hayspur

Table 54. Genetic background of Kooskia NFH spring chinook salmon smolts directly released from the hatchery, 1971-2000

Release Year	Genetic Background [1]
1971	86% RR,14% WR
1972	100% RR
1973	100% CA
1974	100% CA
1975	58% RR, 42% CA
1976	100% SS
1977	84% CA, 11% KK, 5% LW
1978	75% RR, 25% CA
1979	69% KK, 31% CA
1980	31% KK, 69% CA
1981	64% CA, 19% KK, 17% RR
1982	100% CA
1983	65% KK, 35% LE
1984	89% KK, 11% RR
1985	100% KK
1986	100% KK
1987	100% CL
1988	100% CL
1989 -2000	100% KK

1 RR = Rapid River, KK = Kooskia, LE = Leavenworth, SS = South Santiam, CL = Clearwater, LW = Little White Salmon, CA = Carson, WR = Wind River

The first smolt releases were made in 1971. The first adults began to arrive back at the hatchery in 1972. A summary of the program to date is provided in Table 55. The production goal has been modified over the years. Currently, Kooskia NFH has the capacity to rear about 600,000 to 650,000 spring chinook salmon from the egg stage through smolt size. Smolts are released directly into Clear Creek at a size of about 20 fish per pound or 140 mm (TL). To meet this objective, about 200 adult females are needed for spawning. Since the male to female ratio is about 1:1 and spawning protocol calls for 1:1 spawning, the goal for broodstock collection is about 400 adults.

Production is primarily limited by the hatchery well water supply. Because of these production constraints, temperature considerations, and other factors; Dworshak NFH holds and spawns spring chinook salmon adults trapped at Kooskia NFH. Kooskia NFH eggs and juveniles are also often held at Dworshak NFH. However, each stock is released at its own facility. In the past two years Kooskia NFH has been used for incubation and early rearing of Dworshak NFH chinook because of the cold well water supply. In 1995 Kooskia NFH was included in the Dworshak Fisheries Complex and fish production at the two hatcheries is closely coordinated.

The Kooskia spring chinook salmon program has the potential to affect listed A-run steelhead and Snake River fall chinook salmon in several ways: 1) competition; 2) adverse behavioral interactions; 3) disease transmission; and 4) facility operation and maintenance. As with the steelhead program at Dworshak NFH, the USFWS has concluded that any affect of the spring chinook salmon program at Kooskia NFH on listed species would not be significant. The USFWS continues to evaluate and improve spring chinook salmon production to minimize interactions with listed species.

Table 55. Hatchery rack returns and age composition of spring chinook salmon for Kooskia NFH, 1972-2000

Year	I-Salt	II-Salt	III-Salt	Unmeasured	Total Return
1972	5	0	0	0	5
1973	5	45	0	0	50
1974	16	35	2	0	53
1975	15	284	27	0	326
1976	409	286	106	0	801
1977	333	2,539	154	0	3,026
1978	23	1,676	336	0	2,035
1979	11	100	264	0	375
1980	9	55	3	0	67
1981	1	168	78	0	247
1982	3	116	139	0	258
1983	1	231	141	0	373
1984	55	80	206	0	341
1985	26	449	54	0	529
1986	21	159	103	0	283
1987	16	607	64	0	687
1988	39	363	193	0	595
1989	107	717	142	7	973
1990	11	921	209	0	1,141
1991	10	98	350	9	467
1992	14	239	38	21	312
1993	11	749	409	11	1,180
1994	1	96	135	0	232
1995[1]	21	7	12	0	40
1996	86	113	3	0	202
1997	7	1,523	127	0	1,657
1998	1	200	207	0	408
1999	72	28	57	0	157
2000	966	604	11	0	1,581

Miscellaneous Anadromous Stocking

During years when there are surplus adult hatchery returns, outplanting of adult steelhead or spring chinook salmon is conducted in areas of agreement between subbasin salmon managers. Streams receiving outplants have past stocking history, and wild steelhead areas are not stocked. Fish outplanted have originally returned to Dworshak and Kooskia National Fish Hatcheries, Clearwater Hatchery satellites or, in some cases, are brought in from Rapid River Hatchery (chinook). These are not part of any program and only occur when there is a surplus. There is currently no monitoring and evaluation being conducted on these releases.

Existing and Past Efforts

Information presented in Table 56 describes ongoing projects within the Clearwater subbasin related to fish and wildlife restoration activities. Project information is organized according to the Assessment Unit in which the work is being conducted, with a separate category for subbasin-wide projects. Projects were described as subbasin-wide if they applied to more than one Assessment Unit. Within each AU, BPA funded projects are listed first in numerical order. Non-BPA funded projects follow with projects sorted alphabetically by the responsible agency. Information on past or completed projects within the Clearwater subbasin is presented in Appendix I.

Table 56. Ongoing projects within the Clearwater subbasin related to fish and wildlife restoration activities

Responsible Agency	BPA Project # (if applicable)	Project Duration	Project Title	Project Description and Results
Lower Clearwater Assessment Unit				
IDFG	97BI31259	1995-99	Gas Bubble Trauma Monitoring in the Clearwater River Drainage, ID	This project assessed the extent of gas bubble trauma on resident fish species downstream of Dworshak Dam during late spring and summer months. During the five years of the study, over 30,000 individual fish were examined for GBT. The incidence of GBT was never greater than 1.0% in any given year and 95% of incidences occurred in the two sections nearest to Dworshak Dam.
LSCD, BPA$, NRCS,	199901400	1999-2004	Restore anadromous fish habitat in the Little Canyon Creek subwatershed	Agriculture BMP implementation to reduce sediment delivery to steelhead stream, approx. 240,000 tons sediment reduction to date
NPSWCD, BPA$, NRCS	199901500	1999-2004	Restore anadromous fish habitat in the Nichols Canyon subwatershed	Upland land use treatment on private lands to decrease non-point pollution to steelhead stream. Subwatershed Big Canyon - Focus Program
USFWS	199801003	1997-present	Spawning distribution of Snake River fall chinook salmon	This monitoring and evaluation study is designed to determine the spawning distribution of fall chinook salmon released at three acclimation sites (one of which is located in the Clearwater River), and document redd distribution in portions of the Snake River basin. In 2001-2002, we intend to collect data from fish released at the last release site to go on line, and complete the project by November 2002.
NPT	199801004	1998 to present	Monitoring and Evaluation Of Yearling Snake River Fall Chinook Released Upstream Of Lower Granite Dam	Monitor and evaluate the yearling fall chinook pre- and post-release from the acclimation facilities. The project evaluates yearling size, condition, and post-release emigration characteristics (survival, timing, behavior, etc.) using passive integrated transponder (PIT) tagging and radio telemetry technology to assist in management decisions to maximize smolt-to-adult survival andsupplementation program success. The project also helps monitor adult fall chinook migration and spawning distribution in the Snake and Clearwater rivers.
NPT	199501300	1995 to present	Nez Perce Tribe Resident Fish Substitution Program	Provide resident fishery to partially mitigate for the loss of anadromous fisheries. 2001 activities focus on two existing ponds and a newly constructed third pond. As of FY 2000, all three ponds were stocked with rainbow trout and operational. Fishing effort and harvest are estimated. Monitoring of water quality and collection of physical pond data, are conducted to assess aquatic environmental health and to determine optimal stocking densities.
USFWS, BPA$	199901800	1995-ongoing	Characterize & quantify residual steelhead in the Clearwater River, Idaho	The studies goals are to minimize impacts to wild fish in the basin and to maximize efficacy of hatchery reared smolts by reducing residuals. We are characterizing successful and unsuccessful smolts and comparing the differences. Very few of the residuals captured were later seen emigrating toward the ocean and most had not traveled far from their original capture site. Analysis conducted to date indicates very little piscivory occurred in residual steelhead.
BPA, ISCC		2000-ongoing	Water Quality Monitoring	

Table 56 (Continued)

Responsible Agency	BPA Project # (if applicable)	Project Duration	Project Title	Project Description and Results
Lower Clearwater Assessment Unit (Continued)				
Clearwater NF		1995-Current	Sediment Discharge Station	The Forest operates one gaging station and automatic sediment sampler in the Potlatch River to measure stream discharge, suspended sediment, turbidity, particle size distribution, channel cross-section survey and gradient are monitored.
Clearwater NF		1990 - Current	Water Temperature Monitoring	Nine sites on six streams; water temperatures (primarily during May through September) are recorded on an hourly basis to determine baseline conditions in undeveloped watersheds and recovery trends in developed watersheds.
Clearwater NF		1994 - Current	Stream Channel Morphology	Five sites on four streams; three riffles where Wolman pebble counts, stream gradient, and cross-sectional surveys are done.
Clearwater NF		1993 - Current	Riparian Restoration/Protection	Riparian fences is maintained along 11 miles of streams within the upper Potlatch River drainage.
Clearwater NF		1995-Current	Stream Channel Morphology	Two streams; three riffles where Wolman pebble counts, stream gradient, and cross-sectional surveys are done.
CSWCD, ISCC$, NRCS$		1993-1998; 2000-ongoing	Bedrock Cr WQPA & PL566	Idaho Ag Program & NRCS - Riparian restoration, agriculture BMP implementation.
CSWCD, ISCC$, EPA$, NRCS$		2000-	Jim Ford Creek, WQPA, 319, EQIP	TMDL implementation plan agricultural and forestry BMP treatments and monitoring, 1500 acres treated to date
CSWCD, SCC$, NRCS		1991-1998	Lolo Creek WQPA	Idaho Ag program. 7,734 acres treated to date with BMP implementation
FEMA $		1999-	Lawyer Creek FEMA project	Flood mitigation project some implementation, project planning now
IDFG, LSRCP$		1996-Present	Evaluation of Introduced Rainbow Trout into the lower Clearwater River	Rainbow trout are stocked in the lower Clearwater and Salmon rivers as part of the mitigation for the Lower Snake River Compensation Program. Because of the potential impacts to ESA listed steelhead trout and chinook salmon juvenile, diet analysis of the stocked fish is mandated. Since 1996, diet analysis revealed minimum (<1% stomach content) predation.
IDFG, LSRCP$		1982-Present	Steelhead and Salmon Angler Use Surveys	Creel census of steelhead trout and chinook salmon sport fisheries are conducted during open seasons for each. The results of the surveys include estimated angler participation (hours fished) and harvest. Harvest can be cataloged by specific hatchery contribution (marked fish only). Angler use and harvest vary from year to year.
IDFG, EPA$, Winchester WAG		2001-ongoing	Winchester Lake Oxygenation Treatment Project	Proposal for oxygenation of lower stratified layer of lake to increase water quality and prevent fish kills under lake stratification.
ISWCD, ISCC$, EPA$, NRCS		2001-	South Fork Cottonwood WQPA & 319	Onset of TMDL implementation plan in one subwatershed, agricultural BMP treatments & septic tank replacement & monitoring

Table 56 (Continued)

Responsible Agency	BPA Project # (if applicable)	Project Duration	Project Title	Project Description and Results
Lower Clearwater Assessment Unit (Continued)				
LSCD, ISCC$		1988-1998; 2000-2003	Lapwai -Mission WQPA	Idaho ag program - 12,045 acres treated to date with BMPs in Lapwai-Mission Creek watersheds.
LSCD, ISCC$, NRCS,		1996-1998; 2000-ongoing	Holes/Long Hollow subwatersheds WQPA	Idaho Ag program Ag BMP implementation, 10,132 acres treated to date
LSCD, SCC, EPA$, NRCS		1991-2001	Winchester Clean Lake Project - Clean Water Act Section 314 funding	Agriculture and Forestry BMP implementation in upper Lapwai
LSCD, SCC$, EPA$, NRCS		2001-2003	Winchester Lake 319 and WQPA project	Road culvert replacements, road buffers, agricultural BMPs,
LSWCD, ISCC$, NRCS		1988-2003	Lenville & Aspendale WQPA (Little Potlatch Creek)	Idaho Ag program. Ag BMP implementation, Aspendale & Lenville subwatersheds, stream de-listed on 2000 303(d) list, 14,000 acres treated
LSWCD, NRCS $, ISCC, IDFG		1994-ongoing	Potlatch River Basin Study - NRCS	Potlatch project focused on fish habitat restoration, multi- agency participation. Surveyed fish habitat and populations, 1995-1996. In implementation planning state
LSWCD, NPSWCD, NRCS$		2000-ongoing	Palouse New Technology EQIP project	Agricultural BMP implementation; Hatwai, Catholic, Coyote, Middle Potlatch, Little Potlatch Creeks
NPSWCD, Nez Perce County, FEMA $, NRCS		1998-ongoing	Lower Big Canyon FEMA Project	Flood mitigation FEMA, land purchased in 1998, bank stabilization/floodplain Work initiated in 1999
NPSWCD, ISCC$,		1996-1998; 2000-ongoing	Big Canyon WQPA	Idaho Ag Program, BMP implementation
NPSWCD, NRCS $,		1994-1998; 2001-	Lapwai watershed program PL566	Riparian restoration, fish habitat improvement, agriculture BMP implementation.
NPSWCD, SCC$, NRCS$		1991-ongoing	Mission Creek WQPA & PL566 small watershed program	Idaho Ag program & PL566 NRCS-riparian restoration, Ag BMP implementation, 11,130 acres treated to date
NPSWCD, ISCC$, NRCS$		2001-	Nez Perce riparian and livestock feeding area WQPA w/ EQIP	Animal feeding operation treatments including riparian restoration, Idaho ag program; Bedrock Creek, Lapwai Creek
NPSWCD, IASCD$, NRCS, Lewiston High School		2001 -2002	Lindsay Creek Water Quality Monitoring Project	Collecting stream temperature, nitrates, phosphorus, and bacteria samples.

Table 56 (Continued)

Responsible Agency	BPA Project # (if applicable)	Project Duration	Project Title	Project Description and Results
Lower Clearwater Assessment Unit (Continued)				
Nez Perce Tribe Fisheries/ Watershed		1999-present	Big Canyon Creek	Completed watershed assessment
Nez Perce Tribe Fisheries/ Watershed		1999-present	Lapwai Creek Watershed	Completed watershed assessment
NPT, EPA$, NRCS		2000-2002	Lapwai/Winchester Lake 319 project	Riparian restoration, road obliteration
NRCS$, NPT, NPSWCD		2000-ongoing	Soldiers Meadow EQIP	Upper Webb Creek project area tree planting,
Lower North Fork Assessment Unit				
IDFG	8709900	1987-present	Dworshak Dam Impacts Monitoring and Evaluation	Examine effects of the operation of Dworshak Dam on resident fishes in Dworshak Reservoir. Assessed reservoir limnology and angler use. Conducts annual monitoring of the kokanee population and entrainment. Current research focuses on minimizing kokanee entrainment which may benefit other species. Strobe light effectiveness at reducing entrainment will be evaluated and appropriate recommendations for their use made.
NPT	198740700	1993 to present	Dworshak Impacts/M&E and Biological/Integrated Rule Curves	Formulate and refine biological and integrated rule curves for Dworshak Dam and Reservoir. Refine and monitor/evaluate rule curve implementation. The target product is a modeling tool for integrating operational needs and estimating impacts of various operations on the physical and biological characteristics of Dworshak Reservoir. Applies Dworshak data for the purpose of converting the rule curve model developed for Hungry Horse and Libby Reservoirs. Conversion from a FORTRAN to Visual Basic is complete.
Clearwater NF		1981-Current	Sediment Discharge and Bedload Station	The Forest operates one gaging station and automatic sediment sampler within Elk Creek to measure stream discharge, suspended sediment, turbidity, particle size distribution, channel cross-section survey and gradient are monitored. In addition, bedload sediment is measured approximately 15 times per year.
Clearwater NF		1994 - Current	Water Temperature Monitoring	Four streams; water temperatures (primarily during June through September) are recorded on an hourly basis to determine baseline conditions in undeveloped watersheds and recovery trends in developed watersheds
IDFG, USACE		1972-present	Dworshak Mitigation Resident Fish Stocking	Program to provide hatchery fish to replace lost fishery when Dworshak Reservoir inundated the North Fork Clearwater River. Goal of 50,000 pounds of fish at 3 fish/pound of sterile triploid rainbow are stocked in the lower half of the reservoir annually. During most years this target is not reached.
IDFG, USFS		1986-Present	Mountain Lake investigations	Over the past 16 years, all mountain lakes in the S.F. Clearwater River drainage have been surveyed to develop baseline information on fish and aquatic resources. Information has been used to develop a hatchery-reared trout stocking program for lakes that could not otherwise sustain fishable populations. In addition, amphibian populations were surveyed.

Table 56 (Continued)

Responsible Agency	BPA Project # (if applicable)	Project Duration	Project Title	Project Description and Results
Lower North Fork Assessment Unit (Continued)				
IDFG, USFS. IDL, USACE		2000-Present	North Fork Clearwater River Bull Trout Investigations	To better understand bull trout population dynamics in Dworshak Reservoir and the North Fork Clearwater River drainage, 54 bull trout were captured in upper Dworshak Reservoir and 22 were outfitted with radio transmitters. All but five of these fish migrated out of the reservoir into the North Fork Clearwater River drainage. Radio tagged bull trout were monitored by fixed site receivers and frequent aerial and ground surveys. Bull trout spawning grounds were documented. Genetic samples taken.
IDFG, USFS		1992-Present	North Fork Clearwater River Fisheries Investigations	Transects for establishing fish population status are snorkeled in tributaries of the North Fork Clearwater River. The information collected has developed a baseline informational base to determine long-term trends in various fish species populations.
IDFG		1997-Present	North Fork Clearwater River Westslope Cutthroat Trout Investigations	For management purposes, the relative abundance of westslope cutthroat trout, rainbow trout, and their hybrids were assessed in the main stem river. Future sport fishing management may be based on identification of trout species caught as the goal is to reduce genetic introgression between westslope cutthroat and rainbow trout. Cutthroat trout were tagged and exploitation was determined based on tag returns from sport anglers.
IDFG		1995-2001	North Fork Clearwater River Angler Use Survey	In 1995, a year-long creel census was conducted on Dworshak Reservoir and North Fork Clearwater River. Angler use was estimated at 95,700 hours on the reservoir and 64,500 hours on the main stem North Fork Clearwater River. The survey is being repeated on Dworshak Reservoir on a smaller scale in 2001.
IDFG		2001	Zooplankton Monitoring	Sample zooplankton populations using ZPR and ZQI methodology to determine the effect of kokanee density on food availability.
IDFG, USACE		March 2000 - ongoing	Dworshak Terrestrial Resources Inventory Project	Compile flora and wildlife species lists, locate special status species, and identify important habitats of target species on USACE and adjacent land surrounding Dworshak Reservoir. Develop management strategies on USACE land and incorporate data in the USACE's Dworshak Master Plan Update and Supplemental EIS. Surveys have been conducted for flora, herpes, small mammals, bats, migratory land birds, shorebirds, waterfowl, forest owls, northern goshawks, woodpeckers, furbearers, elk and deer. Preliminary findings include over 200 fungi species (16 rare), 624 plant species (29 rare or sensitive in Idaho), and 132 wildlife species (7 Idaho State and/or Federal special status species).
IDFG, USFS		1996-Present	Fish Lake Bull Trout Investigations	Investigations into the life history of bull trout in Fish Lake were initiated in 1996. Genetic relationships with adfluvial and resident bull trout in the N.F. Clearwater River and tributaries will be addressed. Season-long creel census will determine exploitation of bull trout as incidental mortalities to the sport cutthroat trout fishery.
U.S. Army Corps of Engineers (USACE)		Annually	Big Game Browse Rejuvenation - Slashing	USACE has an ongoing project of slashing, prune to 2' in height, old decedent browse fields for the purpose of enhancing big game forage on Dworshak Reservoir. For the past 5 years USACE has slashed 50 acres per year. Results have been excellent. Annual site visits and established photo points confirm that the abundance of available forage and big game use had increased dramatically as a result of this program.

Table 56 (Continued)

Responsible Agency	BPA Project # (if applicable)	Project Duration	Project Title	Project Description and Results
Lower North Fork Assessment Unit (Continued)				
USACE		Annually	Big Game Browse Rejuvenation – Prescribed burning	Prescribed burning has been instituted as a measure to enhance browse conditions in the Grandad Mitigation Area. Adverse effects from past treatments in the mitigation area, coupled with several harsh winters have resulted in extremely poor browse conditions in some areas. USACE is using prescribed burning to treat those areas that have an adequate seed source. Over the past two years approximately 180 acres were treated. Preliminary observations indicate that the project will greatly increase browse abundance.
USACE		Ongoing 1997 to present	Kokanee entrainment	Kokanee loses through entrainment were estimated at 95% of the total population during the 1996 flood event. To minimize entrainment losses and stabilize the kokanee population in Dworshak Reservoir, IDFG is currently conducting research to test the effectiveness of strobe lights as a deterrent. Tests conducted during the 2001 winter resulted in a marked avoidance of the strobe lights and consequently the outlets.
USACE		1/00 to 12/01	Bull trout study	IDFG is currently conducting research to determine the spatial and temporal distribution, the migration patterns, the spawning sites and life history information of bull trout within Dworshak. In 2000 they radio-tagged 21 adult bull trout and documented their distribution and migration.
USACE		In various years from 1970's to present	Big game surveys	Aerial surveys documenting the winter use of Dworshak Reservoir by ungulates has been conducted in numerous winters over the past 30 years. It was last conducted in 2001 and USACE plans to work with IDFG is establish an appropriate frequency for these surveys.
USACE		4/00 to 9/04	Little Bay Stewardship Project	The purpose of this project is to enhance ecosystem integrity to the lower montane forests near Little Bay. Past fire suppression has changed the species composition, form and structure of historic ponderosa pine dominated forests. Many wildlife species are becoming scarce or absent on the landscape as a result of a drastic loss of ponderosa pine communities throughout the Clearwater Basin. This project is incorporating tree thinning and prescribed under-burning to emulate the natural effects of wildfires, typical of these forests. The Little Bay Stewardship Project encompasses 1300 acres and the prescribed burn may involve a multi-agency effort with IDL and Potlatch covering approximately 2000 acres.
USACE		4/01 to 9/05	Elk Creek Meadows Stewardship Project	Similar in purpose to the Little Bay project, this stewardship project encompasses 1100 acres and will solicit partners with adjacent land owners as well.
USACE		Ongoing	Wildlife habitat protection	USACE continues to protect sensitive area from disturbance. In 2000 a gate and 7 barricades were installed and 10 miles of fence line maintenance was conducted to protect Elk Creek Meadows and the Grandad Mitigation Area. 2001 plans include fence maintenance and gates at Magnus Bay and barricades in the mitigation area.
USACE		5/00 to 9/02	Terrestrial resource inventory	Through a Task Order under an existing cooperative agreement, IDFG is conducting a comprehensive baseline investigation of fungi, plants and wildlife occurring on the reservoir. Thus far IDFG has documented countless species and their habitat relationships. Their final report is due to be presented to USACE in the fall of 2002.

Table 56 (Continued)

Responsible Agency	BPA Project # (if applicable)	Project Duration	Project Title	Project Description and Results
Lower North Fork Assessment Unit (Continued)				
USACE		Annually	Eagle surveys	USACE annually conducts aerial surveys for wintering bald eagles.
USACE		Annually	Eagle nest monitoring	Dworshak Reservoir is home to the first documented bald eagle nest within the Clearwater Basin. First discovered in 1999, the nest has yet to produce offspring. Since it's discovery the USACE project Wildlife Biologist has conducted intensive monitoring of the nest site.
Upper North Fork Assessment Unit				
NPT	9501600	1996-2000	Genetic Inventory of Westslope Cutthroat Trout in the N F Clearwater Basin	Document the extent of hybridization among native westslope cutthroat trout and introduced rainbow trout, and evaluate the effects of Dworshak resident fish mitigation on wild trout in the North Fork Clearwater basin. Findings indicated widespread introgression in 2/3 of the sites sampled. Non-introgressed populations of westslope cutthroat trout were detected at several locations. Follow-up recommendations include investigating local broodstock development to replace the stocking of exotic rainbow trout for fishery mitigation.
Clearwater NF		1981-Current	Sediment Discharge Station	The Forest operates two gaging stations and automatic sediment sampler within this AU (Quartz Creek and Cold Springs Creek). Stream discharge, suspended sediment, turbidity, particle size distribution, channel cross-section survey and gradient are monitored.
Clearwater NF		1993 - Current	Stream Channel Morphology	Sixteen sites on 15 streams; three riffles where Wolman pebble counts, stream gradient, and cross-sectional surveys are done.
Clearwater NF		1990 - Current	Water Temperature Monitoring	Approximately 105 sites on 86 streams; water temperatures (primarily during June through September) are recorded on an hourly basis to determine baseline conditions in undeveloped watersheds and recovery trends in developed watersheds
Clearwater NF		2000 - Current	Fish Population Monitoring	Assess bull trout trends via snorkeling approximately 10 stations in the Moose Creek drainage.
Clearwater NF		1995 - Current	Bull Trout Spawning Monitoring	Assess spawning trends in selected reaches; approximately 27 miles in 11 streams.
IDFG		1993-present	Smallmouth Bass Population Trend Monitoring	Annual electrofishing monitoring of smallmouth bass population indices. Calculate Proportional stock density, Catch per unit effort, average size, length-weight relationship and growth rates.
IDFG, USFS			Mountain Lake investigations	Over the past 16 years, all mountain lakes in the N.F. Clearwater River drainage have been surveyed to develop baseline information on fish and other aquatic resources. The information collected has been used to develop a hatchery-reared trout stocking program for lakes that could not other wise sustain fishable populations of fish. In addition, amphibian populations were surveyed.
IDFG, USFS. IDL, USACE		2000-Present	North Fork Clearwater River Bull Trout Investigations	To better understand bull trout population dynamics in Dworshak Reservoir and the North Fork Clearwater River drainage, 54 bull trout were captured in upper Dworshak Reservoir and 22 were outfitted with radio transmitters. All but five of these fish migrated out of the reservoir into the North Fork Clearwater River drainage. Radio tagged bull trout were monitored by fixed site receivers and frequent aerial and ground surveys. Bull trout spawning grounds were documented. Genetic samples taken.

Table 56 (Continued)

Responsible Agency	BPA Project # (if applicable)	Project Duration	Project Title	Project Description and Results
Upper North Fork Assessment Unit (Continued)				
IDFG, USFS		1992-Present	North Fork Clearwater River Fisheries Investigations	Transects for establishing fish population status are snorkeled in tributaries of the North Fork Clearwater River. The information collected has developed a baseline informational base to determine long-term trend in various fish species populations.
IDFG		1997-Present	North Fork Clearwater River Westslope Cutthroat Trout Investigations	For management purposes, the relative abundance of westslope cutthroat trout, rainbow trout, and their hybrids were assessed in the main stem river. Future sport fishing management may be based on identification of trout species caught as the goal is to reduce genetic introgression between westslope cutthroat and rainbow trout. Cutthroat trout were tagged and exploitation was determined based on tag returns from sport anglers.
IDFG		1994	North Fork Clearwater River Angler Use Survey	In 1995, a year-long creel census was conducted on Dworshak Reservoir and North Fork Clearwater River. Angler use was estimated 64,500 hours on the main stem North Fork Clearwater River.
Lolo / Middle Fork Assessment Unit				
Nez Perce Tribe Fisheries/ Watershed	199607702	1996-present	Protect and Restore Lolo Creek Watershed	Project to restore stream habitat for anadromous & resident fish. Accomplishments include eliminating grazing from 10 miles of stream, allowing riparian habitat to regenerate, reduced stream temperatures and sedimentation, and channel morphology to return to equilibrium. 50+ miles of roads have been obliterated, reducing risk of mass failures and sedimentation. Heavily eroding stream banks (100 feet) have been stabilized through bioengineering techniques and revegetation. M&E is being completed to analyze the effectiveness of this restoration project.
Clearwater NF		1980 - Current	Sediment Discharge Station	The Forest operates two gaging stations and three automatic sediment samplers within this AU (Lolo Creek and Eldorado Creek). To measure stream discharge, suspended sediment, turbidity, particle size distribution, channel cross-section survey and gradient. In addition, bedload sediment is measured approximately 15 times per year.
Clearwater NF		1990 - Current	Water Temperature Monitoring	Approximately 16 sites on 18 streams; water temperatures (primarily during June through September) are recorded on an hourly basis to determine baseline conditions in undeveloped watersheds and recovery trends in developed watersheds
Clearwater NF		1988 - Current	Fish Population Monitoring	Assess fish population trends in Lolo Creek via snorkeling at 15 established stations.
Clearwater NF		1976 - Current	Riparian Restoration/Protection	Riparian fence (Musselshell Meadows) is maintained along one mile of Musselshell Creek within the upper Lolo Creek drainage.
Clearwater NF In conjunction with Nez Perce Tribe		2001 - 2003	Aquatic Resource Access Restoration	Four existing culverts within upper Lolo Creek tributaries (Mox Creek, Chamook Creek, Gold Creek and Musselshell Creek) are scheduled to be replaced in the next three years. These culverts are inadequately sized to handle a 100-year flood event and are limiting or preventing the upstream migration of fish and other aquatic organisms.

Table 56 (Continued)

Responsible Agency	BPA Project # (if applicable)	Project Duration	Project Title	Project Description and Results
Lolo / Middle Fork Assessment Unit (Continued)				
IDFG		1982-Present	Steelhead and salmon angler use surveys	Creel census of steelhead trout and chinook salmon sport fisheries are conducted.. The results of the surveys include estimated angler participation (hours fished) and harvest. Harvest of marked fish can be cataloged by specific hatchery contribution. Angler use and harvest vary from year to year
IDFG, USFS			Mountain Lake investigations	Over the past 16 years, all mountain lakes in the Lochsa River drainage have been surveyed to develop baseline information on fish and other aquatic resources. The information collected has been used to develop a hatchery-reared trout stocking program for lakes that could not other wise sustain fishable populations of fish. In addition, amphibian populations were surveyed.
Lochsa Assessment Unit				
Nez Perce Tribe Fisheries/ Watershed	199607709	1996-present	Protecting and Restoring the Fishing to Legendary Bear Creek Watersheds Analysis Area	This project identifies sedimentation and fish barriers at road crossings as major limiting factors in fish habitat. This project has obliterated 140 miles of road, stabilizing a total of 62,041 cubic yds. of fillslope material, in which 20,371 cubic yds. were from stream crossings with failing structures. Three barrier culverts were replaced for fish passage, returning access to 10 miles of spawning, rearing and overwintering habitat.
Clearwater NF		1976-Current	Sediment Discharge Station	The Forest operates seven gaging stations and automatic sediment sampler within this AU to measure stream discharge, suspended sediment, turbidity, particle size distribution, channel cross-section survey and gradient..
Clearwater NF		1994 - Current	Stream Channel Morphology	Nine streams, each with three riffles where Wolman pebble counts, stream gradient, and cross-sectional surveys are done.
Clearwater NF		1982 - Current	Stream Substrate Monitoring	Substrate conditions within two streams (Pete King Creek and Deadman Creek) are monitoring via coring to assess conditions in steelhead trout spawning areas.
Clearwater NF		1990 - Current	Water Temperature Monitoring	Approximately 103 sites on 84 streams; water temperatures (primarily during June through September) are recorded on an hourly basis to determine baseline conditions in undeveloped watersheds and recovery trends in developed watersheds
Clearwater NF		1978 - Current	Fish Population Monitoring	Assess fish population trends in Pete King Creek, Deadman Creek, Fish Creek, and Hungary Creek via snorkeling approximately 70 stations.
Clearwater NF		1994 - Current	Bull Trout Spawning Monitoring	Assess spawning trends in selected reaches; approximately 25 miles in 13 streams.
Clearwater NF In conjunction with Nez Perce Tribe		2000 - 2003	Aquatic Resource Access Restoration	Ten existing culverts within upper Lochsa River tributaries (Papoose Creek, Badger Creek, Wendover Creek and Squaw Creek drainages) are scheduled to be replaced in the next three years. These culverts are inadequately sized to handle a 100-year flood event and are limiting or preventing the upstream migration of fish and other aquatic organisms.
Clearwater NF In conjunction with Nez Perce Tribe		1997 - Current	Watershed Restoration – Road Decommissioning	Approximately 42 miles of road within upper Lochsa River tributaries (Papoose Creek and Wendover Creek drainages) are scheduled to be decommissioned (obliterated or placed in long-term intermittent use status) in 2001.

Table 56 (Continued)

Responsible Agency	BPA Project # (if applicable)	Project Duration	Project Title	Project Description and Results
Lochsa Assessment Unit (Continued)				
IDEQ		2000-2001	Lochsa Water Temperature Model	Develop temperature model for Lochsa River and selected tributaries
IDFG		1982-Present	Salmon angler use surveys	Creel census of chinook salmon sport fishery are conducted during open seasons. The results of the surveys include estimated angler participation (hours fished) and harvest. Harvest of marked can be cataloged by specific hatchery contribution. Angler use and harvest vary from year to year.
IDFG, LSRCP$		1990-present	Powell Satellite Facility	Operate chinook weir and acclimation pond for chinook salmon in conjunction with the Lower Snake River Compensation Plan Clearwater Hatchery.
Nez Perce Tribe Fisheries/ Watershed		2000-present	North Lochsa Face	The road condition inventory is complete in this project area. Due to an appeal of Forest Service activities in this area activities have not been implemented to date.
Lower Selway Assessment Unit				
IDFG, USFS		1986-Present	Mountain Lake investigations	Over the past 16 years, all mountain lakes in the Selway River drainage have been surveyed to develop baseline information on fish and other aquatic resources. The information collected has been used to develop a hatchery-reared trout stocking program for lakes that could not other wise sustain fishable populations of fish. In addition, amphibian populations were surveyed.
IDFG		1976-Present	Selway River Drainage stream surveys	Transects for establishing fish population status are snorkeled on the main stem Selway River and most of the tributaries. The information collected has developed a baseline informational base to determine long-term trend in various fish species populations.
IDFG		1999-2000	Steelhead Trout Usage of Selway Falls fish passage tunnel	The Selway Falls fish tunnel was constructed in the 1960's in an attempt to ease traversing of Selway Falls by anadromous fish. Over time, the tunnel's infrastructure has deteriorated and needs repair. Steelhead trout use was documented by attaching radio transmitters on 32 migrating adults caught below the falls and following their migrational patterns with stationary receivers located above and below the falls. Eighteen adults utilized the tunnel; only 5 fish did not use the tunnel to move above the falls. The remaining 13 fish did not migrate above the falls.
Upper Selway Assessment Unit				
IDFG, USFS		1986-Present	Mountain Lake investigations	Over the past 16 years, all mountain lakes in the Selway River drainage have been surveyed to develop baseline information on fish and other aquatic resources. The information collected has been used to develop a hatchery-reared trout stocking program for lakes that could not other wise sustain fishable populations of fish. In addition, amphibian populations were surveyed.
IDFG		2000	Assessment of fish migration barriers	Three known water diversions in Goat, Running and North Star creeks were assessed as to their impediment to migrational passage for anadromous fish. The Goat Creek water diversion is the only one of concern, but because of wilderness issues, the issue is being resolved internally within the USFS.

Table 56 (Continued)

Responsible Agency	BPA Project # (if applicable)	Project Duration	Project Title	Project Description and Results
Upper Selway Assessment Unit (Continued)				
IDFG		1976-Present	Selway River Drainage stream surveys	Transects for establishing fish population status are snorkeled on the main stem Selway River and most of the tributaries. The information collected has developed a baseline informational base to determine long-term trend in various fish species populations.
South Fork Assessment Unit				
IDFG, NFWF, BLM, RMEF, TU, IFWF	9303500	1994-present	Red River Wildlife Management Area (RRWMA) (previously known as the Little Ponderosa Ranch)	The RRWMA was purchased to 1) maintain and/or enhance quality wildlife, fisheries, scenic values and overall biodiversity, 2) Provide a setting for natural resource-oriented educational, research and study opportunities, 3) Provide a meeting facility for natural resource-oriented agencies and organizations, and the local community, and 4) Promote continued use of the RRWMA for recreational purposes consistent with other goals. Used by University of Idaho, National Science Foundation and local schools. Interpretive sites being developed. Various monitoring surveys conducted as funding permits.
IDFG, USGS	199005200 (partial funding)	1994-present	Production impacts of Various Hatchery Stocks and Evaluate Selway Steelhead as Alternate Broodstock for South Fork Clearwater River	Prior to ESA listing, progeny of Selway steelhead were raised in a paired test with Dworshak and hybrid crosses. Unfed fry, marked parr and smolts were released into Crooked River. Migrants were PIT-tagged, age and genetic samples taken. Adult returns are evaluated for tags/marks, genetic composition, and radio-tagged to determine spawning activity/pairing. Progeny are evaluated for genetic composition and will be monitored until adults. Selway fish grew slower and smolted later. Adult returns have been low for both groups.
ICSWCD, NPNF, IDFG, SCC, NPT, NRCS	199303501	1993 - ongoing	Enhance Fish, Riparian, and Wildlife Habitat Within the Red River Watershed	A natural channel design is used to restore physical and biological processes to improve the quantity and quality of fish and wildlife habitat. Reconnecting historic meanders and reshaping channel cross sections have increased sinuosity by 60 percent, decreased gradient by 40 percent, decreased width to depth ratios, enhanced floodplain function, and improved soil moisture conditions for 91,000 native riparian/wetland plantings. Long-term monitoring of the 2.5-mile stream reach is documenting changes in ecosystem structure and function.
Nez Perce Tribe Fisheries/ Watershed	199607705	1996-present	Restore McComas Meadows/Meadow Creek Watershed	This project analyzes stream habitat and restores it to support anadromous & resident fish. Restoration has included eliminating grazing from 2.5 miles of stream and limited revegetation. Results indicate that natural regeneration of riparian plants is occurring (900% increase over 7 years), although diversity amongst the population is low. Analysis indicates that streambanks remain unstable (less than 75 % stable), and sedimentation (cobble embeddedness = 50%) is high. M&E of this project is ongoing.
Nez Perce Tribe Fisheries/ Watershed	200003600	2000-present	Protect and Restore Mill Creek Watershed	This project will restore stream habitat to support anadromous & resident fish. Accomplishments include eliminating grazing from 1+ miles of stream within meadow habitat. Restoration is aimed at restoring riparian vegetation after decades of cattle grazing, to reduce stream temperatures and sedimentation. M&E is being completed to analyze the effectiveness of this restoration project.
IDFG, LSRCP$		1987-present	Crooked River and Red River Satellite Facilities	Operate chinook weir and acclimation ponds for chinook salmon in conjunction with Lower Snake Compensation Plan Clearwater Hatchery. Monitor adult steelhead and bull trout return to Crooked River.

Table 56 (Continued)

Responsible Agency	BPA Project # (if applicable)	Project Duration	Project Title	Project Description and Results
South Fork Assessment Unit (Continued)				
IDFG, USFS, BLM		1994-Present	Bull Trout investigations in the S.F. Clearwater River	The status and distribution of bull trout in the S.F. Clearwater River have been documented since 1994. Snorkel surveys, spawning ground counts, radio tagging, and trap collections have added to the information regarding this species. Locations of prime juvenile rearing areas and suspected spawning sites have been documented, as well as wintering areas and migration patterns. Genetic and age samples have been taken and cataloged for future analysis.
IDFG, LSRCP$		1982-Present	Steelhead and salmon angler use surveys	Creel census of steelhead trout and chinook salmon sport fisheries are conducted during open seasons for each. The results of the surveys included estimated angler participation (hours fished) and harvest. Harvest can be cataloged by specific hatchery contribution (marked fish only). Angler use and harvest vary from year.
IDFG, USFS		1986-Present	Mountain Lake investigations	Over the past 16 years, all mountain lakes in the S.F. Clearwater River drainage have been surveyed to develop baseline information on fish and other aquatic resources. The information collected has been used to develop a hatchery-reared trout stocking program for lakes that could not other wise sustain fishable populations of fish. In addition, amphibian populations were surveyed.
Nez Perce Tribe Fisheries/ Watershed		2000-present	Newsome Creek	147 miles of road have been condition inventoried, approximately six miles has been decommissioned by abandonment, and 5.8 miles of road have been scheduled for road treatment.
Basinwide Projects or Programs				
USFWS	8909801	1991-Present	Salmon Supplementation Studies in Idaho Rivers	The goal of this multi-agency effort is to evaluate the usefulness of supplementation as a recovery/restoration strategy for depressed stocks of spring and summer chinook. We expect this research to demonstrate the best methods for supplementing existing natural populations of chinook salmon and reestablishing natural populations where they have been extirpated.
IDFG	198909800 or	1992-present	Idaho Supplementation Studies	Evaluate the usefulness of supplementation as a recovery/restoration strategy for depressed stocks of spring and summer chinook salmon in Idaho. Supplementation effects are monitored and evaluated by comparing juvenile production and survival, fecundity, age structure, and genetic structure and variability in treatment and control streams. Operate 5 smolt traps in Clearwater subbasin, conduct spawning surveys and carcass recovery, PIT-tag parr and smolts to determine timing and extent of downstream migration and evaluate adult returns.
IDFG	199107300	1985-present	Idaho Natural Production Monitoring and Evaluation	Collect, manage, analyze and communicate data directly related to anadromous salmonid production, productivity, structure, survival, and stock identification across all production areas and habitat qualities. Techniques include redd counts, carcass recovery, emigrant trapping, and mask and snorkel counts. Established long-term basin-wide database of anadromous and resident salmonid distribution and abundance at over 860 sites in the Clearwater and Salmon subbasins. Identified limiting factors affecting survival. Evaluation of chinook SAR’s with production areas and migration route.

Table 56 (Continued)

Responsible Agency	BPA Project # (if applicable)	Project Duration	Project Title	Project Description and Results
Basinwide Projects or Programs (Continued)				
NPT	198335003	1993 to present	Nez Perce Tribal Hatchery Monitoring And Evaluation	This project has been developed to monitor the results of the NPTH to optimize hatchery and natural production, sustain harvest, and minimize ecological impacts. Activities and sub-activities have been designed to provide data for resolving nine main management questions and critical uncertainties relating to supplementation of spring, early-fall, and fall chinook. Seven primary data collection activities and four small-scale experiments are associated with quantification of performance criterion. Eventually, this project will also sponsor coho and A-type steelhead programs.
NPT	19899802	1992 to present	Evaluate Salmon Supplementation Studies in Idaho Rivers	This project evaluates the usefulness of supplementation as a recovery/restoration strategy for spring and summer chinook salmon through (1) large-scale population production and productivity studies designed to provide Snake River basin-wide inferences, (2) using study streams to evaluate specific supplementation programs, (3) small-scale studies designed to evaluate specific hypotheses.
IDFG	190005500	1993-present	Steelhead Supplementation Studies	Evaluate the feasibility of using artificial production to increase natural steelhead populations and to collect life history and genetic data from wild steelhead populations. We evaluated parr and smolt production from hatchery fish stocked in streams as adults, fingerlings, and smolts. We monitored juvenile abundance, adult escapement, calculated growth rates, determined the age of parr, smolts and adults, and documented emigration characteristics from wild populations. We determined the genetic population structure of Idaho's steelhead assemblage.
NPT	199403400	1994 to present	Assessing Summer And Fall Chinook Restoration In The Snake River Basin	The goal of this project is to collect life history, spawning escapement and locations, juvenile emergence, growth rates, emigration timing, survival to dams, and smolt-to-adult survival information on wild Snake River fall chinook and evaluate supplementation strategies favorable for recovery and restoration of summer and/or fall chinook salmon in the last remaining mainstem habitats of the Snake River Basin above Lower Granite Dam.
SCC/NPT	199608600 199706000	1997-onggong	Clearwater Focus Program	Coordination program to implement NWPPC Fish and Wildlife Program; implementation projects ongoing in Idaho, Lewis, Nez Perce SWCD and Clearwater & Nez Perce Nat'l Forests; facilitate subbasin-wide Policy Advisory Group; initiated assessment in 1999.
NPT	19973800	1997 to present	Preserve Salmonid Gametes	Preserve male salmonid gametes through cryogenic techniques in order to maintain genetic diversity in populations with low levels of abundance and at high risk of localized extinction. Strives to ensure availability of a representative genetic sample of the original male population by maintaining a salmonid germplasm repository. Our approach is to sample and cryopreserve gametes thereby preserving salmonid genetic diversity within the major subbasins in the Snake River basin.

Table 56 (Continued)

Responsible Agency	BPA Project # (if applicable)	Project Duration	Project Title	Project Description and Results
Basinwide Projects or Programs (Continued)				
IDFG	2000-028-00	2000-Present	Evaluation of Pacific Lamprey in Clearwater River Drainage, ID	This project was initiated in 2000 with objectives of determining status and distribution of Pacific lamprey in Clearwater River drainage, focusing primarily in the S.F. Clearwater River drainage for the first two years. During 2000, a total of 262 juvenile Pacific lamprey were captured, but are not numerous or widely distributed. Location of captured ammocoetes suggests slow flowing water with sand/silt substrate is preferred in lateral scour or alcove habitats.
IASCD, EPA$, SCC$, NRCS		2001-2003	Division II AFO Implementation Project	Animal feeding operation treatment, 319 & WQPA cost-share project
IDEQ		2000-2001	Maximum Water Temperatures and their Relationship to Biological Communities in Streams in the Clearwater and Salmon Subbasins	Evaluate natural water-temp variations; relate subbasin characteristics and stream temp regimes to aquatic life
IDEQ		1994-ongoing	Beneficial Uses Reconnaissance Program	Survey work to identify attainment of beneficial uses in streams, used w/ TMDL
IDFG, Potlatch Corporation		2000-2005	Native Fish Enhancement	Watershed Monitoring. Physical removal of exotic brook trout. Monitor response of native westslope cutthroat.
IDFG		1966-present	Chinook and Steelhead Redd Counts in Trend Areas	The IDFG has monitored chinook salmon returns through redd count surveys within the Clearwater subbasin since 1966. Similar redd counts monitoring of steelhead trout has been conducted since 1990. Redd counts are obtained for each species annually through a combination of aerial and ground surveys and provide both baseline and population trend information as well as some potential for future predictions of population trends based on spawner-recruit theory.
IDFG		1996-present	Wildlife Investigations	Long-term projects to explore the effects of cow elk harvest rates and elk density on recruitment rates, examine the various factors influencing calf elk recruitment including cow elk pregnancy rates and body condition, calf elk mortality causes and rates, and predation rates.
IDFG		1990-present	Wildlife Population Monitoring	Annual wildlife surveys conducted to monitor trends in elk, deer, moose, bighorn sheep, mountain goat (aerial surveys), upland game (roadside brood surveys), chukars (aerial surveys) and waterfowl.
IDFG		1975-present	Wildlife Harvest Monitoring	Annual surveys of hunters to obtain estimates of harvest statistics by conducting game check stations, telephone surveys, and hunter harvest reports.
IDFG		1975-present	Wildlife Trap and Transplants	Annual trapping efforts to establish new populations or augment existing populations through transplants.

Table 56 (Continued)

Responsible Agency	BPA Project # (if applicable)	Project Duration	Project Title	Project Description and Results
Basinwide Projects or Programs (Continued)				
IDFG		2000-present	Dworshak Wildlife Investigations	Research effort on U.S. Army Corps of Engineers lands along Dworshak Reservoir to 1)determine locations and prepare lists of TES species and Species of Concern; 2) determine presence of mammals, birds, herptiles, plants and fungi; 3) delineate important habitats to wildlife, with emphasis on target species such as elk and goals of the Clearwater Elk Initiative; 4) compile a report and integrate GIS data layer, and 5) participate in the development of the Master Plan for managing the area.
IDFG		1995-present	Nongame Wildlife Surveys	Trend surveys of harlequin ducks, salamanders, bald eagles, peregrine falcons, raptors, and species identification of bats, migratory songbirds.
IDFG		1987 – present	Habitat Improvement Program	The Habitat Improvement Program (HIP) is a program administered by IDFG to create and improve habitat for upland game and waterfowl on public and private land. Funded by fees collected from upland bird and waterfowl hunters, landowners are provided with financial assistance for waterfowl nesting structures, wildlife ponds, irrigation systems, fence materials, food plots, and herbaceous, shrub and tree plantings. From 1987 to 1999, approximately 350 projects affecting about 7,000 acres have been completed in the Clearwater subbasin.
IDFG		1984 to present	Conservation Data Center (CDC) Rare Plant and Animal Surveys	Idaho Conservation Data Center (CDC) conducts varied inventories and monitoring involving rare plants, rare animals, plant communities, and natural areas. These projects include distribution of rare species; distribution and condition of old growth forest stands; selection, inventory, and monitoring of established ecological reference areas; mapping of vegetation and wildlife habitat; and conservation of high priority wetland and riparian sites. Results produce recommendations for species conservation, site-specific conservation action, assessments of conservation status, rankings of statewide and global rarity, and classifications and descriptions of plant communities.
IDFG, USFS		1998-present	Experimental Brook Trout Removal	A variety of methods are being tested for their efficacy in removing brook trout from mountain lakes and their inlet/outlet streams. Overwinter gill net sets and tiger muskie outplants have been used in conjunction with intensive electrofishing removal. Both methods have been effective at reducing brook trout populations, and monitoring is continuing with tentative plans for expansion.
IDFG, USGS		1994-present	Evaluate Selway Steelhead as Alternate Broodstock for South Fork Clearwater River	Prior to ESA listing, progeny of Selway steelhead were raised in a paired test with Dworshak and hybrid crosses. Unfed fry, marked parr and smolts were released into Crooked River. Migrants were PIT-tagged, age and genetic samples taken. Adult returns are evaluated for tags/marks, genetic composition, and radio-tagged to determine spawning activity/pairing. Progeny are evaluated for genetic composition and will be monitored until adults. Selway fish grew slower and smolted later. Adult returns have been low for both groups.
IDFG and private			Habitat Improvement Program	

Table 56 (Continued)

Responsible Agency	BPA Project # (if applicable)	Project Duration	Project Title	Project Description and Results
Basinwide Projects or Programs (Continued)				
Landscape Dynamics Lab (Univ. of Idaho) and IDFG			Clearwater Vegetation and Structure Classification	Using 2000 LandSat 7 imagery, we are classifying the vegetation type, canopy cover, and structural characteristics of forests in the Clearwater Region. New techniques are being used to increase the resolution from 30m to 15m and to more accurately determine structure information. The distribution of early, mid, and late seral stage forests will be mapped as part of this project.
Landscape Dynamics Lab (Univ. of Idaho)			Latah County Habitat Conservation Plan	Funded by National GAP Analysis Program, USGS, NPS, Palouse Land Trust We are developing a conservation plan for Latah county that incorporates critical wildlife areas, wetlands, remnant Palouse prairie, occurrences of rare and/or under-protected species, and habitat connectivity. The final plan will consider social and economic factors such as threats to habitat degradation, cost of conservation, and aesthetics. Public education is a major priority.
Landscape Dynamics Lab (Univ. of Idaho)			Idaho Comprehensive Conservation Plan	Funded by National GAP Analysis Program, USGS Our primary objective is the identification of a complimentary network of conservation opportunity areas that would capture the full range of variation found in Idaho's species and ecosystems.
Landscape Dynamics Lab (Univ. of Idaho)			Potential Impact of Habitat Management for Elk on Selected Nongame Species	Funded by IDFG For a select set of nongame species, our objectives were to 1) compile a spatially explicit database of occurrences, 2) determine the predicted, pre-treatment status of these species by evaluating 4 different wildlife habitat relationship models, and 3) estimate the impact of proposed habitat treatments on the distribution of each.
multi-agency		1999-ongoing	Idaho OnePlan	Computer-based planning program to combine regulations and BMPs into operating plan for farmers. Integrates ESA, CWA, CAA, wetland protection, nutrient, pest & waste management, etc
multi-agency and individual		1998-ongoing	Clearwater Elk Initiative	Elk habitat restoration, monitoring, public education.
multi-agency, coordinated by RC&D		1995-ongoing	Clearwater Basin Weed Management Area (Committee)	Subbasin-wide noxious weed inventory and treatments coordination group. Issues annual report
NRCS		revised by 1996 farm bill	Wetlands Reserve Program	Cost-share program, permanent & 30 yr easements, & restoration on private lands. 250 ac in subbasin
NRCS		revised by 1996 farm bill	Wildlife Habitat Incentives Program	Cost-share program to develop and improve habitat on private lands. 1,144 ac in subbasin
NRCS$		revised by 1996 farm bill	Environmental Quality Incentives Program	Cost-share program to improve water quality.

Table 56 (Continued)

Responsible Agency	BPA Project # (if applicable)	Project Duration	Project Title	Project Description and Results
Basinwide Projects or Programs (Continued)				
USDA$, through NRCS field offices		1996-2000	Conservation Reserve Program	(10-15 yr contract for non-crop continuous cover, There was no sign-up in 2001. Continuous CRP still active Clearwater- 4,636/24,000 Idaho-14,608/189,000 Latah-44,829/265,900 Lewis-6,006/161,159 Nez Perce- 8,947/215,400 1,139 acres in continuous CRP

Present Subbasin Management

Existing Management

Federal Government

Bonneville Power Administration

The BPA is a federal agency established to market power produced by the federal dams in the Columbia River Basin. As a result of the Northwest Power Act of 1980, BPA is required to spend power revenues to mitigate the damage caused to fish and wildlife populations and habitat as a result of federal hydropower development in the Columbia Basin. BPA is the largest single funder for these activities in the subbasin. Although BPA manages power production at the federal dams in the Basin, river flow and reservoir levels are actually controlled by several agencies working collaboratively as part of Columbia Basin water management protocols that assign jurisdictional priorities for water management depending on circumstances and implementing legislation.

Columbia Basin Fish and Wildlife Authority

The CBFWA is made up of Columbia Basin fish and wildlife agencies (state and federal) and the Columbia Basin tribes. CBFWA's intent is to coordinate management among the various agencies and agree on goals, objectives and strategies for restoring fish and wildlife in the Columbia Basin.

Farm Services Agency (FSA)

FSA is a department within the U.S. Department of Agriculture that ensures the well-being of American agriculture, the environment, and the American public through efficient and equitable administration of farm commodity programs; farm ownership, operating and emergency loans; conservation and environmental programs; emergency and disaster assistance; domestic and international food assistance and international export credit programs. Conservation program payments that FSA administers include Conservation Reserve Program (CRP) and the Environmental Quality Incentives Program. Technical assistance for these programs is provided by NRCS. Delivery of programs is completed through county offices usually located at the county seat.

National Marine Fisheries Service

The NMFS is part of the National Oceanic and Atmospheric Administration (NOAA) which in under the U.S. Department of Commerce. NMFS has ESA administration and enforcement authority for anadromous fish. NMFS reviews ESA petitions, provides regulations and guidelines for activities that affect listed species, and develops and implements recovery plans for listed species in the subbasin. NMFS is also involved in primary research on anadromous and marine species to provide knowledge required for fisheries management.

The recent FCRPS Biological Opinion and the Basinwide Salmon Recovery Strategy have been developed by NMFS and contain actions and strategies for habitat restoration and protection throughout the Columbia River basin. Action agencies are identified that will lead fast-start efforts in specific aspects of restoration on non-federal lands. Federal land management will be implemented by current programs that protect aquatic habitats (PACFISH, ICBEMP). Actions within the FCRPS Biological Opinion are intended to be consistent with or compliment the Northwest Power Planning Council's amended Fish and Wildlife Program and state and local watershed planning efforts.

Natural Resource Conservation Service (NRCS)

NRCS is an agency of the U.S. Department of Agriculture with professionally staffed field offices in Clearwater, Idaho, Latah, Lewis, and Nez Perce Counties. The agency's major purpose is to provide consistent technical assistance to private land users, tribes, communities, government agencies, and conservation districts. NRCS assists in developing conservation plans, provides technical field-based assistance including project designs, and encourages the implementation of conservation practices to improve water quality and fisheries habitat. Programs include Conservation Reserve Program, Public Law 566 (Small watershed program), River Basin Studies, Forestry Incentive Program, Wildlife Habitat Improvement Program, Environmental Quality Incentives Program, and Wetlands Reserve Program.

Northwest Power Planning Council

The Northwest Power Planning Council was created by Congress under the Northwest Power Act of 1980. The intent is to give citizens a stronger voice in determining issues related to hydropower and fish and wildlife in the Columbia River basin. The Northwest Power Planning Council is made up of eight members, with the governors of Idaho, Oregon, Washington, and Montana each appointing two members. The Northwest Power Planning Council has three principal mandates

- 20 year electric power plan to use all available resources to ensure adequate and reliable energy and lowest possible economic and environmental costs
- Development of a program to protect and rebuild fish and wildlife populations affected by the hydropower system
- Educate and involve the public in the Councils decision making process

U.S. Army Corps of Engineers

The USACE has major responsibility for river and harbor development. The Federal Water Pollution Control Act of 1972 gave the USACE authority to enforce section 404 of the Act dealing with discharge of dredged or fill material into waters of the U.S., including wetlands. Amendments to the Act in 1977 exempted most farming, ranching, and forestry activities from 404 permit requirements (Dana and Fairfax 1980). The Act was amended again in 1987 to modify criminal and civil penalties and add administrative penalties. The USACE is also responsible for flood protection by such means as building and maintaining levies, channelization of streams and rivers (also for navigation), and regulating flows and reservoir levels. The USACE is also responsible for the operation of some federal dams, including fish passage on dams in the Columbia and Snake Rivers.

In the Clearwater subbasin the primary activities of the Corps, are its operation of Dworshak Dam and reservoir (located on the North Fork of the Clearwater), including natural resource and recreation management on over 15,000 acres of land that it owns surrounding the reservoir. In addition the Corps manages properties and levees along the lower mainstem Clearwater near and in the town of Lewiston, where the Lower Granite Dam (on the Snake River) pool inundates the lower Clearwater River.

USACE at Dworshak Reservoir has five congressionally authorized management purposes: flood control, hydropower, navigation, recreation, and fish and wildlife. These management purposes are further defined by USACE through policies and regulations. Regulations for fish and wildlife authorized purposes describe three approved management concepts; stewardship, mitigation and enhancement. Stewardship of natural resources ensures the conservation, preservation, or protection of resources for present and future use. Mitigation compensates for ecological resources unavoidably and adversely affected by a Corps project. Enhancement considers fish and wildlife enhancement opportunities above a stewardship level. Project goals and objectives are established to meet the intent of the authorized purposes within the regulatory framework. The goals and objectives for Dworshak Reservoir are currently being revised as a new Master Plan and Supplemental Environmental Impact Statement (SEIS) are being developed for the reservoir. Development of the Master Plan will institute a process that incorporates best science, regulatory constraints and public needs to establish goals and objectives for natural resource management to maximize social benefits. The SEIS will evaluate the environmental impacts from the proposed management established through the master planning process. This process is well underway and substantial financial resources from the Dworshak Project are currently being allocated to various ongoing studies to determine baseline information on all aspects of resource management (Russell Davis, USACE, personal communication April 23, 2001).

The Corps mission statement for the management of natural resources at Dworshak reads as follows

- Manage natural resources to protect, enhance, and/or restore biological diversity and ecosystem integrity for native fish and wildlife species, to maintain forest health, and to protect cultural resources within the current regulatory environment
- Provide good stewardship of resources on landscape level through cooperation with state and federal agencies, private cor4porations, and citizen groups on local and regional concerns
- Manage natural resource program in harmony with other resource missions

U.S. Bureau of Land Management

The BLM administers federal lands in the West that were not claimed by the end of the homesteading era of the 19th century, and that were not set aside as National Forests, National Parks, or other special federal land use designations. The BLM took over the functions of the Grazing Service (established in 1934 by the Taylor Grazing Act) and the General Land Office in 1946 when these to agencies were merged to form the BLM. Lands administered by the BLM consist primarily of dry grass lands and desert within the intermountain West and Southwest. These lands are currently managed for multiple use under authority of the Federal Land Policy and Management Act (FLPMA) of 1976. Primary commodity uses of these lands are grazing and mining. Wildlife, wilderness, archaeological and historic sites, and recreation are also managed on BLM lands. The BLM is also responsible for mineral leasing on all public lands.

U.S. Bureau of Reclamation

The primary activity of the USBR is providing irrigation water for the arid West. This was accomplished by an aggressive dam building and reservoir creation program. Although no longer building dams, the USBR continues to run many large dams and irrigation projects in the western United States. The USBR is also involved in multiple use resource management on its lands and facilities, including recreation and wildlife conservation.

In the Clearwater subbasin the USBR holds a bond on the Lewiston Orchards Irrigation Project. Most of the project features have been rehabilitated or rebuilt by the U.S. Bureau of Reclamation, with the costs currently under repayment by the Lewiston Orchards Irrigation District. The project facilities within the Clearwater subbasin boundary include the

Webb and Sweetwater Creek diversion structures, all or portions of four feeder canals (Webb Creek, Sweetwater, West Fork, and Captain John), three small storage reservoirs (Soldiers Meadow, Reservoir "A", and Lake Waha), a domestic water system, and a system for distribution of irrigation water (U.S. Bureau of Reclamation 2000; Morrison Knutsen Corporation 1992).

U.S. Environmental Protection Agency

Formed in 1970, the USEPA administers the federal Air, Water, and Pesticide Acts. USEPA sets national air quality standards, which requires states to prevent deterioration of air quality in rural areas below the national standards for that particular area. The USEPA also sets national water quality standards (Total Maximum Daily Load or TMDL) for water bodies that the states must enforce. These standards are segregated into “point” and “nonpoint” source water pollution, with point sources requiring permitting. Although controversial, most farming, ranching, and forestry practices are considered nonpoint sources and thus do not require permitting by the USEPA. The USEPA provides funding through Section 319 of the CWA for TMDL implementation projects.

U.S. Fish and Wildlife Service

The USFWS administers the ESA for resident fish and wildlife species. The USFWS is also responsible for enforcing the Lacey Act (1900) to prevent interstate commerce in wildlife taken illegally, and enforcement of the North American Migratory Bird Treaty Act. The USFWS distributes monies to state fish and wildlife departments raised through the federal tax on the sale of hunting and fishing equipment under the authority of the Pitman-Robertson Federal Aid in Fish and Wildlife Restoration Act (1937) and the Dingle-Johnson Act. The USFWS also manages a national system of wildlife refuges and provides funding that emphasizes restoration of riparian areas, wetlands, and native plant communities through the Partners in Wildlife Program. In the Clearwater subbasin the USFWS operates Dworshak and Kooskia NFH’s (See Artificial Production Section).

The USFWS administers the Lower Snake River Fish and Wildlife Compensation Plan (LSRCP) which was authorized by the Water Resources Development Act of 1976, Public Law (P.L.) 94-587, to mitigate and compensate for fish and wildlife resource losses caused by the construction and operation of the four lower Snake River dams and navigation lock projects. The fishery resource compensation plan identified the need to replace adult salmon and steelhead and resident trout fishing opportunities, and the size of the anadromous program was based on estimates of salmon and steelhead adult returns to the Snake River basin prior to the construction of the four lower Snake River dams. In the Clearwater, the LSRCP funds Clearwater Hatchery operated by Idaho Department of Fish and Game and the chinook salmon production portion of the Dworshak NFH operated by the USFWS. A summary document describing the LSRCP and its role in individual subbasins (including the Clearwater) has been compiled and submitted under separate cover to the ISRP and CBFWA (U.S. Fish and Wildlife Service 2001a).

U.S. Forest Service

The USFS was established under the Organic Act of 1897 and is responsible for the management of all National Forests and National Grasslands in the United States. The multiple use mandate of the USFS was emphasized in the Multiple Use Sustained Yield Act of 1960, and the forest planning process that has been in force for over the last 20 years was established under the Forest and Rangeland Renewable Resources Planning Act (RPA) of 1974, and the National Forest

Management Act (NFMA) of 1976. The National Forests of the Columbia Basin are currently preparing to update their Forest Plans based on the preferred alternative of the ICBEMP.

The National Forest states that "the mission of the Forest Service is to sustain the health, diversity, and productivity of ecosystems for the benefit of present and future generations" (Clearwater National Forest 1997). Forest Service land management policy requires them to do the following (Clearwater National Forest 1997):

- Protect minimum viable populations of native and desired nonnative vertebrate species
- Provide habitat protection for endangered species
- Maintain sensitive species at viable levels
- Meet legal requirement to protect soils
- Prohibition of harvest on unsuitable lands

The USFS land allocation, management standards, and guidelines for the Clearwater subbasin are specified in the Clearwater and Nez Perce National Forest Plans (U.S. Forest Service 1987a, 1987b).

U.S. Geological Survey

The USGS monitors hydrology, and maps soil and geological and geomorphological features. The USGS also carries on the fish and wildlife research for the country formerly done by the USFWS. In the Clearwater Basin USGS researchers are doing supplementation research and hatchery stock and basic fish science research at Dworshak NFH.

United States v. Oregon

The November 9, 1987 Columbia River Fish Management Plan was an agreement resulting from the September 1, 1983 Order of the United States District Court for the District of Oregon (Court) in the case of United States et al. v, Oregon, Washington et al., (Case No. 68-513). The purpose of the management plan was to provide a framework within which the parties could exercise their sovereign powers in a coordinated and systematic manner in order to protect, rebuild, and enhance upper Columbia River fish runs while providing harvests for both treaty Indian and non-Indian fisheries. The agreement established goals (rebuild weak runs and fairly share harvest), means (habitat protection, enhancement, artificial production and harvest management), and procedures (facilitate communication and resolve disputes) to implement the plan. Many production activities are guided by the U.S. Vs Oregon agreements, which create a framework within which fish and wildlife restoration proceeds. The legal obligation to provide treaty harvest must be followed as well as Endangered Species Act requirements. The Plan has expired and negotiations are underway to develop a new one.

State Government

Idaho Department of Environmental Quality

The Department of Environmental Quality (IDEQ) is responsible for protecting human health and preserving the quality of Idaho's environment. IDEQ administers a number of core federal environmental protection programs, as well its jurisdiction as provided by state law. IDEQ manages a broad range of activities, including: identification of problem areas; regulation of facilities that generate air, water and hazardous waste pollution; air and water quality monitoring; clean-up of contaminated sites; and providing education and technical assistance to businesses, local and state government agencies, and Idaho citizens. IDEQ implements regulations adopted by the Idaho Board of Environmental Quality (Idaho Department of Environmental Quality 2001a). The IDEQ office in the Clearwater subbasin in located in Lewiston. IDEQ is composed of several divisions, each with a different responsibility and set of goals. These include:

- Waste management and remediation
- Water quality
- Air quality

IDEQ has identified four agency priorities to be included in its 2002 – 2007 Strategic Plan (Idaho Department of Environmental Quality 2001b). Of these, three seem relevant for the Clearwater subbasin (Jim Bellatty, IDEQ, personal communication, March 28, 2001):

- Improve ground water quality in degraded areas and protect all ground water
- Improve the surface water quality in areas identified as not supporting their beneficial uses or where the state believes threatened or endangered species exist
- Improve environmental quality in areas subject to past or present mining activities

The IDEQ administers several programs designed to monitor, protect, and restore water quality and aquatic life uses. These include BURP monitoring; 305(b) water quality assessments; 303(d) reports of impaired waters and pollutants; TMDL assessments, pollutant reduction allocations, and implementation plans; bull trout recovery planning; 319 nonpoint source pollution management; Antidegradation policy; Water quality certifications; Municipal wastewater grants and loans; NPDES inspections; Water quality standards promulgation and enforcement; General ground water monitoring and protection; Source water assessments; and specific watershed management plans identified by the legislature. The Idaho Board of Environmental Quality oversees direction of the agency to meet responsibilities mandated through Idaho Code, Executive Orders, court orders, and agreements with other parties.

Idaho Department of Fish and Game

Under Title 36 of the Idaho Code, the Idaho Department of Fish and Game is responsible to preserve, protect, and perpetuate fish and wildlife in the state of Idaho and provide continued supplies of such fish and wildlife to the citizens of the state for hunting, fishing, and trapping. IDFG works to preserve, protect, perpetuate, and manage all wildlife. IDFG management plans and policies relevant to fish and wildlife and their habitat in the Clearwater subbasin include the *A Vision for the Future: Idaho Department of Fish and Game Policy Plan, 1990-2005* (Idaho Department of Fish and Game 1990); the *Idaho Department of Fish and Game Strategic Plan* (Idaho Department of Fish and Game 2001);the *Idaho Department of Fish and Game Five Year Fish Management Plan: 2001-2006* (Idaho Department of Fish and Game 2001b); *White-tailed Deer, Mule Deer and Elk Management Plan* (Idaho Department of Fish and Game 1999); the *Black Bear Management Plan 2000-2010* (Idaho Department of Fish and Game 1998); the *Nongame Plan 1991-1995* (Idaho Department of Fish and Game 1991c); the *Upland Game Plan 1991-1995* (Idaho Department of Fish and Game 1991e); the *Waterfowl Plan 1991-1995* (Idaho Department of Fish and Game 1991f); the *Moose, Sheep and Goat Plan 1991-1995* (Idaho Department of Fish and Game 1991g); the *Mountain Lion Plan 1991-1995* (Idaho Department of Fish and Game 1991h)and the *Furbearer Plan 1991-1995* (Idaho Department of Fish and Game 1991b).

IDFG individually and/or jointly implements restoration, mitigation and monitoring and evaluation activities throughout the Clearwater River Basin. IDFG also runs an anadromous hatchery at Ahsahka, and other satellite facilities within the subbasin.

Idaho Department of Lands

The Idaho Department of Lands (IDL) manages over 300,000 acres of primarily forested land in the Clearwater subbasin. IDL is charged with managing state owned lands as well as providing other services to residents and businesses in Idaho dealing with various aspects of land management. IDL is composed of five Bureaus: Administration, Fire Management, Forest Management, Forest Assistance, and Lands (Idaho Department of Lands 2000).

The Fire Management Bureau is responsible for protecting six million acres of private, state, and federal forest lands in Idaho. It also provides technical assistance to local fire departments throughout the state (Idaho Department of Lands 2000).

The Forest Management Bureau coordinates and administers forest products sales, forest improvement, forest inventory, and measurement of all designated forest products from endowment lands (Idaho Department of Lands 2000). Revenue from the sale of forest products from endowment lands are used for the support of Idaho public schools.

The Forest Assistance Bureau coordinates and administers Urban/Community forest management, Service Forestry assistance to small forest landowners, the Idaho Forest Practices Act, and the Insect and Disease Program to protect state and private forest of Idaho (Idaho Department of Lands 2000).

The Lands, Range, and Minerals Division has responsibility for range management and surface leasing of state lands as well as administering weed control and water rights filings. It also manages Public Trust Lands, which are those below high water mark of navigable water bodies. Others responsibilities of this division include; land sales and exchanges, mineral leasing, lake protection, and the regulation of oil and gas exploration (Idaho Department of Lands 2000).

Idaho Department of Parks and Recreation

The IDPR was initiated by legislation, Idaho Code 67-4219. It is the intent of the legislation that the department formulate and execute a long range, comprehensive plan and program to acquire, plan, protect, operate, maintain, and wisely develop areas of scenic beauty, recreational utility, historic, archaeological, or scientific interest. There are two state parks in the Clearwater River Subbasin, Dworshak State Park and Winchester Lake State Park.

Idaho Forest Products Commission

The Idaho Forest Products Commission (IFPC) was created in 1992 by an act of the Idaho Legislature. The purpose of the commission is to “promote the economic and environmental welfare of the state by providing a means for the collection and dissemination of information regarding the management of the state’s public and private forest lands and the forest products industry.” IFPC provides a variety of statewide communications activities, educational programs and informational materials to educate specific audiences such as decision makers, educators and students as well as the general public about the need for proper forest management (Idaho Forest Products Commission 2000).

Idaho Geological Survey

The Idaho Geological Survey is the special public service and research agency at the University of Idaho mandated by law to collect and disseminate geologic and mineral data for the state. The Survey studies and reports of the general geology, environmental geology and geological hazards, metallic and nonmetallic deposits, surface and ground water, and energy resources in the state. Staff geologists conduct this applied research with a strong emphasis on producing geologic maps. The information is made publicly available through oral and written communication and in publications. The Survey is governed by and Advisory Board, whose members represent the mining industry, public agencies, higher education, and earth sciences (Idaho Geological Survey 2000).

Idaho Rangeland Resource Commission

The Idaho Rangeland Resource Commission (IRRC) was created by House Bill No. 910, Chapter No. 14, Title No. 58, Idaho Code, which was passed by the legislature and signed by Governor Cecil Andrus during the 1994 legislative session. The mission of the IRRC is to provide programs that result in an informed public that understands and supports balanced, responsible management of Idaho's economically vital private and public rangelands (Idaho Rangeland Resource Commission 2000).

IRRC is a flagship for the industry's important long-term information and education needs through implementation of the commissions mission statement. Activities will be focused statewide in cooperation with state and federal agencies and other entities (Idaho Rangeland Resource Commission 2000).

Idaho Soil Conservation Commission

The Idaho Soil Conservation Commission (SCC) was created in 1939 from Idaho legislation originated to deal with the soil erosion crisis of the Dust Bowl. Today the Commission's purpose is to provide support and service to Idaho's 51 Soil Conservation districts for the wise use and enhancement of soil, water and related resources. The Commission consists of five members appointed to five-year terms by Idaho's Governor. The Commission has a 25-member staff responsible for water quality program delivery and administrative programs. Most staff work through a District in the field, providing technical assistance directly to Idaho land owners and assisting with projects (Idaho Soil Conservation Commission 2000).

Responsibilities of the Commission are: organize Districts and provide assistance, coordination, information and training to District supervisors; ensure that Districts function legally and properly as local subdivisions of state government; administer general funds appropriated by the Idaho Legislature to Districts so they can install resource conservation practices; provide technical assistance personnel to Districts administering water quality projects and conducting soil surveys; and provide timely educational information to Districts (Idaho Soil Conservation Commission 2000).

Idaho State Department of Agriculture

The Idaho State Department of Agriculture (ISDA) serves the state's agricultural community through a wide variety of services. ISDA provides technical assistance, financial assistance, laboratory testing, national and international marketing, inspection, and licensing programs (Idaho State Department of Agriculture 2000).

ISDA is composed of several divisions: Agriculture Inspection Division, Agriculture Resources Division, Animal Industries Division, Plant Industries Division, and the Division of

Marketing and Support Services. Through its divisions, ISDA administers several programs that are important for natural resource in the Clearwater subbasin. Such programs include those that monitor pesticide use and application: pesticide licensing, certification and training; pesticide registration, disposal, and environmental toxicology; pesticide record keeping; and pesticide investigations. Programs dealing directly with natural resources include; a Groundwater Program, Wildlife Laboratory, Noxious Weed Control, Noxious Weed Free Forage and Straw Certification Program, and a chemical container recycling program (Idaho State Department of Agriculture 2000).

Idaho Water Resource Board

The Idaho Water Resource Board prepared the Comprehensive State Water Plan for the North Fork Clearwater Basin. The Plan provides guidance for the development, management, and protection of water and related resources in the North Fork Clearwater Basin in compliance with provisions of the Idaho State Constitution and Idaho State Code. This document describes and evaluates the water resources and related economic, cultural, and natural resources of the basin. It recognizes past actions, addresses present issues and opportunities, and seeks to ensure that uses of the water will complement state goals of achieving a high quality of life in Idaho.

Interest in maintaining the primitive character and aesthetic quality of valuable fish and wildlife habitat in rivers and streams, and maximizing recreational opportunities, led to protected river designations. Waterways within the North Fork Clearwater Basin designated as a State Natural or Recreational River include

- North Fork Clearwater River, headwaters to Dworshak Reservoir
- Isabella Creek, headwaters to mouth
- Weitas Creek, headwaters to mouth
- Kelly Creek, headwaters to mouth
- Cayuse Creek, headwaters to mouth
- Little North Fork Clearwater River, headwaters to Dworshak Reservoir
- Reeds Creek, Calhoun Creek to mouth
- Beaver Creek, Charlie Creek to mouth
- Elk Creek, headwaters to Deep Creek

Other Board actions and recommendations pertain to management of the Dworshak Project, and optimizing water quantity to benefit all users, promote ecologic health, and promote a viable, sustainable economy. The Board further recommends that the Northwest Power Planning Council's Protected Areas Designations be modified to reflect plan actions and recommendations.

The North Fork Clearwater Basin Plan was adopted by the Water Resource Board in January 1996, and was ratified by the Idaho Legislature in that same year. As such, it carries the effect and force of law.

Idaho Code gives the Water Resource Board the authority to hold instream flow water rights for the purpose of maintaining minimum streamflows to protect a variety of instream uses. The Idaho Water Resource Board holds minimum streamflow water rights on several streams within the Clearwater River Basin. Minimum streamflows were established on these rivers to protect fish habitat, recreation, aquatic life, wildlife habitat. Rivers with minimum streamflows include:

- Clearwater River – three water rights on three segments
- North Fork Clearwater River – two water rights on two segments
- Lochsa River
- Selway River
- Elk Creek
- Cayuse Creek
- Little North Fork Clearwater River
- Kelly Creek

The Dworshak Operation Plan was adopted by the Idaho Water Resource Board in 2000, and ratified by the 2001 Idaho Legislature, as an amendment to the Comprehensive State Water Plan for the North Fork Clearwater Basin. The objective of this Plan is to implement procedures that optimize the use of Dworshak water for all beneficial uses including flood control, power production, recreation, commercial navigation, fish and wildlife and water quality. The Plan describes current operations, ongoing studies and related activities, and anlayzes the impacts of current Dworshak operations. The Plan contains eight recommendations made by the Idaho Water Resource Board regarding the future operation of the Dworshak Project.

Local Government

Clearwater Basin Advisory Group

Basin advisory groups (BAGs) were created by state water quality code (Idaho Code 39-3613). The duties of each BAG are specified by 39-3614 Idaho Code. The BAGs were designated by the director of the Idaho Department of Health and Welfare to advise the director on water quality objectives for each river basin in the state. The Clearwater BAG is composed of ten members representing industries and interests affected by the implementation of water quality programs with the Clearwater basin.

Clearwater Resource Conservation and Development Program (RC&D)

Originally established in 1976, the Clearwater RC&D covers Clearwater, Idaho, Latah, Lewis, and Nez Perce Counties and the Nez Perce Indian Reservation in Idaho. The program is locally initiated, sponsored and directed through an elected board that works to enhance the quality of life through projects and activities emphasizing land conservation, community development, water management, and other environmental concerns. NRCS administers the program.

County Government

Idaho County

With a land area of 8,503 square miles, Idaho County is larger than some Eastern states. Although over half of the county lies within the Clearwater subbasin, the southern and western portions of the county drain into the Salmon and Snake Rivers. The county seat is the town of Grangeville.

Idaho County was established in 1864 by the First Idaho Territorial Legislature, with the county seat at Florence. In 1875 the county seat was moved to the town of Mount Idaho, and in 1902 to Grangeville.

Clearwater County

Clearwater County has a land area of 2, 488 square miles and lies entirely within the Clearwater subbasin. The county was named for the Clearwater River, whose name was translated from the Nez Perce term Koos-Koos-Kai-Kai, describing clear water. The Corps of Discovery first encountered the Nez Perce at the town of Weippe in Clearwater County. Pierce, the oldest mining town in Idaho, is also in Clearwater County. The county was established in 1911. The Clearwater county government resides at Orofino, the county seat.

The county population was 9,359 in 1999, including a labor force of 4,104 with 13.5% unemployment. The average monthly wage in the county was $1,999.00, with the two largest employers being the School District and the Clearwater National Forest

Nez Perce County

Nez Perce County has a land area of 855 square miles with county seat located at Lewiston at the confluence of the Clearwater and Snake Rivers. The county was established in 1864 by the Idaho Territorial Legislature and named for the Nez Perce Indians. Nez Perce county was one of the original four counties in Idaho in 1863 from which all 44 counties have been derived. The present boundaries of the county were set in 1911. Nez Perce county includes the cities of Lewiston, Juliaetta, Peck, Gifford, Lenore and Culdesac.

Nez Perce County is a conservation partner with NRCS and the Nez Perce Soil and Water Conservation District. The County participates in habitat restoration and enhancement, water quality, and flood protection projects.

Lewis County

Lewis County has the seventh smallest population of all Idaho counties and is the fourth smallest in area encompassing 480 square miles. Only 2.6 percent of its land is federally managed, the least of any Idaho county. The county seat is the town of Nezperce. The county was named for Meriwether Lewis of the Lewis and Clark expedition.

Latah County

Latah County has a land area of 1,077 square miles. Its county seat is located in the town of Moscow. The county was established in 1888 by an act of Congress. Latah is the 16th county created in the state, and the only Idaho county created by Congress. The name “Latah” is Nez Perce and means “the place of the pine trees and sestle,” The Nez Perce found stones here for pulverizing camas roots and shade from the pines in which to work.

Shoshone County

Shoshone County has a land area of 2,640 square miles, only the southern most portions of which lie within the boundaries of the Clearwater subbasin. Its county seat is located in the town of Wallace, Idaho. The county was established in 1864 by an act of Congress. The county was named after the Shoshone Tribe, and as of 1999 had an estimated population of 13,863 people.

Soil and Water Conservation Districts

Soil and water conservation districts are non-regulatory subdivisions of Idaho State government. A board of five or seven supervisors, who are local residents, and who serve without pay, governs each. All supervisors are elected officials and must be landowners (including urban property owners located within district boundaries) or farm operators in the district to which they are elected. Soil and water conservation districts develop and implement programs to protect and conserve natural resources on nonfederal lands. Districts organize technical advisory groups for projects and call upon local, state, tribal and federal agency specialists, industry representatives, and interested individuals. There are five districts in the Clearwater subbasin: Clearwater SWCD, Idaho SWCD, Latah SWCD, Lewis SCD, and the Nez Perce SWCD.

Districts receive limited funds from local (county) and state (general fund) government. Districts may receive other funds for local project work through the Water Quality Program for Agriculture program (ISCC) and other funding agencies, institutions, or organizations. Working cooperatively, with other entities, districts provide technical assistance to agriculturists and other private landowners based on long standing agreements with the USDA Natural Resources Conservation Service, Idaho Soil Conservation Commission, and other federal and state agencies.

Clearwater Soil and Water Conservation District (CSWCD)

The CSWCD board of supervisors develops a district 5-year resource conservation plan to prioritize and manage conservation efforts throughout the district updating the plan annually. The CSWCD office is located in the federal services center in Orofino housing the USDA Natural Resources Conservtion Service and the Idaho Soil Conservation Commission. In addition to these agencies the CSWCD works very closely with private landowners, industry, and other local, state, tribal, and federal agencies to promote resource conservation implementation. The CSWCD has implemented three watershed projects using Idaho State Water Quality Program for Agriculture (WQPA) funding, sponsored a P.L. 566 (NRCS small watershed program) project, participated in the Jim Ford Creek TMDL process, and is the lead agency for that TMDL implementation project using state and federal funding sources. The district maintains an active information and education program including sponsorship of several youth conservation activities.

Idaho Soil and Water Conservation District (ISWCD)

The ISWCD board of supervisors develops a district 5-year resource conservation plan to prioritize resource issues and manage conservation efforts throughout the district. The plan is updated every year. The ISWCD promotes conservation actions and available programs (local, state, and federal) to private landowners and agricultural operators. The ISWCD is active in the Idaho TMDL process and is the lead agency for the TMDL implementation plan for Cottonwood Creek, Idaho County which is funded by federal and state programs. The ISWCD sponsors the Red River Restoration Project funded by BPA. The ISWCD office is with the USDA Natural Resources Conservation Service; the district partnership also includes other federal, tribal, state, and local resource agencies. The ISWCD facilitates implementation of watershed programs on private lands.

Latah Soil and Water Conservation District (LSWCD)

The LSWCD annually reviews and amends a district-wide five-year resource conservation plan to lead local efforts to promote stewardship of natural resources throughout Latah County. Goals, objectives, and tasks are prioritized and specified for resources (e.g., air and water quality, soil health, forest health, fish and wildlife habitat), and areas of concern. The district is a partner in a network that includes private landowners, conservation agencies and organizations. District offices are with the NRCS and Idaho SCC. The LSWCD has implemented two watershed projects through the Idaho Water Quality Program for Agriculture (WQPA), participated in the TMDL process for Paradise Creek and is the lead agency for the TMDL implementation plan-managing multiple source budgets, and is the lead local agency for the Potlatch River Basin project. The LSWCD co-sponsors multiple-district projects to promote innovative practices and new technologies to agricultural producers.

Lewis Soil Conservation District (LSCD)

The LSCD coordinates resource conservation on private lands in Lewis County and manages the district's specific objectives through their five-year plan that is reviewed and updated annually. The LSCD has sponsored Idaho Water Quality Program for Agriculture projects in five watersheds, administered CWA Section 314 and 319 funds for projects, sponsors the Little Canyon BPA project, participated in the Winchester Lake TMDL and is the lead for the TMDL implementation project. The LSCD office is located with the US Natural Resources Conservation Service and the Idaho Soil Conservation Commission other resource partners include private landowners, local, tribal, and state agencies.

Nez Perce Soil and Water Conservation District (NPSWCD)

The NPSWCD develops an area-wide resource conservation plan, which provides a strategy to identify, prioritize, and treat resource issues within the district. The NPSWCD coordinates 22 different programs/projects addressing watershed health, resource productivity, land management, water quality, and fisheries habitat. The NPSWCD accomplishes its mission by working with conservation partners including private landowners, businesses, local, state, and federal governments, the Nez Perce Tribe, and special interest groups. The NPSWCD responsibilities range from resource assessment, project management, grant administration, project coordination, public outreach, and BMP design and implementation, to the promotion of innovative practices and new technologies. The NPSWCD's strong partnership with private landowners allows for the implementation of watershed programs on private lands.

Watershed Advisory Groups

Watershed advisory groups (WAGs) are created by state water quality code (Idaho Code 39-3615). WAGs are formed to provide advice to the Idaho Department Environmental Quality for specific actions needed to control point and nonpoint sources of pollution within watersheds of those bodies where designated beneficial uses are not fully supported. WAG duties are specified in 39-3616 Idaho Code. There are three WAGs established in the Clearwater River Subbasin, they include Jim Ford Creek WAG, Winchester Lake WAG, and the Cottonwood Creek (Idaho County) WAG.

Tribal Government

Nez Perce Tribe

The Nez Perce Tribe is responsible for managing, protecting, and enhancing treaty fish and wildlife resources and habitats for present and future generations. Tribal government headquarters are located in the Clearwater River subbasin in Lapwai, with offices in Kamiah and Orofino. The Nez Perce Tribe has treaty reserved fishing, hunting and gathering rights pursuant to the 1855 Treaty with the United States. Article 3 of the 1855 treaty states, in part:

> "The exclusive right of taking fish in all the streams where running through or bordering said reservation is further secured to said Indians; as also the right of taking fish at all usual and accustomed places in common with citizens of the Territory; and of erecting temporary buildings for curing, together with the privilege of hunting, gathering roots and berries, and pasturing their horses and cattle upon open and unclaimed land."

The Nez Perce Tribe individually and/or jointly (with state and federal agencies) implements fish and wildlife restoration and mitigation activities throughout areas of interest and influence in north-central Idaho. These lands include but are not limited to the entire Clearwater subbasin in which the Nez Perce Tribe held aboriginal title.

The Tribe's Department of Fisheries Resources Management is responsible for conducting fisheries management. The vision of the Department is to manage fisheries resources to provide for healthy, self sustaining populations of historically present species, to manage and promote healthy ecosystem processes and rich species biodiversity. Inherent in this vision is the policy desire to provide for harvestable fish populations.

Nez Perce Tribal fish and wildlife activities relate to all aspects of management, including recovery, restoration, mitigation, enforcement, and resident fish programs. Nez Perce Tribal policies and plans applicable to subbasin management include the *Wy-Kan-Ush-Mi Wa-Kish-Wit: Spirit of the Salmon* (Columbia River Inter-Tribal Fish Commission 1996a, 1996b) and the Nez Perce Fish and Wildlife Code, Reports to General Council, and Nez Perce Tribe Executive Committee Resolutions.

Cooperative Management Efforts

Clearwater Basin Elk Habitat Initiative

The Clearwater Basin Elk Habitat Initiative (CEI) is a comprehensive, long term effort to improve elk populations in the Clearwater river basin of north central Idaho (U.S. Department of Agriculture 2000). Once the largest elk herd in Idaho and one of the largest in the nation, the Clearwater herd has declined dramatically in the 1990's as a result of declining habitat, forage, and other factors. The initiative was kicked off in December 1998 when a diverse group of individuals, corporations, landowners, government agencies and other organizations signed the CEI charter pledging to work cooperatively to improve elk habitat and populations in the region. The charter now has over 200 signatures.

Clearwater Focus Program

The Clearwater River subbasin was selected by former Governor Phil Batt as a candidate for designation as a *Focus Watershed Program* under the Northwest Power Planning Council's (NWPPC) Columbia River Basin Fish and Wildlife Plan in 1996. The NWPPC accepted the selection and recommended the Bonneville Power Administration fund the program. In early 1997, the Clearwater Focus Program was funded and established as a co-coordination effort by Idaho State through the Soil Conservation Commission and the Nez Perce Tribe through Tribal Fisheries-Watershed Division. This is a coordination program to facilitate implementation of fish and wildlife habitat protection, enhancement, and restoration within the Clearwater subbasin; and to maximize available local, state, tribal, and federal funding and programs.

Through the leadership of the Focus Program co-coordinators, the Clearwater Policy Advisory Committee was formed in August 1999 to address these new requirements and to provide a forum that would maximize interagency coordination and cooperation.

Clearwater Policy Advisory Committee

Provides a structure through which management and technical advice from agencies and organizations with these responsibilities can be coordinated to develop the tools required by the NWPPC's Columbia River Basin Fish and Wildlife Plan and to establish restoration priorities in the Clearwater River Subbasin.

Membership:

- Idaho Department of Environmental Quality Regional Administrator
- Potlatch Corporation Hydrologist
- Idaho Association of Counties Natural Resources Committee Chairman
- Department of Fish and Game, Regional Manager
- Idaho Association of Soil Conservation Districts, Division II Director
- Nez Perce Tribe Executive Committee, Natural Resources Subcommittee Chairman
- U.S. Fish and Wildlife Service, Dworshak Hatchery Complex Manager
- U.S. National Marine Fisheries Service
- Clearwater National Forest Supervisor
- Idaho Department of Lands, Regional Supervisor

Clearwater River Basin Weed Management Area

The CRBWMA is a cooperative management effort composed of private landowners, county governments, tribal government, an university, state and federal land management agencies, and interested organizations and individuals. It brings together those responsible for weed management within the Clearwater River Basin to develop common management objectives, set realistic management priorities, facilitate effective treatment of noxious weeds, and coordinate efforts along logical geographic boundaries with similar land types, use patterns, and problem species.

Existing Goals, Objectives, and Strategies

Fish / Aquatic Resources

Clearwater National Forest

Obtained from the Clearwater National Forest Plan (U.S. Forest Service 1987a).

Goals

- Manage the Forest's fishery streams to achieve optimum levels of fish production by: (1) maintaining high quality habitat in existing high quality streams and, (2) rehabilitating and improving degraded streams on certain developed portions of the Forest; and then maintaining optimum levels
- Manage watersheds, soil resources, and streams to maintain high quality water that meets or exceeds State and Federal water quality standards, and to protect all beneficial uses of the water, which include fisheries, water-based recreation, and public water supplies
- Insure that soil productivity is maintained and no irreversible damage occurs to soil and water resources from Forest management activities
- Maintain water quality to provide for stable and productive riparian and aquatic ecosystems
- Manage for stream channel integrity, channel processes, and the sediment regime (including the elements of timing, volume, and character of sediment input and transport) under which riparian and aquatic ecosystems developed
- Manage instream flows to support healthy riparian and aquatic habitats, the stability and effective function of stream channels, and the ability to route flood discharges
- Manage for natural timing and variability of the water table elevation in meadows and wetlands

- Manage to maintain the diversity and productivity of native and desired non-native plant communities in riparian zones
- Manage riparian vegetation to
  - provide an amount and distribution of large woody debris characteristic of natural aquatic and riparian ecosystems
  - provide adequate summer and winter thermal regulation within the riparian and aquatic zones
  - help achieve rates of surface erosion, bank erosion, and channel migration characteristic of those under which the communities developed
- Manage riparian and aquatic habitats necessary to foster the unique genetic fish stocks that evolved within the specific geo-climatic region
- Manage habitat to support populations of well-distributed native and desired non-native plant, vertebrate, and invertebrate populations that contribute to the viability of riparian-dependent communities

Objectives

- Maintain high quality habitat in existing high quality streams
- Rehabilitate and improve degraded streams
- Maintain restored streams to optimum levels

Strategies

- Implement provisions and standards of Forest Plan as amended by PACFISH and INFISH.
- Implement provisions, terms and conditions of Biological Opinions regarding steelhead trout and bull trout
- Continue collection of necessary information regarding stream conditions to evaluate habitat and fish population conditions
- Continue ongoing and proposed watershed restoration activities (i.e. road obliteration, culvert replacements etc.)
- Continue collection of necessary information regarding stream conditions to identify aquatic resource improvement needs and evaluate habitat and fish population recovery
- Implement provisions, terms and conditions of Biological Opinions regarding steelhead trout and bull trout

Idaho Department of Environmental Quality

Consistent with priorities identified in the IDEQ Strategic Plan for 2002 – 2007, IDEQ has identified two sets of management objectives and strategies for the Clearwater subbasin:

Goal

Restore Cold Water Biota and Salmonid Spawning beneficial uses to Full Support

Objective 1

Complete TMDL Sub-basin Assessments, pollutant reduction allocations, and Implementation Plans for impaired water bodies

Strategies:

1. Maintain current schedule for TMDL development.

2. Complete development of TMDL implementation plans within 18 months of TMDL approval through coordination with appropriate agencies, advisory groups, and interested parties

Objective 2

Implement actions identified in TMDL Implementation Plans to restore aquatic life beneficial uses

Strategy:

Seek funding for projects identified in TMDL Implementation Plan

Idaho Department of Fish and Game

Unless specifically noted, the following information was obtained from the Idaho Department of Fish and Game Fisheries Management Plan for 2001-2006 (Idaho Department of Fish and Game 2001b).

Overall Department Goals

Goal 1. Preserve, protect, perpetuate, and manage Idaho's 500+ fish and wildlife species, as steward of public resources.

Objective 1.1. Minimize the number of Idaho species identified as threatened or endangered under provisions of the Endangered Species Act of 1973, as amended.

- Strategy 1.1.1: Protect, preserve, and perpetuate fish and wildlife resources for their intrinsic and ecological values, as well as their direct benefit to man.
- Strategy 1.1.2: Actively support and participate in efforts to protect or enhance the quality of water in Idaho's lakes, rivers, and streams.
- Strategy 1.1.3:Advocate land management practices that protect, restore and enhance fish and wildlife habitat, especially habitats such as wetlands and riparian areas that benefit a wide variety of fish and wildlife species.
- Strategy 1.1.4: Be an advocate for wildlife and wildlife users in legislation, land and water use activities, policies, or programs that result in significant and unwarranted loss of fish and wildlife habitat or populations, and encourage project designs that eliminate or minimize such losses.

Goal 2. Increase opportunities for Idaho citizens and others to participate in fish- and wildlife-associated recreation.

Objective 2.1. Emphasize recreational opportunities associated with fish and wildlife resources.

- Strategy 2.1.1: Support hunting, fishing, and trapping as traditional and legitimate uses of Idaho's fish and wildlife resources.
- Strategy 2.1.2: Manage fish and wildlife resources for recreational and other legitimate benefits that can be derived primarily by residents of Idaho.
- Strategy 2.1.3: Manage fish and wildlife to provide a variety of consumptive and nonconsumptive recreational opportunities as well as scientific and educational uses.
- Strategy 2.1.4: Manage wildlife at levels that provide for recreational opportunity but do not result in significant damage to private property.

Strategy 2.1.5: Use the best available biological and social information in making and influencing resource decisions.

Overall Fisheries Bureau Goals

Goal 1. To provide viable fish populations now and in the future for recreational, intrinsic, and aesthetic uses.

Objective 1.1. Provide the diversity of angling opportunities desired by the public, within guidelines for protection of existing fish populations.

Strategy 1.1.1. Develop and implement statewide fisheries programs.

Strategy 1.1.2. Operate fish hatcheries to provide eggs and fish for the angling public.

Strategy 1.1.3. Prepare and distribute information to the general public about fishing areas, rules, and techniques for angling.

Strategy 1.1.4. Maintain and enhance the quality of fish habitat so natural production of fish can be maintained.

Strategy 1.1.5. Provide access sites and related facilities for the boating and fishing public.

Goal 2. To preserve Idaho's rare fishes to allow for future management options.

Objective 2.1. Maintain or restore wild populations of game fish in suitable waters.

Strategy 2.1.1. Provide technical expertise to the Executive and Legislative branches, Idaho Northwest Power Planning Council representatives, Idaho Fish and Game Commission and to the citizens of Idaho.

Strategy 2.1.2. Work closely with other regulatory agencies to provide adequate passage for anadromous fish to and from Idaho and the ocean environment.

Strategy 2.1.3. Assist in recovery of rare species through captive rearing projects, supplementation, and protection.

Strategy 2.1.4. Provide input to land management agencies on how fishery resources may be affected by various proposed activities.

Strategy 2.1.5. Conduct periodic surveys of Idaho anglers to determine their preferences and opinions.

Objective 2.2. Maintain and improve habitats, including water quantity and water quality, to preserve aquatic fauna.

Strategy 2.2.1. Provide technical guidance to land management agencies and private landowners to minimize impacts to aquatic habitats from their activities.

Strategy 2.2.2. Coordinate with Natural Resources Policy Bureau, Department of Water Resources, and the Division of Environmental Quality to develop minimum stream flows and lake levels, water quality standards, and riparian habitat standards that maintain or improve habitats.

Goal 3. To maintain and increase sport fishing participation.

Objective 3.1. To educate anglers and potential anglers on the enjoyment, value, and satisfaction of fishing as a lifetime sport.

Strategy 3.1.1. Conduct periodic surveys of Idaho anglers to determine their opinions and preferences.

Strategy 3.1.2. Provide expertise to Departmental information and education specialists, and the news media about sport fishing activities.

Strategy 3.1.3. Develop more user friendly fishing rules brochures for easier compliance of fishing rules.

Strategy 3.1.4. Provide technical data in non-technical language, or in other non-technical forums, to anglers for better understanding of fish biology.

Statewide Fisheries Management Goals

Goal 1. Increase sport-fishing opportunities in Idaho

Strategy 1.1. Develop fishing ponds in areas where stream-fishing opportunity is limited by conservation efforts on native fishes

Goal 2. Provide a diversity of angling opportunities of types desired by the public

Strategy 2.1. Practice current public review process for developing management plans and regulations

Goal 3. Maintain or enhance the quality of fish habitat

Strategy 3.1. Use spatial databases to assist in prioritization of habitat improvement projects

Strategy 3.2. Coordinate with other agencies and landowners to develop comprehensive conservation and restoration plans

Goal 4. Fully utilize fish habitat capabilities by increasing populations of suitable fish species to carrying capacity of the habitat

Strategy 4.1. Control non-native brook trout where interactions with native salmonids limit the survival and production of native salmonid populations

Goal 5. Maintain or restore wild native populations of fish in suitable waters and historic habitats.

Bull Trout (The following is adapted from draft Recovery Criteria for the Clark Fork Bull Trout Recovery Plan 2001, Chip Corsi, IDFG, personal communications)

Objective 5.1 Identify and locate core populations of bull trout in each assessment unit

Strategy 5.1.1. Identify the distribution, abundance, trend and connectivity of bull trout populations in core and potential populations through intensive surveys and GIS mapping. Determine recovery units.

Objective 5.2 Maintain current distribution within core areas in all recovery units and determine where distribution should be restored

Objective 5.3. Maintain stable or increasing trends in abundance in all recovery units. Achieve an average adult abundance that exceeds 100 fish per monitored population with a minimum of 1,000 in each core area.

Strategy 5.3.1. Establish and conduct research and monitoring activities that capture numeric distribution and abundance criteria as required for Fish and Wildlife Service Recovery Plans.

Objective 5.4. Restore and maintain suitable habitat for all bull trout life history stages and strategies. Protect the best habitat. Assess and implement habitat improvement and restoration opportunities in core population and recovery unit areas.

Objective 5.5. Conserve genetic diversity and provide opportunity for genetic exchange. Sample and analyze genetics from all populations in the assessment units to determine metapopulation characteristics.

Other Species

Strategy 5.1. Implement restrictive fishing regulations where warranted.

Strategy 5.2. Assess population/metapopulation dynamics of fluvial populations of salmonids.

Strategy 5.3. Improve understanding and knowledge about current distribution and population status of native nongame species and the role they play in ecological communities through research and monitoring.

Strategy 5.4. Develop species management or conservation plans for native fishes including plans that address fish assemblages containing native sport and nongame fish.

Anadromous Fish Management Goals

Idaho's overall anadromous fisheries goal is to recover wild Snake River salmon and steelhead populations and restore productive salmon and steelhead fisheries. Idaho believes long-term direction must improve in-river conditions enough to provide sustainable 2% to 6% smolt-to-adult survival to achieve recovery (Idaho's comments to NMFS on draft supplemental Biological Opinion for the FCRPS from Governor Batt, April 3, 1998, as included in Idaho Department of Fish and Game (1998a). Specific goals and strategies of IDFG (Idaho Department of Fish and Game 2001b), to meet the overall Idaho anadromous fisheries goal, are as follows.

Goal 1. Maintain genetic and life history diversity and integrity of both naturally-and hatchery-produced fish

Strategy 1.1. Prepare genetic management and conservation plans for wild salmon and steelhead populations using known genetic diversity and genetic structure data

Strategy 1.2. Maintain and establish wild production refugia for salmon and steelhead populations

Strategy 1.3. Minimize harvest impacts on protected naturally reproducing fish stocks through selective fisheries on marked fish and harvest regulations

Strategy 1.4. Establish facilities for captive culture of salmon and steelhead populations likely to become extirpated in the near-term future.

Strategy 1.5. Monitor appropriate population parameters to assess population status, trends, and persistence

Strategy 1.6. Establish captive populations for stocks or populations likely to become extinct in the near-term future

Strategy 1.7. Preserve genetic diversity through gamete cryopreservation

Goal 2. Rebuild naturally reproducing populations of anadromous fish to utilize existing and potential habitat at an optimal level

Strategy 2.1. Use appropriate and proven supplementation techniques to restore and rebuild populations outside of wild production refugia

Strategy 2.2. Achieve and maintain production level in wild populations at 70% of parr carrying capacity

Strategy 2.3. Minimize harvest impacts on protected naturally producing fish through selective fisheries on marked fish and harvest regulations

Strategy 2.4. Continue selective sport fisheries, based on adipose fin-clips, to safeguard naturally produced fish while providing fishing opportunity for surplus hatchery fish

Strategy 2.5. Implement proven hatchery intervention where necessary and ecologically prudent to provide a safety net for selected populations at risk

Strategy 2.6. Balance genetic and demographic risks of unproven hatchery intervention strategies with risk of extinction

Strategy 2.7. Implement proven nutrient fertilization programs where feasible in conjunction and coordination with on-going studies and other land management agencies

Goal 3. Achieve equitable mitigation benefits for losses of anadromous fish to utilize existing and potential habitat at an optimal level.

Strategy 3.1. Improve survival associated with juvenile and adult migration through the federal hydroelectric system by strengthening the scientific foundation from which management alternatives are considered and assessed

Strategy 3.2. Pursuant to the current configuration of federal dams and reservoirs, take more aggressive actions to address significant sources of direct and delayed discretionary mortality while providing risk assessment to judge effectiveness of actions within the context of environmental variability.

Strategy 3.3. Maintain current mitigation hatchery programs at design capacity to fulfill mitigation harvest objectives

Strategy 3.4. Mark all hatchery harvest production to maximize harvest potential

Strategy 3.5. Reduce potential ecological impacts of hatchery produced fish on wild fish

Strategy 3.6. Produce fish that maintain optimum survival to adults through disease control, fish culture practices, and release strategies

Goal 4. Improve overall life cycle survival sufficient for delisting and recovery by addressing key limiting factors identified in all "H's" of hydropower, habitat, harvest, and hatchery effects.

Strategy 4.1. Safeguard naturally produced fish while providing fishing opportunity for surplus hatchery fish by externally marking hatchery production (e.g. adipose fin clip)

Strategy 4.2. Balance genetic and demographic risks of unproven hatchery intervention strategies with risk of extinction

Goal 5. Allow consumptive harvest by sport and treaty fishers.

Strategy 5.1. Minimize harvest impacts on protected naturally producing fish through selective fisheries on marked fish and harvest regulations

Strategy 5.2. Maintain current mitigation hatchery programs at design capacity to fulfill mitigation harvest objectives

Goal 6. Coordinate regional management with Idaho management to ensure achievement of Idaho fish escapement and other goals.

Strategy 6.1. Participate in regional management forums to enable harvest restrictions and passthrough provisions to allow sufficient escapement to achieve Idaho harvest objectives

Idaho Department of Fish and Game's Goals for areas above Dworshak Dam

Idaho Department of Fish and Game's goal for Dworshak Reservoir is to improve the sportfishing within the reservoir as partial mitigation for lost resources due to dam construction and operation. Wild native populations of resident fish will receive priority consideration in management decisions (Idaho Department of Fish and Game 2001b). Within the reservoir, non-native fish species (such as kokanee and smallmouth bass) will be managed to increase sport fish harvest and to diversify sport fishing opportunities (Idaho Department of Fish and Game 1990). It is also a goal of the Department to provide a diversity of angling opportunities of types desired by the public. Management decisions will emphasize maintenance of self-sustaining fish populations. However, hatchery-reared fish will be stocked as appropriate to preserve, establish, or reestablish depleted fish populations and to provide angling opportunity to the general public (Idaho Department of Fish and Game 2001b).

Objectives

1. The objective for kokanee in Dworshak Reservoir is to maintain densities of 30 to 50 adult kokanee per hectare on an annual basis, provide a catch rate of at least 0.7 fish/hr, and provide kokanee at a 30 cm size (Idaho Department of Fish and Game 2001b)
2. The objective for smallmouth bass is to enhance their fishery by habitat improvements and improved forage base
3. Bull trout objectives are to remove the threats to their continued existence, improve their habitat, and allow the population to expand
4. Evaluate, and implement if feasible, the stocking of additional fish species into Dworshak Reservoir to provide additional angling opportunity
5. A final objective is to fully mitigate the impacts due to the construction and operation of Dworshak Dam by enhancing fish and wildlife populations on and off site

Strategies

1) Kokanee strategies –
    a) Reduce entrainment losses of kokanee by testing behavior avoidance devices to move kokanee away from the intakes. Continue testing strobe lights as promising method to deter fish from entrainment. Work with USACE to develop strobe light barrier
    b) Monitor fish loss through location hydroacoustics to allow for immediate changes in dam operation when large numbers of fish become entrained
    c) Monitor year-round fish entrainment with hydroacoustic monitoring to define operating conditions (flows, selector gate settings, time of year, depth of water withdrawal, etc.) related to fish losses.
    d) Examine selective water withdrawal as a method to avoid the entrainment of zooplankton and associated density dependency effects on kokanee size

e) Monitor the kokanee population within Dworshak Reservoir on an annual basis using hydroacoustics or trawling to determine the abundance of each age class of fish and determine success or failure of management efforts. Kokanee spawner counts in representative tributary streams should be counted each year to serve as a second index of the adult kokanee population

2) Smallmouth bass strategies-
   a) Monitor the smallmouth bass population by annual electrofishing of representative shoreline areas and relate year class abundance to operation of Dworshak Dam. Use this information in recommending drawdown and refill options
   b) Enhance kokanee abundance to improve smallmouth growth

3) Bull trout strategies-
   a) Monitor bull trout abundance throughout the drainage to determine whether or not the population is meeting its recovery goals
   b) Track bull trout spawners to their spawning tributaries using radio telemetry Bull trout spawning areas will be given special attention when dealing with land use agencies to insure that the spawning habitat is protected
   c) Determine the diet and movements of bull trout within the reservoir so that competition with other species can be avoided

4) Strategies for diversifying the fishery
   a) Research species that would provide and maintain an objective of a 1:10 predator to prey balance after it is shown that the kokanee population can be maintained at a stable level. Selection of species would go through the American Fisheries Society 7-Step Process For Fish Introductions, and the species would not negatively impact bull trout, cutthroat or other native fish populations.
   b) Monitor kokanee survival rates and abundance to further define the appropriateness of the predator-to-prey objective.
   c) A creel survey should be conducted approximately once every 3 years to determine the effectiveness and angler acceptance of these mitigation efforts.

5) The above strategies will only partially mitigate the losses due to the construction of Dworshak Dam. To further mitigate for the loss of 200 km of flowing water, 264,000 whitefish, 110,000 cutthroat, 6,700 bull trout and an unknown number of redband trout, off-site fishery enhancement should be conducted. These enhancement activities should included: stocking trout into area lakes and ponds, removing unnatural fish barriers to enhance fish movements where appropriate, building catch-out ponds where feasible, providing improved angler access to area waters, and enhancing other off-site fisheries to increase sportfish harvest.

National Marine Fisheries Service (NMFS)

Information is from Angela Somma, NMFS Idaho Habitat Branch Office, personal communication, March 23, 2001. The goal of NMFS with respect to the Clearwater subbasin is to achieve the recovery of Snake River fall chinook salmon and steelhead trout resources). This goal requires development of watershed-wide properly functioning conditions at a viable population level according to standards and criteria identified by NMFS (see National Marine Fisheries Service 1996; McElhany et al. 2000). Actions which will contribute to achievement of these objectives include development of riparian vegetation, restoration of streamflow and appropriate hydrologic peak flow conditions, passage improvements and screening, as well as other activities (Angela Somma, NMFS Idaho Habitat Branch Office, personal communication, March 23, 2001).

The Federal Basin-Wide Strategy for salmon recovery identifies actions in the hydropower, hatchery, harvest, and habitat arenas for short and long term actions. The habitat goals of the Basin-Wide Strategy include the existence of high quality habitats that are protected, degraded habitats that are restored and connected to other functioning habitats, and a system where further degradation of tributary and estuary habitat and water quality is prevented.

Nez Perce Tribe

The broad programmatic vision of the Nez Perce Tribe is to restore all species, stocks, and populations of fishes throughout the Nez Perce Treaty Territory to a healthy abundance so fish are found in all historical habitats where they were once known and to provide Tribal fishing for present and future generations (Nez Perce Tribe Department of Fisheries Resources Management 2000). The following information has been drawn from: Columbia River Inter-Tribal Fish Commission 1995; Nez Perce Tribe Department of Fisheries Resources Management 2000; Nez Perce Tribe Executive Committee 1999; Vigg 2000. Other sources cited by Dave Statler (Nez Perce Tribe, personal communication, May 7, 2001) but not provided include Columbia River Inter-Tribal Fish Commission (1991).

Goals

- Restore anadromous fishes to the rivers and streams that support the historical, cultural and economic practices of the Nez Perce Tribe
- Emphasize restoration strategies that rely on natural production and healthy river systems
- Protect tribal sovereignty and treaty rights
- Reclaim the anadromous fish resource and the environment upon which it depends for future generations
- Conserve, restore and recover native resident fish populations including sturgeon, westslope cutthroat trout, and bull trout
- Protect Nez Perce cultural resources, including enforcement of ARPA and NAGPRA, Antiquities Act, and other related laws.
- Coordinate with tribal, state and federal enforcement entities and regional fish and wildlife managers to align NPT Fisheries/Conservation Enforcement with high priority resource protection needs.

Objectives

- Restore anadromous fishes to historical abundance in perpetuity
- Rebuild resident fish populations in order to restore and sustain traditional subsistence fisheries for native resident fish species

- Developed intensive resident fishery opportunities in support of traditional Nez Perce resident fishing rights
- Produce healthy productive ecosystems, for the increase of anadromous fish populations to parallel the goals and objectives of the *Wy-Kan Ush-Mi Wa-Kish-Wit*
- Protect, restore, and enhance watersheds and all treaty resources within the ceded territory of the Nez Perce Tribe under the Treaty of 1855
- Coordinate tribal, federal and state supplementation, management, habitat restoration and habitat protection efforts to increase anadromous and resident fish populations.
- Provide optimum fish & wildlife conservation protection within the Nez Perce Indian Reservation and Treaty of 1855 areas, in order to enhance and sustain our tribal fisheries, wildlife and the natural ecosystem for future generations
- Protect and ensure the safety of our tribal members while exercising treaty rights
- Integrate the use of artificial production with other fisheries management tools in achieving the program vision
- Implement and monitor needed hatchery supplementation projects
- Monitor and evaluate hatchery production programs to determine program effectiveness and to provide for adaptive management
- Monitor the status of salmon and steelhead populations and supporting fish habitat
- Preserve listed stock gametes

Strategies

- Apply a holistic approach, which encompasses entire watersheds, ridge-top to ridge-top, emphasizing all cultural aspects
- Restrict or eliminate land management activities such as logging, road building, grazing, and mining that are harming the health of riparian ecosystems including water quality degradation, stream habitat degradation, loss of riparian vegetation, streambank destabilization, and altered hydrology
- Improve water quality including reducing temperatures (for cold water biota T<60F), sedimentation, and agricultural runoff
- Restore riparian ecosystems
- Restore in-stream habitat to natural conditions
- Restore spawning and rearing habitat
- Develop watershed assessments to help prioritize restoration work, resource management, and planning efforts
- Continue and implement projects designed to restore hillslope hydrology
- Reduce sedimentation, cobble embeddedness, stream temperature to CRITFC water quality standards for streams supporting cold water biota
- Continue and implement projects designed to protect and restore riparian areas, restore wetlands and floodplain areas, restore the hydrologic connectivity between terrestrial and aquatic ecosystems
- Continue and implement projects to reduce grazing impacts on stream systems and riparian areas
- Implement projects that investigate the impacts of invasive exotic plants and participate in coordinated control efforts
- Implement projects to restore areas impacted by mining activity

- Continue and implement projects to reduce road densities
- Inventory and evaluate natural and artificial passage barriers
- Provide passage for aquatic species as a part of developing sustainable and productive aquatic ecosystems
- Develop a monitoring and evaluation program to determine the extent and quality of habitat available to anadromous and resident fishes
- Continue and expand monitoring to evaluate the success of restoration projects
- Coordinate monitoring programs at the subbasin scale in order to facilitate data sharing
- Use data from all monitoring and evaluation efforts to improve watershed scale planning, decision-making, as well as refine management and restoration practices
- Inventory riparian and wetland areas
- Acquire lands for improved habitat protection, restoration, and connectivity and for mitigation of lost fisheries/wildlife habitat
- Develop projects designed to research the link between aquatic and terrestrial ecosystems including understanding the importance of salmon carcasses in nutrient cycles
- Establish instream flows designed to provide the full range of habitat conditions needed to provide healthy, naturally reproducing salmon populations (and other aquatic species)
- Implement and enforce existing land use and water quality laws and regulations
- Enhance fisheries, wildlife, and natural/cultural resource protection on the Nez Perce Indian Reservation and within Treaty of 1855 areas
- Provide and manage expanded resident fisheries to partly offset the loss of fishing opportunities caused by the permanent blockage at Dworshak Dam
- Manage, develop and evaluate pond-based resident fisheries throughout the Reservation
- Conduct genetic and population assessments of native trout species
- Develop and implement resident fishery mitigation strategies consistent with the long term persistence and genetic integrity of native resident salmonids
- Implement the Nez Perce Hatchery monitoring and evaluation plan to adaptively manage to increase program effectiveness and minimize risk
  - Task 1. Determine if program targets for contribution rate of hatchery fish are being achieved and can be improved
  - Task 2. Determine the increases in natural production that results from supplementation of spring, fall and early fall chinook salmon in the Clearwater River and relate them to limiting factors
  - Task 3. Estimate ecological and genetic impacts to fish populations
  - Task 4. Determine how harvest opportunities on spring, early-fall, and fall chinook salmon can be optimized for tribal and non-tribal anglers within the Nez Perce Treaty lands
  - Task 5. Complete coho management plan, complete facility and production design, construct facilities and fund production of coho production and recovery in the Clearwater subbasin.
  - Task 6. Effectively communicate monitoring and evaluation program approach and findings to resource managers.
- Implement the Idaho Salmon Supplementation study design to assess the use of hatchery chinook salmon to increase natural populations of spring and summer chinook salmon in the Clearwater River drainage

Task 1. Monitor and evaluate the effects of supplementation on presmolt and smolt numbers and spawning escapements of naturally produced salmon
Task 2. Monitor and evaluate changes in natural productivity and genetic composition of target and adjacent populations following supplementation
Task 3. Determine which supplementation strategies (brood stock and release stage) provide the quickest and highest response in natural production without adverse effects on productivity
Task 4. Coordinate supplementation research planning and field evaluation program activities and management recommendations for the Nez Perce Tribe

- Document fish health, movement patterns, migration timing, travel times, juvenile emigration survival, and adult returns of fall chinook salmon in the Clearwater River from supplementation (acclimated releases) of Lyons Ferry Hatchery Snake River stock fall chinook

Task 1. Monitor, evaluate, and compare pre-release and release conditions of hatchery fall chinook released at the Pittsburg Landing, Big Canyon Creek, and Captain John Rapid acclimation facilities with on-station releases at Lyons Ferry Hatchery
Task 2. Monitor, evaluate, and compare post-release behavior, migration timing, and survival of fall chinook released at Pittsburg Landing, Big Canyon Creek, Captain John Rapids, and Lyons Ferry Hatchery
Task 3. Monitor and compare contribution and distribution of adult returns and smolt-to-adult survivals of fall chinook released from Pittsburg Landing, Captain John Rapid, Big Canyon Creek, and Lyons Ferry Hatchery
Task 4. Prepare a cooperative annual report that evaluates the success of supplementation of fall chinook salmon above Lower Granite Dam

- Collect life history and survival information on naturally produced fall chinook salmon and evaluate supplementation strategies that would be favorable for recovery and restoration of summer and fall chinook salmon stocks

Task 1. Investigate the movement patterns, growth rates, and survival of naturally produced fall chinook salmon in the lower Clearwater River to the lower Snake River dams and compare the performance and survival of Lyons Ferry Hatchery fall chinook subyearlings released in the lower Clearwater River
Task 2. Correlate juvenile wild and hatchery fall chinook survival in study streams to emigration conditions and environmental variables to adult returns
Task 3. Provide annual reports summarizing technical findings

- Preserve the genetic diversity of salmonid populations at high risk of extirpation through application of cryogenic techniques

Task 1. Coordinate salmonid gamete preservation with management agencies in the Snake River basin
Task 2. Refine gene bank cryopreservation project goals for salmonid spawning aggregates at high risk of extirpation in the Snake River basin
Task 3. Collect gametes from ESA-listed chinook salmon and steelhead for application of cryopreservation techniques and conduct genetic analysis of fish represented in the germplasm repository for salmonid conservation units at low levels of abundance and high risk of extirpation
Task 4. Technology transfer through annual reports
Task 5. Operation and maintenance of germplasm repository

- Monitor and evaluate coho salmon restoration in the Clearwater River
  - Task 1. Collect baseline environmental information in coho release streams
  - Task 2. Determine post-release survival and smolt-to-adult return of hatchery reared and naturally produced coho salmon
  - Task 3. Determine the number of adult coho salmon harvested annually
  - Task 4. Monitor genetic profile of introduced coho salmon stock, broodstock developed from adult hatchery returns and naturally returning coho salmon adults
  - Task 5. Monitor the ecological interactions of residual coho salmon, hatchery reared coho parr, and naturally produced coho juveniles with other fish species
  - Task 6. Provide annual reports summarizing coho salmon monitoring and evaluation activities
- Conduct juvenile and adult population status monitoring of A strain steelhead in lower Clearwater River streams
  - Task 1. Quantify adult steelhead spawner abundance and calculate spawner to spawner ratios
  - Task 2. Quantify juvenile steelhead abundance and determine smolt-to-adult survival.
- Implement out of basin mainstem measures necessary to achieve desired benefits from within basin activities, including, but not limited to:
  - Increase spill efficiency to achieve at least 90% fish passage efficiency
  - Implement natural river drawdown of the four Lower Snake River dams for recovery of anadromous fish stocks, with necessary investments in community infrastructure
  - Provide 1-3 MAF from the Upper Snake and .450 MAF from Brownlee Reservoir for flow augmentation
  - Other mainstem recommendations contained in Columbia River Inter-Tribal Fish Commission (1995)
- Operate Dworshak Dam to mimic the natural hydrograph
- Until such time as the Lower Snake River is returned to a natural river state, reserve Dworshak flow augmentation volume for summer water cooling
- Develop operational strategies to benefit fisheries both upstream and downstream of Dworshak Dam
- Participate in regional groups involved in setting in-season operations to voice needs of fishery resources with the 1855 Treaty area, especially as related to Dworshak Reservoir and the Lower Clearwater River
- Provide science-based recommendations for management and policy consideration

Nez Perce National Forest

Information was obtained from the Nez Perce National Forest Plan (U.S. Forest Service 1987b).

Goals

- Provide and maintain a diversity and quality of habitat that ensures a harvestable surplus of resident and anadromous game fish species
- Meet established fishery/water quality objectives for all prescription watersheds

Objectives

- Increase anadromous fish habitat potential to 87 percent (a 1% increase over current)

Strategies

- Direct habitat improvement
- Soil and water resource improvement
- Use of fishery/water quality objectives for individual drainages
- Maintenance of current high habitat levels in roadless areas
- Schedule fishery habitat and watershed improvements in those streams where the existing fishery habitat potential is below the stated objective
- Use the “Guide for Predicting Salmonid Response to Sediment Yields in Idaho Batholith Watersheds” to evaluate the attainment of fish habitat objectives

Northwest Power Planning Council

(Northwest Power Planning Council 2000).

Overarching Objectives

- A Columbia River ecosystem that supports an abundant, productive and diverse community of fish (and wildlife)
- Mitigation across the basin for adverse effects to fish (and wildlife) caused by development and operation of the hydrosystem
- Sufficient populations of fish (and wildlife) for abundant opportunities for tribal trust and treaty right harvest and for non-tribal harvest
- Recovery of the fish (and wildlife) affected by the development and operation of the hydrosystem that are listed under the Endangered Species Act

Basin-level Objectives Addressing Anadromous Fish Losses

- Halt declining trends in salmon and steelhead populations by 2005
- Restore widest possible set of healthy naturally reproducing populations of salmon and steelhead by 2012. Healthy populations are defined as having an 80 % probability of maintaining themselves for 200 years at a level that can support harvest rates of at least 30%
- Increase total adult salmon and steelhead runs above Bonneville Dam by 2025 to an average of 5 million annually in a manner that supports tribal and non-tribal harvest. Within 100 years achieve population characteristics that represent on average full mitigation for loss of anadromous fish

Basin-level Objectives Addressing Substitution for Anadromous Fish Losses

- Restore native resident fish species (subspecies, stocks and populations) to near historic abundance throughout their historic ranges where original habitat conditions exist and where habitats can be feasibly be restored
- Reintroduce anadromous fish into blocked areas, where feasible
- Administer and increase opportunities for consumptive and non-consumptive resident fisheries for native, introduced, wild, and hatchery-reared stocks that are compatible with the continued persistence of native resident fish species and their restoration to near historic abundance (includes intensive fisheries within closed or isolated systems)

Basin-level Objectives Addressing Resident Fish Losses

- Complete assessments of resident fish losses throughout the basin resulting from the hydrosystem, expressed in terms of the various critical population characteristics of key resident fish species

- Maintain and restore healthy ecosystems and watersheds, which preserve functional links among ecosystem elements to assure the continues persistence, health and diversity of all species including game fish species, non-game fish species, and other organisms
- Protect and expand habitat and ecosystem functions as the means to significantly increase the abundance, productivity, and life history diversity of resident fish at least to the extent they have been affected by the development and operation of the hydrosystem
- Achieve population characteristics of these species within 100 years that, while fluctuating due to natural variability, represent on average full mitigation for losses of resident fish

Potlatch Corporation

(Terry Cundy, Potlatch Corporation, personal communication, April 18, 2001)

Goals

- Provide high quality riparian and stream conditions across Idaho ownership

Objectives

- Reduce summer maximum stream temperatures (7 day average of max daily temps) to 15C or less
- Reduce fine sediment (<2mm diameter) in riffles to 10% or less
- Increase pools to 35% or greater
- Decrease competition from non-native fish (in particular brook trout)

Strategies

- Manage shade to achieve stream temperatures
- Manage road surface sediment to achieve fine sediment reduction
- Manage riparian forests for fully forested, mature conditions
- Conduct preliminary research to evaluate the effectiveness (magnitude and duration) of brook trout suppression
- Where conditions (shade, roads or riparian forests) meet targets, conduct management to protect existing conditions; where conditions are off-target, conduct enhancement activities to move toward targets

U.S. Bureau of Land Management (BLM)

Goals

- Work cooperatively with Nez Perce Tribe and others to eliminate or reduce recreational conflicts with fall chinook (U.S. Bureau of Land Management 2000)
- Support U.S. Fish and Wildlife Service and Nez Perce Tribe management and research efforts for fall chinook
- Work cooperatively to implement watershed plans
- Restore and protect floodplains and riparian areas along the lower Clearwater River
- Initiate actions to reduce adverse water quality impacts to tributary streams and mainstem rivers
- Initiate restoration actions to improve flood damaged stream channels and riparian areas
- Initiate long term monitoring
- Conduct surveys for westslope cutthroat trout

U.S. Bureau of Reclamation

Joseph Spinazola, personal communication, USBR, Boise 4/13/01

Goals

Reclamation anticipates working through the existing local infrastructure with willing private landowners in the Middle Fork Clearwater watershed to address Reclamation responsibilities related to the December 2000, FCRPS BIOP. Work is expected to begin in 2001 and last 10 years to meet the following specific goals for anadromous fish:

- Acquire adequate instream flow to support migration
- Remove passage barriers
- Screen or upgrade all diversions to comply with NMFS criteria

Objectives

- Restore and increase main stem and tributary flows to improve fish spawning, rearing, and migration
- Eliminate barriers to fish passage
- Screen diversions, consolidate diversions, and rescreen existing diversions to comply with NMFS criteria to reduce overall mortality

Strategies

For flow:

- Obtain methodology to determine flow targets from NMFS
- Conduct research required to quantify flow targets
- Acquire streamflows from willing providers
- Plan and design pipelines, canal lining, diversion automation, and other water conservation measures to provide water to meet irrigation demands and retain residual in stream
- Plan and design stream restoration modifications to enhance natural stream function
- Fund construction, if authorized; otherwise, seek funding mechanism for construction

For barriers:

- Inventory barriers to fish passage
- Provide planning and engineering design assistance to replace barriers with permanent structures that will freely pass fish
- Fund construction, if authorized; otherwise seek funding mechanism for construction

For screens:

- Inventory condition of screened and non-screened diversions
- Provide planning and engineering design assistance
- Fund construction, if authorized; otherwise seek funding mechanism for construction

U.S. Fish and Wildlife Service

The Fish and Wildlife Service, Lower Snake River Compensation Plan Office administers and funds the operation, maintenance, and evaluation of all LSRCP facilities in the Clearwater River Basin through cooperative agreements with the agencies and tribes. A detailed description of the program is included in U.S. Fish and Wildlife Service (2001a). The following goals, objectives, and strategies of the USFWS for the LSRCP were supplied by Howard Burge (U.S. Fish and Wildlife Service, personal communication, May 7, 2001).

Goal

To mitigate and compensate for fish and wildlife resource losses caused by the construction and operation of the four lower Snake River dams and navigation lock projects.

Objective

Return 21,200 spring/summer chinook and 14,000 summer steelhead to the Snake River Basin above Lower Granite Dam to provide harvest for sport anglers and tribes, brood stock for hatchery programs, and some natural spawning escapement where appropriate.

Strategies

- Comply with the Endangered Species Act.
- Meet tribal trust responsibilities.
- Adhere to federal laws, agreements, and court orders.
- Pursue the USFWS Mission and Vision.

The USFWS also operates the Dworshak Fisheries Complex (Dworshak National Fish Hatchery, Kooskia National Fish Hatchery, and the Idaho Fisheries Resource Office). The Idaho Fish Health Center is also co-located at Dworshak National Fish Hatchery. Goals, objectives, and strategies of the USFWS for the Dworshak Fisheries Complex were supplied by Howard Burge (U.S. Fish and Wildlife Service, personal communication, May 7, 2001).

Goal: Mitigate and compensate for fish resource losses caused by the construction and operation of Federal dams and water projects.

Objective 1. Meet the annual mitigation goal of 20,000 returning summer steelhead adults to the Clearwater River to provide tribal and sport harvest throughout the Clearwater basin and meet broodstock needs for the program.

Strategy 1. Maintain USACE summer steelhead mitigation program at Dworshak NFH.

Strategy 2. Maximize survival of steelhead smolts reared and released from Dworshak NFH.

Strategy 3. Improve Dworshak NFHs water system to offset the cool-water, summer flow releases from Dworshak Dam that affect the growth of hatchery steelhead.

Strategy 4. Maintain and preserve the unique North Fork B run summer steelhead.

Objective 2. Meet the annual return goal of 9,135 adult chinook above Lower Granite Dam to provide for tribal and sport harvest and broodstock needs for the program.

Strategy 1. Maintain the LSRCP spring chinook salmon program at Dworshak NFH.

Strategy 2. Maximize survival of spring chinook salmon smolts reared and released from Dworshak NFH.

Objective 3. Release full production of approximately 600,000 spring chinook smolts from Kooskia NFH annually to return adults to provide for tribal and sport harvest and broodstock needs for the program.

Strategy 1. Maintain the USFWS spring chinook salmon program at Kooskia NFH.

Strategy 2. Maximize survival of spring chinook salmon smolts reared and released from Kooskia NFH.

Goal: Protect, restore, and enhance native anadromous and resident fish populations in the Clearwater River basin.

Objective 1. Reverse declining trends of bull trout populations in the Clearwater River basin.

- Strategy 1. Determine bull trout distribution and migration timing in the Clearwater River basin including Dworshak reservoir.
- Strategy 2. Determine the extent of any bull trout entrainment problems at Dworshak Dam and identify potential solutions.
- Strategy 3. Develop eradication methods to reduce brook trout populations that are threatening native bull trout. Sample brook trout removed for pathogens that could potentially affect bull trout.
- Strategy 4. Estimate population size of bull trout migrating to and from Dworshak Reservoir annually.
- Strategy 5. Evaluate bull trout populations for presence of pathogens

Objective 2. Improve status of cutthroat populations in the Clearwater River basin.

- Strategy 1. Monitor cutthroat trout populations in the Clearwater basin to identify any potential threats.
- Strategy 2. Evaluate cutthroat populations for presence of pathogens.

Objective 3. Increase natural production of anadromous salmonids to meet carrying capacities of the basin.

- Strategy 1. Release anadromous salmonids of various life stages into the Clearwater River basin to assist with run rebuilding efforts.
- Strategy 2. Monitor and evaluate the adult return (including spawning distribution), of unmarked Dworshak B steelhead released in the Clearwater basin .
- Strategy 3. Evaluate the efficacy of using late spawning spawning steelhead as broodstock for steelhead supplementation releases.
- Strategy 4. Maintain the Selway River as a wild steelhead refuge and control stream to compare rebuilding efforts against.
- Strategy 5. Evaluate the extent of natural production for adult steelhead outplanted into Clearwater River tributaries.
- Strategy 6. Determine the various anadromous salmonid carrying capacities for the Clearwater basin.
- Strategy 7. Determine the distribution and status of wild/natural steelhead populations in the Lochsa, Selway, and South Fork Clearwater river basins.
- Strategy 8. Monitor and evaluate effects of supplementation on natural spring chinook salmon production and spawning escapement.
- Strategy 9. Monitor and evaluate changes in natural productivity, and genetic composition of target and adjacent populations following spring chinook supplementation.
- Strategy 10. Determine which supplementation strategies provide the quickest and highest response in natural production without adverse effects on productivity.
- Strategy 11. Make recommendations on the use of spring chinook salmon supplementation.
- Strategy 12. Evaluate the extent of natural production for adult spring chinook outplants into Clearwater River tributaries
- Strategy 13. Evaluate supplementation efforts to rebuild fall chinook salmon populations in Clearwater River Basin.
- Strategy 14. Determine how cool-water releases for summer flow augmentation affect the distribution, growth, and movement of listed fall chinook salmon smolts and bull trout in the lower Clearwater River.

- Strategy 15. Assist in tracking spawning distribution of fall chinook salmon in the Clearwater River.
- Strategy 16. Develop a systematic plan for sampling wild, natural, and feral fish populations for pathogens that potentially would affect wild fish, attempts to restore stock, and hatchery fish released into the system.

Objective 4. Minimize potential interactions between listed anadromous stocks and hatchery smolt releases.

- Strategy 1. Reduce steelhead residualism from Dworshak NFH.
- Strategy 2. Characterize and quantify residual steelhead in the Clearwater River, Idaho.
- Strategy 3. Identify the characteristics that produce a successful smolt compared to an unsuccessful smolt (residual).
- Strategy 4. Identify what hatchery practices may influence or increase residualism in steelhead.
- Strategy 5. Determine what interaction (if any) residuals have on wild steelhead in the Clearwater River.

Wildlife / Terrestrial Resources

Clearwater National Forest

Goals

- Provide habitat for viable populations of all indigenous wildlife species
- Maintain and, where appropriate, improve the winter and summer habitat over time to support increased populations of big-game wildlife species
- Limit motorized use on selected big-game range to minimize effects on big game

Objectives

- Conduct field inventories and monitoring of proposed project areas to identify critical habitats
- Implement mitigation or conservation measures during projects to ensure that habitat for wildlife species is restored, enhanced or maintained
- Develop and implement projects to specifically address declining big-game habitats. These projects normally use timber harvest and prescribed fire to create early seral habitats
- Improve and restore wildlife habitats as part of the forest road obliteration program
- Evaluate all roads in cooperation with Idaho Fish and Game Department during project planning for closure. Some roads will then be closed permanently and some seasonally to protect wildlife

Idaho Department of Fish and Game

Mission/Statutory Responsibility (Sec. 36 of Idaho Code)

All wildlife, including all wild animals, wild birds, and fish, within the state of Idaho, is hereby declared to be the property of the state of Idaho. It shall be preserved, protected, perpetuated, and managed. It shall only be captured or taken at such times or places, under such conditions, or by such means, or in manner, as will preserve, protect, and perpetuate such wildlife, and provide for the citizens of this state and, as by law permitted to others, continued supplies of such wildlife for hunting, fishing, and trapping.

Goals

- Continue protection and restoration of wildlife habitat as top priority in the management program (Idaho Department of Fish and Game 1991)
- Insure the viability of nongame populations, including threatened and endangered species, and their habitats in Idaho (Idaho Department of Fish and Game 1991c)
- Assess, conserve, and enhance populations of native species at self sustaining levels throughout their natural geographic range (Idaho Department of Fish and Game 2001a)
- Recover species and restore natural landscapes (Clearwater Nongame Program 2001 Five-year Plan)
- Emphasize critical habitats including marshlands, upland habitats adjacent to population centers and key big game ranges in land acquisition efforts (Idaho Department of Fish and Game 1991)
- Target management and transplant activities toward developing and maintaining self-perpetuating populations of wildlife on suitable ranges (Idaho Department of Fish and Game 1991)
- Whenever unavoidable fish and wildlife habitat or population losses occur, the Department will, where practical and legally possible, actively seek compensation (Idaho Department of Fish and Game 1991)
- Maintain hunting opportunities and enhance the quality of elk hunting on federal lands in the Clearwater Basin (Clearwater Basin Elk Habitat Initiative 1998).
- Increase Idaho's current bighorn sheep population (Idaho Department of Fish and Game 1991a)
- Maintain and restore important habitats and viable Coeur d'Alene salamander populations throughout the salamander's natural range in Idaho (Cassirer et al. 1995)
- Ensure mountain quail population viability and species persistence throughout mountain quail range in Idaho (Sands et al. 1998)
- Maintain viable populations of harlequin ducks along with protection and maintenance of critical habitats to ensure that listing is not warranted (Cassirer et al. 1996)
- Identify, protect, and restore important habitats and viable Townsend's Big-eared bat populations throughout the species' range in Idaho and the rest of the western United States (Pierson et al. 1999)
- Maintain and restore a dynamic ecosystem, encouraging a return of natural disturbance regimes or finding adequate methods for mimicking those disturbances. Where feasible, restore lost or degraded riparian habitats to maximize benefits to riparian species (Idaho Partners in Flight 2000)

Objectives

- Management objectives for white-tailed deer include not falling below 50 percent 4+ points and 17 % 5+ points in the harvest (Idaho Department of Fish and Game 1999)
- Management objectives for mule deer include not falling below 30% 4+ points in the harvest (Idaho Department of Fish and Game 1999)
- Management objectives for elk in the Dworshak zone are to establish a population of 3,600 cows and 750 bulls, including 425 adult bulls at ratios of 18-24bulls:100 cows and 10-14 adult bulls:100 cows (Idaho Department of Fish and Game 1999)

- Management objectives for elk in the Lolo Zone are to establish a population of 7,600 cows and 1,600 bulls, including 975 adult bulls at ratios of 18-24 bulls:100 cows and 10-14 adult bulls:100 cows (Idaho Department of Fish and Game 1999)
- By 2025, restore at least 10 percent of the historical extent of each riparian system within each ecoregion subsection, to conditions that would support productive species of designated focal species (Idaho Partners in Flight 2000)
- In dry ponderosa pine/Douglas-fir/grand fir forests, restore as much as possible but at least 10 percent (100,000 acres) of historical range of these forests meeting the conditions needed for White-headed woodpeckers (Idaho Partners in Flight 2000)

Strategies

- Reestablish ecological processes (fire) in the Clearwater Basin that support elk populations and their habitat at a landscape scale (Clearwater Basin Elk Habitat Initiative 1998)
- Identify and monitor habitats needed to maintain Idaho's wildlife diversity (Idaho Department of Fish and Game 2001a)
- Identify priority habitats of concern and their ecological relationship to native species (Idaho Department of Fish and Game 2001a)
- Monitor changes and trends in habitats, with emphasis on priority habitats (Idaho Department of Fish and Game 2001a)
- Identify conservation, restoration, and management needs and opportunities for priority habitats (Idaho Department of Fish and Game 2001a)
- Take actions to conserve, restore, enhance, or acquire important habitat areas (Idaho Department of Fish and Game 2001a)
- Promote land use patterns and management practices that conserve, restore, and enhance habitats needed to maintain wildlife diversity (Idaho Department of Fish and Game 2001a)
- Determine the status of species, populations, and groups of species, and monitor them on a regular basis for appraising the need for management actions (Idaho Department of Fish and Game 2001a)
- Identify, establish, and implement management measures necessary for restoring threatened and endangered species; preventing species of special concern from qualifying as threatened or endangered; and maintaining or enhancing other species requiring special attention (Idaho Department of Fish and Game 2001a)
- Reintroduce native species or populations where they have been severely depleted or extirpated as may be biologically feasible and ecologically valid (Idaho Department of Fish and Game 2001a)
- Restore riparian habitats based on feasibility, land ownership, size of existing patches, existing land matrix, quality, and habitat connectivity (Idaho Partners in Flight 2000)
- Implement Idaho Conservation Assessments and Strategies (Clearwater Nongame Program 2001 Five-year Plan)
- For white-headed woodpeckers, maintain and restore distribution, diversity, and complexity of landscape and regional-scale features, especially ponderosa pine types, to ensure protection and restoration of systems to which species, populations, and communities are uniquely adapted. Maintain and restore spatial and temporal connectivity within and between ponderosa pine communities for white-headed woodpeckers. Maintain and restore habitat to support well-distributed healthy populations of native plant, invertebrate, and vertebrate species where linkages may exist in fulfilling life history requirements of the white-headed

woodpecker. (Conservation Assessment and Strategy for White-headed Woodpecker, undated report)

- Provide sufficient habitat to support well-distributed marten and fisher populations. Understand the factors limiting the southern expansion of lynx range, mitigate (where possible) these factors such that lynx populations are maintained or restored on suitable habitats, and provide suitable travel linkages between disjunct lynx sub-populations. (Idaho State Conservation Effort 1995)
- Identify and manage existing habitat, enhance degraded habitat, and increase the distribution of habitat. Identify, protect, and enhance habitats that link existing and future populations at the landscape level. Conduct experimental transplants and habitat management actions to more precisely determine habitat relationships (Sands et al. 1998)
- Establish new herds by transplanting bighorn sheep (Idaho Department of Fish and Game 1991a)
- Introduce mountain goats , when available, into all suitable ranges (Idaho Department of Fish and Game 1991d)
- Strongly discourage roads and trails that increase the accessibility of mountain goat habitat to prevent increased vulnerability of goat populations to man's influence (Idaho Department of Fish and Game 1991d)
- Ensure that furbearers are given adequate consideration in land use plans, and that land managers more aggressively consider the effects of land management prescriptions on furbearers (Idaho Department of Fish and Game 1991b)
- Use beavers as a management tool to improve habitat for other fish and wildlife species (Idaho Department of Fish and Game 1991b)
- Identify suitable, previously occupied furbearer habitat and trap and transplant native Idaho furbearers into these areas (Idaho Department of Fish and Game 1991b)

Nez Perce National Forest

(U.S. Forest Service 1987b)

Goals

- Provide and maintain a diversity and quality of habitat to support viable populations of native and desirable non-native wildlife species
- Recognize and promote the intrinsic ecological and economic value of wildlife and wildlife habitats
- Provide high quality and quantity of wildlife habitat to ensure diversified recreational use and public satisfaction
- Manage for summer elk habitat at 75 (187, 506 acres), 50 (541,460 acres), and 25 (168, 799 acres) percent habitat effectiveness in the high, moderate, and low habitat objective areas respectively
- Manage 989,340 acres of forest at 100% elk summer habitat effectiveness (includes 875,000 acres within the wilderness)
- Maintain viable populations of old growth dependent species

Objectives

- Maintain elk winter range carrying capacity at 23,000 animals by the end of the Plan period (1997)

- Maintain or slightly increase moose winter range carrying capacity through silvicultural management
- Limit road access to moose winter range to reduce harassment and poaching
- Provide management for minimum viable populations of old-growth and snag dependent species

Strategies

- Treat 5,000 acres of winter range with prescribed fire annually to maintain elk carrying capacity
- Maintain at least 10% of old-growth habitat on Forest distributed in a way that assures at least 5% of the old growth habitat remains within major prescription watersheds
- Emphasize recovery of the gray wolf and peregrine falcon
- Comply with objectives of the Bald Eagle Recovery Plan by protecting riparian areas and identified perch and roosting sites, and cooperating with NWF annual bald eagle winter surveys
- Comply with assigned objectives of the Grizzly Bear Recovery Plan
- Maintain habitats to provide for populations viability of all sensitive species including the wolverine, big-eared bat, Harlequin duck, boreal owl, and common loon
- Monitor populations of all management indicator species on the forest
- Design timber harvest activities in moderate and high elk objective areas, when compatible with established fish/water quality objectives and economics, so that units at the far end of the road will be cut first
- Avoid logging activity on traditional big game calving/fawning or nursery areas from May 15 through June 15
- Use K-V funds to protect or enhance habitats for threatened and endangered species

Potlatch Corporation

(Brian Moser, Potlatch Corporation, personal communication, April 13, 2001)

Goals

- Provide and maintain landscape- and site-level habitat diversity in order to support diverse and viable populations of wildlife
- Recognize and protect important and sensitive habitats

Objectives

- Maintain a balance of forest seral stages across the ownership through timber harvest and silvicultural practices
- Leave snags, downed logs, and other structures important to wildlife intact on harvest units
- Protect riparian areas
- Provide forage on important elk winter range
- Improve elk productivity

Strategies

- Utilize various even-aged and uneven-aged harvest methods to create a mosaic of successional stages across the ownership

- Use timber harvest and prescribed fire on 3,000 acres to emulate natural conditions and provide habitat for early successional species
- Restrict harvest operations in sensitive habitats
- Maintain a system of road closures to protect elk
- Monitor wildlife populations to assess management effectiveness

General Resources

The following descriptions of existing goals, objectives, and strategies are not separated into fish and wildlife conservation/restoration categories.

Clearwater Focus Program, Idaho Soil Conservation Commission component

(Janet Hohle, ISCC, personal communication, April 30, 2001; Northwest Power Planning Council 1994; Clearwater Policy Advisory Committee 1999)

Goals

- Implement and co-coordinate the NWPPC's Fish and Wildlife Program in the Clearwater River subbasin in cooperation with the Nez Perce Tribe
- Coordinate Idaho State conservation goals with those of the Nez Perce Tribe, NWPPC Fish and Wildlife Program, Endangered Species Act, Clean Water Act, and National Environmental Protection Act
- Coordinate multiple agencies goals and objectives in the Clearwater River subbasin to maximize program success and use of available funding
- Facilitate the Clearwater Policy Advisory Committee

Objectives

- Participate and facilitate subbasin assessment and regional planning processes to organize ecosystem enhancement and restoration efforts
- Facilitate funding coordination and searches for enhancement and restoration implementation throughout the subbasin for plans that emphasize fish and wildlife habitat enhancement or restoration and/or reduction of nonpoint source pollution and other water quality issues
- Provide infrastructure support for the Clearwater Policy Advisory Committee responsibilities
- Provide technical and programmatic support with emphasis on private landowners, soil conservation districts, etc

Strategies

- Coordinate Clearwater River subbasin level participation in the Mountain Snake Provincial review process, completion of the Clearwater Ecosystem Assessment, and subsequent regional planning processes
- Prepare and assist with preparation of funding proposals and project design documentation
- Promote and support funding coordination, cost-sharing, and implementation coordination
- Provide Clearwater PAC with administrative, communication, and technical assistance
- Assist five-subbasin soil conservation districts participation in the NWPPC Fish and Wildlife Program in conjunction with each SCD's specific goals and objectives

- Provide program monitoring coordination for BPA funded projects implemented or managed through SCDs and coordinate monitoring efforts with other programs in the subbasin

Clearwater Policy Advisory Committee

Mission: To foster stewardship of natural resources in the Clearwater River Subbasin, to protect, enhance, and restore watershed health, function, and uses.

Goals and Objectives:

- Improve communication, coordination, and cooperation among subbasin federal, local, Nez Perce Tribe, and state agencies and organizations;
- Participate in the development of a comprehensive subbasin assessment and subbasin planning tool to achieve multiple jurisdictions' stewardship goals;
- Assist the public review process for documents and tools developed.
- Cooperate in the coordinated assessment and evaluation of project development, prioritization, and implementation;
- Collaborate in the design of a monitoring system to evaluate subbasin health.
- Recommend coordinated resource management, research, and information activities that meet the Mission of the Clearwater Policy Advisory Committee.

Clearwater Soil and Water Conservation District

(Clearwater Soil and Water Conservation District 2001)

Goals

- Restore and maintain the chemical, physical, and biological integrity of the Nation's waters as stated in the 1972 Clean Water Act
- Reduce soil erosion and sediment loading and improve soil resources on non-irrigated cropland, rangeland, and riparian areas
- Apply conservation practices that eliminate or reduce nutrient and sediment pollution

Objectives

- Prioritize streams within district for project development
- Reduce soil erosion and other nonpoint pollution from upland land uses
- Develop healthy and respectful working relationships with other agencies and the Nez Perce Tribe with a common goal of conservation

Strategies

- Continue to implement programs in Lolo Creek and Jim Ford Creek watersheds.
- Develop and implement conservation program for Whiskey Creek watershed
- Assist landowners with BMP implementation near 303(d) streams
- Reduce stream temperatures by improving riparian areas and wetlands
- Provide technical assistance to operators to prepare Nutrient Management Plans and BMPs; participate in the Division II-wide Animal Feeding Operation program funded by CWA Section 319 and Idaho State WQPA
- Monitor surface water and groundwater; support state and federal monitoring work

Idaho Conservation Partnership Strategic Plan 2001 (NRCS, ISCC, RC&D, IASCD, IDEQ, IDA)

Goals

- Improve water quality in Idaho State
- Increase quality and decrease loss of agricultural lands in Idaho State
- Reduce sediment production and delivery from agricultural lands in Idaho State
- Promote and facilitate conservation plans addressing noxious/invasive plants, riparian health, threatened/endangered species, fuel management, and vegetation health/diversity

Objectives

- All TMDLs will be completed for water bodies in Idaho State listed under the Clean Water Act Section 303(d) by December 2007
- Watershed plans will be completed and actively implemented for water bodies in Idaho State listed under the Clean Water Act Section 303(d) by 2010
- Erosion on all crop/grazing/forest – lands in Idaho State will be reduced to “T”, the acceptable soil loss for land use criteria defined by the revised “universal soil loss equation”
- Loss of farmland in Idaho State through land use conversion will be reduced 50%
- Sedimentation throughout Idaho State will meet pollution standards specified in respective TMDLs by 2010
- Sediment control practices will be installed on all croplands in Idaho State by 2010
- Conservation plans addressing these objectives will be implemented on all crop/grazing/forest – lands in Idaho State by 2010

Strategies

- Seek and focus appropriate state and federal funding to achieve goals
- Develop educational process for state and federal legislative entities
- Incorporate the Idaho OnePlan
- Explore tax incentive opportunities
- Encourage voluntary participation in conservation actions
- Facilitate Idaho State wide evaluation and assessment of conservation goals and objectives
- Support local leadership infrastructures to achieve goals
- Gain local planning and zoning support for farmland protection

Idaho Department of Lands

(Robert McKnight, IDL, personal communication April 24, 2001).

Goals

- The purpose of the IDL Wildlife Management Policy is to promote biologically sound wildlife habitat management programs for state owned lands that are compatible with the endowment trust principle, and to develop procedures and guidelines for integrating wildlife needs into the resource management planning process

Objectives and Strategies

- Recognize the value of wildlife and their habitats and consider the impacts to wildlife habitat in management plans or projects and where appropriate, take measures that protect or improve important and critical habitat subject to the fundamental mission of support to the endowments

- Avoid any action which will jeopardize or destroy the habitat necessary for the conservation of any threatened or endangered species or species of special concern or knowingly cause a species to become threatened or endangered
- Consider the impacts of our actions in relationship to other landowners and develop cooperative agreements where possible to manage the overall wildlife habitat and access control
- Develop a liaison with the Idaho Fish and Game Department at the local level. Seek consultation regarding the species of wildlife being managed in the project areas, potential impacts of our actions on wildlife, and recommended measures to protect or enhance any important or critical habitat
- The IDL Wildlife Management Policy requires supervisory staff to meet with local wildlife managers to identify wildlife species using the area, locate their habitat and work toward resolving associated resource management conflicts

Idaho Forest Products Commission

(Idaho Forest Products Commission (2000)

Goals

- Increase public understanding that Idaho's forests are a renewable source of important consumer products and environmental values
- Provide and disseminate information about economic and environmental aspects of timber management practices
- Promote public support for Idaho's forest products industry
- Help achieve and maintain a healthy forest products industry through responsible forest stewardship
- Advocate balanced use of forest resources

Idaho Rangeland Resource Commission

(Idaho Rangeland Resource Commission 2000)

Goals

- Increase public understanding that Idaho's rangelands are a renewable resource of important consumer products and environmental values
- To provide and disseminate information about the economic and environmental aspects of grazing management practices
- To promote support for Idaho's livestock industry
- To help achieve and maintain an healthy livestock industry through responsible rangeland stewardship
- To advocate balanced use of rangeland resources

Idaho Soil Conservation Commission

(Boise Central Staff, personal communications, April 26, 2001 – supplied via Janet Hohle)

Goals

- Assist 51 soil conservation districts to deliver natural resource conservation programs.
- Coordinate work with participants of the Idaho Conservation Partnership

- Provide the Idaho State executive and legislative branches with information and education on commission goals and objectives
- Fulfill responsibilities under Idaho water quality law as the state designated agency for agriculture and grazing
- Function as state-level entity to implement Idaho's Agricultural Pollution Abatement Plan

Objectives

- Provide technical and programmatic assistance to soil conservation districts for conservation implementation delivery
- Manage and coordinate Water Quality Program for Agriculture
- Participate in the implementation of the Idaho Conservation Partnership Strategic Plan
- Coordinate with the Office of Species Conservation

Strategies

- Place and support SCC technical staff throughout Idaho in priority areas as funding allows
- Sponsor and support NWPPC coordination work in the Upper Salmon Model Program and the Clearwater Focus Program
- Facilitate Idaho Association of Soil Conservation District technical staff in priority areas
- Coordinate with Idaho Department of Agriculture responsibilities

Idaho Soil and Water Conservation District

(Idaho Soil and Water Conservation District 2001)

Goals

- Encourage and promote BMPs to reduce soil erosion, and enhance water quality
- Improve water quality on 303(d) listed streams
- Improve water quality on the South Fork of Cottonwood Creek
- Improve fish and wildlife habitat

Objectives

- Enhance education and information program
- Continue to support the Red River Meadow Restoration Project
- Coordinate with NRCS and other state and federal agencies engaged in conservation
- Provide technical and administration assistance for the TMDL implementation project on the South Fork Cottonwood Creek and participate in the bi-district Lawyer Creek project

Strategies

- Continue to function as sponsor for the BPA funded Red River Project and provide administrative assistance
- Encourage and provide assistance for conservation planning on private lands
- Encourage and provide assistance for riparian and upland BMP implementation
- Design and implement road treatments in cooperation with Idaho County Road Department
- Design and implement animal waste treatment plans, riparian and crop management plans, and septic system plans through the CWA Section 319 program and Div II-wide WQPA project

Latah Soil and Water Conservation District

(Latah Soil and Water Conservation District 2001)

Goals

- Lead and support landowners, agricultural operators, local communities, and government agencies to collectively identify natural resource issues of concern, review alternative solutions, and undertake local efforts to resolve priority issues using voluntary mechanisms
- Promote individual, local, regional, state, tribal and national planning efforts that recognize, and manage for, the interconnected elements of natural systems and seek sustainable management approaches for the natural resources within the District while providing for the long-term natural resource conservation objectives of land owners and agricultural operators, strengthening the long term health of local economies and protecting the long-term public interest of the community, as a whole
- Lead the voluntary implementation of conservation efforts that seek to simultaneously protect and enhance the long-term productivity of the District's natural resource base while providing for the long-term natural resource conservation objectives of land owners and agricultural operators, protecting the established rights of individual land owners and operators, strengthening the long-term health of local economies and protecting the long-term public interest of the community, as a whole
- Promote efforts to enhance the local communities understanding of ecological systems, the social systems directly dependent upon these natural systems and the political and organizational systems developed for the management of natural resources within the District

Objectives

- Lead local efforts to identify common natural resource issues of concern
- Support local landowner natural resource planning and implementation goals
- Support forest health planning efforts and implementation goals
- Support local efforts to protect and enhance fish and wildlife species with special attention to threatened and endangered species, habitats, and ecosystems

Strategies

- Coordinate programs in watersheds with assessments or TMDL implementation plans
- Participate in the Clearwater River subbasin component of the Mountain Snake Province review process
- Lead efforts to complete planning of the Potlatch River Basin project; lead BMP implementation
- Provide technical and funding assistance for existing local conservation programs

Lewis Soil Conservation District

(Lewis Soil Conservation District 2000)

Goals

- Eliminate or reduce nonpoint source pollution delivery to receiving streams
- Reduce erosion to acceptable levels and to improve soil resources on all lands
- Maintain working relationships with other conservation agencies
- Deliver active public outreach program within the district

Objectives

- Fulfill administrative and technical responsibilities for all existing conservation projects
- Actively participate in all TMDL activities within the district
- Develop resource conservation projects within prioritized watersheds: Little Canyon, Lawyer, Six Mile, Lapwai, Mission, Big Canyon
- Promote riparian, rangeland, and nutrient management programs (e.g., Div II-wide animal feeding operation project) and appropriate BMPs
- Enhance education and information program

Strategies

- Continue to assist landowners with conservation efforts to improve water quality and fish habitat through existing watershed projects and other available funding programs
- Continue implementation of watershed plan in Little Canyon funded by the BPA and the Idaho State WQPA
- Develop and implement a watershed restoration plan/project for Lawyer Creek.
- In conjunction with the Little Canyon Creek project continue the Hatchery in the Classroom project at the Nezperce High School
- Encourage development of riparian areas; focus on demonstration project
- Design method to provide producers assistance with pasture, grazing, and nutrient plans
- Continue information and education program; enhance by increasing partnership contacts

Nez Perce Soil and Water Conservation District

(Nez Perce Soil and Water Conservation District 2001)

Goals

- Develop watershed based resource plans for watersheds within the NPSWCD boundaries
- Cooperate and coordinate in developing watershed plans for watersheds located within multiple conservation districts
- Implement BMPs identified in the watershed plans on all land uses
- Coordinate technical/financial resources for the implementation of BMPs on private lands
- Reduce erosion and improve water quality and fisheries habitat on cropland, forestland, and rangeland resources
- Assist landowners, communities, and tribes in meeting state, local, and federal regulations including the Clean Water Act, Endangered Species Act, and NEPA regulations
- Improve the condition of fisheries habitat including riparian and wetland areas
- Improve grazing land and cropland productivity
- Establish fish and wildlife habitat, water quality and resource condition monitoring programs
- Develop and promote public awareness programs to promote good stewardship

Objectives

- Develop one watershed based resource plan annually
- Conduct one meeting annually to coordinate watershed efforts and technical/financial resources for BMP implementation with local stakeholders
- Implement 50% of the identified BMPs to improve priority fish habitats within 10 years
- Reduce erosion and identified pollutants by 60% in identified priority areas within 10 years
- By 2010, water quality will be improved to meet TMDL standards in identified watersheds

- By 2010, improve riparian and wetland areas to proper functioning condition
- By 2015, improve rangeland condition from “fair” to “good”
- By 2015, reduce cropland and urban erosion to “T”
- By 2005, complete 25% of the identified animal feeding operation improvements
- By 2005, 50% of the streams within the District will be monitored for stream temperature
- By 2005, develop volunteer based stream assessment or improvement projects on 5 streams
- By 2005, implement water quality/fisheries habitat education program targeting the urban public

Strategies

- Assess watershed conditions and identify priority areas for treatment
- Monitor resource conditions and implement additional monitoring sites with landowners
- Install BMPs to improve water quality and fisheries habitat on cropland, rangeland, forestland, and urban resources including roads and stormwater sources
- Identify priority fish habitat enhancement/restoration or protection areas and implement identified BMPs
- Inventory, assess and install BMPs on riparian and wetland areas
- Identify priority erosion control and water quality improvement areas
- Conduct on-site investigations, feasibility analysis and complete designs for identified BMPs
- Inventory, plan and develop alternatives, and develop BMPs for private landowners, units of government, and local interest groups for problems identified in watershed plans
- Identify and obtain commitments from volunteer groups to implement stream monitoring or improvement projects
- Protect and restore freshwater habitats for key species. Restore and increase the connections between rivers and their floodplains and riparian zones
- Coordinate with local conservation partners to implement public awareness/education campaign

U.S. Army Corps of Engineers

Following is the mission statement for programs and activities related to environmental stewardship and the management of natural resources (U.S. Army Corps of Engineers 1996).

- The Army Corps of Engineers is the steward of the lands and waters at Corps water resources projects. Its Natural Resources Management Mission is to manage and conserve those natural resources, consistent with ecosystem management principles, while providing quality public outdoor recreation experiences to serve the needs of present and future generations.
- In all aspects of natural and cultural resources management, the Corps promotes awareness of environmental values and adheres to sound environmental stewardship, protection, compliance and restoration practices.
- The Corps manages for long-term public access to, and use of, the natural resources in cooperation with other Federal, State, and local agencies as well as the private sector.
- The Corps integrates the management of diverse natural resource components such as fish, wildlife, forests, wetlands, grasslands, soil, air, and water with the provision of public recreation opportunities. The Corps conserves natural resources and provides public recreation opportunities that contribute to the quality of American life.

USDA Natural Resources Conservation Service

The following is from the Natural Resources Conservation Service Strategic Plan 2000 – 2005 (USDA Natural Resources Conservation Service 2000)

Goal 1. Enhance natural resource productivity to enable a strong agricultural and natural resource sector.
- Objective 1.1. Maintain, restore, and enhance cropland productivity.
- Objective 1.2. Maintain, restore, and enhance irrigated land.
- Objective 1.3. Maintain, restore, and enhance grazing land productivity.
- Objective 1.4. Maintain, restore, and enhance forestland productivity.

Goal 2. Reduce unintended adverse effects of natural resource development and use to ensure a high quality environment.
- Objective 2.1. Protect farmland from conversion to non-agricultural uses.
- Objective 2.2. Promote sound urban and rural community development.
- Objective 2.3. Protect water and air resources from agricultural non-point sources of impairment.
- Objective 2.4. Enhance animal feeding operations to protect the environment.
- Objective 2.5. Maintain, restore, or enhance wetland ecosystems and fish and wildlife habitat.

Goal 3. Reduce risks from drought and flooding to protect individual and community health and safety.
- Objective 3.1. Protect upstream watersheds from flood risks.
- Objective 3.2. Protect watersheds from the effects of chronic water shortages and risks from drought.

Goal 4. Deliver high quality services to the public to enable natural resource stewardship.
- Objective 4.1. Deliver services fairly and equitably.
- Objective 4.2. Strengthen the conservation delivery system.
- Objective 4.3. Ensure timely, science-based information and technologies.

Strategies

- NRCS will work with the conservation partnership to achieve stated goals and objectives. Detailed lists of strategies pertaining to individual goals and objectives are presented in the Natural Resources Conservation Service Strategic Plan, 2000 – 2005 (USDA Natural Resources Conservation Service 2000).

Research Monitoring, and Evaluation Activities

BPA Funded M&E

Idaho County Soil and Water Conservation District

Implementation and effectiveness monitoring of the Lower Red River Meadow Restoration Project (BPA 199303501) has been ongoing since 1997. The program evaluates revegetation success, construction-related turbidity impacts, stream channel response, floodplain hydroperiod, ground and surface water elevations, riparian/greenline community composition, summer water temperatures, fish habitat area and diversity, spawning substrate quality, fish populations and densities, chinook redd counts, wildlife habitat values, and bird species numbers and diversity.

Idaho Department of Fish and Game

Idaho Natural Production Monitoring and Evaluation Program

The Idaho Natural Production Monitoring and Evaluation program (BPA number 199107300) is a long term project designed to monitor trends in juvenile spring and summer chinook salmon and steelhead trout populations in the Salmon, Clearwater, and lower Snake River drainages (Hall-Griswold and Petrosky 1996). The monitoring approach consists of three integrated levels including parr density monitoring, parr standing stock evaluations, and estimation of survival rates between major freshwater life stages of chinook salmon and steelhead trout. Annual general monitoring of anadromous fish densities is being used to follow population trends and define seeding levels over a broad geographic area, but generally with a small number of sections per stream. Intensive studies estimate spawning escapements, standing stocks of parr and outmigrant yields for a limited number of streams. A comprehensive database has been developed that includes resident and fish species and amphibians observed while monitoring. It is the most requested data by other agencies and consultants. Data from the Idaho Supplementation Studies project and regional data is being added and will provide a more complete picture of anadromous and resident fish population status in Idaho.

Idaho Natural Production Monitoring and Evaluation project

The Idaho Natural Production Monitoring and Evaluation project (Project No. 199107300) funded the Spring/Summer Chinook Salmon Population Viability Assessment initiated in 1999. Population viability analyses use biologically-based models combined with statistical time-series driven methodologies to quantify the extinction risks to a population. Risk of extinction was assessed for 14 core subpopulations of Snake River spring/summer chinook originating in the Selway River and the South Fork, Middle Fork, and mainstem Salmon River of Idaho. Model development and populations viability analyses are still ongoing. The models will be used to estimate population persistence for the specific stocks and to help prioritize potential population conservation intervention actions. The results developed to date are preliminary. Only point estimates of parameter values and point estimates of extinction probabilities have been developed. Confidence intervals, from which inferences on persistence can be made, will follow. In general, extinction-time distributions varied over the populations under study. Models predicted relatively high probabilities of extinction for the populations of the Selway Basin (Bear Creek and mainstem Selway River), the Middle Fork Salmon River (Camas Creek, Loon Creek, Marsh Creek, and Sulphur Creek), and the mainstem Salmon River (Valley Creek and Yankee Fork Salmon River). A relatively high probability of persistence through the next 100 years was predicted for populations of the South Fork Salmon River (Johnson Creek, Secesh River, and mainstem South Fork Salmon River) and the Middle Fork Salmon River (Big Creek and Bear Valley Creek).

Idaho Supplementation Studies

In 1991, the Idaho Supplementation Studies (ISS, BPA project # 198909800) project was implemented to address critical uncertainties associated with hatchery supplementation of chinook salmon populations in Idaho. The project encompasses most anadromous production waters in the Clearwater Salmon River subbasins and was designed to address questions identified in the Supplementation Technical Work Group Five-Year Workplan (Supplementation Technical Work Group 1988). Cooperators include the Idaho Cooperative Fish and Wildlife Research Unit, Idaho Department of Fish and Game, Nez Perce Tribe, Shoshone-Bannock Tribes, and United States Fish and Wildlife Service. Two goals of the project were identified: 1) assess the use of hatchery chinook salmon to increase natural populations in the Salmon and Clearwater river drainages, and 2) evaluate the genetic and ecological impacts of hatchery chinook salmon on naturally reproducing chinook salmon populations. Four objectives to achieve these goals were developed: 1) monitor and evaluate the effects of supplementation on presmolt and smolt numbers and spawning escapements of naturally produced fish; 2) monitor and evaluate changes in natural productivity and genetic composition of target and adjacent populations following supplementation; 3) determine which supplementation strategies (brood stock and release stage) provide the quickest and highest response in natural production without adverse effects on productivity; and 4) develop supplementation recommendations. The complete study design is found in Bowles and Leitzinger (1991). Smolt trapping, parr and smolt PIT-tagging, snorkeling and intensive redd and carcass surveys are used to monitor population parameters in control and treatment streams. Resident fish abundance, distribution and movements are documented, adding to our knowledge of these species. Amphibians are noted as well.

Small-scale studies addressing specific hypotheses of the mechanisms of supplementation effects (e.g., competition, dispersal, and behavior) have been completed (Peery and Bjornn 1993, 1994, 1996). Baseline genetic data have also been collected (Marshall 1992, 1994).

Steelhead Supplementation Studies

The Steelhead Supplementation Study (SSS, BPA project # 190005500) was initiated in 1992 to help determine the utility of supplementation as a potential recovery tool for steelhead, primarily in areas where the native stock was extirpated or reduced to very low abundance. This project has estimated smolt production from hatchery adult outplants, monitored wild steelhead escapement in Fish Creek, estimated smolt production in Fish Creek, and PIT-tagged juvenile steelhead to obtain migration characteristics, growth rates, and smolt-to-adult survival. Additionally, the project estimated age of adult and juvenile steelhead, monitored juvenile abundance in tributaries of the Selway and Lochsa rivers, and monitored stream temperature in 40 streams. Distribution and abundance of resident fish species are documented as well.

In 2000 the project collected fin samples from wild juvenile steelhead in 70 streams and from the five hatchery stocks raised in Idaho in 2000. These data will be used to determine the evolutionary significance and genetic population structure of Idaho's steelhead assemblage in relationship to the recent listing of steelhead under the Endangered Species Act, and to judge their genetic relationship with other coastal and interior steelhead trout and hatchery populations.

Dworshak Dam Impacts Monitoring and Evaluation

Dworshak Dam Impact Assessment and Fishery Investigation Project (BPA project number 8709900) examines the effects of the operation of Dworshak Dam on resident fishes in

Dworshak Reservoir. Past research concentrated on assessing reservoir limnology, conducting creel surveys, monitoring the kokanee population through annual mid-water trawling and/or hydroacoustic surveys, conducting annual kokanee spawning escapement estimates, and monitoring entrainment.

Current research is focused on improving kokanee densities in the reservoir by reducing entrainment. Reducing entrainment losses of kokanee may also benefit other species by: lessening entrainment of other sportfish, providing more prey (small kokanee) for bull trout, and allow nutrients (in the form of kokanee spawners) to move upstream into the tributaries.

Evaluation of Pacific Lamprey in the Clearwater River Drainage, Idaho

An evaluation of Pacific lamprey life history, distribution and status in the Clearwater drainage was initiated in 2000 under BPA project # 2000-028-00. Objectives of the project are to 1) Determine life history characteristics of Pacific lamprey ammocoetes and macrothalmia in the Clearwater River drainage, 2) Determine habitat requirements of Pacific lamprey in the Clearwater drainage and 3) Determine distribution of Pacific lamprey in the South Fork Clearwater River drainage. The project started in the South Fork Clearwater River drainage because lamprey ammocoetes have been incidentally caught in the Idaho Supplementation Studies smolt trap in Red River since 1993. Randomly selected transects in 1 km sections were electrofished using shockers designed specifically for sampling ammocoetes. Transects were located in Red River. Spot sampling also occurred in the mainstem South Fork, American River and Newsome Creek. Ammocoetes were located in sand/fine gravel substrate located behind large boulders in Red River and the South Fork mainstem. Elastomer tags were used to mark ammocoetes for identification if recaptured. Prior to this project, ammocoetes were sent to the USGS lab at Cook, WA for positive identification, transformation, aging and subsequent genetic sampling as part of a Columbia Basin lamprey project. Ammocoetes were also provided for genetic analysis to researchers at the CRITFC. Future sampling will increase the number of sites both within drainages already sampled and in new tributaries within the South Fork Clearwater drainage.

Production impacts of Various Hatchery Stocks and Evaluate Selway Steelhead as Alternate Broodstock for South Fork Clearwater River

This combined study was initiated in 1993 by the Idaho Department of Fish and Game and the National Biological Survey (NBS). The NBS portion was funded by BPA Project # 9005200. The purposes of the study were twofold. First, the study was designed to compare growth, survival and reproductive success of fish from established hatchery stocks and from wild stocks, both reared in natural streams and in hatcheries. Dworshak (North Fork Clearwater) B-run and wild Selway B-run fish were collected in Brood Years 1993, 1994 and 1995, and their progeny raised and released as unfed fry, one and two year old smolts into Crooked River (South Fork AU). The smolts were differentially marked, a portion PIT-tagged, and all monitored through juvenile migration and adult return. Returning adults were identified to broodstock when possible, radiotagged and spawning activity documented. The study is ongoing with the last of the adults expected to return in 2002. A final report will then be written. The second purpose was to evaluate whether Selway fish would be a more suitable broodstock for the South Fork Clearwater River. Since the removal of Harpster Dam in the 1970's, restoration of steelhead trout in the South Fork Clearwater River has been slow, even with extensive outplants of Dworshak broodstock steelhead, both juveniles and adults. Selway River steelhead were chosen for the donor stock because of the similarities to the South Fork Clearwater River drainage and the presence of the Selway fish tunnel which facilitated capture. Progeny of naturally spawning research and wild/natural fish returning to Crooked River are being sampled for genetics, marked with a PIT-tag, and their downstream migration and return as adults followed. Genetic samples are currently backlogged without funding to analyze.

Red River Wildlife Management Area

The 314 acre Little Ponderosa Ranch near Red River, Idaho, was purchased in September 1993 and renamed the Red River Wildlife Management Area (RRWMA). Funds to purchase the area came from BPA mitigation funds (Project 9303500), the Rocky Mountain Elk Foundation and Trout Unlimited, sponsored by the Bureau of Land Management (BLM) for a "Bring Back the Natives" grant through the National Fish and Wildlife Foundation. The management goals for the area are 1) Manage the area to maintain and/or enhance quality wildlife, fisheries, scenic values, and overall biodiversity through ecosystem-based management, 2) Provide a setting for natural resource-oriented educational, research and study opportunities through cooperative efforts with federal, state, and private groups or individuals, 3) Provide a meeting facility for natural resource-oriented agencies and organizations, and the local community, and 4) Promote continued use of the RRWMA for recreational purposes consistent with wildlife, fisheries, and educational goals. The Red River Wildlife Management Area Plan (Idaho Department of Fish and Game 1999a) outlines specific objectives and strategies for the RRWMA. A plan was also developed in 1996 to outline opportunities for potential educational programs at the RRWMA.

The RRWMA was the site of phases 1-4 of the Red River Restoration Project (BPA Project 199303501). Monitoring and evaluation activities for that project are ongoing. Grants obtained through BLM have enabled the construction of a watchable wildlife platform, interpretive signs, nature trail, and other educational endeavors. The RRWMA is one of four sites used by the National Science Foundation (NSF) and University of Idaho (UI) for a stream restoration summer course. Participants are at risk\low income students (two from local communities, two from California) that show academic promise and community involvement. A combined grant from BPA, NSF and Communities Creating Connections funded two remote cameras, one from the ranch house and one in Red River. The cameras are linked to a computer in the ranch house, and live images can be viewed from the Internet. Local schools and the UI also regularly use the RRWMA as an outdoor classroom. To date all operating costs associated with other wildlife surveys and habitat improvements, as well as facilities upkeep, has come from facility user fees and grants. Since these monies are limited, there is a need for funding to develop and maintain the facilities, conduct monitoring surveys and fully realize the educational plan.

Lewis Soil Conservation District

BPA Project No. 199901400. BMP effectiveness monitoring on practices that have been installed on upland agricultural lands. Visual and photo point inspection. Water quality monitoring in coordination with Idaho Association of Soil Conservation Districts and the Nez Perce Tribe which are non-BPA funded projects.

National Marine Fisheries Service

NMFS has directed a genetic monitoring and evaluation project since 1989 (BPA project number 8909600). The program is examines the effects of genetic mixing of hatchery and wild salmon and steelhead at the Dworshak hatchery are measured in quantifiable terms through genetic analysis of released and returning fish populations.

Nez Perce Soil and Water Conservation District

BPA Project No. 199901500. BMP effectiveness monitoring on practices that have been installed on upland agricultural lands. Visual and photo point inspections. Water quality monitoring in coordination with Idaho Association of Soil Conservation Districts and the Nez Perce Tribe's Water Resources Department, which are non-BPA funded projects.

Nez Perce Tribe

NPT Ongoing Fisheries Research Projects

- Nez Perce Tribal Hatchery M&E Monitoring and Evaluation (8335003)
- Idaho Salmon Supplementation Studies (8909802)
- Evaluate Potential Means of Rebuilding Sturgeon Populations in the Snake River Between Lower Granite and Hells Canyon Dams (9700900)
- Listed Stock Gamete Preservation Project (9703800)
- Assessing Summer and Fall Chinook Salmon Restoration (9403400)
- Fall Chinook Yearling Monitoring and Evaluation (9801004)

New Fisheries Research Projects

- Adult Steelhead Abundance Monitoring and Quantification of Smolt-to-Adult Survival through Use of PIT Tag Technology in Big Canyon Creek.

Monitoring and Evaluation - Fish

Monitoring and evaluation programs evaluate the performance and status of Hatchery M&E, natural fish (abundance and distribution), genetic structure, life history diversity, ecological interactions, habitat capacity, effectiveness of management actions (reintroduction/supplementation), and sustainability of harvest. These are currently being addressed through five major research projects: Idaho's Salmon Supplementation Studies, Nez Perce Tribal Hatchery M&E, Steelhead Supplementation Studies in Idaho Rivers, Fall Chinook Salmon Reintroduction Feasibility Study, and Hatchery M&E programs.

Approaches to monitoring population status and the benefits and impacts from supplementation actions for spring and fall chinook salmon have been developed by Bowles and Leigtzinger 1991, Steward 1996, and Hesse and Cramer 2000, and Byrne 1992.

Treatment and control streams have been established as part of ongoing programs conducted by the Nez Perce Tribe, Idaho Department of Fish and Game and U.S. Fish and Wildlife Service for spring chinook, fall chinook and B-run steelhead. Treatment and control streams within the Clearwater subbasin and the responsible cooperator are

Nez Perce Tribal Hatchery

- Lolo Creek, M&E treatment, NPT: ongoing
- Meadow Creek (Selway), M&E treatment, NPT: ongoing
- Yoosa Creek, M&E treatment, NPT: ongoing
- Eldorado Creek, M&E control, NPT: ongoing
- Newsome Creek, M&E treatment, NPT: ongoing
- Clearwater River, M&E treatment for fall chinook salmon, NPT: ongoing
- Selway River, M&E treatment for early fall chinook salmon, NPT: proposed
- Lower Lochsa River, M&E control for early fall chinook salmon, NPT: proposed
- South Fork Clearwater River, M&E treatment for early fall chinook salmon, NPT: proposed

Idaho Supplementation Studies

- Crooked River, M&E treatment, IDFG: ongoing
- American River, M&E control, IDFG: ongoing
- Red River, M&E treatment, IDFG: ongoing
- Clear Creek, M&E treatment, USFWS: ongoing
- White Cap Creek, M&E control, IDFG: ongoing
- Pete King Creek, M&E treatment, USFWS: ongoing
- Fishing (Squaw) Creek, M&E treatment, NPT: ongoing
- Bear (Papoose) Creek, M&E treatment, NPT: ongoing
- Colt Killed Creek, M&E treatment, IDFG: ongoing
- Big Flat Creek, M&E treatment, IDFG: ongoing
- Crooked Fork Creek, M&E control, IDFG: ongoing
- Brushy Fork Creek, M&E control, IDFG: ongoing

Steelhead Supplementation Studies

- Fish Creek, M&E, control, IDFG: ongoing
- Clear Creek, M&E, control, IDFG/USFWS: ongoing
- Red River, M&E, treatment, IDFG: ongoing
- Gedney Creek, M&E, control, IDFG: ongoing

Hatchery Monitoring and Evaluation

- Crooked River, M&E, treatment, IDFG: ongoing
- Red River, M&E, treatment, IDFG: ongoing
- Walton Creek, M&E, treatment, IDFG: ongoing

The Nez Perce Fisheries/Watershed Program has an existing M&E strategy for ongoing projects, and is finalizing development of a more comprehensive watershed scale M&E plan. The plan currently being developed will be incorporated into each watershed where restoration projects are on-going or proposed, and will establish baseline and trend data related to ecosystem function in these areas.

In addition, each on-the-ground project has an M&E plan that determines if the project is successful in meeting its objective(s), how it contributed to the overall health of the ecosystem, and is used as a feedback loop into future project development. On-the-ground project M&E has been developed for the following on-going BPA projects:

- Protect and Restore Bear to Fishing Creek Watersheds (199607709)
- Protect and Restore Big Canyon Creek Watershed (199901600)
- Protect and Restore Lapwai Creek (199901700)
- Protect and Restore Lolo Creek Watershed (199607702)
- Protect and Restore Mill Creek Watershed (200003600)
- Protect and Restore North Lochsa Face Analysis Area Watersheds (200003400)
- Restore McComas Meadows/Meadow Creek Watershed (199607705)
- Rehabilitate Newsome Creek Watershed (00004494)

Non-BPA Funded M&E

Clearwater National Forest

The Clearwater National Forest develops annual monitoring and evaluation plans (Murphy et al. 2000). The primary goal of monitoring is to determine if land management activities are meeting Forest Plan standards and objectives (Murphy et al. 2000).

The CNF divides monitoring strategy into two major areas, including on-site and instream monitoring. On-site monitoring includes baseline, implementation, BMP effectiveness and PACFISH and INFISH compliance. Instream monitoring addresses the relationship between land disturbance activities and water quality and fisheries habitat. It includes baseline, effectiveness, and validation monitoring (Murphy et al. 2000).

Clearwater Soil and Water Conservation District

Water quality monitoring in Water Quality Program for Agriculture projects, Lolo Creek and Jim Ford Creek watersheds.

Idaho Association of Soil Conservation Districts

Water quality monitoring throughout subbasin on agricultural lands located in watersheds with streams on the 1998 Section 303(d) TMDL list, in cooperation with conservation districts. Streams include: Big Canyon, Cottonwood (Idaho County), Lindsay, Little Canyon, and upper Lapwai.

Idaho Department of Fish and Game

The IDFG has monitored chinook salmon returns through redd count surveys within the Clearwater subbasin since 1966, and intermittently for steelhead trout since 1990. Redd counts through aerial and ground surveys provide both baseline and population trend information, as well as some potential for future predictions of population trends based on spawner-recruit theory.

An extensive monitoring and evaluation program documents hatchery practices and evaluates the success of hatchery programs at meeting LSRCP mitigation objectives and IDFG management objectives, and to monitor and evaluate the success of supplementation programs. The IDFG-LSRCP hatchery monitoring and evaluation program identifies hatchery rearing and release strategies that will allow the LSRCP program to meet its mitigation requirements and improve the survival of hatchery fish while avoiding negative impacts to natural (including listed) populations. Continuous coordination between the Hatchery Evaluation Study and IDFG's BPA-funded supplementation research project is required because these programs overlap in several areas including juvenile outplanting, broodstock collection, and spawning (mating) strategies.

Selway Falls Fish Tunnel Rehabilitation

The Selway River anadromous fish passage tunnel was constructed in the 1960's and has provided an alternative route for movement above Selway Falls, particularly during periods of drought or extremely high flows originating in the Selway River drainage. Species of particular concern include steelhead trout, chinook salmon, bull trout, and Pacific lamprey. The infrastructure of the passage tunnel has deteriorated over the past 40 years and does not provide the optimum passage conditions as initially having. The interior baffles no longer function to slow water movement and the upper headgate facility does not operate effectively to control flows through the tunnel.

Based on radio telemetry in 1999, Idaho Department of Fish and Game personnel found that less than 60% of steelhead trout, staging at the entrance to the tunnel, eventually migrated above the falls. The fish that did not move above the falls apparently did not enter tributaries below the falls for spawning purposes either.

In 1999 the Idaho Department of Fish and Game contracted with Nicholls Engineering, Spokane, WA., to determine the extent of the deterioration and develop estimates for renovating the facility. The lack of optimum passage conditions could delay or deter some portion of the fish runs to move above the falls. Reconstruction would result in better passage conditions above Selway Falls into pristine anadromous and resident fish habitat which at this time is sorely underseeded. Better passage conditions can translate into more fish utilizing the excellent spawning and rearing habitat available. The overwhelming bulk of the habitat above Selway Falls lies within the Selway-Bitterroot Wilderness area.

Bull Trout Investigations in the North Fork Clearwater River Drainage

The completion of Dworshak Dam in 1971 eliminated anadromous fish runs and the impacts on resident fish species in the basin are not clear. It is assumed that the construction of Dworshak Dam significantly reduced the distribution, abundance and population viability of native resident fish populations above the dam, but information to support this assumption does not exist. Dworshak Dam has possibly isolated and fragmented the Clearwater River bull trout populations(s). The impact(s) of severing the migratory corridor between the North Fork Clearwater River (NFCR) and mainstem Clearwater River could be critical in sustaining a viable bull trout population upstream of Dworshak Dam. While direct assessment of the change in bull trout population dynamics is not feasible, assessment of current viability in the North Fork is possible. This study, which began in 2000, attempts document and assess bull trout populations in the NFCR drainage, and to assess the bull trout population in Fish Lake, and its relationship to the rest of the North Fork. This study is a cooperative project between IDFG and the Clearwater National Forest. Objectives of the study include 1) Determine migration patterns of bull trout within the NFCR, 2) Determine spatial and temporal distribution of bull trout within Dworshak Reservoir and the North Fork Clearwater drainage, 3) Identify bull trout spawning sites within the NFCR and 4) Obtain basic life history information on bull trout within Dworshak Reservoir and the NFCR. In 2000, 59 bull trout were captured in Dworshak Reservoir, and 21 of those were implanted with radio transmitters. Within this group, 44% migrated into Black Canyon, 25% migrated into Kelly Creek drainage, 6% migrated into Weitas Creek, and 25% remained in the North Fork Clearwater River downstream of Skull Creek. Redd surveys were conducted in six drainages, the majority of redds found in Lake Creek, the outlet of Fish Lake. Research continues in 2001.

Dworshak Terrestrial Resources Inventory Project

In early 2000, IDFG entered in a contract with the USACE to perform surveys along Dworshak Project and adjacent lands. The objectives of this study are to compile fungi, plant, and wildlife species lists, locate special status species, and identify important habitats of special status species and target species (raptors, deer and elk). Data from this study will be used to develop resource objectives for the USACE's Dworshak Master Plan Update and Supplemental Environmental Impact Statement. Preliminary findings from 2000 include

- >200 fungi species, sixteen of which are classified as "Survey and Manage Species" by the US Forest Service. 81 lichen species, 11 ranked "rare" by McCune (1994).103

bryophyte species, 5 ranked "rare" by Christy and Harpel (1997).440 vascular plant species, 13 with Federal special status.
- 6 amphibian species, 3 with Idaho State and Federal special status.
- 4 reptile species, 1 with Federal special status.
- 100 bird species, 1 with Idaho State and Federal special status.
- 22 mammal species, 2 with Idaho State and/or Federal special status.

Surveys will continue through 2001, and results will be incorporated into a final report prepared by IDFG and the USACE in 2002. Additionally, IDFG will identify management concerns and provide recommendations for managing Dworshak Project lands. Management topics currently identified include
- potential impacts of prescribed burning on rare plant species,
- protection of rare plant populations,
- impacts of water level fluctuations on amphibians, waterfowl, and vegetation and creation of wetland pools in the reservoir's draw-down zone,
- impacts of stray cattle and introduced bullfrogs on the integrity of existing wetlands and Columbia spotted frogs populations,
- construction of a bat gates at adits/caves known to host bats,
- protection of active bald eagle and goshawk nests,
- review and adjust elk and deer mitigation management objectives to reflect changing needs and landscape level opportunities

Idaho Department of Environmental Quality

The Beneficial Use Reconnaissance Project (BURP), and the Water Body Assessment Guidance (WBAG) program monitor and assess the physical, chemical, and biological integrity of water bodies in Idaho. Waters identified as potentially impaired undergo a more rigorous water quality Sub-basin Assessment that incorporates all available information and focuses on the cause and extent of impairments for development of a Total Maximum Daily Load (TMDL) if necessary.

BURP relies heavily on macroinvertebrate sampling, habitat evaluation and measurement, bacterial sampling, and fish sampling. The BURP protocol closely follows USEPA's *Rapid Bioassessment Protocols for Use in Streams and Rivers*. BURP data also documents existing uses, which must then be designated and protected under Idaho's water quality standards. It is the goal of the state to re-monitor water bodies on a rolling five year schedule.

The WBAG was designed to use BURP data to answer questions about stream integrity, water quality, and beneficial use support status. It originally consisted of multi-metric indexes for macroinvertebrates and habitat, qualitative and quantitative fisheries assessments, and evaluation of criteria exceedances. Assessments of BURP data collected from 1994 through 1996 were conducted to generate the 1998 list of impaired waters required under section 303(d) of the CWA. Revisions to the assessment methodology are currently underway that would allow the use of more types of data, revise the macroinvertebrate and habitat indexes, add a multi-metric fish index, revise the salmonid spawning beneficial use assessment, and add an interpretation of criteria exceedances in the assessments. The revised water body assessment methodology is expected to be completed in 2001 for use in the next 303(d) and 305(b) reporting cycles, and in ongoing TMDL sub-basin assessments.

The Idaho Department of Environmental Quality also manages databases related to a coordinated temperature monitoring program within the Clearwater subbasin which began in 2000. Approximately 300-400 locations in the Clearwater subbasin are monitored by one of nine different agencies including Idaho Department of Environmental Quality, Idaho Department of Fish and Game, Nez Perce Tribe, Clearwater and Nez Perce National Forests, National Biological Survey, U.S. Geologic Survey, Bureau of Land Management, and the Soil Conservation Commission (Dan Stewart, Idaho Department of Environmental Quality, personal communication, April 6, 2001). The program will ensure consistent data collection and handling and minimize duplication of effort.

Idaho Soil Conservation Commission

Water quality monitoring in the Potlatch River based on priority watersheds identified in Schriever and Nelson. 1999. *Potlatch River Basin Fisheries Inventory.*

Nez Perce National Forest

The Nez Perce National Forest annual monitoring plans for soil, air, water and fisheries on an annual basis. The most recent of these documents is for the fiscal year 2000 (Howard 2000). Annual monitoring plans attempt to meet the requirements of both the Forest Plan and Idaho State water quality standards.

Monitoring activities within the NPNF plan are categorized as baseline, trend, implementation, effectiveness or validation, with many projects including elements of multiple categories. Baseline monitoring includes information which characterize existing conditions and may also serve as indicators of long-term trends. Implementation monitoring determines if plans have been constructed or put into effect as designed. Effectiveness monitoring determines whether and to what degree implemented practices were effective at accomplishing their objectives. Validation monitoring is used to test assumptions in the Forest Plan or predictive models (Howard 2000).

Nez Perce Soil and Water Conservation District

Water quality monitoring in Big Canyon Creek and Hatwai Creek.

U.S. Bureau of Land Management

The Bureau of Land Management, Cottonwood Field Office, annually monitors baseline conditions, long term trends, BMP/mitigation implementation, and BMP/mitigation effectiveness. Fisheries and water quality objectives have been identified in the BLM Management Framework Plan. Annual monitoring has also been identified in Section 7 consultation (Endangered Species Act) for listed fish for various proposed and ongoing BLM projects/activities. The primary goal of monitoring is to address the relationship of land use activities effects on fish, aquatic habitats, riparian habitats, and water quality.

In summary monitoring efforts are conducted to determine if land management activities are meeting Management Framework Plan standards and objectives, compliance with Section 7 consultation (ESA), PACFISH compliance, and meeting state water quality/Clean Water Act requirements (e.g., management effects/303(d) streams).

Statement of Fish and Wildlife Needs

The following list(s) include specific immediate or critical needs defined collectively by fish and wildlife resource managers within the Clearwater subbasin. Needs have been defined to address limiting factors to fish and wildlife, ensure that gaps in current data or knowledge are addressed, enable continuation of existing programs critical to successful management of fish and wildlife resources, and to guide development of new programs to facilitate or enhance fish and wildlife management.

Needs have been grouped into three broad categories. Both aquatic and terrestrial needs have been identified, as well as combined aquatic and terrestrial needs which apply equally to both resource groups. The order in which needs are listed in no way implies priority. Restoration efforts directed at either aquatic or terrestrial resources are likely to impact the ecosystem as a whole and aquatic and terrestrial needs are not perceived to be mutually exclusive.

Combined Aquatic and Terrestrial Needs

1. Develop and implement BMPs on agricultural, mining, grazing, logging and development activities to protect, enhance, and/or restore fish and wildlife habitat, streambank stability, watershed hydrology, and floodplain function.
2. Synthesize historic and existing fish and wildlife resource data to determine what is known about the subbasin, and identify gaps for more efficient and meaningful assessment, monitoring and evaluation work.
3. Develop and implement comprehensive and consistent subbasin databases related to both aquatic and terrestrial resources and establish a centralized data repository. This will promote more effective resource management.
4. Coordinate M&E efforts at the subbasin and provincial scale to maximize effectiveness and minimize redundancy.
5. Continue ongoing, and establish new, monitoring and evaluation programs for fish supplementation, habitat restoration and improvement, habitat baseline conditions, water quality and water quantity improvements, conditions and trends. These M&E activities are critical to evaluating the effectiveness of projects in improving habitat, watershed health and enhancing production of target species.
6. Investigate effects of potential loss or lack of nutrients due to declines in anadromous salmonid populations, and coordinate and evaluate nutrient enhancement alternatives.
7. Complete road inventories and assess impacts to aquatic and terrestrial resources. Use information to facilitate transportation planning and to reduce road densities. Support planned road closures on public land and encourage closure of other roads.
8. Continue and expand the cooperative/shared approach in research, monitoring and evaluation between tribal, federal, state, local and private entities to facilitate restoration and enhancement measures. Protection and restoration of fish and wildlife populations and habitat will not be successful without the interest and commitment by all.
9. Acquire lands when opportunities arise for improved habitat protection, restoration, and connectivity and for mitigation of lost fish and wildlife habitat (land purchases, land trusts, conservation easements, landowner cooperative agreements, exchanges).
10. Protect existing pristine and key fish and wildlife habitats directly threatened by subdivision, recreation, or extractive resource uses.
11. Complete detailed 6th code subwatershed assessments to ground-truth existing regional databases

12. Support timely updates and resource inventories related to local land use plans to further prevent degradation of floodplains, wetlands, riparian and other sensitive areas.
13. Continue to develop watershed assessments at multiple scales to facilitate integrated resource management and planning efforts.
14. Develop Federal Recovery Plans for threatened and endangered species to provide recovery guidance for state, tribal and local entities as required by law.

Fisheries / Aquatic Needs

General

1. Develop catchable fish ponds in the subbasin to provide fishing opportunities. Catchable fish ponds are needed to provide opportunity as more restrictive regulations are implemented to protect native fish species. They are also needed as resident fish substitution to partially mitigate for loss of anadromous fish caused by the permanent blockage at Dworshak Dam harvest .
2. Continue ongoing mitigation programs to provide sport and tribal fisheries
3. Ensure natural river strategy alternative is implemented as required for recovery of listed anadromous species.
4. Improve and maintain quality control of fish marking programs.
5. Re-establish a smolt trap facility on the lower Clearwater River to determine migration characteristics and timing, hatchery:wild ratio, and to implant and recover tags for in-basin and out-of-basin monitoring.

Water Quality

1. Continue coordinated temperature monitoring throughout the subbasin. Identify spatial and temporal gaps, establish additional flow and temperature gauging stations and upgrade existing to provide real-time data, and expand longitudinal profiles. Fish distribution and habitat quality are highly influenced by water temperature. This parameter most be monitored in both wilderness and managed watersheds to provide baselines to evaluate population recovery and watershed restoration activities.
2. Reduce stream temperature, sediment and embeddedness to levels meeting appropriate standards for supporting self sustaining populations of aquatic species.
3. Restore and augment streamflows at critical times using (but not limited to) water right leases, transfers, or purchases, and improved irrigation efficiency.
4. Reduce impacts from agricultural sediment, fertilizer, pesticide loading, confined animals operations, stormwater and road runoff, wastewater effluent, mining and logging.

Habitat / Passage

1. Protect and restore riparian and instream habitat structure, form and function to provide suitable holding, spawning and rearing areas for anadromous and resident fish.
2. Protect, restore and create riparian, wetland, and floodplain areas within the subbasin and establish connectivity.
3. Develop regional curves based on existing stream gauge data and specific to individual hydro-physiographic provinces within the basin for use as aids in channel morphology monitoring and in channel stream course modification/restoration. Where existing stream gauge data is not sufficient to develop regional curves, expand this network.
4. Restore a more normal hydrograph to altered watersheds by addressing land use activities through implementation of BMPs and other restoration strategies.

5. Inventory natural and artificial passage barriers within the subbasin and evaluate if removal or modification is warranted.
6. Investigate connectivity between populations and the role of natural and artificial barriers in population isolation. Remove or modify identified natural or artificial passage barriers where aquatic considerations have been met.
7. Complete culvert inventory and assess associated passage and flow issues. Evaluate whether removal or modifications are warranted.
8. Renovate the Selway Falls Fish tunnel to restore upstream passage for adult chinook, steelhead and Pacific lamprey into pristine habitat in the upper Selway River drainage.

Genetic Conservation

1. Continue gene conservation efforts (cryopreservation) for fall chinook salmon and steelhead in the subbasin.
2. Develop gene conservation efforts (cryopreservation) to preserve genetic diversity within the geographic population structure for bull trout and cutthroat trout.
3. Develop conservation hatcheries with native steelhead broodstock.

Hatch-Wild Interactions

1. Continue and expand investigations of interactions between hatchery and wild chinook, steelhead, and resident fish.
2. Quantify the types and extent (amount) of straying by chinook and steelhead occurring within subbasins, within the Mountain Snake Province, and within designated ESUs.
3. Complete a province-wide chinook salmon genetic assessment which will provide a baseline for monitoring hatchery introgression into wild populations.
4. Continue and expand genetic profiling to define steelhead sub-populations within the subbasin to determine geographic structure, gene flow, genetic similarity and hatchery introgression into wild populations.

Resident Fish

1. Enhance and diversify the fishery within Dworshak Reservoir
2. Assess the status of native species that have received little attention to date. In particular, westslope cutthroat trout, bull trout, sand roller and Pacific lamprey appear to be well below historic population levels. Collect life history, distribution, abundance by life stage, genetic and homing behavior attributes.
3. Determine habitat requirements and limiting factors for Pacific lamprey production in the subbasin and assess the rehabilitation potential and process in the subbasin.
4. Determine habitat requirements, distribution, and limiting factors of sand roller.
5. Monitor impacts of illegal, incidental, sport and Tribal harvest on resident native populations.
6. Determine distribution of introduced non-native species and their effects on native fish, including predation and competition. Control numbers and distribution of exotic species where feasible.
7. Investigate the existence, life history, genetics of redband trout in the subbasin. Include populations in allopatry and sympatry with steelhead, identifying genetic and spatial segregation and overlap using current DNA-marker and GIS technology.
8. Determine how flow augmentation effects bull trout in the North Fork and Lower Clearwater Rivers.

9. Determine the extent and magnitude of entrainment of resident fish including bull trout and kokanee from Dworshak Dam and develop and implement methods to minimize entrainment as appropriate.
10. Monitor bull trout and westslope cutthroat trout population size in Dworshak Reservoir.
11. Determine and implement ways to increase the productivity of Dworshak Reservoir.
12. Develop more "fish friendly" operations at Dworshak Dam.

Chinook Salmon (Includes all races unless specifically noted)

1. Gather improved population status information for wild, natural and hatchery chinook salmon including life history characteristics, juvenile and adult migration patterns, juvenile rearing areas, adult holding areas, survival factors, smolt-to-adult survival, adult spawner abundance, distribution, timing and parentage, spawning success, and spawner to spawner ratios. Improvements should include maximizing the use of spatial technology (GIS) in data collection. Mechanism is through continued and expanded Idaho Supplementation Studies and Idaho Natural Production Monitoring Program.
2. Calculate returns per spawner from index surveys to determine if this relationship is improving as smolt passage facilities are modified at Columbia River dams.
3. Monitor spring chinook by examining population trends and develop modeling and monitoring tools to determine out-of-basin impacts to Clearwater subbasin chinook.
4. Continue to monitor and evaluate impacts of Dworshak dam on spawning and rearing of fall chinook salmon in the Lower North Fork and mainstem Clearwater Rivers.
5. Continue evaluating reintroduction efforts for fall chinook salmon.
6. Determine the extent of natural production from outplanting hatchery adults

Coho Salmon

1. Continue to determine smolt-to-adult survival, survival factors, life history characteristics, and extent of natural production of hatchery origin coho salmon.
2. Continue to develop coho salmon adult spawner escapement and spawner numbers, spawner to spawner ratios, locations, and timing.
3. Determine the spatial distribution within streams and throughout the subbasin of adult coho salmon.
4. Monitor the inter-species specific interactions of coho salmon juveniles.
5. Examine the genetic stock structure of Clearwater River subbasin coho salmon in relation to initial broodstock.

Summer Steelhead

1. Determine smolt-to-adult return rates (SAR) for hatchery steelhead in the Clearwater River.
2. Gather improved wild, natural, and hatchery A-run and B-run steelhead population status information including tributary specific life history characteristics, juvenile and adult migration patterns, juvenile rearing areas, adult holding areas, survival factors, smolt-to-adult survival, adult spawner abundance, distribution, timing and parentage, spawning success, and spawner to spawner ratios. Improvements should include maximizing the use of spatial technology (GIS) in data collection. Mechanism is through continued and expanded Idaho Supplementation Studies and Idaho Natural Production Monitoring Program.
3. Validate index areas for summer steelhead to ensure they are appropriate measures of productivity.

4. Need to calculate returns per spawner from index surveys to determine if this relationship is improving as smolt passage facilities are modified at Columbia River dams.
5. Monitor adult movement to determine if and where passage impediments exist within the basin for summer steelhead.
6. Develop an evaluation program to determine the effectiveness of releasing unmarked hatchery steelhead to re-build runs in Clearwater River tributaries
7. Determine the efficacy of using dorsal fin erosion to identify un-marked hatchery steelhead.
8. Determine the extent of natural production from outplanting hatchery adults
9. Expand supplementation evaluation studies in the South Fork Clearwater River to address effectiveness of juvenile and adult steelhead outplants.

Monitoring and Evaluation

1. Develop appropriate intensity and spatial distribution of monitoring to estimate parr carrying capacity to compliment and enhance Natural Production Monitoring..
2. Refinement of aquatic life beneficial use monitoring and assessment methods to better focus restoration efforts.
3. Develop a comprehensive M&E plan for Dworshak Dam operations.
4. Continue Nez Perce Tribal Hatchery Monitoring and Evaluation to determine hatchery chinook performance, natural production responses, competitive interactions, harvest management and provide for applied adaptive management.
5. Continue Lower Snake River Compensation Hatchery Monitoring and Evaluation to determine hatchery chinook and steelhead performance, natural production responses, competitive interactions, harvest management and provide for applied adaptive management.

Enforcement / Education

1. Better educate the public on issues and policies important to natural resource restoration, protection, and enhancement to encourage meaningful public participation.
2. Continue and improve enforcement of laws and codes related to protection of fish, wildlife and their habitats, through coordinated conservation enforcement activities by the Nez Perce Tribe, state and Federal agencies.

Wildlife / Terrestrial Needs

General

1. Construct a detailed GIS based wildlife habitat map by watershed for the entire subbasin. This would include providing personnel and equipment to search available databases for existing coverages, digitizing existing wildlife information currently not available in GIS format, and identifying key areas.
2. Research broad ecological relationships and identify limiting factors for focal and other wildlife species within the subbasin.
3. Fund the establishment of techniques, surveys, and programs to assess the health and trend of wildlife, wildlife habitat, and overall biodiversity in the subbasin. Existing surveys and information are inadequate to assess distribution, abundance, or trends of most plant and animal species in the subbasin, making it difficult to protect species or to evaluate progress toward goals stated in this summary.
4. Address and mitigate hydropower impacts on loss of wildlife and wildlife habitat within the basin, based on species-specific habitat units.
5. Continue long-term landbird monitoring.

6. Assess predator impacts on big game and gain insight into predator/prey dynamics.
7. Cooperate on threatened, endangered, and sensitive species recovery or conservation strategy efforts in the subbasin.

Ponderosa Pine Communities

Due to the documented loss of ponderosa pine communities and associated terrestrial species as a result of logging and fire suppression, the following needs are identified

1. Inventory, map, and assess the distribution of ponderosa pine communities and associated wildlife and plant species.
2. Acquire lands on breaklands when opportunities arise for improved habitat protection, restoration, and connectivity for ponderosa pine communities and for mitigation of lost wildlife habitat for ponderosa pine associated species (land purchases, land trusts, conservation easements, landowner cooperative agreements, exchanges).
3. Restore ponderosa pine communities.
4. Create and maintain large diameter snags in ponderosa pine communities.
5. Develop an information and education stewardship program to foster ponderosa pine protection.

Prairie Grasslands

Due to the documented loss of prairie grasslands and associated terrestrial species as a result of agricultural activities and exotic weed invasions, the following needs are identified

1. Inventory, map and assess the distribution of prairie grasslands and associated wildlife and plant species.
2. Acquire lands when opportunities arise for improved habitat protection, restoration, and connectivity for prairie grasslands and for mitigation of lost wildlife habitat for prairie grassland associated species (land purchases, land trusts, conservation easements, landowner cooperative agreements, exchanges).
3. Restore prairie grasslands.
4. Investigate and develop appropriate and practical restoration techniques for prairie grasslands
5. Develop native plant nurseries for propagation and restoration
6. Seed-bank native prairie species.
7. Plan and develop for potential reintroduction of native prairie fauna.
8. Develop conservation plans for Jessica’s aster and Palouse goldenweed.
9. Develop an information and education stewardship program to foster prairie grassland protection.

Riparian Communities

Due to the extensive degradation and loss of riparian and wetland communities, the following needs are identified

1. Inventory, map, and assess the distribution of riparian communities and associated wildlife and plant species.
2. Acquire lands when opportunities arise for improved habitat protection, restoration, and connectivity for riparian communities and for mitigation of lost wildlife habitat for riparian

associated species (land purchases, land trusts, conservation easements, landowner cooperative agreements, exchanges).
3. Protect, restore, and create wetland and riparian habitat in areas of greatest need.
4. Develop an information and education stewardship program to foster riparian community protection.
5. Develop riparian plant nursery for propagation and restoration of native communities.

Noxious Weeds

Due to the increase of noxious weeds and the resultant loss of productivity and biodiversity, the following needs are identified

1. Inventory and map the distribution of noxious weeds.
2. Develop and use restoration techniques for noxious weed infested communities.
3. Continue control programs for noxious weeds to restore natural habitat conditions and communities for wildlife species and improve watershed function.
4. Develop an information and education stewardship program for noxious weeds.

Late Seral Communities

Due to a significant reduction of late seral forest communities and associated terrestrial species, the following needs are identified

1. Inventory and map the distribution of all late successional habitats in the subbasin.
2. Investigate techniques and methods to retain late successional habitats on state and private lands (land exchanges, conservation easements).
3. Develop and implement management prescriptions to restore and promote late successional habitats.
4. Develop an information and education stewardship program to foster late seral community protection.

Early Seral Communities

Due to a significant reduction of early seral forest communities and associated terrestrial species, the following needs are identified

1. Inventory and map the distribution of early seral communities.
2. Create and restore early seral habitats where fire suppression has resulted in heavy fuel loads using a variety of methods and techniques.

Fragmentation

Habitat fragmentation from human activities have effected wildlife populations within the Clearwater subbasin, leading to the following needs being identified

1. Identify by county critical wildlife areas and plant communities.
2. Acquire critical habitats threatened by development when opportunities arise for improved habitat protection, restoration, and connectivity (land purchases, land trusts, conservation easements, landowner cooperative agreements, exchanges).

3. Work with counties to support timely updates and resource inventories related to local land use plans to further prevent degradations of floodplains, wetlands, riparian, and other sensitive areas.
4. Reduce road densities through closures, obliteration, and reduced construction.
5. Improve enforcement of road closures.
6. Evaluate and mitigate fragmentation impacts from Dworshak Dam and Reservoir.

References

Agee, J. K. (1993). Fire Ecology of Pacific Northwest Forests. Washington, DC: Island Press.

Agee, J. K. (1994). *Fire and Weather Disturbances in Terrestrial Ecosystems of the Eastern Cascades*. U.S. Forest Service.

Agee, J. K. and Maruoka, K. R. (1994). Historical Fire Regimes of the Blue Mountains. Blue Mountains Natural Resources Institute. http://www.fs.fed.us/pnw/bmnri/pubs/tn1.htm.

Anderson, A. L. (1930). *The Geology and Mineral Resources of the Region About Orofino, Idaho*. Moscow: University of Idaho Bureau of Mines and Geology.

Arnsberg, C., and Connor (1992). Mainstream Clearwater River Study: Assessment for Salmonid spawning, incubation, and rearing.

Arnsberg, B. D. and Statler, D. P. (1995). *Assessing Summer and Fall Chinook Salmon Restoration in the Upper Clearwater River and Principal Tributaries: 1994 Annual Report*. Orofino: Nez Perce Tribe. Prepared for Bonneville Power Administration.

Asherin, D. A. and Orme, M. L. (1978). *Inventory of Riparian Habitats and Associated Wildlife Along the Lower Clearwater River and Dworshak Reservoir*. Idaho Cooperative Wildlife Research Unit; Wildlife and Range Sciences, University of Idaho. Funded by the U.S. Army Corps of Engineers, North Pacific Division.

Axtell, H. (1998). Affidavit for SRBA. Snake River Basin Adjudication Instream Flow Claims, Nez Perce Tribe, Office of Legal Counsel.

Barker, R.J. (1982). *Soil Survey of Idaho County Area, Idaho, Western Part.* U.S. Department of Agriculture, Soil Conservation Service.

Batt, P. E. (1996). Governor Philip E. Batt's State of Idaho Bull Trout Conservation Plan. Boise.

Behnke, R. J. (1992). Native Trout of Western North America. Bethesda, MD: American Fisheries Society.

Berkson, J. (1991). Lyons Ferry Fall Chinook Wire Tag Analysis. Portland, Oregon, Columbia River Inter-Tribal Fish Commission.

Bjornn, T. C. and Mallett, J. (1964). Movements of Planted and Wild Trout in an Idaho River System. Transactions of the American Fisheries Society 93(1): 70-76.

Black, A. E.; Strand, E.; Watson, C.; Wright, R. G.; Scott, J. M. and Morgan, P. (1997). Land Use History of the Palouse Bioregion: Pre-European to Present. U.S. Geological Survey. http://biology.usgs.gov/luhna/palouse/fnluhna.html.

Bonneville Power Administration, U.S. D. O. E., Bureau of Indian Affairs, U.S. Department of the Interior, and Nez Perce Tribe. (1997). Final Environmental Impact Statement Nez Perce Tribal Hatchery Program. Portland, Oregon.

Bowers, D. and Steve Nadeau. (2000). Inventory of Fungi, Plants, and wildlife in the Dworshak Reservoir Project Area. Lewistion,Idaho, Idaho Department of Fish and Game.

Bowles, E. C. and E. Leitzinger. (1991). Salmon supplementation studies in Idaho rivers: experimental design. Idaho Department of Fish and Game, prepared for U.S. Department of Energy, Bonneville Power Administration, Contract DE-BI79-89BP01466, Project 89-098. 167 pp.

Bugosh, N. (1999). *Lochsa River Subbasin Assessment*. Lewiston, ID: Idaho Department of Environmental Quality.

Bull, E. L., S. R. Peterson, and J. W. Thomas. (1986). Resource Partitioning Among Woodpeckers in Northeast Oregon. USDA Forest Service, Research Note PNW-444. 19 pp.

Busacca, A. J. and McDonald, E. V. (1994). Regional Sedimentation of Late Quaternary Loess on the Columbia Plateau: Sediment Source Areas and Loess Distribution Patterns. Washington Division of Geology and Earth Resources. 80: 181-190.

Busby, P. J.; Wainwright, T. C.; Bryant, G. J.; Lierheimer, L. J.; Waples, R. S.; Waknitz, F. W. and Lagomarsino, I. V. (1996). *Status Review of West Coat Steelhead from Washington, Idaho, Oregon, and California*. Seattle: National Marine Fisheries Service.

Buskirk, S. W., et al. (1994). *Martens, Sables, and Fishers: Biology and Conservation*. New York, Cornell University Press.

Byrne, A. (2001). Steelhead Supplementation Studies in Idaho Rivers. 2000 Annual Report. Idaho Department of Fish and Game Report 01-15. Bonneville Power Administration Project Number 199005500.

Byrne, A. (1992). Steelhead supplementation studies in Idaho rivers. Experimental design. Idaho Department of Fish and Game, Report Number 94-11. Boise, Idaho. 90 pp.

Carter, R. H. (1998). Affidavit for SRBA. Snake River Basin Adjudication Instream Flow Claims, Nez Perce Tribe, Office of Legal Counsel.

Cassirer, E.F., Groves, C.R., and Genter, D.L. (1994) Coeur d'Alene Salamander Conservation Assessment. USDA Forest Service Region 1.

Cassirer, E. F., C. Johnson, C. R. Peterson, W. Wall, and D. Davis (1995). Draft Coeur d'Alene Salamander (Plethodon idahoensis) Habitat Conservation Assessment and Conservation Strategy, State of Idaho**:** 22.

Cassirer, E. F., J. D. Reichel, R. L. Wallen, and E. C. Atkinson. (1996). Harlequin Duck (*Histrionicus Histrionicus*) United States Forest Service/ Bureau of Land Management Habitat Conservation Assessment and Conservation Strategy for the Rocky Mountains.**:** 55.

Cederholm, C. J. and nine others. (2000). *Pacific Salmon and Wildlife-Ecological Contexts, Relationships, and Implications for Management*. Olympia: Washington Department of Fish and Wildlife.

Chapman, D. and ten others. (1991). Status of Snake River chinook salmon. Report to the Pacific Northwest Utilities Conference Committee, 531 p. + appendices.

Chapman, D. W. (1981). *Pristine Production of Anadromous Salmonids - Clearwater River*. Portland: Prepared for the Bureau of Indian Affairs.

Christy, J. A. and J. S. Harpel. (1997). Rare bryophytes of the interior Columbia River basin and northern Great Basin, U.S.A. Journal Hattori Botanical Laboratory 82:61-75.

Clearwater Basin Bull Trout Technical Advisory Team (1998a). *Bull Trout Assessment for the Lochsa and Selway Subbasins (Including the Middle Fork of the Clearwater Upstream of the South Fork).*

Clearwater Basin Bull Trout Technical Advisory Team (1998b). *Lower Clearwater River Bull Trout Problem Assessment*. Prepared for the state of Idaho.

Clearwater Basin Bull Trout Technical Advisory Team (1998c). *North Fork Clearwater River Basin Bull Trout Problem Assessment*. Prepared for the state of Idaho.

Clearwater Basin Bull Trout Technical Advisory Team (1998d). *South Fork Clearwater River Subbasin Bull Trout Problem Assessment*. Prepared for the state of Idaho.

Clearwater Basin Elk Habitat Initiative. (1998). Charter for 1998-2002. Idaho Department of Fish and Game. Lewiston, Idaho 12 pp.

Clearwater National Forest (1997). *Clearwater Subbasin Ecosystem Analysis at the Watershed Scale*. Orofino, ID.

Clearwater National Forest (1999). *North Fork Big Game Habitat Restoration on a Watershed Scale (BHROWS): Watersheds within the North Fork Clearwater River Subbasin*. North Fork Ranger District.

Clearwater Nongame Program 2001 Five-year Plan. (2001). Idaho Department of Fish and Game, Lewiston, Idaho. 4 pp.

Clearwater Policy Advisory Committee. (1999). Clearwater PAC Charter.

Clearwater Soil and Water Conservation District. (2001). Five-year resource conservation plan. Orofino, ID.

Clearwater Soil and Water Conservation District. (1993). Agricultural pollution abatement plan, Lolo/Ford Creek watershed. Orofino, ID. 105 p.

Close, D.A. (2000). Pacific Lamprey Research and Restoration Project. Annual Report 1998. DOE-BPA Project No 94-026 Contract No 00000248.

Close, D. A.; Fitzpatrick, M.; Li, H.; Parker, B.; Hatch, D. and James, G. (1995). *Status Report of the Pacific Lamprey (Lampetra tridentata) in the Columbia River Basin*. Corvallis: Oregon State University, Department of Fisheries and Wildlife; Columbia River Inter-Tribal Fish Commission; Confederated Tribes of the Umatilla Indian Reservation, Department of Natural Resources.

Cochnauer, T. (1999). Summarization of Gas Bubble Trauma Monitoring in the Clearwater River, Idaho, 1995-1999. Bonneville Power Administration DOE/BP 31259-3D 245

Cochnauer, T. and C. Claire. (2001). Evaluate Status of the Pacific lamprey in the Clearwater River drainage, Idaho. Annual Report 2000. Bonneville Power Administration. Project 2000-028-00.

Columbia Basin Fish and Wildlife Authority. (1991). *Integrated System Plan for Salmon and Steelhead Production in the Columbia River Basin*. Funded by the Northwest Power Planning Council.

Columbia Basin Fish and Wildlife Authority. (1999). FY 2000 Draft Annual Implementation Work Plan. Submitted to the Northwest Power Planning Council. http://www.cbfwf.org/products.htm.

Columbia River Intertribal Fish Commission. 1995. The Columbia river anadromous fish restoration plan of the Nez Perce, Umatilla, Warm Springs, and Yakima Tribes, Volume 1.

Columbia River Inter-Tribal Fish Commission. (1996a). *Wy-Kan-Ush-Mi Wa-Kish-Wit: Spirit of the Salmon. Vol. I*.

Columbia River Inter-Tribal Fish Commission. (1996b). *Wy-Kan-Ush-Mi Wa-Kish-Wit: Spirit of the Salmon. Vol. II: Subbasin Plans*.

Columbia River Inter-Tribal Fish Commission. (1999). Nez Perce Tribal Hatchery benefit risk analysis, draft final report (24 February, 1999). Production and Restoration Research Group, Columbia River, Inter-Tribal Fish Commission. Report to the Nez Perce Tribe.

Columbia River Inter-Tribal Fish Commission. (2000). CRITFC Subbasin Restoration Plan: Clearwater River System.

Connor, W. P. and several co-authors. (2001). Snake River fall chinook salmon early life history and growth as affected by dams. Pages 27 to 60 in K. F. Tiffan, D. W. Rondorf, W. P. Connor, and H. L. Burge, editors. Annual report 1999 to Bonneville Power Administration Contract Number DE-AI79-91BP21708. (http://www.efw.bpa.gov/Environment/EW/EWP/DOCS/ REPORTS/GENERAL)

Conservation Assessment and Strategy for White-headed Woodpecker. (Undated Report).

Cooper, S. V.; Neiman, K. E. and Roberts, D. W. (1991). *Forest Habitat Types of Northern Idaho: A Second Approximation*. U.S. Forest Service, Intermountain Research Station.
Cooper, S. V., K. E. Neiman, R. Steele, and D. W. Roberts. (1987). Forest Habitat Types of Northern Idaho: A Second Approximation. USDA Forest Service, General Technical Report INT-236. 135 pp.
Cramer, S.P. (1995). Selway genetic resource assessment, supplement to Nez Perce Tribal Hatchery genetic risk assessment. S.P. Cramer & Associates, Inc. contract report to Nez Perce Tribal Executive Committee, Lapwai, Idaho.
Cramer and Neeley. (1992). Genetic risk assessment of the Nez Perce Tribal Hatchery master plan. Prepared for Nez Perce Tribe Department of Fisheries Resources Management. Lapwai, Idaho 83540.
Crow, E. P. Jr. (1998). Affidavit for SRBA. Snake River Basin Adjudication Instream Flow Claims, Nez Perce Tribe, Office of Legal Counsel.
Csuti, B.; Kimerling, A.; O'Neil, T.; Shaughnessy, M.; Gaines, E.; and Huso, M. (1997). Atlas of Oregon Wildlife. Oregon State University Press: Corvallis, OR. 492 p.
Dahl, T. E. (1990). Wetlands – Losses in the United States, 1780's to 1980's. U.S. Fish and Wildlife Service Report to Congress, Washington D.C. 13 pp.
Dana, S.T. and S.K. Fairfax. (1980). Forest and Range Policy: Its Development in the United States. New York. McGraw Hill.
Daniel, S. (2001*). Eurasian Watermilfoil in Kootenai County*. Hayden, ID: Kootenai County Noxious Weed Control.
Daubenmire, R. F. (1942). An Ecological Study of the Vegetation of Southeastern Washington and Adjacent Idaho. Ecological Monographs 12(1): 53-79.
Davis, R. J. (1952). Flora of Idaho. Dubuque, IA: Wm. C. Brown Company.
Deeble, B. (2000). Sharp-tailed Grouse (Tympanuchus phasianellus). The Wings of the Americas. The Nature Conservancy. <http://www.tnc.org/wings/wingresource/stgr2.htm> accessed on Feb. 23, 2001.
Deriso, R.B. (*In press*). Bayesian analysis of stock survival and recovery of spring and summer chinook of the Snake River basin. *In* Incorporating Uncertainty into Fishery Models. *Edited by* J.M. Berksen, L.L. Kline, and D.J. Orth. American Fisheries Society. Bethesda, MD.
Dobler, F. C.; Eby, J.; Perry, C.; Richardson, S. and Vander Haegen, M. (1996). Status of Washington's Shrub-Steppe Ecosystem: Extent, Ownership, and Wildlife/Vegetation Relationship. Olympia: Washington Department of Fish and Wildlife.
Duff, D. A., Ed. (1996). *Conservation Assessment for Inland Cutthroat Trout Status and Distribution*. Ogden, UT: U.S. Forest Service, Intermountain Region.
Edelmann, F. and J. Copeland. (1998). Wolverine Distribution in the Northwest United States and a Survey in the Seven Devils Mountains of Idaho. *Northwest Science* 73(4): 295-300.
Evans, S.; Keller, S.; Lincoln, R.; Phelps, S.; Stern, L.; Stone, D. and Wright, S. (1997). *Draft Environmental Impact Statement: Wild Salmonid Policy*. Olympia: Washington Department of Fish and Wildlife.
Evermann, B.W. (1896). A preliminary report upon salmon investigations in Idaho in 1894. Bulletin of the U.S. Fish Commission, Volume 15 for 1895, pp 253-284.
Falter, C.M. (1982). Limnology of Dworshak Reservoir in a low flow year. U.S. Army Corps of Engineers. Walla Walla, Washington.
Fickeisen, D.H. and D.R. Geist. (1993). Resident Fish Planning: Dworshak Reservoir, Lake Roosevelt, and Lake Pend Oreille. Pacific Northwest Laboratory, prepared for U.S.

Department of Energy, Bonneville Power Administration, Project number 93-026. Portland, Oregon.
Finklin, A. I. (1977). *Climate of the Selway-Bitterroot Wilderness*. Missoula: Intermountain Forest and Range Experiment Station, Northern Forest Fire Laboratory.
Fuller, R. K.; Johnson, J. H. and Bear, M. A. (1984). *A Biological and Physical Inventory of the Streams Within the Lower Clearwater River Basin, Idaho*. Lapwai, ID: Nez Perce Tribe. Submitted to the Bonneville Power Administration.
Garcia, A.P., R.D. Waitt, C.A. Larsen, S.M. Bradbury, B.D. Arnsberg, M. Key, and P. A. Groves. (1999). Fall chinook salmon spawning ground surveys in the Snake River Basin upriver of Lower Granite Dam, 1998. *In* A.P. Garcia, ed. Spawning distribution of fall chinook salmon in the Snake River. Annual Report 1998. U.S. Fish and Wildlife Service, submitted to Bonneville Power Administration, Portland, Oregon, Contract 98 AI 37776.
Gerhardt, N. (1999). A Brief History of Dams on the South Fork Clearwater River. Nez Perce National Forest.
Gilbert, C.H. and B.W. Evermann. (1895). Bulletin of the United States Fish Commission. Vol. XIV for 1894. Washington Government Printing Office 1895. A Report Upon Investigations in the Columbia River Basin, with Descriptions if Four New Species of Fishes.
Graham, R.; Reynolds, R.; Reiser, M.; Bassett, R.; and Boyce, D. (1994). Sustaining Forest Habitat for the Northern Goshawk: A Question of Scale. Studies in Avian Biology 16:12-17.
Greiser, T. W. (1998). Appendix A, Usual and Accustomed Places Data Base Summary. Snake River Basin Adjudication Instream Flow Claims, Nez Perce Tribe, Office of Legal Counsel.
Groves, C.R., B. Butterfield, A. Lippincott, B. Csuti, and J. M. Scott. (1997a). Atlas of Idaho's Wildlife, Integrating Gap Analysis and Natural Heritage Information. Abigail Lippincott, ed. Boise, ID: Idaho Department of Fish and Game.
Groves, C. Frederick, T.G., Frederick.; Atkinson, E.; Atkinson, M.; Shepherd, J. and Servheen, G. (1997b). Density, Distribution, and Habitat of Flammulated Owls in Idaho. Great Basin Naturalist 57(2): 116-123.
Guscinski, H. ; Furniss, M.; Ziemer, R. and Brookes, M. H. (2000). *Forest Roads: A Synthesis of Science information*. U.S. Department of Agriculture.
Hall-Griswold, J. A. and Petrosky, C. E. (1996). *Idaho Habitat/Natural Production Monitoring Part I*. Idaho Department of Fish and Game.
Hammond, R.J. (1979). Larval biology of the Pacific lamprey, Entosphenus tridentatus (Gairdner), of the Potlatch River, Idaho. M.Sc. thesis. University of Idaho, Moscow, Idaho. 44pp.)
Hansen, D. L. (1977). Habitat Selection and Spatial Interaction in Allopatric and Sympatric Populations of Cutthroat and Steelhead Trout. Ph.D. Dissertation. Wildlife Science Department, University of Idaho.
Hanson, H.J. and R.C. Martin. (1989). Phase II: Wildlife protection, mitigation, and enhancement planning Dworshak Reservoir. Idaho Dep. Fish and Game. Bonneville Power Administration. Division of Fish and Wildlife. Project 88-154.137pp.
Hare, S.R., Mantua, N.J., and Francis, R.C. (1999). Inverse production regimes: Alaska and West Coast Pacific salmon. Fisheries (Bethesda), 24: 6-14.
Hesse, J.A. and S.P. Cramer. (2000). Monitoring and evaluation plan for the Nez Perce Tribal Hatchery: Phase 1 Action Plan. Prepared for Bonneville Power Administration, Project 8335000. Nez Perce Tribe, Lapwai, Idaho.

Hesse, J.A., P.J. Cleary, and B.D. Arnsberg. (1995). Salmon supplementation studies in Idaho Rivers. Annual Report 1994. Prepared for Bonneville Power Administration, Project no. 89-098-2.

Hooper, Peter R., and Donald A. Swanson. (1990). The Columbia River Basalt Group and associated Volcanic Rocks of the Blue Mountains Province. In: Walker, George W., ed., Geology of the Blue Mountains Region of Oregon, Idaho, and Washington: Cenozoic Geology of the Blue Mountains Region. U.S. Geological Survey Professional Paper 1437. pp. 63-100.

Horton, W.A. (1980). Dworshak Reservoir fisheries investigations. Idaho Department of Fish and Game. Job Performance Report, Prepared for United States Army Corps of Engineers, Contract Number DACW68-79-C-0034, Boise.

Hoss, S.A. (1970). Reintroductions of salmon and steelhead into portions of the Clearwater River drainage. Annual project closing Report July 1, 1968 to June 30, 1969. Columbia River Fishery Development Program. Project No. 161.22A. Contract No. 14-17-0001-1860. Idaho Department of Fish and Game, Boise, Idaho. 10 pp.

Houde, E. D. (1987). Fish early life history dynamics and recruitment variability. American Fisheries Society Symposium 2 pp. 17-29.

Howard, G. (2000). *Annual Monitoring Plan for Soil, Air, Water and Fisheries: Nez Perce National Forest, Fiscal Year 2000*.

Hubbard, C. R. (1956). *Geology and Mineral Resources of Nez Perce County*. Moscow: Idaho Bureau of Mines and Geology.

Idaho Conservation Data Center. (2000). Rare Animals. http://www2.state.id.us/fishgame/animal.htm.

Idaho Department of Commerce. (2000). Idaho Data Center. http://www.idoc.state.id.us/Data/dtacntr.html.

Idaho Department of Environmental Quality. (2001a). Idaho Department of Environmental Quality, 2001-2006 Strategic Plan. Boise, Idaho.

Idaho Department of Environmental Quality. (2001b). Idaho Department of Environmental Quality, 2002-2007 Strategic Plan. Boise, Idaho.

Idaho Department of Fish and Game. (1990). A Vision for the Future. Idaho Department of Fish and Game Policy Plan 1990-2005. Boise, Idaho. 33 pp.

Idaho Department of Fish and Game. (1991a). Bighorn Sheep Species Management Plan, 1991-1995. Boise, Idaho. 37 pp.

Idaho Department of Fish and Game. (1991b). Furbearers Species Management Plan, 1991-1995. Boise, Idaho. 67 pp.

Idaho Department of Fish and Game. (1991c). Nongame Species Management Plan, 1991-1995. Boise, Idaho. 163 pp.

Idaho Department of Fish and Game. (1991d). Mountain Goat Species Management Plan, 1991-1995. Boise, Idaho. 25 pp.

Idaho Department of Fish and Game. (1991e). Upland Game Plan 1991-1995. Idaho Department of Fish and Game. Boise, ID.

Idaho Department of Fish and Game. (1991f). Waterfowl Plan 1991-1995. Idaho Department of Fish and Game. Boise, ID.

Idaho Department of Fish and Game. (1991g). Moose, Sheep and Goat Plan 1991-1995. Idaho Department of Fish and Game. Boise, ID.

Idaho Department of Fish and Game. (1991h). Mountain Lion Plan 1991-1995. Idaho Department of Fish and Game. Boise, ID.
Idaho Department of Fish and Game. (1996). Fisheries Management Plan 1996-2000. Idaho Department of Fish and Game, Boise, Idaho.
Idaho Department of Fish and Game. (1998). Black Bear Management Plan, 2000-2010. Idaho Department of Fish and Game. Boise, ID.
Idaho Department of Fish and Game. (1998a). Idaho's Anadromous Fish Stocks: Their Status and Recovery Options. Report to the Director. May 1, 1998. Idaho Department of Fish and Game. IDFG 98-13.
Idaho Department of Fish and Game. (1999). White-tailed Deer, Mule Deer and Elk Management Plan. Idaho Department of Fish and Game. Boise, ID.
Idaho Department of Fish and Game. (1999a). Red River Wildlife Management Plan. Idaho Department of Fish and Game, Lewiston, ID.
Idaho Department of Fish and Game. (1999a). Parr Monitoring Database: 1985-1987 Snorkel Survey Fish Counts for the Clearwater Basin.
Idaho Department of Fish and Game. (2001). Idaho Department if Fish and Game Strategic Plan.
Idaho Department of Fish and Game. (2001a). State of Idaho Wildlife Conservation and Restoration Program Comprehensive Program. Boise, Idaho, 16 pp.
Idaho Department of Fish and Game. (2001b). IDFG Fisheries Management Plan 2001-2006. Idaho Department of Fish and Game, Boise, Idaho.
Idaho Department of Fish and Game. (2001c). South Fork Clearwater River Bull Trout Investigations. Report to the Nez Perce National Forest and the Bureau of Land Management. Idaho Department of Fish and Game, Lewiston, Idaho.
Idaho Department of Fish and Game and Nez Perce Tribe. (1991). Proposed Wildlife Mitigation Agreement for Dworshak Dam. Pages ii-27 *in* Background For Dworshak Wildlife Mitigation Discussions. Administrative Record, Memorandum and Mail, Inc. 250pp.
Idaho Department of Lands. (2000). Idaho Department of Lands Home Page. http://www2.state.id.us/lands/
Idaho Department of Parks and Recreation. (1987). *Idaho Wetlands Conservation Priority Plan – An Addendum to the 1983 Statewide Comprehensive Outdoor Recreation Plan.* Department of Water Resources, Boise, ID. 13 pp.
Idaho Department of Water Resources. (2000). Dworshak Operation Plan. Prepared for Idaho Water Resource Board.
Idaho Forest Products Commission. (2000). Idaho Forest Products Commission Home Page. http://www.idahoforests.org/
Idaho Geological Survey. (2000). Idaho Geological Survey Home Page. http://www.idahogeology.org/
Idaho OnePlan. (2001). Idaho OnePlan Home Page. http://www.oneplan.org
Idaho Partners in Flight. (2000). Idaho Bird Conservation Plan Version.
Idaho Rangeland Resource Commission. (2000). Idaho Rangeland Resource Commission Home Page. http://www.irrc.state.id.us/
Idaho Soil Conservation Commission. (2000). Idaho Soil Conservation Commission Home Page. http://www.scc.state.id.us/
Idaho Soil and Water Conservation District. (2001). Annual work plan and five year resource conservation plan. Grangeville, ID.

Idaho State Conservation Effort. (1995). Forest Carnivores in Idaho. Habitat Conservation Assessments and Conservation Strategies. 125 pp.
Idaho State Department of Agriculture. (2000). Idaho State Department of Agriculture Home Page. http://www.agri.state.id.us/
Jette, C., J. Connett, J. P. McCaffrey. (1999). Biology and Biological Control Agents of Yellow Starthistle. USDA Forest Service, Forest Health Technology Enterprise team, FHTET-98-17. 93 pp.
Johnson, D.J, R.E. Larson, and CR. Steward. (1995). Supplement to the Nez Perce Tribal Hatchery Master Plan. Report prepared for the U.S. Department of Energy, Bonneville Power Administration, Division of Fish and Wildlife, Portland, Oregon. 33pp.
Johnson, C. G.; Clausnitzer, R. R.; Mehringer, P. J. and Oliver, C. D. (1994). *Biotic and Abiotic Processes of Eastside Ecosystems: The Effects of Management on Plant and Community Ecology, and on Stand and Landscape Vegetation Dynamics*. U.S. Forest Service.
Johnson, D. B. (1985). *A Biological and Physical Inventory of Clear Creek, Orofino Creek, and the Potlatch River, Tributary Streams of the Clearwater River, Idaho*. Lapwai, ID: Nez Perce Tribe, Fisheries Resource Management.
Jones, R. M.; Mital, J. and Murphy, P. K. (1997). *Watershed Sensitivity: Clearwater National Forest*. Clearwater National Forest.
Kaminski, T. and Hansen, J. (1984). Wolves of central Idaho. Montana Coop. Wildlife Research Unit. Missoula, MT. Unpublished Report 197pp.
Kan, T.T. 1975. Systematics, variation, distribution and biology of lampreys of the genus Lampetra in Oregon. Doctoral Dissertation, Oregon State University, Corvallis, Oregon. 194p.
Kiefer, S.; Rowe, M. and Hatch, K. (1992). *Stock Summary Reports for Columbia River Anadromous Salmonids Volume V: Idaho Final Draft for The Coordinated Information System*. Idaho Department of Fish and Game
Kincaid. (1998). Hatchery Genetic Management Plan. Nez Perce Tribe. 30 January, 1997. 50pp.
Knutson, K. L. and Naef, V. L. (1997). Management Recommendations for Washington's Priority Habitats: Riparian. Washington Department of Natural Resources. http://www.wa.gov/wdfw/hab/ripxsum.htm.
Kucera, P. A. and Johnson, D. B. (1986). *A Biological and Physical Inventory of the Streams Within the Nez Perce Reservation: Juvenile Steelhead Survey and Factors That Affect Abundance in Selected Streams in the Lower Clearwater River Basin, Idaho*. Lapwai, ID: Nez Perce Tribe, Fisheries Resource Management.
Kucera, P. A.; Johnson, J. H. and Bear, M. A. (1983). *A Biological and Physical Inventory of the Streams Within the Nez Perce Reservation*. Lapwai, ID: Nez Perce Tribe, Fisheries Resource Management.
Larsen, E. M. and Nordstrom, N., Eds. (1999). Management Recommendations for Washington's Priority Species, Volume IV: Birds. Olympia: Washington Department of Fish and Wildlife.
Larson, R. E. and Mobrand, L. (1992). *Nez Perce Tribal Hatchery Master Plan and Appendices*. Nez Perce Tribe; Mobrand Biometrics; Bonneville Power Administration, Division of Fish and Wildlife.
Latah Soil and Water Conservation District. 2001. Strategic five-year plan. Moscow, ID.
LeFranc, M.; Moss, M.; Patnode, K.; and Sugg, W. (1987). Grizzly Bear Compendium. National Wildlife Federation: Washington, DC.
Lewis Soil Conservation District. (2000). Five-year plan and annual report. Nezperce, ID.

Lichthardt, J. and R. K. Moseley. (1994). Ecosystem Analysis and Conservation Planning for the Clearwater and Nez Perce National Forests. Idaho Department of Fish and Game, Conservation Data Center. 52 pp.

Ligon, D. J. (1973). Foraging Behavior of the White-Headed Woodpecker in Idaho. The Auk 90(October): 862-869.

Liknes, G.A., and P.J. Graham. (1988). Westslope cutthroat trout in Montana: life history, status, and management. American Fisheries Society Symposium 4:53-60.

Lipscomb, S. W. (1998). *Hydrologic Classification and Estimation of Basin and Hydrologic Characteristics of Subbasins in Central Idaho*. U.S. Geological Survey. Prepared in cooperation with the Bureau of Indian Affairs.

Mack, C. (2001). Idaho Wolf Update: April 2001.

Mack, C. and Laudon, K. (1998). Idaho Wolf Recovery Program: Progress Report. 22pp.

Magoun, A. J. and J. P. Copeland (1996). Characteristics of Wolverine Reproductive Den Sites. *Journal of Wildlife Management* 62(4): 1313-1320.

Maiolie, M.A., B. Ament and B. Harryman. (1999a). Strobe light testing and kokanee population monitoring; Dworshak dam impacts assessment and fisheries investigation. Idaho Department of Fish and Game, Annual Progress Report for 1997, Prepared for Bonneville Power Administration, Project number 87BP35167, Portland, Oregon.

Maiolie, M.A., B. Harryman, and B. Ament. (1999b). Strobe light testing and kokanee population monitoring; Dworshak dam impacts assessment and fisheries investigation. Idaho Department of Fish and Game, Annual Progress Report for 1998, Prepared for Bonneville Power Administration, Project number 87BP35167, Portland, Oregon.

Maiolie, M.A. and S. Elam. (1995). Dworshak dam impacts assessment and fisheries investigations project. Idaho Department of Fish and Game, Annual Progress Report, Prepared for Bonneville Power Administration, project number 89-99, Portland, Oregon.

Maiolie, M. A., D. P. Statler, and S. Elam. (1993). Dworshak Dam impact assessment and fishery investigation and trout, bass, and forage species. Combined Project Completion Report. Prepared for Bonneville Power Administration. Project Nos. 87-99 and 87-407. 92 pp.

Mallett, J. (1974). Inventory of salmon and steelhead resources, habitat use and demands. Federal Aid in Fish Restoration, Job Performance Report: Project F-58-R-1. Idaho Department of Fish and Game, Boise, Idaho.

Marmorek, D.R., C.N. Peters and I. Parnell (editors). (1998). Plan for Analyzing and Testing Hypotheses (PATH): Final Report for Fiscal Year 1998. ESSA Technologies Ltd., 1765 West 8th Avenue, Suite 300. Vancouver, BC V6J 5C6 263 pp.

Marshall, A.R. (1992). Genetic analysis of 1991 Idaho chinook salmon baseline collections. Attachment B in Leitzinger, E. J., K. Plaster, and E. Bowles. 1993. Idaho supplementation studies annual report 1991-1992. Fisheries Research Section, Idaho Department of Fish and Game annual report to U.S. Department of Energy-Bonneville Power Administration, Portland, Oregon.

Marshall, A.R. (1994). Genetic analysis of 1993-94 Idaho chinook salmon baseline collections, and a multi-year comparative analysis. Appendix A in Nemeth, D., K. Plaster, K. Apperson, J. Brostrom, T. Curet, and E. Brown. (1996). Idaho supplementation studies annual report 1994. Idaho Department of Fish and Game annual report to U.S. Department of Energy-Bonneville Power Administration, Portland, Oregon.

Marshall, D.B., M. Chilcote, and H. Weeks. (1996). Species at Risk: Sensitive, Threatened, and Endangered Vertebrates of Oregon. Oregon Department Fish and Wildlife, Portland. Second edition.

Marshall, A. G. (1998). Affidavit for SRBA. Snake River Basin Adjudication Instream Flow Claims, Nez Perce Tribe, Office of Legal Counsel.

Matthews, G.M. and R.S. Waples. (1991). Status review for Snake River spring and summer chinook salmon. U.S. Department of Commerce, NOAA Technical Memorandum NMFS F/NWC-200, Seattle, WA., 75 p.

Maughan, O. W. (1972). Distribution and Geographic Variation of Sculpins in the Clearwater Basin. Doctor of Philosophy. Department of Zoology, Washington State University.

Mauser, G.; Cannamela, D. and Downing, R. (1989). *Dworshak Dam Impact Assessment and Fishery Investigation*. Idaho Department of Fish and Game; Bonneville Power Administration.

McClelland, D. E.; Foltz, R. B.; Wilson, W. D.; Cundy, T.; Heinemann, R.; Saurbier, J. and Schuster, R. L. (1997). *Assessment of the 1995 and 1996 Flood on the Clearwater National Forest. Part I*. U.S. Forest Service, Northern Region.

McClelland, D. E.; Foltz, R. B.; Falter, C. M.; Wilson, W. D.; Cundy, T.; Schuster, R. L.; Saurbier, J.; Rabe, C. and Heinemann, R. (1998). Relative Effects on a Low-Volume Road System of Landslides Resulting from Episodic Storms in Northern Idaho. Transportation Research Record 1652: pp. 235-243.

McCune, B. (1994). Lichen species groups in the Columbia Basin-ecosystem functions and indicator values. Unpublished report, East-side Ecosystem Management Project, Washington, USA.McElhany, P.; Rucklelshaus, M. H.; Wainwright, T. C; Ford, M. J. and Bjorkstedt, E. P. (2000). *Variable Salmonid Populations and the Recovery of Evolutionarily Significant Units*. Seattle: National Marine Fisheries Service: Northwest Fisheries Science Center: Southwest Fisheries Science Center.

McGinnis, W. J. and Christensen, H. H. (1996). *The Interior Columbia River Basin: Patterns of Population, Employment, and Income Change*. Portland: U. S. Department of Agriculture, Forest Service, Pacific Northwest Research Station.

McGreer, D. J. (1981). *Skid Trail Erosion Tests - First Year Results*. Lewiston, ID: Potlatch Corporation.

Meehan, W. R. and Bjornn, T. C. (1991). Salmonid Distributions and Life Histories. In: Influences of Forest and Rangeland Management on Salmonid Fishes and Their Habitats. W. R. Meehan, Ed. Bethesda, MD: American Fisheries Society Special Publication, pp. 47-82.

Megahan, W. F. and Kidd, W. J. (1972). Effects of Logging and Logging Roads on Erosion and Sediment Deposition from Steep Terrain. Journal of Forestry 70(3): 136-141.

Mehrhoff, L.A. and S.Sather-Blair. (1985). Wildlife mitigation status report: Dworshak Dam and reservoir. Pages G1-G45 *in* R.C. Martin, ed., 1985. Status review of wildlife mitigation at 14 of 27 major hydroelectric projects in Idaho. U.S. Department of Energy, Bonneville Power Administration, Division of Fish and Wildlife.

Miller, W.H. (1987). A Review of Dworshak National Fish Hatchery Mitigation Record. U.S. Fish and Wildlife Service Dworshak Fisheries Assistance Office. Ahsahka, Idaho.

Minakawa, N. (1997). The dynamics of aquatic insect communities associated with salmon spawning. Ph.D. dissertation. University of Washington, Seattle.

Mivart, St. G.J. (1890). Dogs, jackals, wolves, and foxes: a monograph of the Canidae. R. H. Porter. London. 216pp.

Morrison Knudsen Corporation (1992). *Lewiston Orchards Irrigation District Alternative Irrigation Water Supply Evaluation*. Prepared for the U.S. Bureau of Reclamation.

Moseley, R. K. and C. Groves. (1992). Rare, Threatened and endangered Plants and Animals of Idaho. Idaho Department of Fish and Game, Conservation Data Center. 33 pp.

Murphy, L. W. and Metsker, H. E. (1962). *Inventory of Idaho Streams Containing Anadromous Fish Including Recommendations for Improving Production of Salmon and Steelhead. Part II: Clearwater River Drainage*. Idaho Department of Fish and Game; U.S. Fish and Wildlife Service.

Murphy, P. K.; Jones, R. M. and Mital, J. (2000). *Clearwater National Forest Watershed and Fisheries Monitoring Plan*. Clearwater National Forest.

Murphy, P., T. Cochnauer and E. Schriever. (2001) Draft. Ice Lake Brook Trout Control: Utilization of Tiger Muskie for Suppressing Self-sustaining Populations of Introduced Brook Trout. Idaho Department of Fish and Game.

Mutch, R.W.; Arno, S.F.; Brown, J.K.; Carlson, C.E.; Ottmar, R.D. and Peterson, J.L. (1993). *Forest Health in the Blue Mountains: A Management Strategy for Fire Adapted Ecosystems*. Portland: U.S. Department of Agriculture.

National Marine Fisheries Service. (1997). In Digital Studios. Salmon Conflict. Position Statements. Response of National Marine Fisheries Service, (R. Jones) to questionnaire for Internet project. CyberLearning Collection. http://www.cyberlearn.com. Ron. S. Nolan, Aptos, CA Posted March 22, 1997.

National Marine Fisheries Service. (1996). *Making Endangered Species Act Determinations of Effect for Individual or Grouped Actions at the Watershed Scale*.

National Marine Fisheries Service. (1995). Endangered Species Act Section 7 Consultation. Biological Opinion. Reinitiation of Consultation on 1994-1998 operation of the federal Columbia River power system and juvenile transportation program in 1995 and future years. March 2, 1995. National Marine Fisheries Service. Northwest Region.

National Research Council. (1995). Upstream: salmon and society in the Pacific northwest. Prepublication copy. National Research Council, National Academy of Sciences. Washington, D.C.

Nemeth, D. J. and R. B. Kiefer. (1999). Snake River Spring and Summer Chinook Salmon: The Choice For Recovery. Fisheries

Nez Perce National Forest. (1998). *South Fork Clearwater River Landscape Assessment Vol. I: Narrative*.

Nez Perce Soil and Water Conservation District. (2001). Resource conservation plan. Lewiston, ID.

Nez Perce Tribe and Idaho Department of Fish and Game. (1990). *Clearwater River Subbasin Salmon and Steelhead Production Plan*. Funded by the Northwest Power Planning Council; Columbia Basin Fish and Wildlife Authority.

Nez Perce Tribe Department of Fisheries Resources Management. (2000). Department of Fisheries Resources Management Report to the Nez Perce Tribe General Council, September, 2000. Lapwai, ID.

Nez Perce Tribe Executive Committee. (1999). NPTEC Resolution NP 99-140.

Norberg, E.R. and L. Trout. (1958). Clearwater game and range study, Pittman-Robertson Project. W-112-R final report, Idaho Department Fish and Game, Boise.

Northwest Power Planning Council. (2000). Columbia River Basin Fish and Wildlife Program. A Multi-Species Approach for Decision Making. Council document 2000-19.

Northwest Power Planning Council. (1994). *1994 Columbia River Basin Fish and Wildlife Program Overview*. Portland:
Northwest Power Planning Council. (1992). Columbia basin fish and wildlife program – strategy for salmon, volumes 1 and 2. Northwest Power Planning Council, Portland, OR.
Oatman, R. W. (1998). Affidavit for SRBA. Snake River Basin Adjudication Instream Flow Claims, Nez Perce Tribe, Office of Legal Counsel.
Olson, B. E. (1999). Impacts of noxious weeds on ecologic and economic systems. In: Biology and Management of Noxious Rangeland Weeds. R. L. Sheley and J. K. Petroff, eds. Oregon State University Press, Corvallis, OR. Pp. 4-18.
Orr, E. L. and Orr, W. N. (1996). Geology of Central Idaho. Geology of the Pacific Northwest: 194-217.
Pacific States Marine Fisheries Commission. (2001). StreamNet On-Line: The Northwest Aquatic Information Network. http://www.streamnet.org.
Paradis, W. J.; Lentz, H. S.; Blair, S.; Lake, L. and Cochrane, A. (1999a). *Middle Fork Clearwater River Face Drainages Biological Assessment*. Nez Perce National Forest.
Paradis, W. J.; Lentz, H. S.; Mays, D.; Blair, S. and Lake, L. (1999b). *South Fork Clearwater River Biological Assessment*. Nez Perce National Forest.
Peery, C. A., and T. C. Bjornn. (1993). Ecological effects of hatchery reared chinook salmon on naturally produced chinook salmon, 1992 annual report. Attachment A in Leitzinger, E. J., K. Plaster, and E. Bowles. (1993). Idaho supplementation studies annual report 1991-1992. Fisheries Research Section, Idaho Department of Fish and Game annual report to U.S. Department of Energy-Bonneville Power Administration, Portland, Oregon.
Peery, C. A., and T. C. Bjornn. (1994). Ecological effects of hatchery reared chinook salmon on naturally produced chinook salmon, 1993, 1993 annual report. Appendix I in Leitzinger, E. J., K. Plaster, P. Hassemer, and P. Sankovich. (1996). Idaho supplementation studies annual progress report 1993. Idaho Department of Fish and Game annual report to U.S. Department of Energy-Bonneville Power Administration, Portland, Oregon.
Peery, C. A., and T. C. Bjornn. (1996). Small-scale Investigations into chinook salmon supplementation strategies and techniques: 1992-1994-emigration of chinook salmon fry from the upper Salmon River, 1991. Technical Report 96-3, Idaho Cooperative Fish and Wildlife Research Unit, Moscow, Idaho.
Petrosky, C.E., Schaller, H.A. and Budy, P. (*In press*). Productivity and survival rate trends in the freshwater spawning and rearing stage of Snake River chinook salmon (*Oncorhynchus tshawytscha*). Can. J. Fish. Aquat. Sci. Accepted March 2001.
Pettit, S. W. (1985). Salmon and steelhead management - 1983. In: Federal Aid in Fish Restoration. Job Performance Report, Project F-73-R-6; Subproject II: Salmon and Steelhead Investigations; Study III, Job 1. Idaho Department of Fish and Game. 25 pages.
Pierson, E.D., M.C. Wachenhut, J.S. Altenbach, P. Bradley, P. Call, D.L. Genter, C.E. Harris, B.L. Keller, B. Lengus, L. Lewis, B. Luce, K.W. Navo, J. M. Perkins, S. Smith, and L. Welch. (1999). Species conservation assessment and strategy for Townsend's big-eared bat (*Corynorhinus townsendii townsendii* and *Corynorhinus townsendii pallescens*). Idaho Conservation Effort, Idaho Department of Fish and Game, Boise Idaho. 67 pp.
Piorkowski, R.J. (1995). Ecological effects of spawning salmon on several south-central Alaskan streams. Ph.D. dissertation. University of Alaska, Fairbanks.
Powell, R. A. (1993). *The Fisher: Life History, Ecology, and Behavior*. Minnesota, University of Minnesota Press.

Pratt, K. L. (1984). *Habitat Use and Species Interactions of Juvenile Cutthroat (Salmo clarki lewisi) and Bull Trout (Salvelinus confluentus) in the Upper Flathead River Basin.* M.S. Fisheries Department, University of Idaho.

Quigley, T. M. and Arbelbide, S. J., Eds. (1997). *An Assessment of Ecosystem Components in the Interior Columbia Basin and Portions of the Klamath and Great Basins*. Portland: U.S. Forest Service.

Reading, D. (1996). The Economic Impact of Steelhead Fishing and the Return of Salmon Fishing in Idaho. Report to the Idaho Fish and Wildlife Foundation. Ben Johnson Associates.

Reading, D. (1999). The Economic Impact of a Restored Salmon Fishery in Idaho. Report to the Idaho Fish and Wildlife Foundation. Ben Johnson Associates.

Reiser, D. (1998). Why fish need water: life history strategies and habitat requirements of salmonid populations in the Snake, Salmon, and Clearwater River basins of Idaho. Snake River Basin Adjudication Instream Flow Claims, Nez Perce Tribe, Office of Legal Counsel.

Rich, B. A.; Scully, R. J. and Petrosky, C. E. (1992). *Idaho Habitat/Natural Production Monitoring. Part I: General Monitoring Subproject, Annual Report 1990*. Portland: Idaho Department of Fish and Game. Prepared for Bonneville Power Administration.

Richards, M. (1968). Appraisal of project results for salmon and steelhead reintroductions and introductions into the Clearwater River drainage, Idaho. Annual project closing report July 1, 1966 to June 30, 1967. Columbia River Fishery Development Program. Project No. 161.1B-IDA. Contract No. 14-17-0001-1419. Idaho Department of Fish and Game, Boise, Idaho. 9pp.

Richards, M. (1967). Reintroduction of salmon and steelhead into portions of the Clearwater River drainage, July 1, 1966 to June 30 1967. Annual Project Closing Report. Contract No.14-17-0001-1418. Project No. 221.1-IDA-1.3. Idaho Department of Fish and game, Boise, Idaho.

Rieman, B. E. and Apperson, K. A. (1989). *Status and Analysis of Salmonid Fisheries: Westslope Cutthroat Trout Synopsis and Analysis of Fishery Information*. Idaho Department of Fish and Game.

Rieman, B. E. and McIntryre, J. D. (1993). *Demographic and Habitat Requirements for Conservation of Bull Trout*. Ogden, UT: U.S. Forest Service, Intermountain Research Station.

Ries, R. D.; Burns, D. and Lund, J. (1991). *Fine Sediment Deposition in Selected Tributaries to the Salmon River in the Payette National Forest: Report of Monitoring Results 1989-1990*.

Ruggiero, L. F., K. B. Aubry, et al. (1994). American Marten, Fisher, Lynx, and Wolverine in the Western United States. Fort Collins, CO, U.S. Forest Service**:** 184.

Sands, A. R., C. A. Vogel, and K. P. Reese. 1998. Idaho Mountain Quail Conservation Plan. 1998. 24 pp.

Schaller, H.A., Petrosky, C.E. and Langness, O.P. (1999). Contrasting patterns of productivity and survival rates for stream-type chinook salmon (*Oncorhynchus tshawytscha*) populations of the Snake and Columbia rivers. Can. J. Fish. Aquat. Sci **56**: 1031-1045.

Schoen, D.; Jones, R. M. and Murphy, P. K. (1999). *Section 7 Watershed Biological Assessment Lochsa River Drainage Clearwater Subbasin: Determination of Effects of Ongoing Activities Based on the Matrix of Pathways and Indicators of Watershed Condition for Steelhead Trout, Fall Chinook Salmon and Bull Trout*. Clearwater National Forest.

Schriever, E. and D. Schiff. (2001). Bull Trout Investigations in the North Fork Clearwater Drainage, 2000. Report to the Clearwater National Forest. Idaho Department of Fish and Game, Lewiston, Idaho

Servheen, G. and L. Bomar. (2000). Clearwater elk population and habitat investigations 1998-1999. Unpubl. Rept. Idaho Dept. of Fish and Game. Lewiston, ID. 85 pp.

Sheley, R. L. and J. K. Petroff (Eds.). 1999. *Biology and Management of Noxious Rangeland Weed*s. Oregon State University Press, Corvallis. 438 pp.

Shrivell, C.S. (1990). Ability of PHABSIM to predict chinook salmon spawning habitat. Regulated Rivers 3:277-289.

Siddall, P. (1992). South Fork Clearwater River Habitat Enhancement. Nez Perce National Forest report to Bonneville Power Administration. Project 84-5. Agreement No. DE-A179-84BP16475.

Simpson, J. C. and Wallace, R. L. (1982). Fishes of Idaho. Moscow: University of Idaho Press.

Slickpoo, A. (1989). Ancient Nez Perce Fishing Practices on the Snake and Salmon Rivers. Snake River Basin Adjudication Instream Flow Claims, Nez Perce Tribe, Office of Legal Counsel.

Smith, D. R. (1954). *The Bighorn Sheep in Idaho: (Its Status Life History and Management*). Boise, State of Idaho: Department of Fish and Game.

Soil Survey Staff. (1975). Soil Taxonomy. U.S. Dept. Agric. Handb. 436. U.S. Govt. Printing Office, Washington DC.

Space, R. S. (1964). The Clearwater Story: A History of the Clearwater National Forest. Missoula, MT: U.S. Forest Service.

Staley, W. W. (1940). *Mining Activity in the North Fork of the Clearwater River Area*. Moscow: University of Idaho.

Stapp, D.; Bryan, E. and Rigg, D. (1984). *The 1978 Clearwater River Survey*. Laboratory of Anthropology, University of Idaho.

Steward, C. R. (1996). *Monitoring and Evaluation Plan for the Nez Perce Tribal Hatchery*. Lapwai, ID: Nez Perce Tribe.

Stone, J., T. Coley, T. Sundlov and S. Barndt. (2001). Evaluate Habitat Use and Population Dynamics of Lampreys in Cedar Creek. Annual Report 2000, Bonneville Power Administration, Contract No. 00000014, Project No. 200001400, 27 electronic pages (BPA Report DOE/BP-00000014-1)

Stuebner, S. (1997). The Wanderer. National Wildlife(October/November): 40-45.

Supplementation Technical Work Group. 1988. Supplementation research-proposed five-year work plan. Northwest Power Planning Council, Portland, Oregon.

Swanston, D. N. (1991). Natural Processes. In: Influences of Forest and Rangeland Management on Salmonid Fishes and Their Habitats. W. R. Meehan, Ed. Bethesda, MD: American Fisheries Society, pp. 139-180.

Swanston, D. N. and Swanson, F. J. (1976). Timber Harvesting, Mass Erosion, and Steepland Forest Geomorphology in the Pacific Northwest. In: Geomorphology and Engineering. D. R. Coates, Ed. Stroudsburg, PA: Dowden, Hutchinson and Ross, Inc., pp. 199-221.

Thomas, C. A; Broom, H. C and Cummans, J. E. (1963). *Magnitude and Frequency of Floods in the United States: Part 13. Snake River Basin*. Washington, DC: U.S. Geological Survey.

Thompson, K. L. (1999). *Biological Assessment: Lower Selway 4th Code HUC. Fish, Wildlife and Plants*. Nez Perce National Forest, Moose Creek Ranger District.

Thwaites, R. G., Ed. (1959). Original Journals of the Lewis and Clark Expedition. Vol. 5. New York: Antiquarian Press.

University of Montana. (2001). Invaders Database. http://invader.dbs.umt.edu/.

U.S. Army Corps of Engineers. (1996). Project Operations: Environmental Stewardship Operations and Maintenance Policies ER 1130-2-540.

U.S. Army Corps of Engineers. (1975). Final Environmental Impact Statement-Dworshak Reservoir.

U.S. Army Corps of Engineers. (1974). Revised master plan for development and management of Dworshak Reservoir. Appendix 0. Fish and Wildlife Plan. 27pp.

U.S. Army Corps of Engineers. (1967). *Revised Draft Detailed Project Report: Lapwai Creek Culdesac, Idaho*. Walla Walla District.

U.S. Bureau of Land Management. (2000). *Clearwater River, North Fork Clearwater River, and Middle Fork Clearwater River Subbasins: Biological Assessment of Ongoing and Proposed Bureau of Land Management Activities on Fall Chinook Salmon, Steelhead Trout, Bull Trout, and BLM Sensitive Species*. Cottonwood, ID:

U.S. Bureau of Reclamation. (2000). Lewiston Orchards Project, Idaho. Data Web. http://dataweb.rsgis.do.usbr.gov/html/lewiston.html.

U.S. Census Bureau. (2000). United States Census 2000. http://www.census.gov/.

U.S. Department of Agriculture Natural Resources Conservation Service. (2000). NRCS Strategic Plan 2000-2005. <http://www.nhq.nrcs.usda.gov/SPA/SPA/pdf_files/straplan.pdf>

U.S. Department of Agriculture. (2000). The Clearwater Basin Elk Habitat Initiative: CEI. <http://www.fs.fed.us/r1/clearwater/cei/ceihome.htm>. accessed on March 1, 2001.

U.S. Department of Agriculture. (2000a). Conservation Reserve Program. Farm Service Agency. http://www.fsa.usda.gov/crpstorpt/10approved/DEFAULT.HTM.

U.S. Environmental Protection Agency. (1999). Permit Compliance System. http://www.epa.gov/enviro/html/pcs/pcs_overview.html

U.S. Fish and Wildlife Service. (2001a). Lower Snake River Compensation Plan Program Summary for the Independent Science Review Panel, April 2001. Compiled by the USFWS, LSRCP, Boise, ID

U.S. Fish and Wildlife Service. (2000). Record of Decision and Final Rule for Grizzly Bear Recovery in the Bitterroot. <http://www.r6.fws.gov/bitterroot/> accessed on 2/19/01.

U.S. Fish and Wildlife Service. (2000a). Listings by State and Territory. http://ecos.fws.gov/webpage/webpage_usa_lists.html?#ID.

U.S. Fish and Wildlife Service. (1999). *Draft Lower Snake River Juvenile Salmon Migration Feasibility Study*. Prepared for the U.S. Army Corps of Engineers, Walla Walla District.

U.S. Fish and Wildlife Service. (1994). The reintroduction of gray wolves to Yellowstone National Park and central Idaho: Final Environmental Impact Statement. U.S. Fish and Wildlife Service, Denver, CO.

U.S. Fish and Wildlife Service. (1993). *A Summary of the Grizzly Bear Recover Plan*. Bethesda, MD.

U.S. Fish and Wildlife Service. (1987). Northern Rocky Mountain Wolf Recovery Plan. U.S. Fish and Wildlife Service, Denver, CO 119pp.

U.S. Fish and Wildlife Service. (1962). Bruce's Eddy Dam and Reservoir: a detailed report on fish and wildlife resources.
U.S. Fish and Wildlife Service and Nez Perce Tribe. (1995). *Interactions of Hatchery and Wild Steelhead in the Clearwater River of Idaho*. Ahsahka, ID:
U.S. Fish and Wildlife Service and Nez Perce Tribe. (1997). *Interactions of Hatchery and Wild Steelhead in the Clearwater River of Idaho*. Ahsahka and Lapwai, ID:
U.S. Forest Service. (1987a). *Clearwater National Forest Plan*. Orofino, ID.
U.S. Forest Service. (1987b). *Nez Perce National Forest Plan*. Grangeville, ID.
U.S. Forest Service. (2000). Forest Roads: A synthesis of information. http://www.fs.fed.us/news/roads/science.pdf
U.S. Geological Survey. (1996). National Water Summary on Wetland Resources. J.D. Fretwell, J. S. Williams, and P. J. Redman, compilers. U.S. Geological Survey Water-Supply Paper 2425.
Van Dusen, H.G. (1903). Annual reports of the Department of Fisheries of the State of Oregon for the years 1901 and 1902 to the Twenty-Second Legislative Assembly [Regular Session]. 183pp.
Van Dusen, H.G. (1905). Annual Reports of the Department of Fisheries of the State of Oregon for the years 1903 and 1904 to the Legislative Assembly, Twenty-Fourth Regular Session. 197p.
Vigg, S. (2000). Nez Perce Tribal Conservation Enforcement Multi-Year Strategic Plan, FY 2000-2004. Prepared for Chief Adam Villavicencio, NPT Department of Fisheries/Conservation Enforcement - by Steven Vigg & Company, Corbett, Oregon. December 31, 2000 Draft. 10p.
Walters, J., J. Hansen, J. Lockhart, C. Reighn, R. Keith, and J. Olson. (2001). Idaho supplementation studies five year report 1992-1996. Project Report, Idaho Department of Fish and Game Report 99-14, to Bonneville Power Administration, Contract DE-BI19-89BP01466, Portland, Oregon.
Waples, R.S., R.P. Jones, Jr., B.R. Beckman, and G.A. Swan. (1991). Status Review for Snake River Fall Chinook Salmon. U.S. Dep. Commer., NOAA Tech. Memo. NMFS F/NWC-201. 73 p.
Weddell, B.J. and J. Lichthardt. (1998). Identification of Conservation Priorities for and Threats to Palouse Grassland and Canyon Grassland Remnants in Idaho, Washington, and Oregon. Prepared for Bureau of Land Management, Cottonwood, Idaho.
Weigel, D. E. and D. P. Statler. (2001; in process). *Genetic Inventory of Westslope Cutthroat Trout in the North Fork Clearwater Basin, Idaho: Final Report 1999/2000*. Orofino, ID: Nez Perce Tribe. Prepared for Bonneville Power Administration.
Weigel, D. E. (1997). *Genetic Inventory of West slope Cutthroat Trout in the North Fork Clearwater Basin, Idaho: Annual Report 1996*. Orofino, ID: Nez Perce Tribe. Prepared for Bonneville Power Administration.
Whitt, C.R. (1954). The Age, Growth and Migration of Steelhead Trout in the Clearwater River, Idaho. M.S. Thesis, University of Idaho, Moscow, Idaho. 67pp.
Whitman, S. C. (1998). Affidavit for SRBA. Snake River Basin Adjudication Instream Flow Claims, Nez Perce Tribe, Office of Legal Counsel.
Williams, G. W. (1997). *References on the American Indian Use of Fire in Ecosystems*. U. S. Forest Service, Pacific Northwest Region.

Williams et al. (1998). Response to the questions of the Implementation Team regarding juvenile salmon transportation in the 1998 season. ISAB Report 98-2. February 27, 1998. Independent Scientific Advisory Board. Northwest Power Planning Council and National Marine Fisheries Service, Portland, OR

Wilson, D.; Coyner, J and Deckert, T. (1983). *Land System Inventory of the Clearwater National Forest*.

Wilson, A.; Wilson, E.; Groves, C.; and Wallace, R. (1997). U.S. Distribution of the Coeur d'Alene Salamander (*Plethodon idahoensis* Slater and Slipp). Great Basin Naturalist 57(4):359-362.

Wilson, A. and Larsen, J. (1998). Biogeographic analysis of the Coeur d'Alene Salamander (Plethodon idahoensis). Northwest Science 72(2):111-115.

Winans, G. A., P.B. Aebersold, and R.S. Waples. (1996). Allozyme variability of Oncorhynchus nerka in the Pacific Northwest, with special consideration to populations of Redfish Lake, Idaho. Transactions of the American Fisheries Society 125:645-6663.

Wipfli, M.S., Hudson, J.P., Caoutte. (1998). Influence of salmon carcasses on stream productivity: response of biofilm and benthic macroinvertebrates in southeastern Alaska, U.S.A. Can. J. Fish. Aquat. Sci. 55:1,503-1,511.

Wisdom, M. J., R. S. Holthausen, D. C. Lee, B. C. Wales, W. J. Murphy, M. R. Eames, C. D. Hargis, V. A. Saab, T. D. Rich, F. B. Samson, D. A. Newhouse and N. Warren. (2000). Source habitats for terrestrial vertebrates of focus in the Interior Columbia Basin: Broad-scale trends and management implications. U.S. Department Agric., For. Serv., Pacific Northwest Res. Stat. Gen. Tech. Rep. PNW-GTR-xxx, Portland.

Woods, P. D. and Horstmann, M. C. (1994). *A Land Use History of the Interior Columbia River Basin: 13,000 BP to 1940*. Washington: Woods Institute; Lolo National Forest.

Appendix A - Summary of GIS data layers used in the Clearwater subbasin summary and their associated sources and scales

General Description	Source	Scale / Resolution
States	ICBEMP	1:100,000
Counties	ICBEMP	1:100,000
Cities	ICBEMP	1:100,000
HUCs – 4th code	ICBEMP	1:100,000
HUCs – 6th code	ICBEMP	1:100,000
Assessment Units	WSU	1:100,000
Digital Elevation Model (DEM)	USGS	30m grid cells
Major Rivers	ICBEMP	1:2,000,000
Streams	Streamnet	1:250,000
Streams	Streamnet	1:100,000
Flow Variation	Lipscomb (1998)	
Dams	IDWR	1:100,000
303(d) listed stream segments	Updated from ICBEMP	1:100,000
Lithology	IDWR	1:500,000
Mines (Hazard Ratings)	ICBEMP	Point data
Mine Claim Density	ICBEMP	1:500,000
Precipitation	PRISM	2.25 minute
Avg. Annual Temperature	ICBEMP	None given
Land Cover (Use)	Idaho GAP data from Univ. of Idaho Landscape Dynamics Lab	1:100,000
Land Ownership	Idaho Gap NPT – Land Services Dept. Potlatch Corporation	1:100,000 1:24,000 1:24,000
Historic Vegetation	ICBEMP	1km grid cells
Current Vegetation (for comparison to historic)	ICBEMP	1km grid cells
Current Vegetation	Idaho GAP	30m grid cells
Vegetation Structural Stage - Current	ICBEMP	1km grid cells
Vegetation Structural Stage - Historic	ICBEMP	1km grid cells
Starthistle Distribution	Idaho Weed Watchers	Unspecified
Knapweed Distribution	Idaho Weed Watchers	Unspecified
Historic Fire Regime	ICBEMP	1km grid cells
Current Fire Regime	ICBEMP	1km grid cells
Fire History	USFS (NPNF and CNF)	Variable
Sensitive Plants/ Animals	IDFG-CDC	Point data
Fish Distributions/Status	Derived	6th Field HUC

Carrying Capacity (Steelhead and Spring Chinook)	NWPPC Presence/Absence database (Streamnet)	1:250,000
Habitat Quality (Steelhead and Spring Chinook)	NWPPC Presence/Absence database (Streamnet)	1:250,000
Constraints (Steelhead and Spring Chinook)	NWPPC Presence/Absence database (Streamnet)	1:250,000
Index of Culvert Numbers	WSU	1:100,000
Section 7 Watersheds	ICBEMP	1:500,000
Bull Trout Key watersheds	WSU	1:100,000
Critical Habitat – Fall Chinook	WSU	1:250,000
Roads	USFS road layers (USFS property) USGS quad map layers (Non-USFS property)	1:24,000 1:24,000
Protected Areas (Excludes Roadless Areas)	ICBEMP	1:24,000 – 1:500,000
Inventoried Roadless Areas	USDA Forest Service	1:24,000 – 1:198,000
Grazing Allotments	USDA Forest Service (NPNF and CNF)	Unspecified
Grazeable lands	USGS GIRAS database	1:250,000

Appendix B – Maps showing water quality limited stream segments listed on IDEQ's 1998 303(d) list

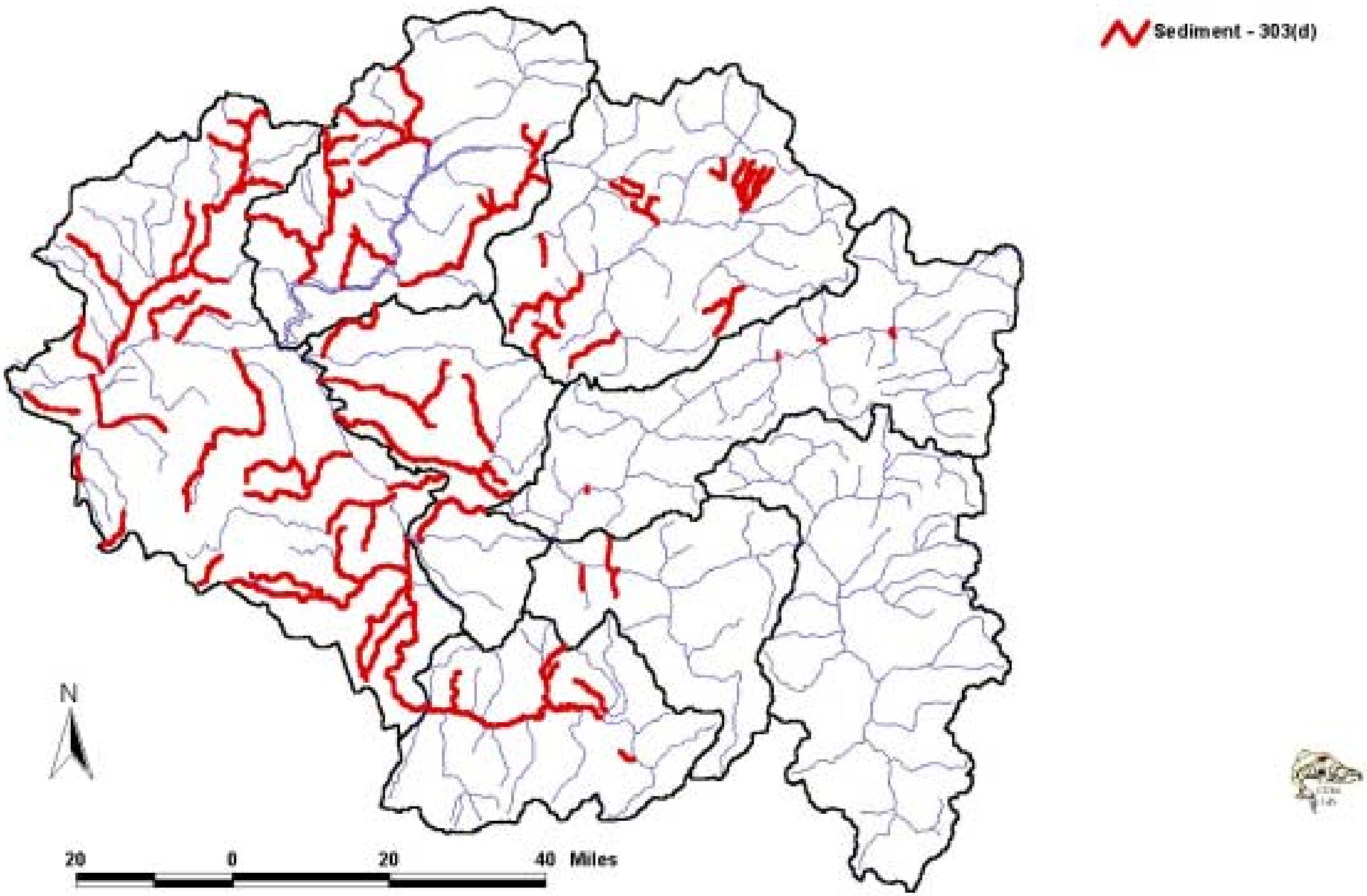

Figure 43. Distribution of water quality limited stream segments listed on the 1998 303(d) list by IDEQ for impairment due to sediment

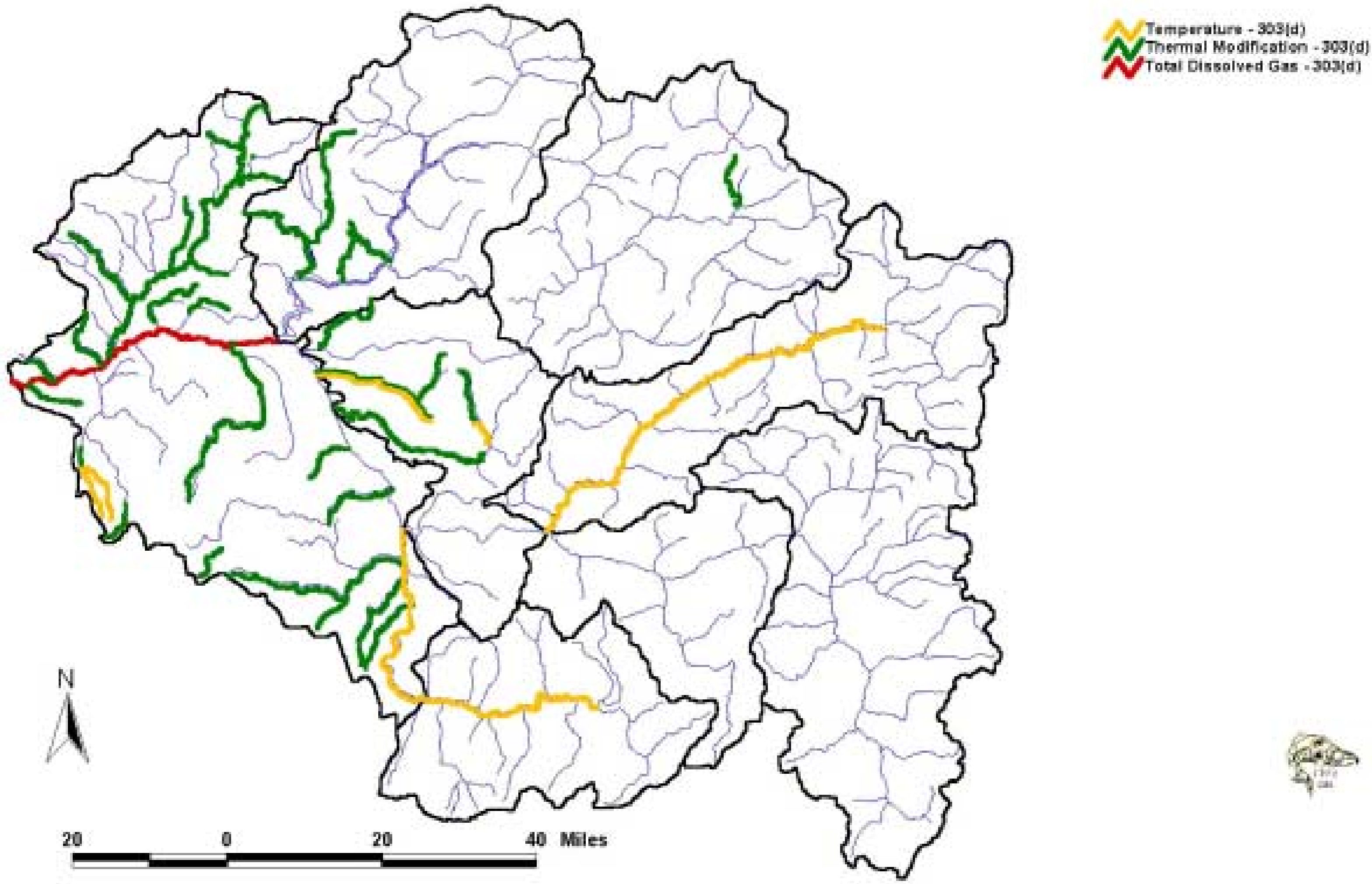

Figure 44. Distribution of water quality limited stream segments listed on the 1998 303(d) list by IDEQ for impairment due to temperature, thermal modification, and total dissolved gas

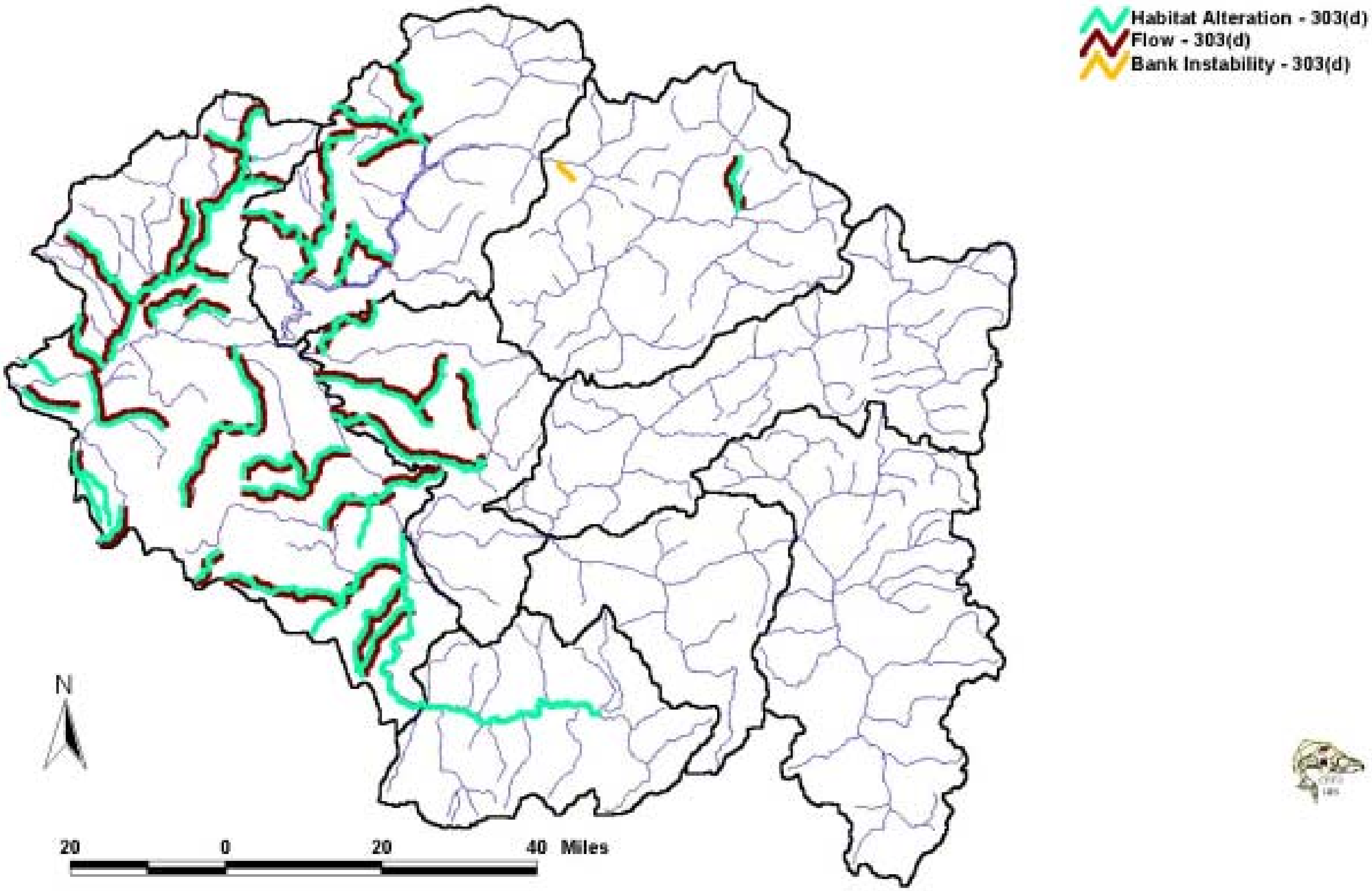

Figure 45. Distribution of water quality limited stream segments listed on the 1998 303(d) list by IDEQ for impairment due to habitat alteration, flow, and bank instability

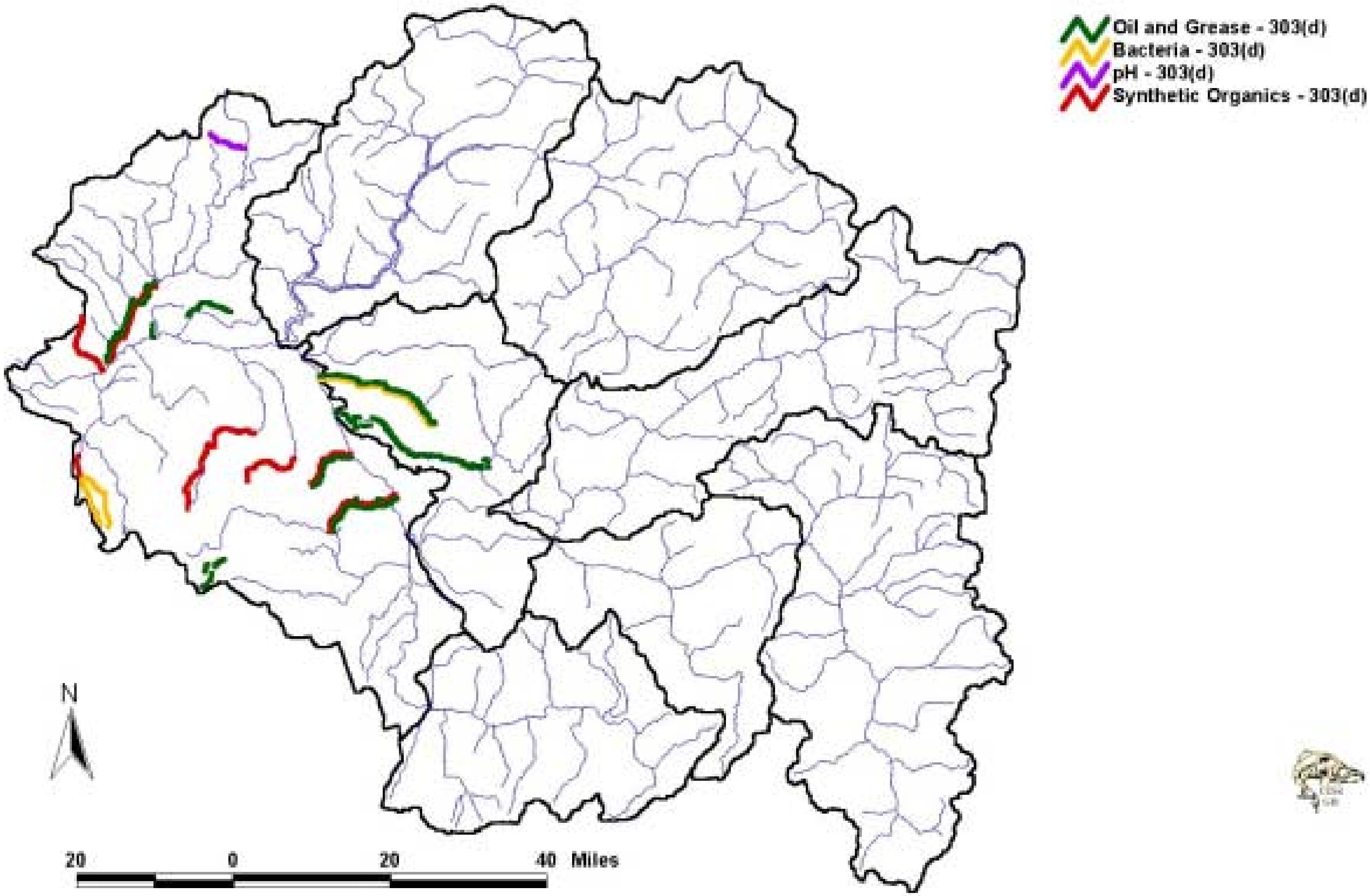

Figure 46. Distribution of water quality limited stream segments listed on the 1998 303(d) list by IDEQ for impairment due to oil and grease, bacteria, pH, and synthetic organics

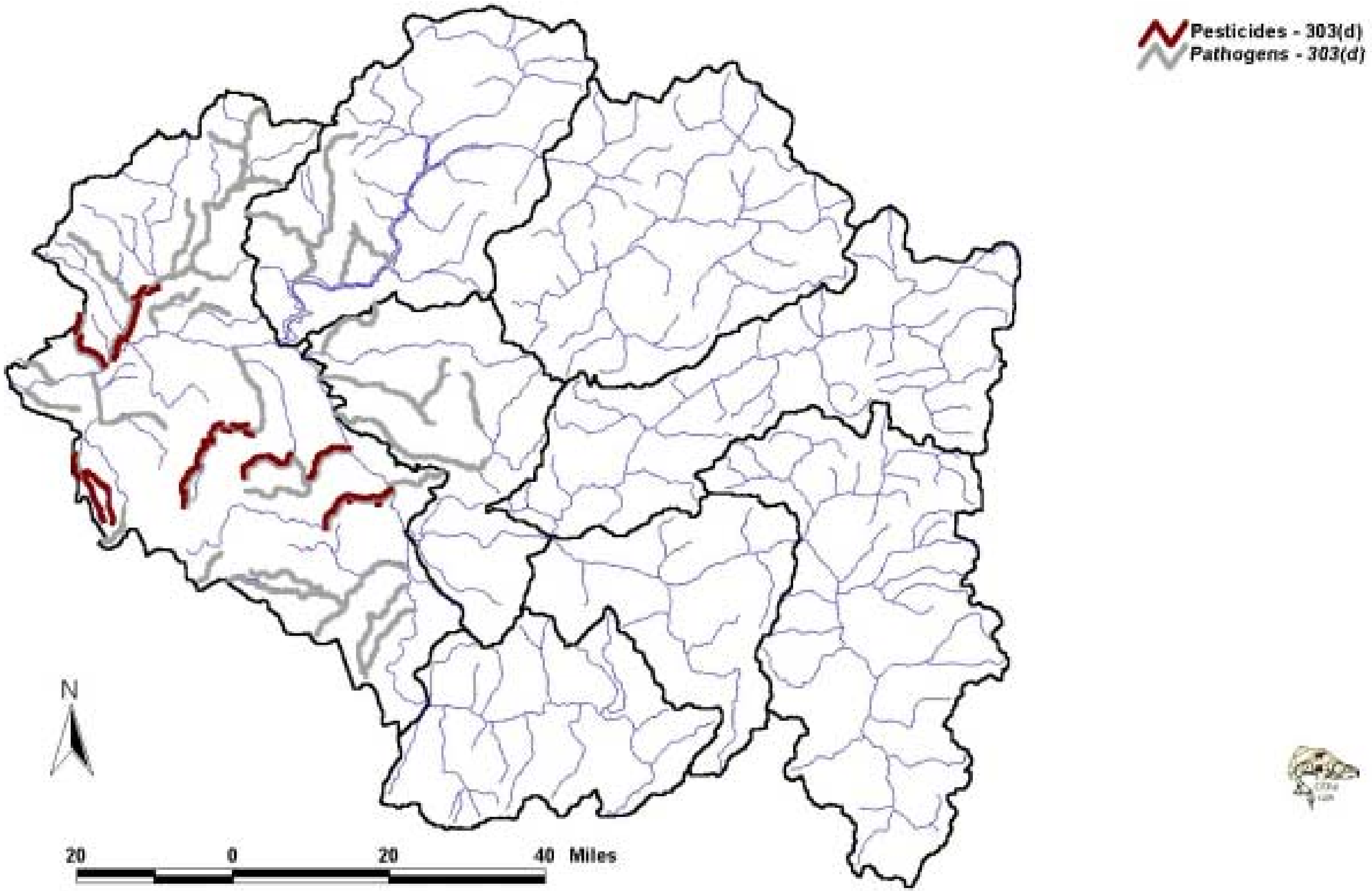

Figure 47. Distribution of water quality limited stream segments listed on the 1998 303(d) list by IDEQ for impairment due to pesticides and pathogens

Appendix C - Rare plant species of the Clearwater subbasin

Vascular and Non-vascular Species	
Allotropa virgata	Candy stick
Asplenium trichomanes	Maidenhair Spleenwort
Aster jessicae	Jessica's Aster
Astragalus paysonii	Payson's Milkvetch
Blechnum spicant	Deer fern
Botrychium crenulatum	Crenulate Moonwort
Botrychium lanceolatum var. lanc.	Lance-leaf Grape-fern
Botrychium minganense	Mingan Moonwort
Botrychium montanum	Mountain Moonwort
Botrychium pinnatum	Northern Grape-fern
Botrychium simplex	Least Moonwort
Buxbaumia aphylla	Leafless Bug-on-a-stick
Buxbaumia viridis	Green Bug-on-a-stick
Calochortus nitidus	Broadfruit Mariposa
Cardamine constancei	Constance's Bittercress
Carex buxbaumii	Buxbaum's Sedge
Carex hendersonii	Henderson's Sedge
Carex leptalea	Bristle-stalked Sedge
Cetraria subalpina	Subalpine Cetraria
Cladonia andereggii	Anderegg's Cladonia
Cornus nuttallii	Pacific Dogwood
Corydalis caseane ssp. hastata	Case's Corydalis
Cypripedium fasciculatum	ClusteRed Ladyslipper
Dasynotus daubenmirei	Dasynotus
Dodecatheon dentatum	White Shooting Star
Douglasia idahoensis	Idaho Douglasia
Eburophyton austiniae	Phantom Orchid
Haplopappus hirtus var. sonchifolius	Sticky Goldenweed
Haplopappus liatriformis	Palouse Goldenweed
Hookeria lucens	Light Hookeria
Hypogymnia apinnata	Tube Lichen
Lobaria hallii	Hall's Lungwort
Lomatium dissectum var. dissectum	Fern-leaved Desert Parsley
Lomatium salmoniflorum	Salmon-flowered Desert Parsley
Mertensia bella	Oregon Bluebells
Mimulus alsinoides	Chickweed Monkeyflower
Mimulus ampliatus	Spacious Monkeyflower
Mimulus clivicola	Bank Monkey-flower
Pentagramma triangularis spp. triang.	Gold-back Fern
Petasites frigidus var. palmatus	Sweet Coltsfoot
Petasites sagittatus	Arroeleaf Coltsfoot
Phlox idahonis	Clearwater Phlox
Pilophorus acicularis	Nail Lichen
Polypodium glycyrrhiza	Licorice Fern
Pseudocyphellaria anthraspis	White-dot Lichen
Psilocarphus tenellus	Slender Woolly-heads
Rhizomnium nudum	Naked-stem Rhizomnium
Rubus spectabilis	Salmonberry
Silene spaldingii	Spalding's Silene
Sphaerophorus globosus	Tuckermann's Ball-bearing Lichen
Synthyris platycarpa	Evergreen Kittentail
Tauschia tenuissima	Leiberg's Tauschia
Thelypteris nevadensis	Sierra Wood-fern
Triantha occidentalis ssp. brevistyla	Short-styled Triantha
Trientalis latifolia	Western Starflower
Trifolium plumosum var. amplifolium	Plumed Clover
Waldsteinia idahoensis	Idaho Barren Strawberry

Appendix D - Wildlife species of the Clearwater subbasin

Amphibians	
Ambystoma macrodactylum	Long-toed Salamander
Ambystoma tigrinum	Tiger Salamander
Ascaphus truei	Tailed Frog
Bufo boreas boreas	Western Boreal Toad
Bufo woodhousii	Woodhouse's Toad
Dicamptodon aterrimus	Idaho Giant Salamander
Plethodon idahoensis	Coeur d'Alene Salamander
Pseudacris regilla	Pacific Chorus Frog
Rana catesbeiana	Bullfrog
Rana luteiventris	Spotted Frog
Rana pipiens	Northern Leopard Frog
Spea intermontana	Great Basin Spadefoot
Taricha granulosa	Rough-skinned Newt
Birds	
Accipiter cooperii	Cooper's Hawk
Accipiter gentilis	Northern Goshawk
Accipiter striatus	Sharp-shinned Hawk
Actitis macularia	Spotted Sandpiper
Aechmophorus clarkii	Clark's Grebe
Aechmophorus occidentalis	Western Grebe
Aegolius acadicus	Northern Saw-whet Owl
Aegolius funereus	Boreal Owl
Aeronautes saxatalis	White-throated Swift
Agelaius phoeniceus	Red-winged Blackbird
Aix sponsa	Wood Duck
Alectoris chukar	Chukar
Ammodramus savannarum	Grasshopper Sparrow
Anas acuta	Northern Pintail
Anas americana	American Wigeon
Anas clypeata	Northern Shoveler
Anas crecca	Green-winged Teal
Anas cyanoptera	Cinnamon Teal
Anas discors	Blue-winged Teal
Anas platyrhynchos	Mallard
Anas strepera	Gadwall
Anthus rubescens	American Pipit
Aquila chrysaetos	Golden Eagle
Archilochus alexandri	Black-chinned Hummingbird
Ardea herodias	Great Blue Heron
Asio flammeus	Short-eared Owl
Asio otus	Long-eared Owl
Athene cunicularia	Burrowing Owl
Aythya affinis	Lesser Scaup
Aythya americana	Redhead
Aythya collaris	Ring-necked Duck
Aythya valisineria	Canvasback
Bartramia longicauda	Upland Sandpiper
Bombycilla cedrorum	Cedar Waxwing
Bombycilla garrulus	Bohemian Waxwing
Bonasa umbellus	Ruffed Grouse
Botaurus lentiginosus	American Bittern
Branta canadensis	Canada Goose
Bubo virginianus	Great Horned Owl
Bucephala albeola	Bufflehead
Bucephala clangula	Common Goldeneye

Bucephala islandica	Barrow's Goldeneye
Buteo jamaicensis	Red-tailed Hawk
Buteo lagopus	Rough-legged Hawk
Buteo swainsoni	Swainson's Hawk
Calcarius lapponicus	Lapland Longspur
Calidris alpina	Dunlin
Calidris bairdii	Baird's Sandpiper
Calidris mauri	Western Sandpiper
Calidris melanotos	Pectoral Sandpiper
Calidris minutilla	Least Sandpiper
Calidris pusilla	Semipalmated Sandpiper
Callipepla californica	California Quail
Carduelis flammea	Common Redpoll
Carduelis hornemanni	Hoary Redpoll
Carduelis pinus	Pine Siskin
Carduelis tristis	American Goldfinch
Carpodacus cassinii	Cassin's Finch
Carpodacus mexicanus	House Finch
Cathartes aura	Turkey Vulture
Catharus fuscescens	Veery
Catharus guttatus	Hermit Thrush
Catharus ustulatus	Swainson's Thrush
Catherpes mexicanus	Canyon Wren
Certhia americana	Brown Creeper
Ceryle alcyon	Belted Kingfisher
Chaetura vauxi	Vaux's Swift
Charadrius semipalmatus	Semipalmated Plover
Charadrius vociferus	Killdeer
Chen caerulescens	Snow Goose
Chen rossii	Ross's Goose
Chlidonias niger	Black Tern
Chondestes grammacus	Lark Sparrow
Chordeiles minor	Common Nighthawk
Cinclus mexicanus	American Dipper
Circus cyaneus	Northern Harrier
Cistothorus palustris	Marsh Wren
Clangula hyemalis	Oldsquaw
Coccothraustes vespertinus	Evening Grosbeak
Coccyzus americanus	Yellow-billed Cuckoo
Colaptes auratus	Northern Flicker
Columba fasciata	Band-tailed Pigeon
Columba livia	Rock Dove
Contopus borealis	Olive-sided Flycatcher
Contopus sordidulus	Western Wood-pewee
Corvus brachyrhynchos	American Crow
Corvus corax	Common Raven
Cyanocitta cristata	Blue Jay
Cyanocitta stelleri	Steller's Jay
Cygnus columbianus	Tundra Swan
Cypseloides niger	Black Swift
Dendragapus canadensis	Spruce Grouse
Dendragapus obscurus	Blue Grouse
Dendroica coronata	Yellow-rumped Warbler
Dendroica petechia	Yellow Warbler
Dendroica townsendi	Townsend's Warbler
Dryocopus pileatus	Pileated Woodpecker
Dumetella carolinensis	Gray Catbird
Empidonax hammondii	Hammond's Flycatcher
Empidonax minimus	Least Flycatcher
Empidonax oberholseri	Dusky Flycatcher
Empidonax occidentalis	Cordilleran Flycatcher

Empidonax traillii	Willow Flycatcher
Eremophila alpestris	Horned Lark
Euphagus cyanocephalus	Brewer's Blackbird
Falco columbarius	Merlin
Falco mexicanus	Prairie Falcon
Falco peregrinus	Peregrine Falcon
Falco sparverius	American Kestrel
Fulica americana	American Coot
Gallinago gallinago	Common Snipe
Gavia immer	Common Loon
Geothlypis trichas	Common Yellowthroat
Glaucidium gnoma	Northern Pygmy-owl
Grus canadensis tabida	Greater Sandhill Crane
Haliaeetus leucocephalus	Bald Eagle
Hirundo pyrrhonota	Cliff Swallow
Hirundo rustica	Barn Swallow
Histrionicus histrionicus	Harlequin Duck
Icteria virens	Yellow-breasted Chat
Icterus galbula	Northern Oriole
Ixoreus naevius	Varied Thrush
Junco hyemalis	Dark-eyed Junco
Lagopus leucurus	White-tailed Ptarmigan
Lanius excubitor	Northern Shrike
Lanius ludovicianus	Loggerhead Shrike
Larus argentatus	Herring Gull
Larus californicus	California Gull
Larus delawarensis	Ring-billed Gull
Larus glaucescens	Glaucous-winged Gull
Larus philadelphia	Bonaparte's Gull
Leucosticte atrata	Black Rosy Finch
Leucosticte tephrocotis	Gray-crowned Rosy Finch
Limnodromus griseus	Short-billed Dowitcher
Limnodromus scolopaceus	Long-billed Dowitcher
Limosa fedoa	Marbled Godwit
Lophodytes cucullatus	Hooded Merganser
Loxia curvirostra	Red Crossbill
Loxia leucoptera	White-winged Crossbill
Melanerpes lewis	Lewis's Woodpecker
Meleagris gallopavo	Wild Turkey
Melospiza georgiana	Swamp Sparrow
Melospiza lincolnii	Lincoln's Sparrow
Melospiza melodia	Song Sparrow
Mergus merganser	Common Merganser
Molothrus ater	Brown-headed Cowbird
Myadestes townsendi	Townsend's Solitaire
Nucifraga columbiana	Clark's Nutcracker
Numenius americanus	Long-billed Curlew
Nyctea scandiaca	Snowy Owl
Nycticorax nycticorax	Black-crowned Night Heron
Oporornis tolmiei	Macgillivray's Warbler
Oreortyx pictus	Mountain Quail
Otus flammeolus	Flammulated Owl
Otus kennicottii	Western Screech Owl
Oxyura jamaicensis	Ruddy Duck
Pandion haliaetus	Osprey
Passer domesticus	House Sparrow
Passerculus sandwichensis	Savannah Sparrow
Passerella iliaca	Fox Sparrow
Passerina amoena	Lazuli Bunting
Perdix perdix	Gray Partridge
Perisoreus canadensis	Gray Jay

Phalacrocorax auritus	Double-crested Cormorant
Phalaropus lobatus	Red-necked Phalarope
Phalaropus tricolor	Wilson's Phalarope
Phasianus colchicus	Ring-necked Pheasant
Pheucticus melanocephalus	Black-headed Grosbeak
Pica hudsonia	Black-billed Magpie
Picoides albolarvatus	White-headed Woodpecker
Picoides arcticus	Black-backed Woodpecker
Picoides pubescens	Downy Woodpecker
Picoides tridactylus	Three-toed Woodpecker
Picoides villosus	Hairy Woodpecker
Pinicola enucleator	Pine Grosbeak
Pipilio erythrophthalmus	Rufous-sided Towhee
Piranga ludoviciana	Western Tanager
Plectrophenax nivalis	Snow Bunting
Pluvialis dominica	American Golden-plover
Podiceps auritus	Horned Grebe
Podiceps grisegena	Red-necked Grebe
Podiceps nigricollis	Eared Grebe
Podilymbus podiceps	Pied-billed Grebe
Poecile atricapilla	Black-capped Chickadee
Poecile gambeli	Mountain Chickadee
Poecile rufescens	Chestnut-backed Chickadee
Pooecetes gramineus	Vesper Sparrow
Porzana carolina	Sora
Rallus limicola	Virginia Rail
Recurvirostra americana	American Avocet
Regulus calendula	Ruby-crowned Kinglet
Regulus satrapa	Golden-crowned Kinglet
Riparia riparia	Bank Swallow
Salpinctes obsoletus	Rock Wren
Sayornis saya	Say's Phoebe
Seiurus noveboracensis	Northern Waterthrush
Selasphorus rufus	Rufous Hummingbird
Setophaga ruticilla	American Redstart
Sialia currucoides	Mountain Bluebird
Sialia mexicana	Western Bluebird
Sitta canadensis	Red-breasted Nuthatch
Sitta carolinensis	White-breasted Nuthatch
Sitta pygmaea	Pygmy Nuthatch
Sphyrapicus nuchalis	Red-naped Sapsucker
Sphyrapicus thyroideus	Williamson's Sapsucker
Spizella arborea	American Tree Sparrow
Spizella breweri	Brewer’s Sparrow
Spizella pallida	Clay-colored Sparrow
Spizella passerina	Chipping Sparrow
Stelgidopteryx serripennis	Northern Rough-winged Swallow
Stellula calliope	Calliope Hummingbird
Sterna caspia	Caspian Tern
Sterna forsteri	Forster's Tern
Sterna hirundo	Common Tern
Strix nebulosa	Great Gray Owl
Strix varia	Barred Owl
Sturnella neglecta	Western Meadowlark
Sturnus vulgaris	European Starling
Tachycineta bicolor	Tree Swallow
Tachycineta thalassina	Violet-green Swallow
Thryomanes bewickii	Bewick’s Wren
Tringa flavipes	Lesser Yellowlegs
Tringa melanoleuca	Greater Yellowlegs
Tringa solitaria	Solitary Sandpiper

Troglodytes aedon	House Wren
Troglodytes troglodytes	Winter Wren
Turdus migratorius	American Robin
Tyrannus tyrannus	Eastern Kingbird
Tyrannus verticalis	Western Kingbird
Tyto alba	Common Barn Owl
Vermivora celata	Orange-crowned Warbler
Vermivora peregrina	Tennessee Warbler
Vermivora ruficapilla	Nashville Warbler
Vireo gilvus	Warbling Vireo
Vireo olivaceus	Red-eyed Vireo
Vireocassinii	Cassin’s Vireo
Wilsonia pusilla	Wilson's Warbler
Xanthocephalus xanthocephalus	Yellow-headed Blackbird
Zenaida macroura	Mourning Dove
Zonotrichia albicollis	White-throated Sparrow
Zonotrichia leucophrys	White-crowned Sparrow
Mammals	
Alces alces	Moose
Canis latrans	Coyote
Canis lupus	Gray Wolf
Castor canadensis	Beaver
Cervus elaphus nelsonii	Rocky Mountain Elk
Clethrionomys gapperi	Southern Red-backed Vole
Didelphis virginiana	Virginia Opossum
Eptesicus fuscus	Big Brown Bat
Erethizon dorsatum	Common Porcupine
Euderma maculatum	Spotted Bat
Felis concolor	Mountain Lion
Glaucomys sabrinus	Northern Flying Squirrel
Gulo gulo	Wolverine
Lasionycteris noctivagans	Silver-haired Bat
Lasiurus cinereus	Hoary Bat
Lepus americanus	Snowshoe Hare
Lepus townsendii	White-tailed Jackrabbit
Lontra canadensis	Northern River Otter
Lynx canadensis	Lynx
Lynx rufus	Bobcat
Marmota caligata	Hoary Marmot
Marmota flaviventris	Yellow-bellied Marmot
Martes americana	American Marten
Martes pennanti	Fisher
Mephitis mephitis	Striped Skunk
Microtus longicaudus	Long-tailed Vole
Microtus montanus	Montane Vole
Microtus pennsylvanicus	Meadow Vole
Microtus richardsoni	Water Vole
Mus musculus	House Mouse
Mustela erminea	Ermine
Mustela frenata	Long-tailed Weasel
Mustela vison	Mink
Myotis californicus	California Myotis
Myotis ciliolabrum	Western Small-footed Myotis
Myotis evotis	Long-eared Myotis
Myotis lucifugus	Little Brown Myotis
Myotis thysanodes	Fringed Myotis
Myotis volans	Long-legged Myotis
Myotis yumanensis	Yuma Myotis
Neotoma cinerea	Bushy-tailed Woodrat
Ochotona princeps	American Pika

Odocoileus hemionus	Mule Deer
Odocoileus virginianus	White-tailed Deer
Ondatra zibethicus	Common Muskrat
Onychomys leucogaster	Northern Grasshopper Mouse
Oreamnos americanus	Mountain Goat
Perognathus parvus	Great Basin Pocket Mouse
Peromyscus maniculatus	Deer Mouse
Phenacomys intermedius	Heather Vole
Plecotus townsendii pallescens	Pale Western Big-eared Bat
Procyon lotor	Common Raccoon
Rattus norvegicus	Norway Rat
Reithrodontomys megalotis	Western Harvest Mouse
Sciurus niger	Fox Squirrel
Sorex cinereus	Masked Shrew
Sorex hoyi	Pygmy Shrew
Sorex merriami	Merriam's Shrew
Sorex palustris	Water Shrew
Sorex preblei	Preble's Shrew
Sorex vagrans	Vagrant Shrew
Spermophilus columbianus	Columbian Ground Squirrel
Spermophilus lateralis	Golden-mantled Ground Squirrel
Spilogale gracilis	Western Spotted Skunk
Sylvilagus floridanus	Eastern Cottontail
Sylvilagus nuttallii	Mountain Cottontail
Synaptomys borealis	Northern Bog Lemming
Tamias amoenus	Yellow-pine Chipmunk
Tamias ruficaudus	Red-tailed Chipmunk
Tamiasciurus hudsonicus	Red Squirrel
Taxidea taxus	American Badger
Thomomys talpoides	Northern Pocket Gopher
Ursus americanus	Black Bear
Ursus arctos	Grizzly Bear
Vulpes vulpes	Red Fox
Zapus princeps	Western Jumping Mouse
Reptiles	
Charina bottae	Rubber Boa
Chrysemys picta	Painted Turtle
Coluber constrictor	Racer
Crotalus viridis	Western Rattlesnake
Diadophis punctatus	Ringneck Snake
Elgaria coerulea	Northern Alligator Lizard
Eumeces skiltonianus	Western Skink
Hypsiglena torquata	Night Snake
Phrynosoma douglassii	Short-horned Lizard
Pituophis catenifer	Gopher Snake
Sceloporus occidentalis	Western Fence Lizard
Thamnophis elegans	Western Terrestrial Garter Snake
Thamnophis sirtalis	Common Garter Snake

Appendix E - Sources used to delineate limiting factors for fish in the Clearwater subbasin

Brostrom, J. Idaho Department of Fish and Game. Personal communication, March 30, 2001.

Clearwater Basin Bull Trout Technical Advisory Team (1998a). *Bull Trout Assessment for the Lochsa and Selway Subbasins (Including the Middle Fork of the Clearwater Upstream of the South Fork).*

Clearwater Basin Bull Trout Technical Advisory Team (1998b). *Lower Clearwater River Bull Trout Problem Assessment*. Prepared for the state of Idaho.

Clearwater Basin Bull Trout Technical Advisory Team (1998c). *North Fork Clearwater River Basin Bull Trout Problem Assessment*. Prepared for the state of Idaho.

Clearwater Basin Bull Trout Technical Advisory Team (1998d). *South Fork Clearwater River Subbasin Bull Trout Problem Assessment*. Prepared for the state of Idaho.

Clearwater Biostudies and others (1999). Includes 135 distinct documents produced by four separate authors and cited in *Citations of Contracted Stream Inventories, Clearwater National Forest, Compiled April 20, 1999* (cited by Jody Brostrom of Idaho Department of Fish and Game).

Clearwater BioStudies. (1999a). Aquatic habitat conditions and salmonid abundance in the upper North Fork Clearwater River (from Meadow Creek downstream to Kelly Forks), North Fork Ranger District, summer 1998. Contract report # 53-0276-7-112. Final report submitted to U.S.D.A. Forest Service, Clearwater National Forest, Orofino, Idaho. (mainstem of the North Fork Clearwater River, report no. 48)

Clearwater National Forest (1997). Clearwater Subbasin Ecosystem Analysis at Watershed Scale. Potlatch and Orofino/Lolo Watersheds. Clearwater National Forest, Orofino, ID.

Columbia Basin Fish and Wildlife Authority (1999). FY 2000 Draft Annual Implementation Work Plan. Submitted to the Northwest Power Planning Council. http://www.cbfwf.org/products.htm.

Dupont, J. Idaho Department of Lands. Personal communication, February 14, 2001.

Fuller, R. K.; Johnson, J. H. and Bear, M. A. (1984). *A Biological and Physical Inventory of the Streams Within the Lower Clearwater River Basin, Idaho*. Lapwai, ID: Nez Perce Tribe. Submitted to the Bonneville Power Administration.

Johnson, D. B. (1985). *A Biological and Physical Inventory of Clear Creek, Orofino Creek, and The Potlatch River, Tributary Streams of the Clearwater River, Idaho*. Lapwai, ID: Nez Perce Tribe, Fisheries Resource Management.

Kucera, P. A. and Johnson, D. B. (1986). *A Biological and Physical Inventory of the Streams Within the Nez Perce Reservation: Juvenile Steelhead Survey and Factors That Affect Abundance in Selected Streams in the Lower Clearwater River Basin, Idaho*. Lapwai, ID: Nez Perce Tribe, Fisheries Resource Management.

Kucera, P. A.; Johnson, J. H. and Bear, M. A. (1983). *A Biological and Physical Inventory of the Streams Within the Nez Perce Reservation*. Lapwai, ID: Nez Perce Tribe, Fisheries Resource Management.

Nez Perce National Forest (1995). No Reference Provided - Jody Brostrom, Idaho Department of Fish and Game, personal communication, March 30, 2001.

Nez Perce National Forest (1998a). *South Fork Clearwater River Landscape Assessment Vol. I: Narrative*.

Nez Perce National Forest (1998b). *South Fork Clearwater River Landscape Assessment Vol. II: Maps*.

Nez Perce Tribe and Idaho Department of Fish and Game (1990). *Clearwater River Subbasin Salmon and Steelhead Production Plan*. Funded by the Northwest Power Planning Council; Columbia Basin Fish and Wildlife Authority.

Paradis, W. J.; Lentz, H. S.; Mays, D.; Blair, S. and Lake, L. (1999b). *South Fork Clearwater River Biological Assessment*. Nez Perce National Forest.

Schoen, D.; Jones, R. M. and Murphy, P. K. (1999). *Section 7 Watershed Biological Assessment Lochsa River Drainage Clearwater Subbasin: Determination of Effects of Ongoing Activities Based on the Matrix of Pathways and Indicators of Watershed Condition for Steelhead Trout, Fall Chinook Salmon and Bull Trout*. Clearwater National Forest.

Thompson, K. L. (1999). *Biological Assessment: Lower Selway 4th Code HUC. Fish, Wildlife and Plants*. Nez Perce National Forest, Moose Creek Ranger District.

Weigel, D. E. (1997). *Genetic Inventory of Westslope Cutthroat Trout in the North Fork Clearwater Basin, Idaho: Annual Report 1996*. Orofino, ID: Nez Perce Tribe. Prepared for Bonneville Power Administration.

Weigel, D. E. and Cross, S. (1998). *Genetic Inventory of Westslope Cutthroat Trout in the North Fork Clearwater Basin, Idaho: Annual Report 1997*. Orofino, ID: Nez Perce Tribe. Prepared for Bonneville Power Administration.

Weigel, D. E. and Zakrajesek, J. (1999). *Genetic Inventory of Westslope Cutthroat Trout in the North Fork Clearwater Basin, Idaho: Annual Report 1998*. Orofino, ID: Nez Perce Tribe. Prepared for Bonneville Power Administration.

Appendix F - Figures depicting limiting factors for fish in the Clearwater subbasin

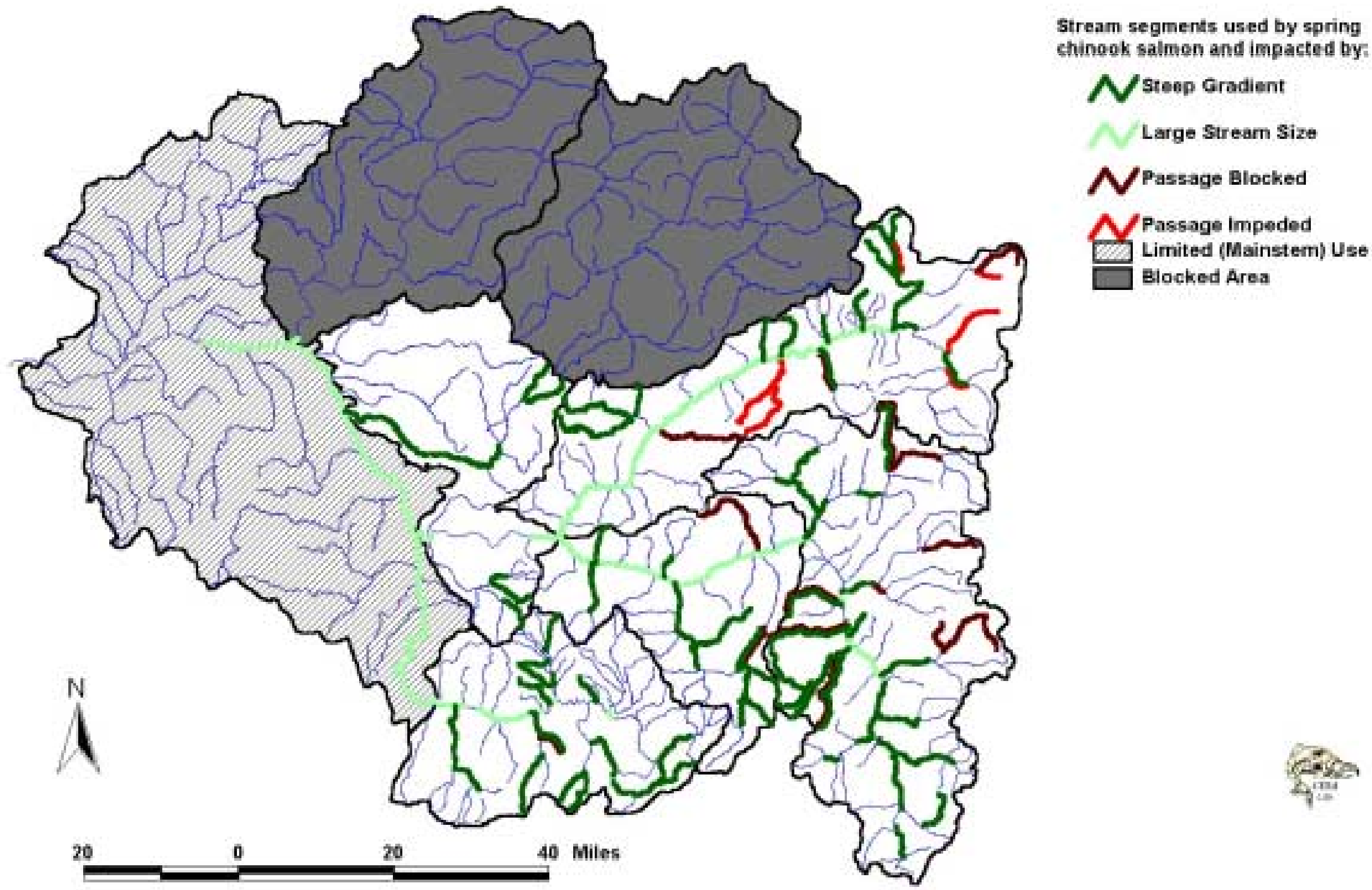

Figure 48. Clearwater subbasin stream segments where chinook salmon populations may be constrained by steep gradients, large stream size, or blocked or impeded passage (Pacific States Marine Fisheries Commission 2001)

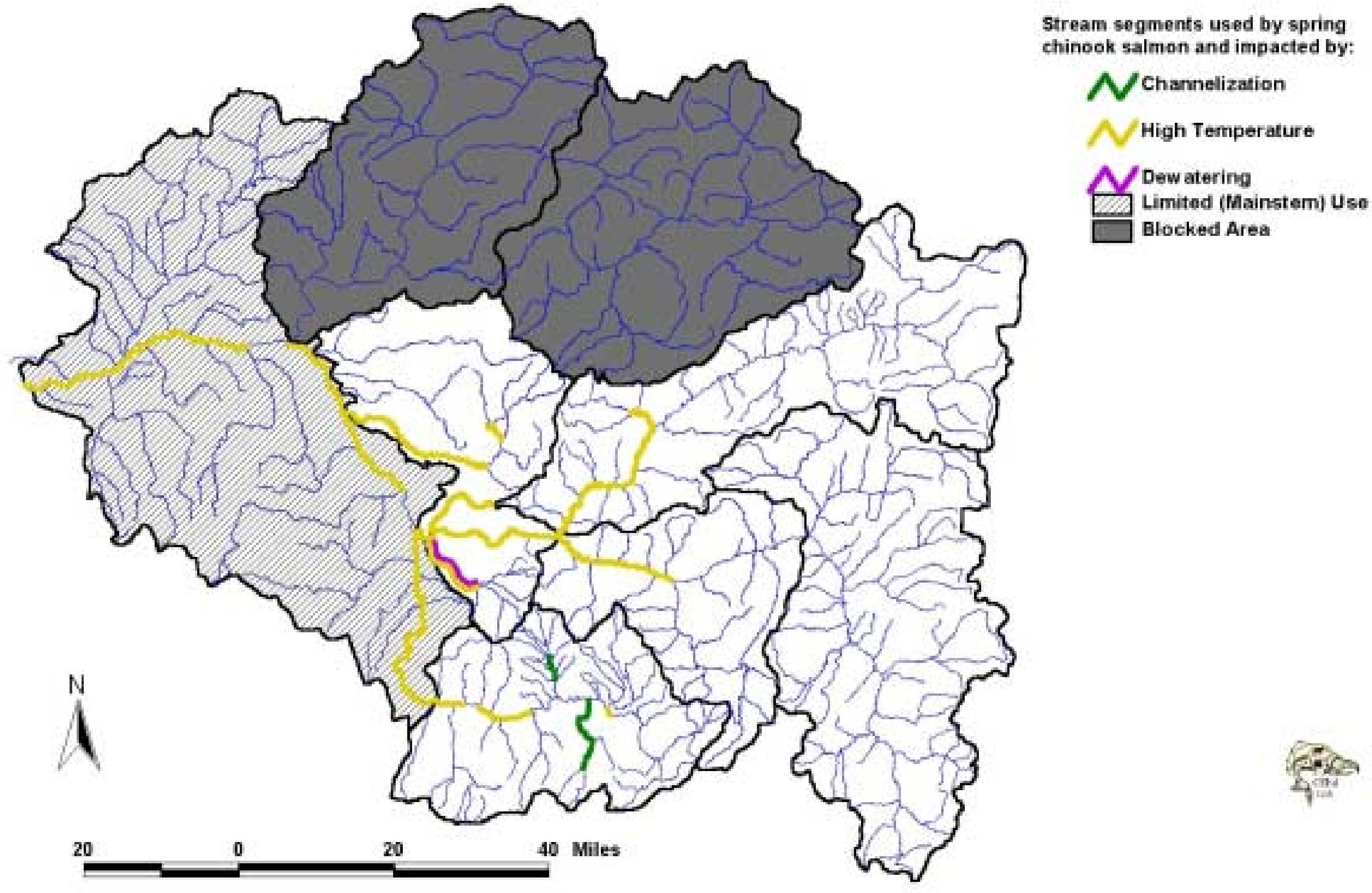

Figure 49. Clearwater subbasin stream segments where chinook salmon populations may be constrained by channelization, high temperatures, or dewatering (Pacific States Marine Fisheries Commission 2001)

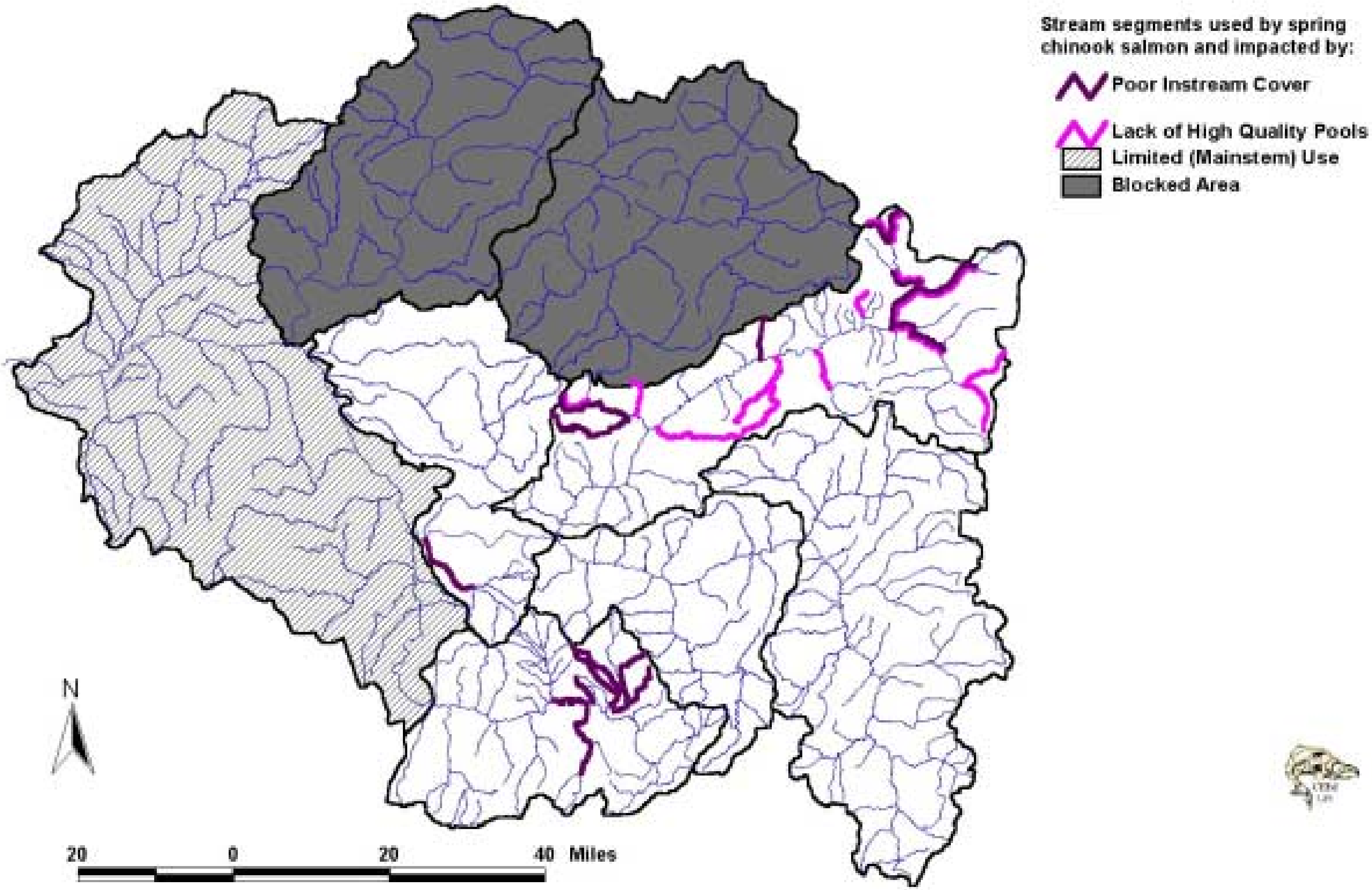

Figure 50. Clearwater subbasin stream segments where chinook salmon populations may be constrained by poor instream cover or lack of high quality pools (Pacific States Marine Fisheries Commission 2001)

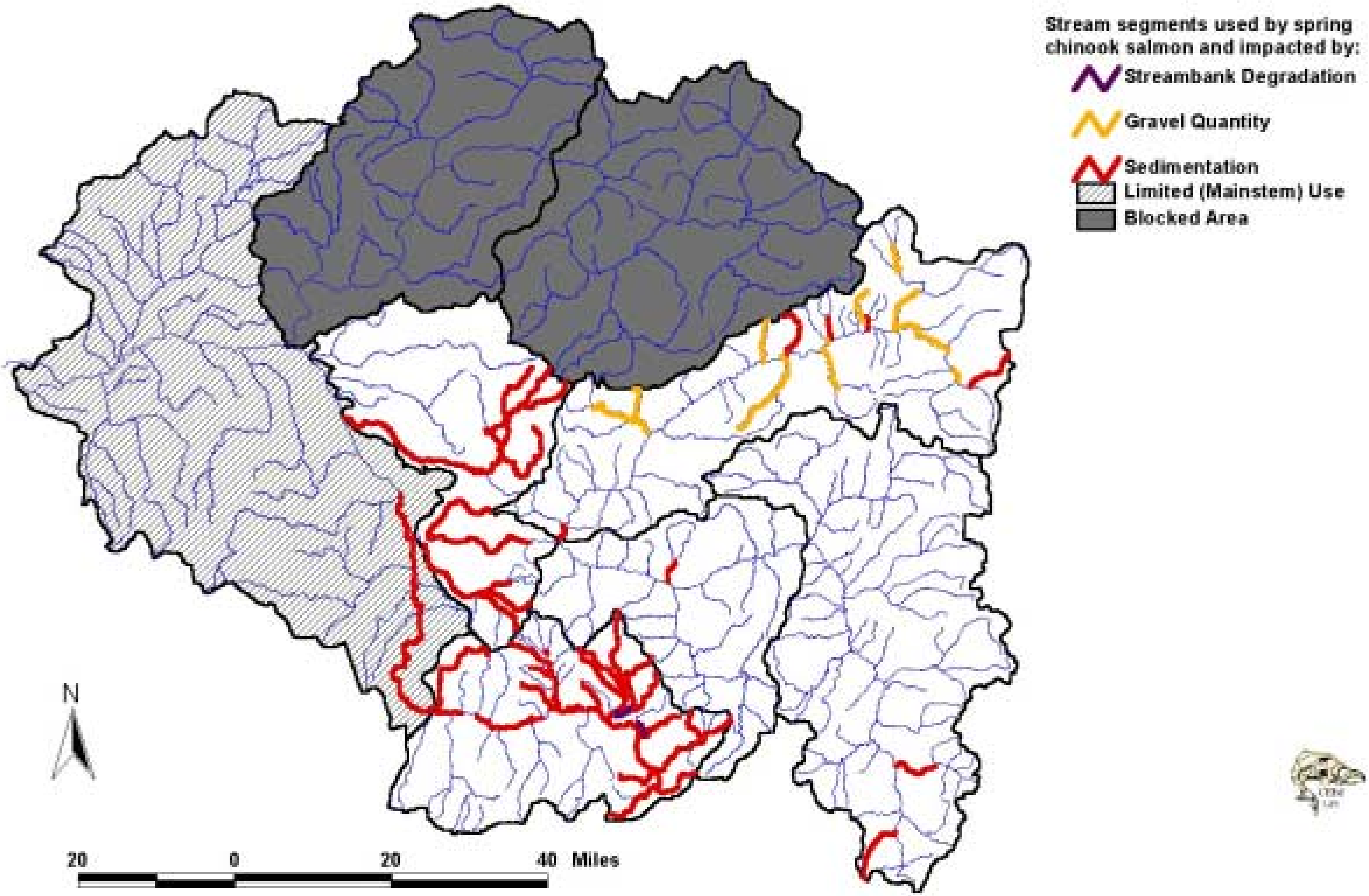

Figure 51. Clearwater subbasin stream segments where chinook salmon populations may be constrained by streambank degradation, limited gravel quantity or sedimentation (Pacific States Marine Fisheries Commission 2001)

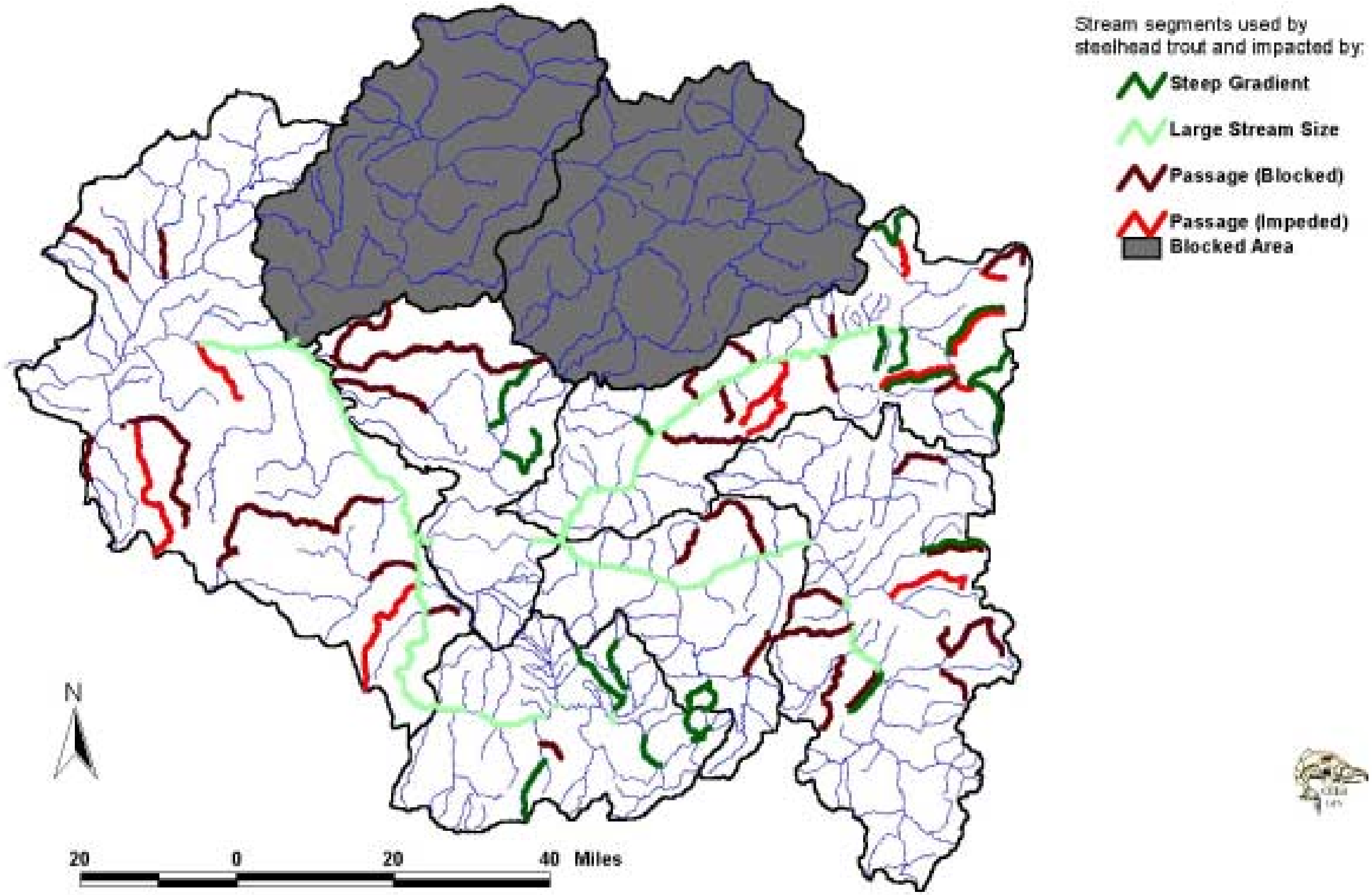

Figure 52. Clearwater subbasin stream segments where steelhead trout populations may be constrained by steep gradients, large stream size, or blocked or impeded passage (Pacific States Marine Fisheries Commission 2001)

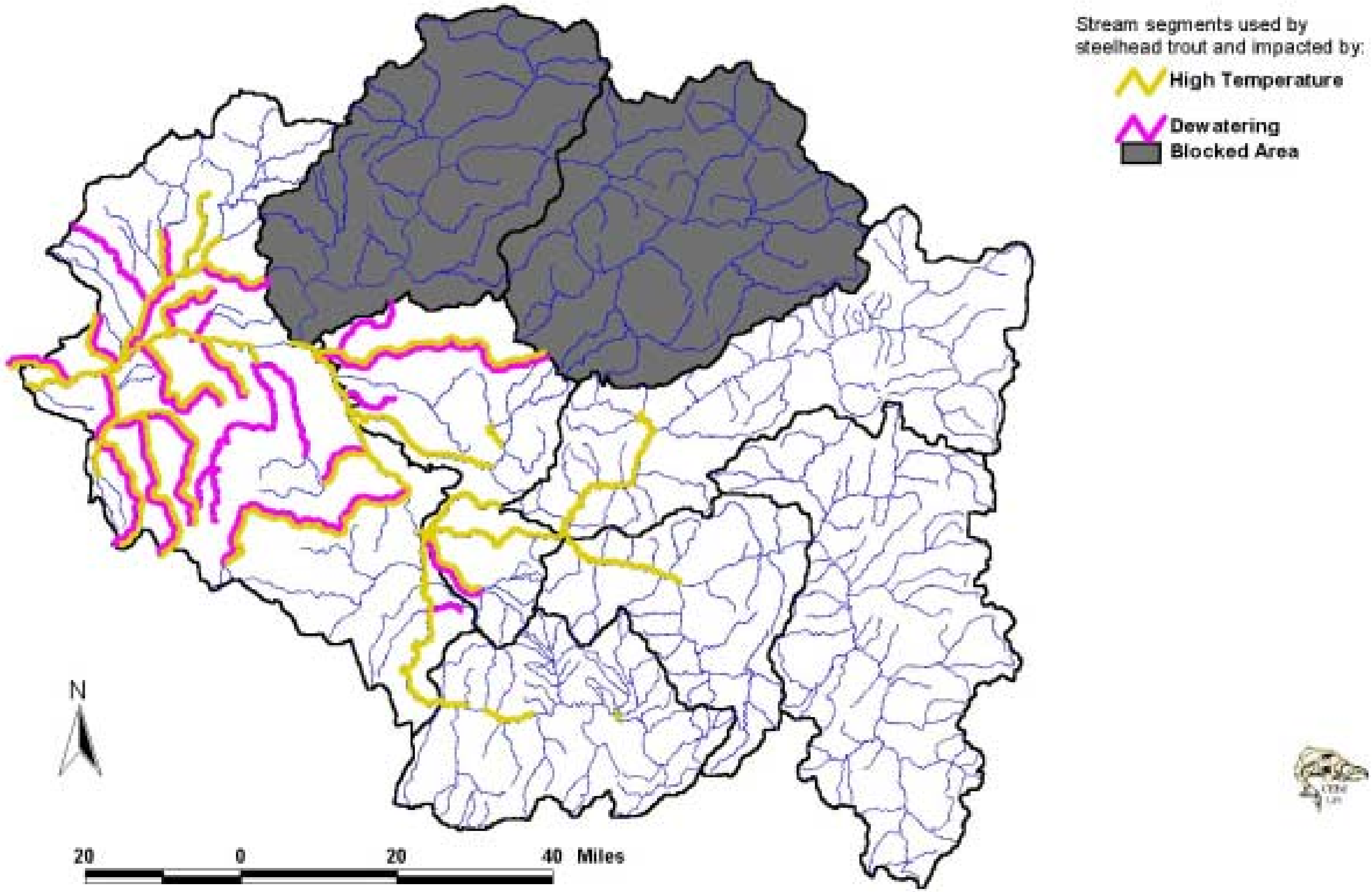

Figure 53. Clearwater subbasin stream segments where steelhead trout populations may be constrained by high temperatures, or dewatering (Pacific States Marine Fisheries Commission 2001)

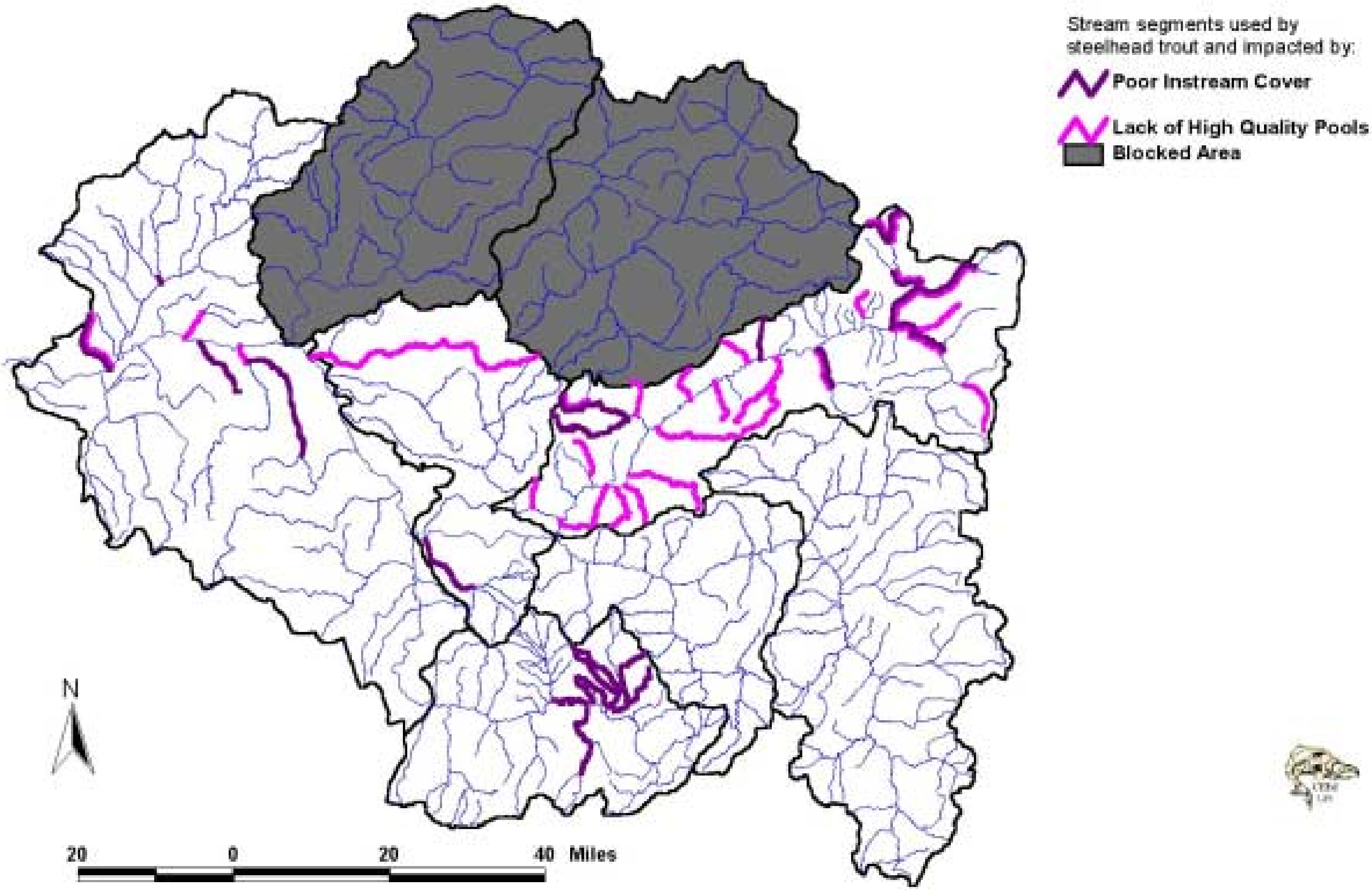

Figure 54. Clearwater subbasin stream segments where steelhead trout populations may be constrained by poor instream cover or lack of high quality pools (Pacific States Marine Fisheries Commission 2001)

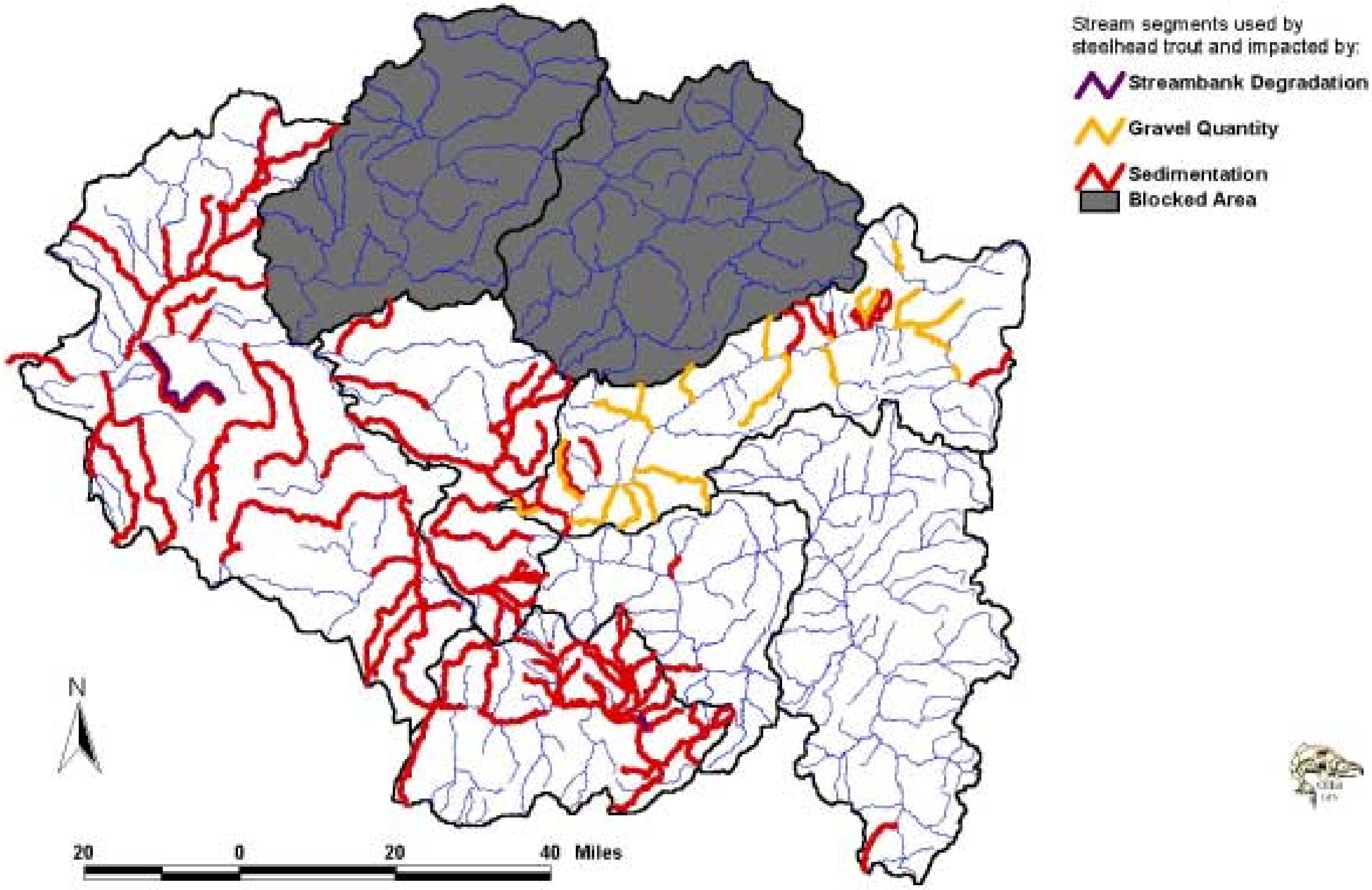

Figure 55. Clearwater subbasin stream segments where steelhead trout populations may be constrained by streambank degradation, limited gravel quantity or sedimentation (Pacific States Marine Fisheries Commission 2001)

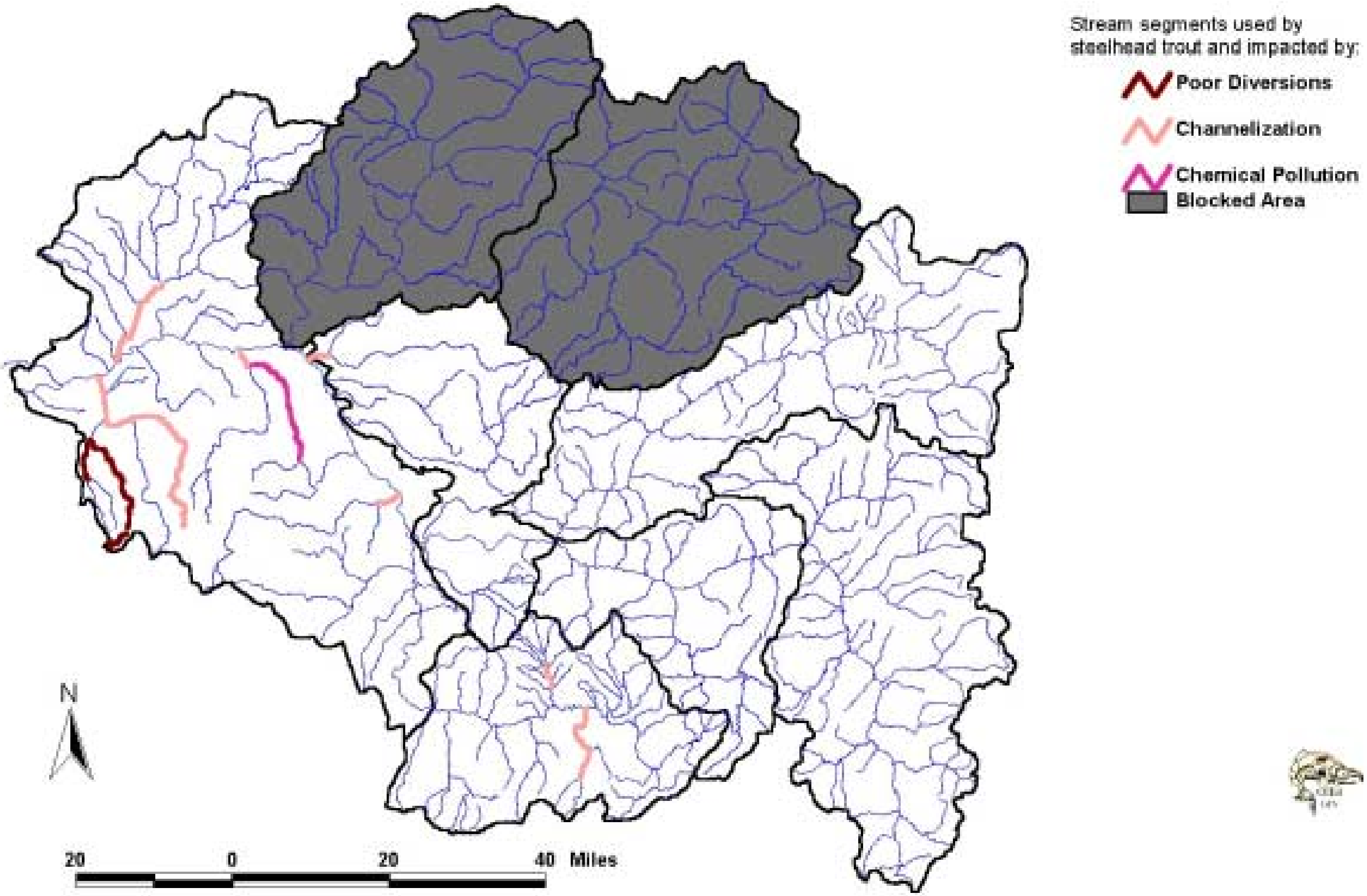

Figure 56. Clearwater subbasin stream segments where steelhead trout populations may be constrained by poor diversions, channelization, or chemical pollution (Pacific States Marine Fisheries Commission 2001)

Appendix G – Draft Hatchery and Genetic Management Plan (HGMP) - Clearwater Fish Hatchery

Appendix H - Hatchery and Genetic Management Plan (HGMP) – Nez Perce Tribe Resident Fish Substitution Program

Appendix I - Past efforts in the Clearwater subbasin

Available information regarding past projects was not generally available in a consistent format, and was often found to be incomplete. Although attempts were made to rectify these issues when possible, information presented herein remains reflective of the quality of information readily available. Projects are organized by Assessment Unit or described as Subbasin-Wide when applicable to multiple AUs. If project locations could not be determined from available information (None stated, or when multiple locations exist with the same name, i.e. Cedar Creek) the location was defined as "Unknown Location". The information presented should not be considered a complete list of past projects related to fish and wildlife in the Clearwater subbasin.

BPA Funded Projects or Programs

Project Title/Description	Funding Agency	Executing Agency	Year(s)
Basin Wide or multiple Assessment Units			
Genetic identification study	BPA 7900100	NMFS	1980;1982
Production impacts of various hatchery stocks	BPA 8005200	NMFS, USGS	1996;1998-1999
Snake juvenile wild spring chinook mortality study	BPA 8101700	NMFS	1992; 1996
Inventory Nez Perce reservation streams	BPA 8200100	NPT	1982-1986
Barge transportation study	BPA 8200200	NMFS	1982-1984; 1986-1987
Study stress on transported chinook smolts	BPA 8200500	Univ. of Idaho	1982-1983
Smolt marking	BPA 8300600	USFWS	1983-1995
Idaho habitat evaluation/offsite mitigation record This project evaluated juvenile chinook and steelhead production benefits with respect to BPA-funded habitat improvement projects throughout anadromous waters in the state	BPA 8300700	IDFG	1983-1991
New fish tag system	BPA 8331900	NMFS	1983-1999
Monitor smolts - Lower Granite Dam and Reservoir This project operates smolt traps on the Snake and Salmon rivers. One was operated on the Clearwater from the 1988 to the mid 1990's. Fish were tagged and their migration through Lower Granite Reservoir monitored.	BPA 8332300	IDFG, NMFS	1988-1999
Crooked River, Lolo Creek, White Sands Creek - Fish habitat work	BPA 8352200	CNF	1983-1986
Clearwater Fish Trap - Water budget management	BPA 8353600	NMFS, PSMFC	1983-1987
Protect upper snake wild adult steelhead Mark hatchery steelhead so wild fish wouldn't be harvested in sport fishery	BPA 8400200	IDFG	1984-1990
Haysfork Creek, Meadow Creek, Red River, Crooked River - Fish habitat/passage improvements	BPA 8400500	NPNF	1984-1992
Fish marking: chinook and steelhead marked fish so water budget could be evaluated	BPA 8401700	IDFG	1984-1986
Clearwater basin habitat improvement study	BPA 8403100	USFS	1984
Survey artificial salmon production facilities	BPA 8405100	SBA	1984-1986
Dworshak wildlife mitigation and enhancement	BPA 8711100	IDFG, NPT, Confluence NW	1987-89; '92; 1994-95
Augmented fish health monitoring	BPA 8711900	USFWS	1987; 1989; 1991
Travel time and survival smolt physiology	BPA 8740100	USFWS	1987-1999

Dworshak wildlife mitigation & enhancement plan	BPA 8740600	NPT	1987
Film BPA fish enhancement activities in Idaho	BPA 8741100	Echo Film Productions	1987
Newsclips of Idaho salmon habitat projects	BPA 8742200	FishPro	1987
Lower Clearwater habitat study	BPA 8801500	NPT	1987-1993
Analyze salmon and steelhead supplementation	BPA 8810000	USFWS	1988-1990
Dworshak photoperiod and temperature treatments	BPA 8814100	NMFS	1988-1992
Smolt quality assessment of spring chinook	BPA 8904600	NMFS	1989-1995
Annual coded wire tag program	BPA 8906500	USFWS	1990-1999
Genetic monitoring and evaluation program for salmon and steelhead	BPA 8909600	NMFS	1989-1999
Salmon supplementation studies in Idaho	BPA 8909801	USFWS	1992-1999
Salmon supplementation studies in Idaho	BPA 8909802	NPT	1992-1999
Lower Clearwater aquatic mammal study	BPA 9005100	NPT	1990-1994
Production impacts of various hatchery stocks	BPA 9005200	USFWS, NMFS	1991-1997
Elisa-based segregation of adult chinook for bacterial kidney disease	BPA 9102200	USFWS	1991-1995
Post release survival of fall chinook in Snake River	BPA 9102900	USFWS	1991-1999
Idaho Water rental, which evaluates resident fish impacts due to water releases from Dworahak among other things	BPA 9106700		1991-1999
Law enforcement protection of salmon stocks	BPA 9202401	CRITFC	1992-1996
Law enforcement protection of salmonids This study funded Idaho Fish and Game conservation officers to enforce laws to reduce poaching on anadromous fish, and to enforce stream alteration laws. They worked both instate and within the Columbia basin	BPA 9202404	IDFG	1992-1996
Increase law enforcement - interagency task force coordination	BPA 9202405	Waste Mgt. of Vancouver	1993; 1995
Columbia Basin regional fish screening	BPA 9202800	CBFWF, PSMFC	1992-1996
Assess summer and fall chinook salmon restoration in Snake River basin	BPA 9403400	NPT	1994-1999
Dworshak wildlife mitigation agreement	BPA 9406000	Confluence NW	1994-1995
Audit Columbia basin anadromous hatcheries	BPA 9500200	Montgomery Watson	1995
Nez Perce trout ponds	BPA 9501300	NPT	1995-2000
North Fk. Clearwater R - Genetic inventory of westslope cutthroat trout	BPA 9501600	NPT	1995-1999
Pit tagging hatchery spring/summer chinook	BPA 9602000	USFWS, WDFW	1996-1997
Pit-tag hatchery spring/summer chinook. This project PIT-tagged a proportion of the hatchery smolt releases to monitor outmigrant route in the mainstem, and to evaluate return as adults. A corresponding proportion of wild/natural fish were also PIT-tagged in ongoing Idaho Supplementation Studies and Natural Production Monitoring Program.	BPA 9602002	IDFG	1996
Gas Bubble Disease monitoring and research of juvenile salmonids	BPA 9602100	USFWS	1996-1999
Distribution of smolts and Gas Bubble Disease	BPA 9603100	USACE	1996
Fall chinook yearling monitoring and evaluation	BPA 9801004	NPT	
Smolt monitoring program	BPA	NMFS, PSMFC	1980-1986
Fish marking: chinook and steelhead This project marked juvenile salmon and steelhead to evaluate and increase Water Budget efficiency.	BPA	IDFG	1984-1986

Characterize and quantify residual steelhead in Clearwater River	BPA	USFWS	1999
Enhance law enforcement for fish and wildlife and watersheds of the Nez Perce	BPA	NPT	1999
Grass waterways, plant riparian vegetation, create sediment traps, and repair roads	BPA		1999-2000
Nez Perce Tribe resident fish substitution program	BPA	NPT	2000
Lower Clearwater Assessment Unit			
Nez Perce technical support This project provided funding for IDFG staff to participate on the Technical Advisory Committee for development of Nez Perce Tribal Hatchery	BPA 8812600	IDFG	1988;1992-1993
Dworshak wildlife mitigation trust This was the mitigation trust established for wildlife habitat lost when Dworshak Dam was completed. It purchased in kind lands for the Craig Mountain Wildlife Management area and several other smaller parcels	BPA 9205700	IDFG	1992;1994
Lapwai Creek - Early action	BPA 9607700	NPT	1996-1997
Lapwai Creek - Rehabilitation	BPA	NPT	1999
Big Canyon Creek - Protect and restore	BPA	NPT	1999
Big Canyon Creek - Water quality and snorkeling	BPA, State Ag., FEMA	SCC, NRCS	2000
Little Canyon Creek - Put in culvert outlets, stabilize grade, grass waterways, change to no-till farming, create sediment traps and/or ponds, develop off-site watering access, and plug gullies	BPA		1999-2000
Lower North Fork Assessment Unit			
Buck Creek - Protect a 67-acre stand of old growth for the pileated woodpecker	BPA 9009100	IDFG	1990-1991;1994
Genetic inventory of westslope cutthroat trout	BPA 9501600	NPT	1995-1999
Upper North Fork Assessment Unit			
No project information located			
Lolo/Middle Fork Assessment Unit			
Eldorado Creek - Fish habitat work	BPA 8400600	CNF	1984-1986
Orofino Creek - Fish passage study	BPA 8711200	Seton, Johnson and O'Dell	1987-1988
Dworshak wildlife mitigation and enhancement plan	BPA 8740700	NPT	1987
Assess summer and fall chinook salmon restoration in Snake River basin	BPA 9403400	NPT	1994-1999
Jim Brown Creek - 8 miles riparian fencing, streambank stabilization	BPA	NPT	1997-2000
Jim Brown Creek - Streambank stabilization project monitoring: channel shape, riparian vegetation, sediment	BPA	NPT	2000
Lolo Creek - 5 miles riparian fencing and off-site water development	BPA	NPT	1997-2000
Lolo Creek - Road obliteration effectiveness monitoring	BPA	NPT, CNF	1999-2000
Lolo Creek - 50+ miles road obliteration	BPA	NPT	
Lower Eldorado Falls - Final design for fish passage improvements	BPA	NPT	1999
Musselshell Creek - Construct two cattleguards and one off-site watering development for cattle in the uplands	BPA	NPT	1998
Musselshell Creek - Design and construct riparian/meadow protection fence	BPA	NPT, CNF	1997-1998
Lochsa Assessment Unit			
Papoose Creek - Unplug and replace culverts, stabilize banks, plant riparian vegetation, and repair roads	BPA	NPT	1996-2000

Squaw / Papoose Creek - Road obliteration	BPA		1997
Squaw Creek - Re-vegetate and improve fish passage	BPA		1996
Squaw Creek - Fix culverts, stabilization, revegetation, road repair	BPA		1996-2000
Squaw Creek - Obliterate 14 miles road	BPA	NPT, CNF	1998-2000
Protect and restore the Squaw and Papoose Creek watersheds	BPA	NPT	1999
Protect and restore North Lochsa Face analysis area	BPA	NPT	2000
Pete King Creek - Spring chinook parr plants	BPA	USFWS	1998-?
Lower Selway Assessment Unit			
No project information located			
Upper Selway Assessment Unit			
No project information located			
South Fork Assessment Unit			
Crooked River – Fish passage improvemtents	BPA 8350200	NPNF	1983-1992
Enhance Fish, Riparian, and Wildlife Habitat Within the Red River Watershed: Lower Red River Meadow Restoration Project	BPA 9303501	ICSWCD	
Newsome Creek - Construct a sediment basin, fence, restore around Glory Hole mine	BPA 9303600	NPNF	1993-1996
McComas Meadows / Meadow Creek - Monitor channel and thalweg profiles, woody species age class, cobble embeddedness, juvenile fish density, redd count, substrate condition, residual pool analysis, habitat survey, stream discharge, water table level	BPA	NPNF, NPT	1990-2000
McComas Meadows / Meadow Creek - Remove dilapidated riparian fencing, plant riparian vegetation, install piezometers, and a stream gaging station	BPA	NPT	1996-2000
Mill Creek - Build 1.5 miles riparian fencing	BPA	NPT, NPNF	2000
McComas Meadows / Meadow Creek - Design, construct, and maintain 5 miles of riparian/meadow protection fence	BPA	NPT, NPNF	1996-1998
Cottonwood Creek - Water quality monitoring	BPA	SCC, NRCS	2000

Non-BPA Funded Projects or Programs

Project Title/Description	Funding Agency	Executing Agency	Year(s)
Basin Wide or multiple Assessment Units			
Browns Creek, Meadow Creek - Revegetation projects		NPNF	1998
Bully Creek, Castle Creek, Crooked River, Hamby Creek, O'Hara - Watershed improvement project evaluation		NPNF	1998
Bull Trout Assessments – Lower Clearwater, North Fork, South Fork and Lochsa/Selway/Middle Fork		Bull trout Technical Advisory Team	1998
Landslide inventory		NPNF	2000
Landslide inventory, effectiveness monitoring, and water quality and flow monitoring		NPNF	1997
North Fk. and Clearwater R - Gas bubble trauma monitoring		IDFG	1995-1999
Noxious weed inventory and treatments		Clearwater Basin Weed Mgt. Group	
Crooked Fork Creek, Papoose Creek - Slide area, road, and stream channel restoration		CNF	1996

Selway River - Mass erosion rate study		NPNF	1996-1997
State Agricultural Water Quality Program, Program amended into Water Quality Program for Agriculture in 2000 and now ongoing		ISCC, IDEQ, NRCS	1988-1998
Stream alteration coordination to identify and fix migration barriers		IDFG, IDWR, IDT, IDL, USFWS	
Yellow Starthistle bio cont agnt ed & distribution		CBWCC, CNF	
Lower Clearwater Assessment Unit			
Big Canyon Ck. - Ground water monitoring / riparian evaluation for flood damaged stream segments	BLM	BLM	1994
Big Canyon Creek - Ground and surface water relationship study	BLM	Inter-Fluve	1994
Cottonwood (city) - Evaluate nutrient removal	IDHW	Univ. of Idaho	
Dry Gulch Creek - Drainage improvement projects, road recontouring		NPNF	1998
Feather Creek - Electric fence installed, 18,000 trees planted		CNF	1995
Hatwai Creek Water Quality Incentive Program	FSA	NRCS	1996-2000
Hatwai Creek Riparian Demonstration Project	ISCC	NPSWCD	1994
Hog Meadow Creek - Electric fence installation		CNF	1994;1997-1998
Lapwai Creek - Flood control		IDT	1998
Lawyer Creek - Flood mitigation	FEMA		1999
Little Boulder Creek - Tree plantings		CNF	1994
Little Canyon Ck. - Develop / Implement Allotment Management Plan for riparian grazing	BLM	BLM	1986
Little Canyon Ck. Landslide/debris torrent rehabilitation and removal of full fish passage barrier in Little Canyon Creek (removal of 10,000 cubic yards from stream channel)	BLM	BLM	1992
(McGary Meadows area) One enclosure, one permanent fence, 41 structure complexes, willow planting		CNF	1994
Nat Brown Creek - 0.5 mi. riparian zone fenced		CNF	1999
Pine Creek - 8 mi. road removal		CNF	1997
Pine Creek - 10 mi. road removal	CNF	Watershed Rest. Proj.	1996
Potlatch River, W. Fork - In-stream structures constructed, 0.8 km channel fenced		CNF	1991
Potlatch River, W. Fork - Two cattle crossings retrofitted and fencing installed		CNF	1993
Potlatch River, E. Fork - 51 structural complexes, 1994 structures maintained/improved, 300 cottonwoods planted at enclosures		CNF	1995
Potlatch River, E. Fork - Seven permanent fences reconstructed		CNF	1996
Potlatch River, E. Fork - 4 ac shrubbery, 4 ac willows, 13 ac trees, slide area stabilization		CNF	1997
Potlatch River, E. Fork - In-stream structures constructed, fencing, revetments, plantings	CNF	Latah Co. Wildlife Club	1990
Potlatch River, E. Fork - In-stream structures constructed		CNF	1991
Potlatch River, E. Fork - 1.4 km channel fenced, 758 m eroding banks stabilized, 4000 conifers, 790 deciduous, 6000 willow clippings planted	CNF	Latah Co. Wildlife Club	1991
Potlatch River, E. Fork - Habitat improvement, 400 m stream length fenced	CNF	Rivermasters Engr.	1992
Potlatch River - 3 mi. road removed and vegetated		CNF	1998

Potlatch River - Electric fence installed		CNF	1996-1998
Potlatch River - Study on water quality, fish distribution, density, habitat condition		ISCC, NRCS, LCSWCD, IDHW, NPT, IDFG	1995
Three Mile Creek - Water temperature, DO, pH, turbidity, nutrient, NH3, conductance, flow, TSS, bacteria		IDEQ	2000
Confined Animal Feeding Operations Inventory and Analysis - Hatwai Creek, Catholic Creek, Potlatch River, Pine Creek, Bedrock Creek, Hubbard Gulch, Big Canyon Creek, Jacks Creek, Rattlesnake Creek, Cottonwood Creek, Lapwai Creek, Lindsay Creek watersheds	USEPA	NPSWCD	1998
Lower North Fork Assessment Unit			
Beaver Creek - 146 in-stream structures constructed over 3km	CNF	Potlatch Corp	1991
Beaver Creek - 103 structures installed over 1.8 km	CNF	Potlatch Corp	1992
Butterfield Creek, Cameron Creek, Round Meadow Creek - Large woody debris installed		CNF	1996
Elk Creek - In-stream structures installed		CNF	1989
Elk Creek - In-stream structures constructed, 280 m dredged of 77m3 sediment		CNF	1990
Elk Creek - In-stream structures constructed, 0.5 km dredged		CNF	1991
Elk Creek - Permanent riparian fencing at slide sediment trap, 2500 trees on 42 ac +20 riparian ac.		CNF	1994
Elk Creek - 214 cu yds sediment removed from traps, 14 large woody debris installed		CNF	1995
Elk Creek - 245 cu yds sediment removed, electric fence installed, 10 ac. Planted with 8000 cedar trees		CNF	1996
Elk Creek - 2 sediment traps installed, 247 cu yds removed, 8000 cedar trees planted		CNF	1997
Elk Creek - Removal of sediment in two traps		CNF	1998, 1999
Elk Creek - Unnamed tributary sediment traps (2), one off-channel sediment trap, 500 conifers planted, sediment removal	CNF	Rivermasters Engr	1992
Johnson Creek - 2.5 miles installed with 150 pieces of large organic debris		CNF	1993
Long Meadow Creek - Straw sediment dams		CNF	1995
Quartz Creek - 43 in-stream structures constructed		CNF	1990
Upper North Fork Assessment Unit			
Corral Creek - Electric fence installation		CNF	1994;1996-1998
Corral Creek - In-stream structures constructed		CNF	1991
E. Fk. Corral Creek - 0.4 km channel fenced		CNF	1991
W. Fk. Corral Creek - 4000 conifers, 250 deciduous trees planned		CNF	1991
W. Fk. Corral Creek - Electric fence installation		CNF	1994
Cougar Creek - Electric fence installed		CFN	1996
Cougar Creek - 12 ac riparian zone fenced (high tensile electric)		CNF	1997
Gravey Creek - In-stream structures constructed		CNF	1988;1990
Sylvan Creek - 15 in-stream structures		CNF	1993
Sylvan Creek - 50 in-stream structures		CNF	1994
Sylvan Creek - In-stream structures constructed		CNF	1990
Orogrande Creek - 120 in-stream structures constructed over 5 km		CNF	1992
Orogrande Creek - 9 miles and 25 ac. Slide area restoration		CNF	1996

Orogrande Creek - 4 mi. road removal	CNF	Watershed Rest. Proj.	1998
Washington Creek - 30 in-stream structures constructed		CNF	1990
Lolo/Middle Fork Assessment Unit			
Camp Creek - 36 in-stream structures (woody debris, rock and log weirs) constructed over 1 km		CNF	1991
Camp Creek - Sediment removal		CNF	1992
Clear Creek - Chinook/steelhead rearing habitat	USFWS	Partners for Wildlife	
Dollar Creek - In-stream structures constructed, sediment removed		CNF	1991
Dollar Creek - Sediment removal		CNF	1992,1994, 1995
Eldorado Creek - In-stream structures, 4,000 conifers planted		CNF	1991
Eldorado Creek - Two sediment traps constructed		CNF	1990
Eldorado Creek - 5 winter boulders, sediment removal (2), rock deflector, migration barrier opened, rock weir repair		CNF	1994
Eldorado Creek - 650 yds sediment removal		CNF	1996
Eldorado Creek - Two sediment traps constructed		CNF	1996
Eldorado Falls - Passage design		NPT	
Eldorado Creek, Musselshell Creek -Road Removal		CNF	1999
Jim Brown Creek - Riparian BMP effectiveness. Physical and biological data collected, photo points established		CSWCD, Gilmore consult	
Lolo Creek Private Land Acquisition (acquired 93 acres adjacent to 0.7 mile of Lolo Creek and 0.5 mile of Mud Creek)	BLM	BLM	2000
Lolo Creek - In-stream structures, 366m^2 side channels, 30 ac riparian zone improved		CNF	1990
Lolo Creek - In-stream structures, 10 ac planted in 4000 conifers		CNF	1991
Lolo Creek, Yoosa Creek - 40 in-stream structures constructed		CNF	1992
Lolo Creek - 10 BPA structures maintained, sediment removal		CNF	1995
Lolo Creek - Adult fish weir		NPT	1996-1999
Lolo Creek - Habitat typing	BLM	Inter-Fluve	1993
Lolo Creek - Discharge station	BLM	NPT, ?SWCD	
Musselshell Creek - Riparian fencing, 1 ac		CNF	1994
Musselshell Creek - Riparian fence 0.5 mi. stream length, permanent		CNF	1996
Musselshell Creek - Riparian fence replaced 2 mi. and 130 ac		CNF	
Musselshell Creek - Riparian fencing replaced, 1 mi.	CNF	NPT	1998
Schmidt Creek road restoration and improvement project	BLM	BLM	1995
Schmidt Creek - Road erosion control		BLM	
Six Bit Creek - In-stream structures constructed		CNF	1990-1991
Walde Creek - 1 mi. road removed	CNF	Inland Fisheries	1999
Yoosa Creek - 4 log weirs, 16 deflector/cover structures		CNF	1994
Yoosa Creek - 3 log weirs repaired		CNF	1995
Lochsa Assessment Unit			
Coolwater Ridge - Erosion control on old remount station		NPNF	1999
Deadman Creek, W. Fork - 3 ac. riparian zone planted, 500 deciduous trees		CNF	1992
Doe Creek - Large woody debris installed		CNF	1997
Papoose Creek - 1 mi. road removed	CNF	Inland Fisheries	1999
Pete King Creek - In-stream structures constructed		CNF	1990
Pete King Creek - In-stream structures, 131 m3 sediment from 4 traps		CNF	1991
Pete King Creek - 170 m3 sediment removed from 4 traps		CNF	1992

Pete King Creek - 200 cu yds sediment removed		CNF	1993
Pete King Creek - sediment removal (4 sites), 8 mi. habitat & slide rest.		CNF	1996
Pete King Creek - Sediment removal from 4 sites		CNF	1997
Pete King Creek - 4 areas sediment removal, riparian revegitation, conifer planting		CNF	1998
Squaw Creek - Road removal 46 mi., woody debris placed	CNF	NPT	1998
Squaw Creek - 10 log weirs installed, some in W Fk		CNF	1992
Squaw Creek - Road removal, woody debris placed		CNF	1997
Squaw Creek - Road removal (46 mi), woody debris placed		NPT	1998
Squaw Creek - Monitor juvenile density, suspended sediment load, temp. substrate condition, habitat survey		NPT, NPNF	1990-?
Walton Creek - 71 sedimentation prevention structures constructed		CNF	1992
Walton Creek - In-stream structures, 7 log and boulder	CNF	IDFG	1990
Lower Selway Assessment Unit			
Bear Creek - Abandond trail stabilization		NPNF	1999
Hamby Creek, O'Hara Creek - Road decommission and obliteration		NPNF	1998-1999
Wart Creek - Revegetation of rock pit		NPNF	1998-1999
Upper Selway Assessment Unit			
Copper Butte - Abandoned trail stabilization		NPNF	1999
Deep Creek - 275 cu. yds. dredged		CNF	1994
Moose Creek, North Fk - Revegetation of salt lick		NPNF	1999
South Fork Assessment Unit			
American River, E Fk – Instream structures installed in 1 mile of stream		BLM	1985
American River, E Fk – Removal of partial barrier		BLM	1985
American River - Instream structures installed in 6 miles of stream		BLM	1983, 1984, 1985, 1992
American River - Streambank stabilization along 0.3 mile of stream		BLM	1985, 1992
American River - Installation of large woody debris in 2 miles of stream		BLM	1992
American River - Road restoration and restricted vehicle access		BLM	1992
American River - Instream structures installed in 0.3 mile of stream crossing private lands		BLM and Shearer Lumber Co.	1994
American River - Riparian plantings along 2 miles of stream		BLM	1983, 1984, 1985, 1999
Big Elk Cr. - Development and implementation of the Big Elk Creek Pilot Riparian Grazing Project		BLM	
Big Elk Cr. - Riparian exclosure constructed for 0.4 mile of stream		BLM	1983, 1997
Big Elk Cr. - Riparian plantings along 0.5 mile of stream		BLM	1983, 1984, 1985, 1999
Big Elk Cr. - Constructed 1 acres study exclosure		BLM	1992
Big Elk Cr. - Streambank stabilization (tree revetment) for 0.3 mile of stream		BLM	1983
Big Elk Cr. - Riparian pasture fence constructed for 1.5 mile of stream		BLM	1987
Big Elk Cr. - Instream structures installed in 0.5 mile of stream		BLM	1987
Box Sing Ck - Channel restoration and improvement of stream ford crossing		BLM	1992

Buffalo Gulch Ck - Development and implementation of Buffalo Gulch watershed restoration plan		BLM	1983
Bully Creek - Drainage improvement projects, road recontouring		NPNF	1998
Crooked River - Stabilization		NPNF	1998
Kirks Fork Ck - Removal of partial barrier		BLM	1985
Leggett Creek - Flood damage repairs		NPNF	1998
Little Elk Ck - Riparian plantings along 0.2 mile of stream		BLM	1999
Mill Creek – drainage improvement projects, road recontouring		NPNF	1998
Mill Creek - Channel condition monitoring		NPT	2000
Red River, West Fk - Sediment storage monitoring		NPNF	1991-1994
Red River - Timber harvest monitoring		NPNF	1993-1994
S Fk. Clearwater R - Instream structures installed in 0.25 mile of river		BLM	1989
S Fk. Clearwater R - Constructed two side channels for rearing habitat		BLM	1989
S Fk. Clearwater R - Riparian seedings and plantings along 0.25 mile of river		BLM	1989
S Fk. Clearwater River - Stewardship contracting for prescribed burns, planting, road obliteration		CNF	1999-?
S Fk. Clearwater River - Monitor temp, sediment, bacteria, channel morph.		IDEQ	2000
S Fk. Clearwater River, Elk Summit Area - Drainage improvement projects		NPNF	1999
Twentymile Ck. - Mine rehabilitation monitoring		NPNF	1993
Unknown Location(s)			
Cedar Placer Mine - Stabilization		NPNF	1999
Chamook Creek - Sediment removal		CNF	1991
Chamook Creek - Sediment trap constructed		CNF	1996
Comet Creek - 3 mi. road removal	CNF	Fisheries	1999
Fog Mountain - Abandoned trail stabilization		NPNF	1999
Hungary Mill Area - Road obliteration		NPNF	1999
Microgold Placer - Mine rehabilitation monitoring		NPNF	1990
Mox Creek - Culvert fish passage enhanced		CNF	1996
Neva Hill - 66 large woody debris installed		CNF	1995
North Fk. Clearwater R - Stewardship contracting for prescribed burns, planting, road obliteration		CNF	1999-?
Otter Wing Area - Revegetation		NPNF	1999
Prospector Bunny Area -Road stabilization		NPNF	1999
Scott TS - Road obliteration monitoring		NPNF	1998-2001
Shasta Lake - Mountain lakes water chemistry-phase III		NPNF	1995-1999
Silver Meadow Area - Riparian fencing		NPNF	1999

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