

Aquatic Ecosystems

Key Terms Used in this Section

Anadromous fish ~ Fish that hatch in fresh water, migrate to the ocean, mature there, and return to fresh water to reproduce; for example, salmon and steelhead.

Beneficial Uses ~ Any of the various uses which may be made of water including, but not limited to, domestic water supplies, industrial water supplies, agricultural water supplies, navigation, recreation in and on the water, wildlife habitat, and aesthetics. The beneficial use is dependent upon actual use, the ability of the water to support a non-existing use either now or in the future, and its likelihood of being used in a given manner. The use of water for the purpose of wastewater dilution or as a receiving water for a waste treatment facility effluent is not a beneficial use.

Best Management Practices ~ Practices designed to prevent or reduce water pollution.

Coarse woody debris (CWD) ~ Pieces of woody material having a diameter of at least three inches and a length greater than three feet (also referred to as large woody debris, or LWD).

Endemic ~ Plants or animals that occur naturally in a certain region and whose distribution is relatively limited to a particular locality.

Extinction ~ Complete disappearance of a species from the earth.

Extirpation ~ Localized disappearance of a species from an area.

Headwaters ~ Beginning of a watershed; unbranched tributaries of a stream.

Hybridization ~ The cross-breeding of unlike individuals to produce hybrids.

Hydrologic ~ Refers to the properties, distribution, and effects of water. "Hydrology" refers to the broad science of the waters of the earth—their occurrence, circulation, distribution, chemical and physical properties, and their reaction with the environment.

Pools ~ Portions of a stream where the current is slow, often with deeper water than surrounding areas and with a smooth surface texture. Often occur above and below riffles and generally are formed around stream bends or obstructions such as logs, root wads, or boulders. Pools provide important feeding and resting areas for fish.

Resident ~ Fish that spend their entire life in freshwater; examples in the UCRB include bull trout and westslope cutthroat trout.

Riparian areas ~ Area with distinctive soil and vegetation between a stream or other body of water and the adjacent upland; includes wetlands and those portions of floodplains and valley bottoms that support riparian vegetation.

Salmonid ~ Fishes of the family Salmonidae, including salmon, trout, chars, whitefish, ciscoes, and grayling.

Sediment ~ Solid materials, both mineral and organic, in suspension or transported by water, gravity, ice, or air; may be moved and deposited away from their original position and eventually will settle to the bottom.

Sensitive species ~ Species identified by a Forest Service regional forester or BLM state director for which population viability is a concern either (a) because of significant current or predicted downward trends in population numbers or density, or (b) because of significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution.

Strongholds/Strong populations (fish) ~ Watersheds that have the following characteristics: (1) presence of all major life-history forms (for example, resident, fluvial, and adfluvial) that historically occurred within the watershed; (2) numbers are stable or increasing, and the local population is likely to be at half or more of its historical size or density; (3) the population or metapopulation within the watershed, or within a larger region of which the watershed is a part, probably contains at least 5,000 individuals or 500 adults.

Uplands ~ The portion of the landscape above the valley floor or stream.

Watershed ~ 1) The region draining into a river, river system, or body of water. 2) In this EIS, a watershed also refers to a drainage area of approximately 50,000 to 100,000 acres, which is equivalent to a 5th-field Hydrologic Unit Code (HUC).

Wetlands ~ In general, an area soaked by surface or groundwater frequently enough to support vegetation that requires saturated soil conditions for growth and reproduction; generally includes swamps, marshes, bogs, wet meadows, mudflats, natural ponds, and other similar areas. For legal definition, see Glossary in Chapter 5.

Introduction to Aquatic Ecosystems

This section summarizes the condition of aquatic ecosystems in the project area by first describing the hydrologic environments of watersheds, water bodies, riparian areas, and wetlands. Then the status of fish species that use and are affected by these environments are described. Information is drawn from the Landscape Ecology and Aquatic Staff Area Reports (1996), Henjum et al. (1994), Wissmar et al. (1994), and other sources as cited. Within the sections describing hydrologic environments, there are descriptions of key processes and conditions that act to form and modify the physical and vegetational characteristics of aquatic ecosystems, such as streamflow, sedimentation, erosion, channel formation, and riparian vegetation. Those processes and conditions that can be affected by regional-scale management decisions are emphasized. A summary of current conditions in each of these hydrologic environments is also included.

The section describing fish focuses on past and current conditions of many fish species in the entire project area. Special attention is given to native fish species, especially wide-ranging salmon and trout species. Similar to the descriptions of the hydrologic environments, aspects of native fishes that are particularly affected by regional-scale management decisions are emphasized. Issues discussed include: (1) the overall status of native fish species in the region; (2) management of habitat for rare and endangered species, especially wide-ranging species; (3) genetic diversity; and (4) introduction of non-native species.

Hydrology and Watershed Processes

Summary of Conditions and Trends

- ◆ Management activities throughout watersheds in the project area have affected the quantity and quality of water, processes of sedimentation and erosion,

and the production and distribution of organic material, thus affecting hydrologic conditions. On federally administered lands the most pronounced changes to watersheds are due to road construction, vegetation alteration (including silvicultural practices, fire exclusion, and forage production), and improper livestock grazing.

- ◆ Environmental changes within landscapes commonly cumulate and appear on a watershed basis.

Watersheds are natural divisions of the landscape and the basic functioning unit of hydrologic systems. Watersheds can be considered in a variety of scales ranging from continents to hillslopes (see figure 2-15, Ecosystem Scales). Watersheds are hierarchical ~ smaller ones nest within larger ones. Commonly used terms referring to watershed scale are shown in table 2-13 (see also figure 2-2, Hydrologic Hierarchy, in the Introduction to this chapter). Landforms contained within watersheds are also hierarchical. Valleys nest within watersheds, and their form is in part controlled by watershed physiography and geologic history. Streams and rivers flow through valleys, and channel form is influenced by interactions between streams and valleys. Individual features within channels, such as pools and riffles, reflect stream-channel processes and history, and as a result, are the culmination of watershed processes at multiple scales. These principles of multi-scaled analysis were used in the Scientific Assessment (Quigley and Arbelbide 1996) to evaluate the condition and inherent sensitivity of watersheds in the ICBEMP project area.

These natural hierarchies make watersheds an appropriate context for considering many ecological processes. Physical processes such as rainfall, streamflow, erosion, and sedimentation interact within watershed boundaries to shape and form the landscape. Watershed boundaries have meaning for living organisms as well. Most aquatic species, such as fish, do not cross watershed divides. Other species, particularly riparian area species such as the beaver, can be considered watershed residents. Human residence and use patterns are also strongly tied to locations of lakes, rivers, and streams.

Environmental changes commonly cumulate and appear on a watershed basis. Changes in soil, vegetation, topography, and chemicals result in changes in the quantity and quality of water, sediment, and organic material that flow through a watershed. The response of a particular watershed to environmental change varies considerably because each watershed is unique. Factors that govern how a watershed may respond to environmental change include

the size and location of these changes, the physical and biological characteristics of the watershed, and the history of natural and human disturbances.

Streams, Rivers, and Lakes

Summary of Conditions and Trends

- ◆ Flow regimes of streams, rivers, and lakes throughout the UCRB planning area have been extensively altered by dams, diversions, and control of lake outlets. Banks and beds of streams, rivers, and lakes have been altered by bank and shore structures, including urban development, transportation improvements, instream mining activities, flood-control works, and alteration of riparian areas. In general, the changes have been greatest for the larger streams, rivers, and lakes.
- ◆ Water quantity and flow rates have been locally affected by dams, diversions, and groundwater withdrawal. More subtle but widespread changes in water quantity and flow patterns on federally administered lands have probably been caused by road construction and changes in vegetation due to silvicultural practices and improper livestock grazing.
- ◆ Within the UCRB planning area, some Forest Service- or BLM-administered streams are Water Quality Limited as defined by the Clean Water Act. On Forest Service-administered lands in the project area, the primary water quality problems are sedimentation, turbidity, flow alteration, and high temperatures. On BLM-administered lands, high sediment, turbidity levels, and temperatures are the primary reasons for listing as Water Quality Limited.
- ◆ Streams and rivers are highly variable across the project area, reflecting diverse physical settings and disturbance histories. Nevertheless, important aspects of fish habitat, such as pool frequency and large woody debris abundance, have decreased

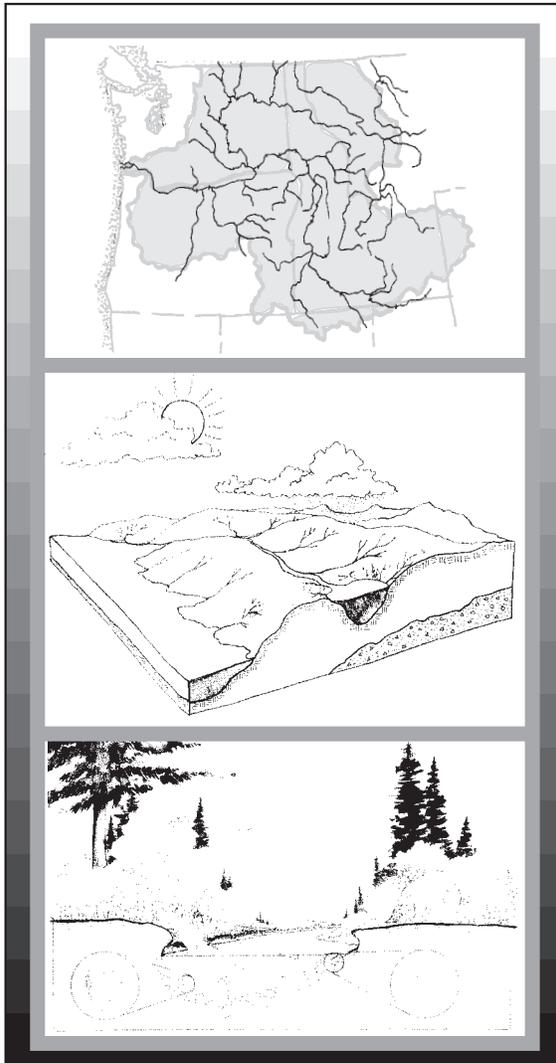


Figure 2-15. Ecosystem Scales.

Watersheds and ecosystems can be considered on a variety of scales ranging from continents to hillslopes. The ICBEMP project focuses its attention on the broader scales illustrated in the top two boxes.

throughout much of the project area. Pool frequency and wood frequency are generally less in areas with higher road densities and in areas where timber harvest has been a management emphasis.

Movement of water is one of the fundamental ways to transfer energy and materials in ecosystems (figure 2-16). Water in streams and rivers transports sediment, organic material, nutrients, and aquatic organisms, resulting in constant redistribution and shaping of landforms and stream channels. The wide variety of water bodies, with their associated energy and food sources, provide abundant and diverse habitats for water-dependent plant and animal species.

Streams, rivers, and lakes are also a focus for human activities. As human population in the planning area increases, and as demands for food, energy, transportation networks, and recreation opportunities expand, uses of stream and river systems increase. These uses have resulted and will result in escalating conflicts over water and stream channels, both between competing human uses, and between human uses and ecological requirements of the native biota. Resolution of many of these conflicts is outside the authority of BLM and Forest Service decision-makers, and is therefore outside the scope of this EIS. However, there are some critical regional issues regarding streams and stream channels that are affected by BLM and Forest Service decision-making. These issues

have to do with water quantity and quality, habitat quality, and stream channel processes.

Water Quantity and Quality

Water quantity and quality are important components of aquatic habitats. Moreover, the primary influence land managers have over the condition of aquatic ecosystems on Forest Service- or BLM-administered lands is through management of water quantity and quality.

Water Quantity

Within the upper Columbia Basin, there are approximately 133,100 miles of streams and rivers (including larger irrigation canals) and several thousand lakes mapped at the scale of 1:100,000. Thirty percent of these streams and a majority of the lakes are on Forest Service- or BLM-administered lands. Most of these streams ultimately drain into the Columbia River, which has a drainage area of 237,000 square miles (152 million acres) and an average annual discharge of 140 million acre feet at the town of The Dalles, Oregon. About 35 percent of the flow at The Dalles originates from Canada. A large part of the flow from the southeastern portion of the project area enters the Columbia River via the Snake River, which has a drainage area of 108,500 square miles (69 million acres) and an average annual discharge of 40 million acre feet near its confluence with the Columbia River in south-central Washington.

Table 2-13. Hierarchy of Watersheds, UCRB

Hierarchy Term	Hydrologic Unit code (HUC) ¹	UCRB Example	Approximate Size of Example, in Acres
Region	First Field	Columbia River	165,760,000 ²
Subregion	Second Field	Lower Snake River	22,400,000
River Basin	Third Field	Salmon River	8,960,000
Subbasin	Fourth Field	South Fork Salmon River	840,000
Watershed	“Fifth Field”	East Fork South Fork Salmon River	84,500
Subwatershed	“Sixth Field”	Profile Creek	12,600

¹ First Field through Fourth Field HUCs were formally designated by the U.S. Geological Survey. “Fifth Field” and “Sixth Field” watersheds were designated for the project area as a part of the landscape Staff Area Report (1996).

² The area of the Columbia River watershed includes the entire basin, including portions outside the project area west of the crest of the Cascade Range and in Canada.

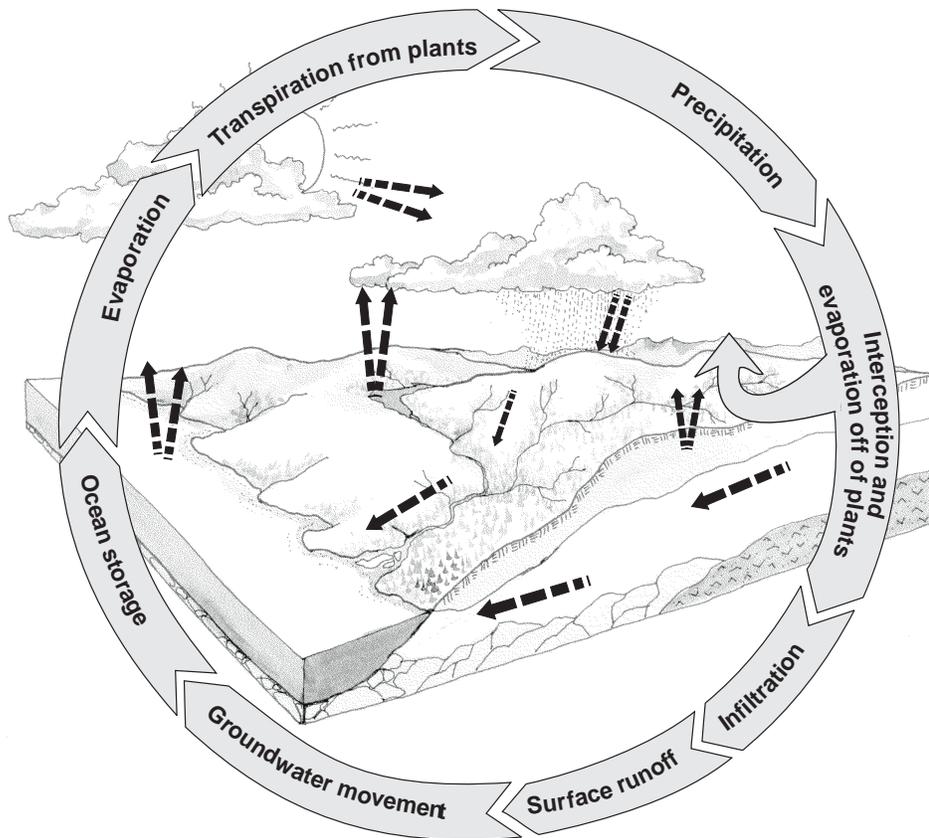


Figure 2-16. The Hydrologic Cycle and Aquatic Ecosystem Health.

A complex system called the hydrologic cycle links atmospheric water, surface water, and groundwater, and controls the distribution and movement of water in every ecosystem. Changes in aquatic and riparian ecosystems in the UCRB planning area pose serious risks to a number of key links in the hydrologic cycle. Among the more observable changes, disturbance and compaction of soil and changes in vegetation are altering the relationships between infiltration, soil moisture storage, groundwater recharge, evapotranspiration, surface runoff, and streamflows.

These alterations can lower water tables, interrupt the return of water to the atmosphere, and affect water quantity and quality in lakes and streams. The interactions of the hydrologic cycle provide the key to processes (such as flooding) that route and deliver water, wood, and sediment to streams and connect the streams to their floodplains, adjacent riparian areas, and uplands. Changes to these interactions and processes are tied inextricably to degradation of aquatic and riparian habitats for anadromous and inland fishes and terrestrial and aquatic wildlife.

The hydrologic and other biophysical and nutrient cycles are key ecological processes in every ecosystem type and are inextricably woven together through and across ecosystem boundaries. The hydrologic cycle is discussed here to highlight its relationship to riparian and aquatic ecosystem health, but it also is critical in rangeland and forest ecosystems.

*Photo 15***NOT AVAILABLE IN PDF**

Photo 15. More than 100,000 miles of streams and rivers of all sizes are found in the upper Columbia Basin. Photo by Doug Basford

Most surface runoff results from snowmelt and/or rainfall in mountainous regions, resulting in spring and summer annual peak discharges. The vast majority of streamflow originates on public lands, especially higher elevation Forest Service-administered lands. There is substantial year-to-year variability in streamflow quantity, because of variability in rainfall and snowfall accumulation (McIntosh et al. 1994).

Most streamflow in the upper basin results from surface runoff or shallow groundwater flow into streams. Groundwater-influenced streams provide unique terrestrial and aquatic habitats because of their relatively constant flows of cold, clear, and high-quality water.

Scarcity of streamflow during the growing season, year-to-year streamflow variability, and the general aridity of low-elevation valleys and plains have spurred flow regulation and storage, water diversions, and groundwater withdrawal throughout the planning area. These human modifications range from massive Federal storage and irrigation projects, to numerous small headwater reservoirs (stock tanks) used for livestock grazing. These projects help assure reliable water supplies for irrigation, livestock, and human use in addition to providing flood control and hydropower benefits. Reservoirs associated with these projects are extensively used for a variety of recreation activities. In total, about seven million acres in the Columbia River Basin are presently irrigated, resulting in a seven to ten percent reduction of annual flow volume (Landscape Ecology STAR 1996). As a result of impoundments and diversions, most streams in

the planning area, especially larger ones, have significantly altered flow regimes resulting in changed habitat conditions, especially for those aquatic species that have survival strategies adapted to natural flow patterns. Altered flow regimes also affect channel stability by changing the rates and timing of sediment and organic-material transport.

On Forest Service- or BLM-administered lands, management activities that have altered flow include flow impoundment (dams and reservoirs), water withdrawal (diversions and pumping), road construction, and vegetation manipulation. Timber harvest, fire suppression, improper livestock grazing, and associated activities have altered the timing and volume of streamflow by changing on-site hydrologic processes (Keppeler and Ziemer 1990; Wright et al. 1990). Changes can be either short- or long-term depending on which hydrologic processes are altered and the intensity of alteration (Harr 1983).

Vegetation manipulation activities can change rates and amounts of evaporation and transpiration (water use by plants), and, in some areas, can change rates and volumes of snow accumulation and snowmelt. These effects are best understood for forested environments, where, within clearcuts, snow tends to accumulate in greater amounts and melt faster than in forested areas, leading to larger and earlier peak flows (Harr 1986, King 1994). These effects are greatest in association with rain-on-snow events, during which rain falls on snowpack, causing melting and changes in the timing of runoff. This happens particularly within the “transient snow zone”

found at elevations commonly between 2,000 and 5,000 feet in the UCRB. Although there is less clearcutting now, the hydrologic effects of past clearcuts can persist for three to four decades, depending on vegetation characteristics (FEMAT 1993). Soil compaction due to improper livestock grazing (Platts 1991), and timber harvesting activities, such as yarding and heavy equipment operation, can also result in decreased soil permeability and increased runoff (Chamberlin et al. 1991).

The past history of fire suppression may have also affected flow quantity and quality. On rangelands, fire suppression is partly responsible for expansion of western juniper (Terrestrial STAR 1996). Expansion of western juniper and increasing density can result in decreased understory vegetation, which is believed to contribute to decreased soil infiltration and increased peak discharges during intense rainfall (Terrestrial STAR 1996). In forested environments, increased above-ground vegetation due to fire suppression may also have resulted in increased evapotranspiration rates and decreased runoff. Where high intensity fires have increased due to fire suppression, decreased soil porosity has resulted, thus increasing runoff and soil erosion (McNabb and Swanson 1990). Fire can also cause water-repellent layers to form in soils, resulting in temporarily increased runoff (DeBano et al. 1976).

Road construction in forested environments is a management activity that has probably had a major effect on runoff and streamflow, although most studies investigating this issue have been outside the project area. The relatively impermeable surfaces of roads, associated cutbanks, and roadside ditches result in decreased infiltration and more surface runoff. Roadcuts also intercept subsurface flow and route it quickly to stream channels. Roadside ditches and newly formed gullies downstream from culverts extend the channel network (Harr et al. 1975, 1979; Megahan et al. 1992; Jones and Grant, 1996; Wemple 1993; Ziemer 1981).

Water Quality

As specified in the Clean Water Act of 1972 and subsequent amendments, water quality includes all attributes that affect existing and designated uses of a water body. Included are human uses such as recreation, hydropower, and water supply, and other uses such as maintenance of fisheries and riparian habitats.

As a result, water quality attributes that are considered under the Clean Water Act include traditional physical and chemical constituents such as pH, bacteria concentration, temperature, discharge, and factors relevant to aquatic habitat such as the abundance of large woody debris, pool frequency, and riparian canopy density.

The Clean Water Act requires that every two years each State review all available information on water quality as part of a Statewide water quality assessment. Where application of current Best Management Practices or technology-based controls are not sufficient to achieve designated water quality standards, the water body is classified as "Water Quality Limited." About 10 percent of project area streams and rivers are potentially Water Quality Limited. On Forest Service-administered lands in the project area, the primary water quality concerns are sedimentation and turbidity, flow alteration, and high summer water temperatures. On BLM-administered lands, high sediment and turbidity levels and high temperatures are the primary reasons for listing as Water Quality Limited.

Water temperature is considered under the Clean Water Act and is a regionally important facet of aquatic habitat on Forest Service- and BLM-administered lands within the project area. The relationship between land-use practices, water temperature, and effects on fish species is better understood than for any other aspect of water quality (Rhodes et al. 1994). Water temperature influences metabolism, behavior, and mortality of aquatic species (Beschta et al. 1987; Bjornn and Reiser 1991). Salmonids (salmon and trout) are cold-water fish that are particularly sensitive to increases in temperature; sustained water temperatures of greater than 64 to 80 degrees Fahrenheit are lethal for most species. In the upper basin, where summer air temperatures are generally much higher than 80 degrees Fahrenheit, many streams have lost their capability to support cold-water fish, and salmonid mortality in streams that still support salmonids is common due to elevated water temperatures (Henjum et al. 1994).

On public lands in the upper basin, non-point sources of pollution are the primary cause of degraded water quality. A non-point source of pollution is water pollution whose source(s) cannot be pinpointed, but that can be best controlled by proper soil, water, and land management practices.

Water Quality and the Clean Water Act

Water quality is regulated by State environmental agencies under authority granted by the Clean Water Act (1972) and subsequent amendments. Under the Clean Water Act, Federal agencies are, in general, required to meet State requirements. In the upper Columbia Basin, the Forest Service and BLM are the responsible management agencies for water quality on lands they manage, as described in memoranda of understanding (MOUs) with State environmental agencies. These MOUs require Federal agencies to meet water quality standards, monitor activities to assure they meet standards, report results to the States, and meet periodically to recertify Best Management Practices (BMPs) which are practices designed to prevent or reduce water pollution. The primary mechanisms for regulating and controlling non-point sources of pollution are adopting and implementing (1) Best Management Practices, (2) numeric and narrative water quality standards, and (3) the antidegradation policy (40 CFR 131).

Stream Channels

Water, sediment, solutes, and organic material derived from hillslopes and their vegetative cover flow into and through streams and rivers. The shape and character of stream channels constantly and sensitively adjust to the flow of these materials by adopting distinctive patterns such as pools-and-riffles, meanders, and braids (Leopold et al. 1964). The vast array of physical channel characteristics combined with energy and material flow, provide diverse habitats for a wide variety of aquatic and riparian-dependent species.

Stream Channel Processes, Functions, and Patterns

The varied topography within the planning area, coupled with the irregular occurrence of channel-affecting processes and disturbance events such as fire, debris flows, landslides, volcanic activity, drought, and extreme floods, result in a mosaic of river and stream conditions that are dynamic in space and time under natural conditions (Reeves et al. 1995). The primary consequence of most of these disturbances is to directly or indirectly provide large pulses of sediment and wood into stream systems. As a result, most streams and rivers in the planning area probably undergo cycles of channel change on timescales ranging from years to hundreds-of-years in response to episodic inputs of wood and sediment. The types of disturbance, such as fire, flood, or debris flow, that affect the morphology of a particular channel depends on watershed characteristics, channel size, and position of the channel within the watershed (Reeves et al. 1995; Grant and Swanson 1995). Many aquatic and riparian plant and animal species have evolved in concert with the dynamic nature of stream channels, developing traits, life-history adaptations, and propagation strategies that allow persistence and success within landscapes that experience harsh disturbance regimes. Figure 2-17 illustrates how salmon and trout use various portions of a stream during different parts of their life cycles.

Photo 15a

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Photo 15A: Channels are affected by disturbances such as debris flows, which are dynamic in space and time. Photo by USFS/Boise NF

In order to guide understanding and management of streams and rivers, stream classification systems (for example Rosgen 1994; Montgomery and Buffington 1994) have been established on the basis of distinctive patterns of stream behavior. These classifications are primarily derived from consideration of stream slope and confinement (relating to the stream's ability to move and erode its banks and bed). In general, stream types range from steep and confined channels that generally consist of step-pool and cascade-dominated streams (Rosgen "type A"; Montgomery and Buffington "source"), through moderate gradient and moderately confined rapid-dominated channels (Rosgen "type B"; Montgomery and Buffington "transport"), to low gradient, unconfined, pool-and-riffle dominated channels (Rosgen "types C, D, and E"; Montgomery and Buffington "response"). Other stream types include:

- (1) Gullied, or streams actively eroding their streambeds and streambanks (Rosgen type G) and,
- (2) Low gradient, entrenched, wide streams (Rosgen type F).

In general, steeper channels (slopes greater than four percent) are commonly found in the headwater or mountainous portions of a landscape, and are less sensitive to watershed disturbances because of their high degree of confinement and their position high in the watershed unless the soils are highly erosive. Once disturbed, however, steep and confined streams may take considerable time to recover to their previous condition. Channels with slopes between two and four percent generally contain abundant rapids and steep riffles. Lower-gradient streams (slopes less than two

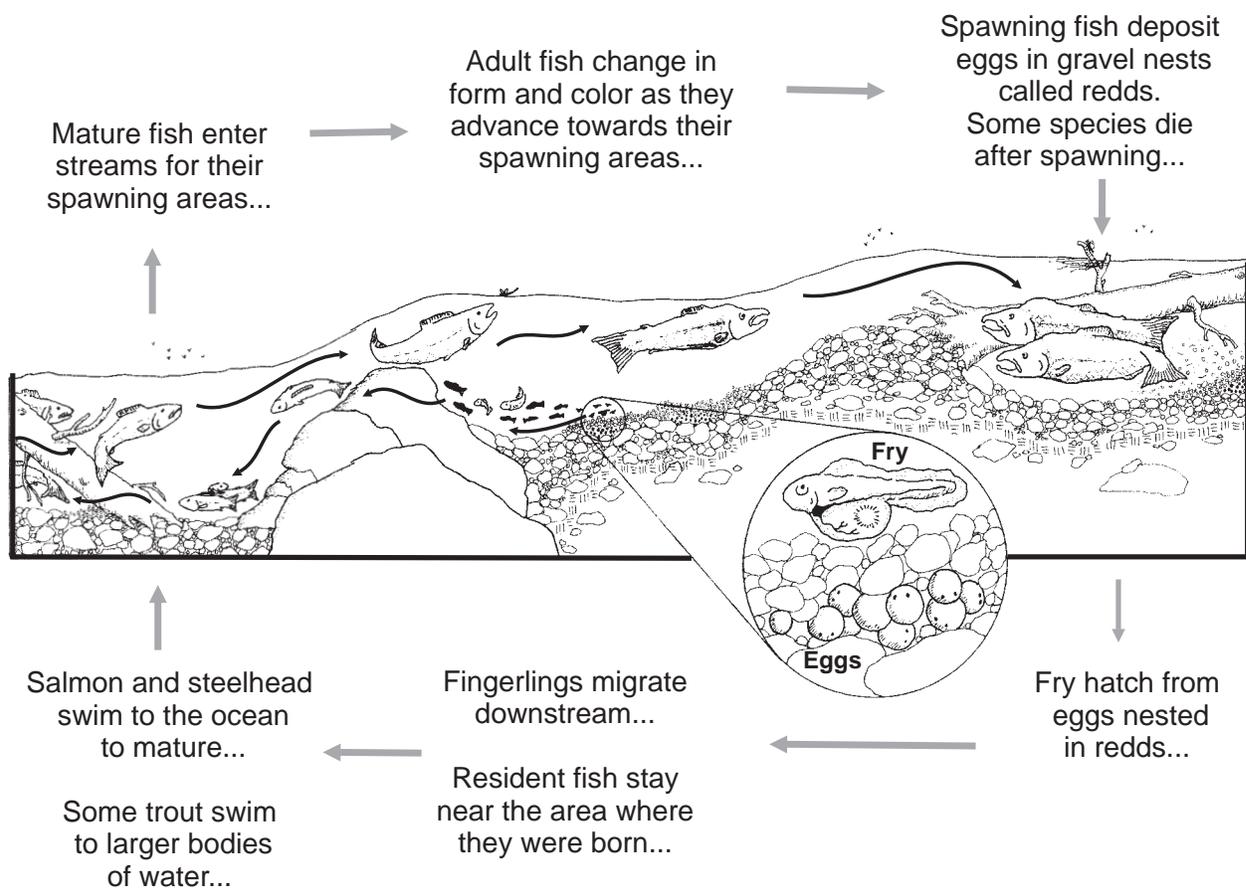


Figure 2-17. Salmon and trout are among the aquatic species whose life cycles have evolved in concert with the dynamic nature of stream channels.

percent) are generally larger, and under natural conditions meander and migrate freely within wider valleys. Low gradient streams and rivers commonly have numerous side channels and high water channels, and generally contain the most biologically productive aquatic ecosystems. These low-gradient channels are generally sensitive to cumulative and local watershed disturbances, but commonly recover quickly where there are natural hydrologic and sediment regimes. Describing watersheds using valleybottom and streamtype settings (see sidebar) provides a broad characterization that integrates the landform and stream features of the valley morphology with the stream channel pattern, shape, and morphology. Streams, on the other hand, can be characterized based on their interrelationship to the valley and adjacent landform. Figures 2-18 and 2-19 illustrate the differences in streamtypes in steep mountainous areas and in lower elevation areas.

Current Conditions

Within the ICBEMP project area, humans have extensively altered stream channels by direct modifications such as channelization, wood removal, diversion, and dam-building, and also by indirectly affecting the incidence, frequency, and magnitude of disturbance events. This has affected inputs and outputs of sediment, water, and wood. These factors have combined to cause pervasive changes in channel conditions throughout the planning area, resulting in aquatic and riparian habitat conditions much different from those that existed prior to extensive human alteration (Henjum et al. 1994; McIntosh et al. 1994; Wissmar et al. 1994). In general, the largest rivers such as the Columbia and Snake rivers, have been converted from free flowing streams to a series of reservoirs. Many intermediate-sized rivers, such as the Payette, Clarks Fork, and Clearwater Rivers, are now important transportation corridors that are flanked by roads, railroads, or both, with floodplains that have been encroached upon by transportation features and other human structures.

Indirect effects of past land management activities are also pervasive in the planning area. Mining, timber harvest, grazing, beaver trapping, and road-building have all altered channels by affecting the rate with which sediment, water, and wood enter and are transported through stream channels. Almost all Forest Service- or BLM-administered lands

that are outside designated Wilderness have been entered at some level for resource extraction since the early 1800s. Most of the large-scale and intense operations, such as in-stream dredging and severe overgrazing, that seriously affected channel morphology were halted by the early 1900s (Wissmar et al. 1994). Nevertheless, the effects of past management activities clearly continue to affect channel morphology today.

The Aquatic Staff Area Report (1996) addresses the current status of stream channel morphology in the project area and relations to management actions through analysis of aquatic habitat inventories. These analyses include surveys of 105 streams inventoried in the 1940s and 1950s, and more than 6,000 stream inventories completed in the past five years that summarized stream conditions across a spectrum of physiographic environments and management histories. Key findings from analysis of both data sets are that stream channel morphology is highly variable, depending on stream type and biophysical environment, but there are major correlations between management intensity and stream channel morphology over time and space.

Aspects of channel morphology in the upper Columbia Basin that have apparently been affected by land management practices include the frequency of pools, the frequency of large pieces of wood in the channel, and the composition of substrate (amount of fine sediment). Low gradient (slopes less than two percent) and larger streams are apparently the most sensitive to management activities. Pool frequency and wood frequency are generally less in areas with higher road densities, and in areas where timber harvest has been a management emphasis. Additionally, where measured, the percent of the channel bed covered with fine sediment (less than 0.25 inches) increases with road density. These findings are consistent with observations from site-specific analyses that indicate that improper road construction, grazing, and timber harvest practices increase delivery of fine sediment to stream channels, filling pools and causing stream aggradation (Furniss et al. 1991; Hicks et al. 1991).

An example of changed riparian and aquatic environments is Marble Creek on the St. Joe River. In 1911, the river had numerous log jams that had been there for years. Shortly

Valleybottoms and Streamtype Settings in the UCRB Planning Area, by ERU

The dominant valleybottom settings of the Columbia Plateau ERU consist of steep, highly confined valleys and moderately steep to flat, moderately confined valleys. Steep, step-pool streamtypes are dominant, many of which are estimated to be unstable and high sources of sediment. Rapids and meandering pool-riffle streamtypes are also common, as well as a high local occurrence of braided streams. Entrenched, low gradient streams are also fairly common, many of which are unstable.

The Blue Mountains ERU has a similar dominant valley setting to the Columbia Plateau even though the landforms are different. Steep step-pool streams and mid-gradient rapid type streams dominate. Low gradient meandering and braided streams (Rosgen types C, E, and D) are moderately common across all watersheds within the ERU. Entrenched, low gradient streams are fairly common, many of which are unstable or in transition.

The Northern Glaciated Mountains ERU is dominated by steep confined and moderately steep, moderately confined valleys as well as flat unconfined valleys. Steep step-pool and cascade dominated streams, as well as mid-gradient rapid-type and meandering pool-riffle streams are all common throughout the ERU. This ERU has the highest occurrence of braided stream systems. It also ranks the highest across the project area for occurrence of wetlands and lakes.

The Lower Clark Fork ERU is dominated by steep confined valleys, moderately steep- moderately confined valleys, and flat unconfined valleys. Steep cascading and step-pool streams and meandering pool-riffle streams are the dominant streamtypes.

The Upper Clark Fork ERU is also dominated by steep confined and moderately steep-moderately confined valleys, but lack the flat unconfined valleys which co-dominate the Lower Clark Fork. Steep step-pool and mid-gradient rapid-type streams dominate; meandering low gradient streams have a patchy occurrence in roughly half the watersheds in this ERU. There is also a relatively high occurrence of low gradient sinuous streams (Rosgen type E) and a high percentage of wetlands and lakes.

The Owyhee Uplands ERU is dominated by flat moderately confined valleys but also has moderate and steep confined and moderately confined valleybottoms. The steep, mid-gradient, and low gradient streams are all well represented across the ERU. This ERU is uncommon in that it has a high occurrence of braided streams (both types D and DA) and is among the highest for low gradient sinuous streams. In addition it has a high occurrence of entrenched unstable streamtypes and unstable gullied streamtypes.

Valleybottom settings in the Upper Snake ERU are similar to those in the Owyhee Uplands. Mid-gradient, rapid-type streams dominate as well as steep step-pool and gullied streams. Braided streams are fairly common and low gradient sinuous pool-riffle streams occur locally. There is a high degree of channelized streams relative to the other ERUs.

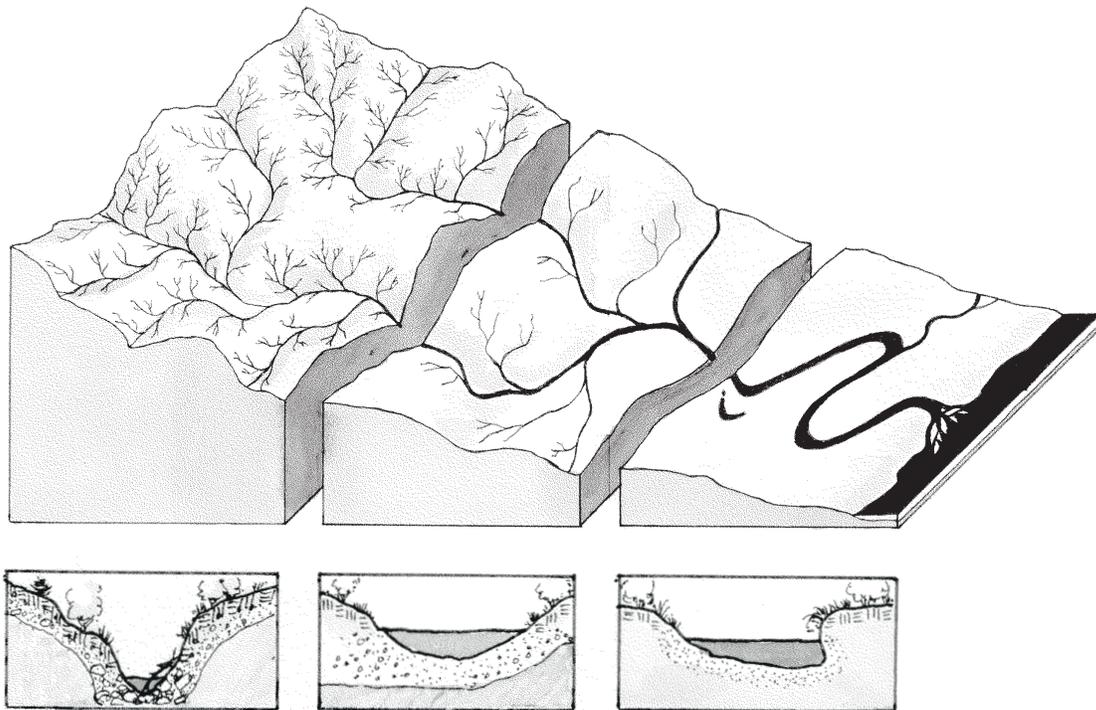
The Snake Headwaters ERU is dominated by flat unconfined valleys, moderately steep-moderately confined valleys, and steep confined valleys, similar to the Owyhee Uplands and Upper Snake. The steep, mid-gradient, and low gradient streams are all well represented across the ERU. There is a high occurrence of braided streams, and steeper braided streams associated with alluvial fans. This ERU also has frequent occurrence of sinuous pool-riffle streams, and wetlands and lakes.

Dominant valley settings in the Central Idaho Mountains are steep confined valleys, moderately steep-moderately confined valleys, and flat moderately confined valleys. The steep, mid-gradient, and low gradient streams are all well represented across the ERU. This ERU is notable for the frequent local occurrence of braided streams, the extensive occurrence of sinuous pool-riffle stream (probably in association with glaciated areas), and the relatively common occurrence of entrenched unstable streams.

thereafter, the log jams were removed. Removing and salvaging logs from log jams peaked in Idaho and Montana in the 1920s, after which it was noted that the once numerous fish were no longer present.

In addition to these specific changes to streams and rivers, and those discussed in the Scientific Assessment (1996), land management practices have caused an overall change in the scale and frequency of landscape disturbance, resulting in a distinctly different character of watersheds and their stream systems when viewed from a regional perspective. Instead of individual and isolated watersheds, riparian areas, and stream channels being episodically affected by large disturbances, such as floods, fire, and insect infestations, with other neighboring watersheds remaining largely unaffected, past land

management practices of widespread flow impoundment, road construction, improper livestock grazing, and timber harvest have led to increased levels of watershed disturbances spread over time and space. Consequently, most watersheds contain stream channels and aquatic habitats that are now subject to continuing cumulative effects of watershed disturbance. This contrasts with the more pulse-like pattern of disturbance with which most streams and associated species evolved. As a result, most stream channels are in a somewhat “unnatural” condition, with habitat conditions that are less than optimal for aquatic and riparian-dependent species, which evolved in environments that probably had many more high-quality habitat areas spread across the landscape.



Steep mountain headwater streams flow swiftly through and cut a deep "V" shaped valleys. Rapids, small pools and waterfalls are common and densely spaced.

Foothill streams flow through moderately confined valleys. Pools and riffles are common. The valley broadens and the river begins to meander.

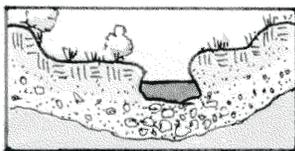
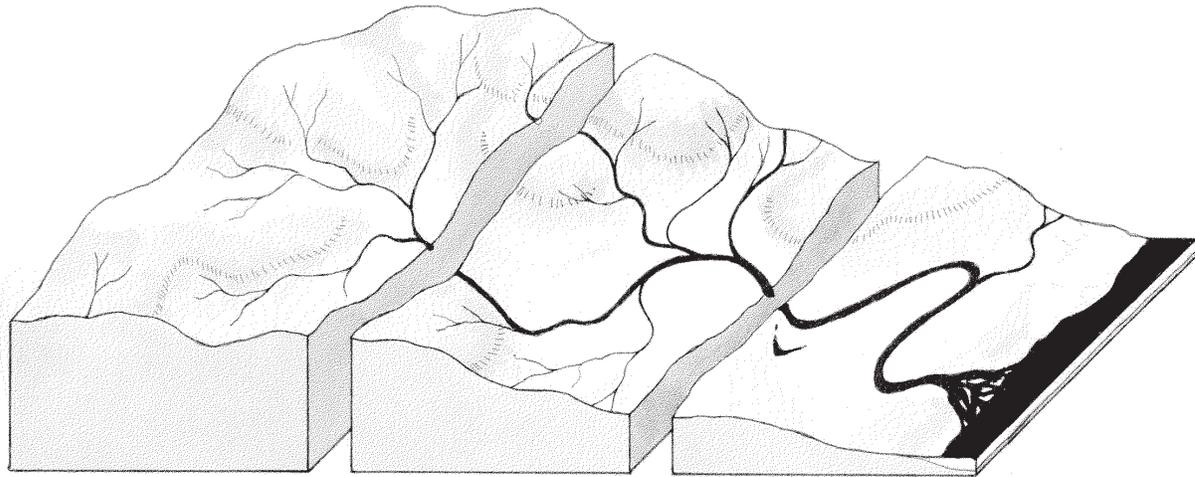
The river continues to meander slowly across a broad, nearly flat valley with wide floodplains. Large pools, and off-channel standing water is common.

Figure 2-18. Steep Mountain Headwaters Profile. Stream channels change in shape and velocity based on the steepness of the round slope and the amount of surface water. In general, steeper channels are commonly found in the headwater or mountainous portions of a landscape.

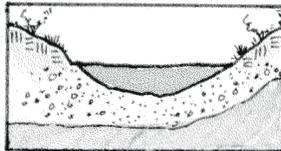
Improving trends in channel conditions have been documented within the UCRB planning area. For example, in the South Fork Salmon River in Idaho, studies showed a 78 percent reduction in the volume of stored sediment between 1965 and 1989. Excessive sedimentation resulting from a combination of extensive logging, road construction, and wildfire combined with large storm events during the winter of 1964–65, buried prime spawning and rearing habitat in the river. Following a moratorium on logging activities coupled with a watershed restoration and monitoring program, a large volume of fine sediment was moved out of the system. Not only was the volume of fine sediment reduced, but the size of particles on the streambed increased, indicating that the sources of sediment have stabilized to some degree (Bohn and Megahan 1991).

Lakes

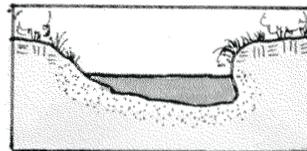
Within the project area, lake conditions have been most affected by recreation and residential development. Recreation activities such as backpacking, horsepacking, recreational vehicle use, and road and trail development have resulted in damage to lake environments, particularly beaches and other near-shore areas. Recreation activities have commonly led to introduction of non-native plant and animal species, resulting in local extinction of native invertebrates, amphibians, and fish. Recreational boating has led to the introduction of numerous non-native plants, such as Eurasian watermilfoil. Large mid-elevation lakes, such as Priest and Payette Lakes in Idaho and Flathead Lake in Montana, have been the most affected from a growing regional population seeking to live or recreate near lakes.



Gently sloped mountain headwater streams flow gradually with seasonal influxes that create two distinct channel types. Meadows are common.



Foothill streams flow through moderately confined valleys. Pools and riffles are common. The valley broadens and the river begins to meander.



The river continues to meander slowly across a broad, nearly flat valley with wide floodplains. Large pools, and off-channel standing water is common.

Figure 2-19. Lower Elevation Headwaters Profile. Lower elevation headwater streams flow more slowly and create distinct channel types different from steep mountain headwater streams. Once the streams reach middle and lower gradients, the stream profile resembles that of the stream whose headwaters started in steeper mountains.

Water transfers and diversions for drinking water or irrigation water supply have affected and continue to affect many lakes throughout the project area, especially where drought and diversion of inflow have resulted in very low lake levels during the last several years. Dozens of moderate-sized lakes have their shorelines influenced by modification and control of their outlet streams or rivers. Regulation of lake level for water supply purposes has had effects on near-shore aquatic and wetland plant and animal communities, and the spawning success of near-shore spawning fishes. Additionally, inter-basin water transfers have promoted the continued spread of non-native plants and animals while inhibiting natural migration routes of native species.

Riparian Areas and Wetlands

Summary of Conditions and Trends

- ◆ The overall extent and continuity of riparian areas and wetlands has decreased, primarily due to conversion to agriculture but also due to urbanization, transportation improvements, and stream channel modifications.
- ◆ Riparian ecosystem function, determined by the amount and type of vegetation cover, has decreased in most subbasins within the project area.
- ◆ A majority of riparian areas on Forest Service- or BLM-administered lands are either “not meeting objectives”, “non-functioning”, or “functioning at risk.” However, the rate has slowed, and a few areas show increases in riparian cover and large trees.
- ◆ Within riparian woodlands, the abundance of mid-seral vegetation has increased whereas the abundance of late and early seral structural stages has decreased, primarily due to fire exclusion and the harvest of large trees.
- ◆ Within riparian shrublands, there has been extensive spread of western juniper and introduction of exotic grasses and

forbs, primarily due to processes and activities associated with improper livestock grazing.

- ◆ The frequency and extent of seasonal floodplain and wetland inundation have been altered by changes in flow regime due to dams, diversions, and groundwater withdrawal, and by changes in channel geometry due to sedimentation and erosion, channelization, and installment of transportation improvements such as roads and railroads.
- ◆ There is an overall decrease in large trees and late seral vegetation in riparian areas.

Over the past 100 to 150 years, riparian areas and wetlands have been subject to increasingly concentrated and competing resource demands, including water withdrawal, mineral, sand and gravel extraction, human settlement, agricultural practices, timber harvest, livestock use, wildlife, and recreation. This has caused conflicts and complex issues that now confront agencies that manage riparian areas.

Riparian areas and wetlands cover a relatively small portion of the upper Columbia Basin. Their ecological significance, however, far exceeds their limited physical area. Riparian areas and wetlands are an important component of the overall landscape, forming some of the most dynamic and ecologically rich areas on the landscape (Elmore and Beschta 1987). Riparian areas exist in rangeland and forestland environments throughout the planning area (see figure 2-20). Riparian and wetland systems are responsive and dynamic, and when modified, can seriously affect adjacent aquatic and terrestrial ecosystems.

Riparian and Wetland Processes, Functions, and Patterns

Riparian areas are water-dependent systems that consist of lands along, adjacent to, or contiguous with streams, rivers, and wetland systems (see figure 2-20). Riparian ecosystems are the ecological links between uplands and streams, and between terrestrial and aquatic components of the landscape. Many riparian areas have wetlands associated with them. While riparian areas are defined primarily on

the basis of their nearness to streams and rivers, wetlands occur wherever the water table is usually at or near the ground, or where the land is at least seasonally covered by shallow water. Wetlands in the project area include marshes, shallow swamps, lake shores, sloughs, bogs, and wet meadows. They are an important part of the overall landscape, providing major contributions to ecosystem productivity, and structural and providing biological diversity, particularly in drier climates (Elmore and Beschta 1987).

Within the interior Columbia Basin, wetlands constitute a very small portion of the total land area ~ less than 1.5 percent. Many wetlands have been drained, filled, pumped dry, or otherwise degraded or lost. About 60 percent of the historical wetlands remain within the basin, compared to a national wetland area of 50 percent of historical. Most of the wetland loss is a result of historical draining for agriculture and farming, but smaller wetlands within forest and rangeland riparian areas have been altered or lost from road placement within valleybottoms and other causes. Many small and isolated wetlands exist in alpine areas in the Blue Mountains and Northern Glaciated Mountain ERUs. These are commonly remnants of small lakes that were formed by glaciation, landslides, or lava flows.

Physical Processes in Riparian Areas and Wetlands

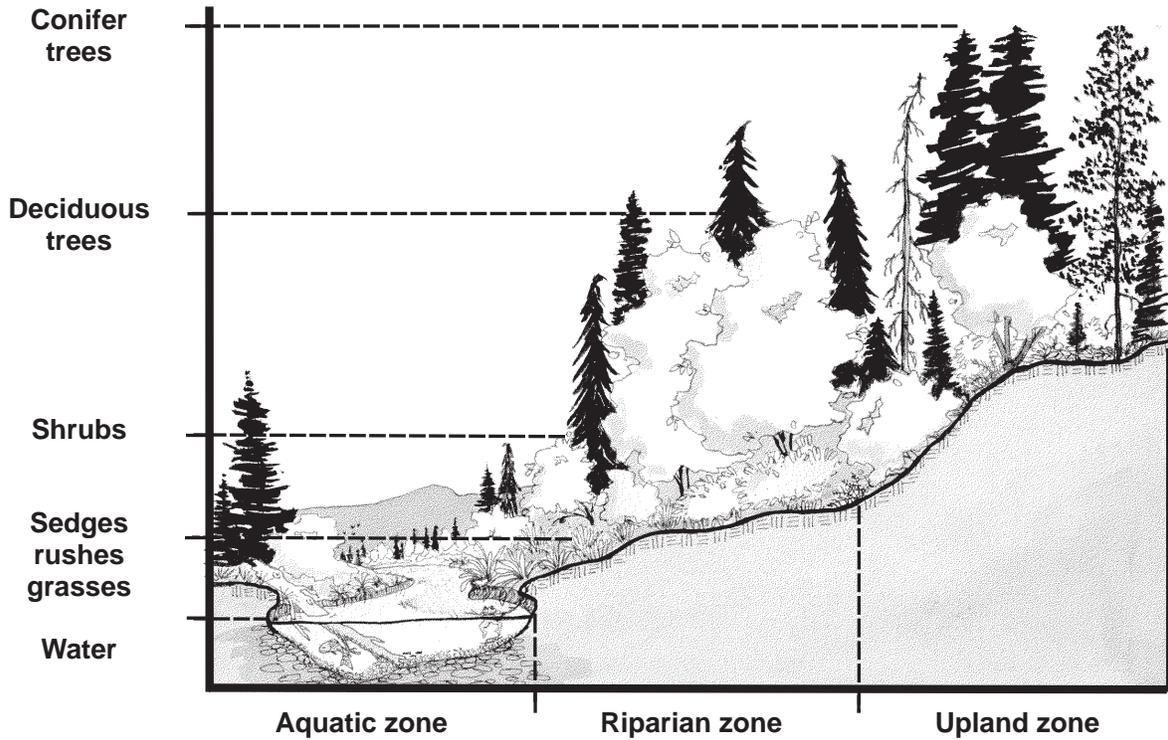
Important physical processes in riparian areas primarily related to the interactions between stream channels, adjacent valley bottoms, and

riparian vegetation, which depends on the frequency of floodplain inundations (flooding). Water that infiltrates into the floodplain during periods of high flow, returns to the channel during periods of low flow, contributing a cool source of summer base flow for many streams, especially in low-elevation alluvial valleys. Seasonal inundation of the floodplain results in overbank deposition and enrichment of riparian soils. Inundation of floodplain also reduces water velocities during flooding and aids in reducing downstream flood peaks, both factors that reduce the risk of channel erosion. Inland wetlands perform many of the same functions, such as detaining storm runoff, reducing flow peaks and erosion potential, retaining and filtering sediment, and augmenting groundwater recharge by storing water and releasing it more slowly, later into the dry season.

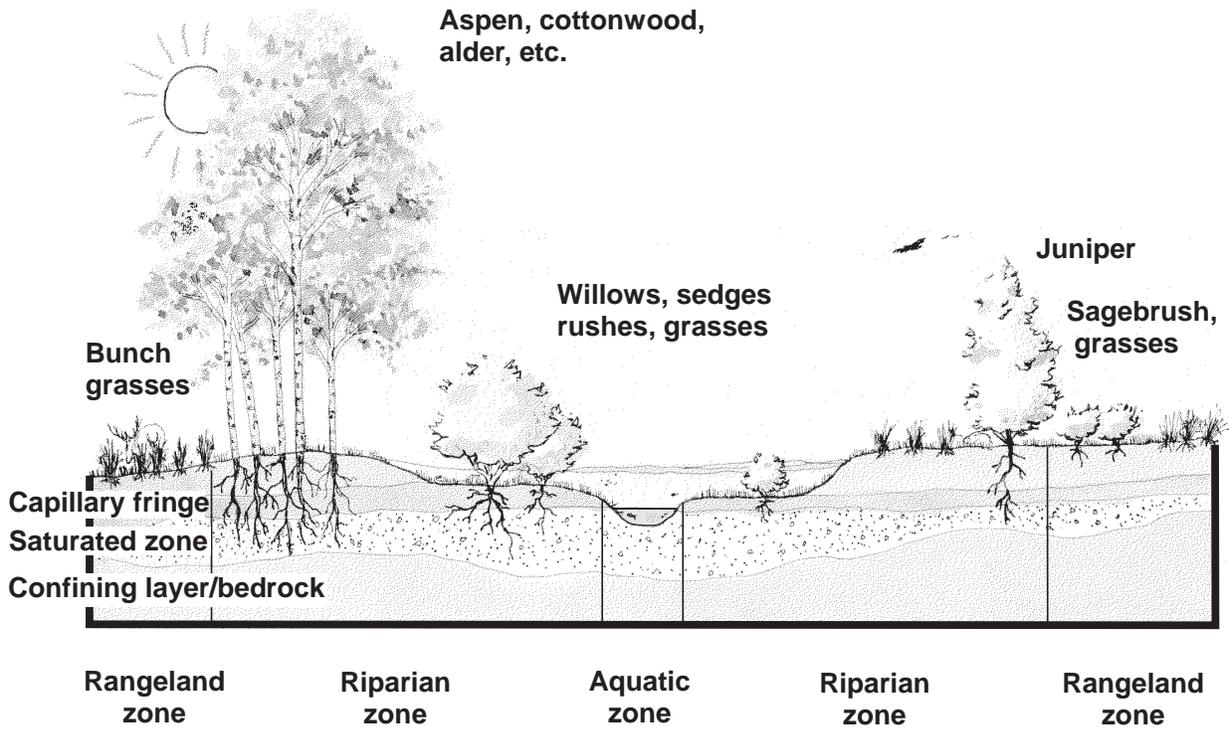
Riparian vegetation also plays a role in many physical processes within riparian areas. Vegetation shades streams and moderates water temperatures by helping keep waters cool in the summer and providing an insulating effect in the winter. Densely vegetated riparian areas buffer the input of sediment from hillslopes and filter fertilizers, pesticides, herbicides, and sediment from runoff generated on adjacent lands. Riparian vegetation also promotes bank stability and contributes organic matter and large woody debris to some stream systems, which is an important component of instream habitat conditions (Gregory et al. 1991; Henjum et al. 1994; Hicks et al. 1991; Kovalchick and Elmore 1992; Sedell et al. 1990). Complex off-channel habitats, such as backwaters, eddies, and side channels, are

Wetlands ~ A Definition

The U.S. Army Corps of Engineers, Environmental Protection Agency, Fish and Wildlife Service, and Natural Resource Conservation Service worked together to develop common language and criteria for the identification and delineation of jurisdiction wetlands in the United States (Federal Interagency Committee for Wetland Delineation 1989). The four Federal agencies defined wetlands as possessing three essential characteristics: (1) hydrophytic vegetation, (2) hydric soils, and (3) wetland hydrology, which is the driving force creating all wetlands. The three technical characteristics specified are mandatory and must all be met for an area to be identified as a wetland. Hydrophytic vegetation is defined as plant life growing in water, soil, or on a substrate that is at least periodically deficient in oxygen as a result of excessive water content. Hydric soils are defined as soils that are saturated, flooded, or ponded long enough during the growing season to develop anaerobic (without oxygen) conditions in the upper part of the soil profile. Generally, to be considered a hydric soil, there must saturation at temperatures above freezing for at least seven days. Wetland hydrology is defined as permanent or periodic inundation, or soil saturation to the surface, at least seasonally. The presence of water for a week or more during the growing season typically creates anaerobic conditions in the soil, which affects the types of plants that can grow and the types of soils that develop (Hansen et al. 1994).



A. Forested Riparian Characteristics



B. Rangeland Riparian Characteristics

Figure 2-20. Forested and Rangeland Riparian Characteristics

often formed by the interaction of streamflow and riparian features such as living vegetation and large woody debris (Gregory et al. 1991). These areas of slower water provide critical refuge during floods for a variety of aquatic species, and serve as rearing areas for juvenile fish. Additionally, streams and riparian areas are dynamic and change in response to upslope and broader landscape processes and disturbances. These disturbances may influence stream pattern and profile, but typically valley width and gradient do not change. Valleybottoms are generally stable physical settings which contain dynamic components of stream types and riparian vegetation (Manning 1995). The shape, size, steepness, of the valleybottom and stream corridor side-slopes have profound effects on the development of in-stream morphology and aquatic habitat (Cupp 1989).

Riparian and Wetland Vegetation

Most riparian and wetland areas within the project area stand out because of their unique vegetation. In drier regions, ribbons of dense vegetation flank streams and rivers, in distinct contrast to the surrounding uplands and valley bottoms.

The broad-scale analysis of vegetation conducted as part of the Science Assessment (1996) identified three potential vegetation groups associated with riparian areas: riparian woodland (dominated by cottonwood, aspen, ponderosa pine, and Douglas-fir), riparian shrub (dominated by alder and willow), and riparian herb (including sedges, forbs, and

grasses). Because riparian vegetation grows in thin strips along streams and rivers, it was difficult to accurately determine the areal extent using a broad-scale analysis during the Assessment. Consequently, the three potential vegetation groups have been lumped into one group (riparian potential vegetation group) for descriptive, management, and analytical purposes in this EIS.

Under natural conditions, riparian plant communities have a high degree of structural and compositional diversity, reflecting the history of past disturbances such as floods, fire, wind, grazing, plant disease, and insect outbreaks (Gregory et al. 1991). Historically (prior to the 1900s), disturbance regimes along riparian areas were dominated by floods and fires, with some grazing by native ungulates (large, hoofed mammals, such as deer, elk, and antelope). Within the riparian woodland potential vegetation group, fires were normally infrequent but severe, occurring at 65- to 150-year recurrence intervals when there were appropriate weather, fuel, and ignitions conditions. In the riparian shrub potential vegetation group, fire was typically more frequent, occurring every 25 to 50 years (Landscape STAR 1996). Because predators typically used riparian habitat as cover, native ungulates typically remained on the uplands and only made dispersed visits to riparian areas for water. However, during drought periods, riparian areas were more intensively grazed by native ungulates.

Photo 16

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Photo 16. Riparian vegetation plays an important role in stream process and function. Photo by Doug Basford.

Riparian Terrestrial Species and Habitats

Riparian areas contain the most biologically diverse habitats on Federal lands, attributable to a variety of structural features including live and dead vegetation and close proximity of riparian areas to water bodies. Riparian areas are valuable to wildlife for food, cover, and water (Bull 1977; Thomas et al. 1979), and provide important habitat for over half of the wildlife species in the upper Columbia Basin. For example, of the 378 terrestrial species known to occur in the Blue Mountains, 75 percent either directly depend on riparian areas or use them more than other habitats (Thomas et al. 1979). Riparian areas provide nesting and brooding habitat for birds. They also provide thermal cover and favorable microclimates due to increased humidity, a higher transpiration rate, shade, and increased air movement helping in homeostasis (a condition where energy expenditure is minimized), especially when surrounded by non-forested ecosystems (Thomas et al. 1979). Common deciduous trees and shrubs in riparian areas, such as cottonwood, alder, willow, and red osier dogwood, are important food sources for mammals such as deer, elk, moose, hares, rabbits, voles, and beavers, as well as other animals. In riparian areas that consist of aspen and cottonwood, which incorporates herbaceous and shrubby components, 24 species of amphibians, 145 species of birds, 62 species of mammals, and 10 species of reptiles are found

(Terrestrial Staff Database 1996). Riparian areas also serve as big game migration routes between summer and winter range; provide travel corridors or connectors between habitat types for many terrestrial species such as carnivores, birds, and bats; and play an important role within landscapes as corridors for dispersal of plants (Bull 1977; Gregory et al. 1991; Heinemeyer and Jones 1994; Thomas et al. 1979; Vogel and Reese 1995; Washington Department of Fish and Wildlife 1995).

Riparian habitat is used by more bird species than any other habitat type within the project area (Neotropical Migratory Bird Report in press 1996). Fifteen neotropical migrant bird species (species that breed in North America and winter in Central or South America) use riparian habitat either exclusively or in combination with only one other habitat type. Within the project area, 84 of the 132 breeding migrant birds use riparian vegetation for nesting or foraging. Riparian vegetation was used by more species of neotropical migrant birds (64 percent) than any other habitat (Saab and Rich 1995).

Cottonwood, willow, and aspen are critical food for beavers. Before the 1900s, prior to being trapped to very low population levels, beavers were a critical component of nearly all riparian areas with perennial streams. Beaver activity can significantly affect physical processes and habitat conditions within riparian areas. Beaver dams lead to flooding and expansion of floodplains, and the creation of wetland-riparian

Photo 17: Riparian areas serve as migration routes for elk and other big game between summer and winter ranges. These areas are also valuable for other wildlife for food, cover, and water. Photo by USFS.

Photo 17

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areas. These features help dissipate the erosive power of floods, trap sediment, and affect the plants and animals associated with these areas. Beaver ponds provide and promote important habitat for many birds, mammals, and fish.

Wetlands also provide important habitat for a variety of species, including resident and migratory birds (for example, swallows, flycatchers, waterfowl, and shorebirds), mammals (for example, bats, ungulates, and beavers), unique plant species (for example, cattails, sedges, rushes, pond lilies, and willows), amphibians (for example, salamanders and frogs), invertebrates (for example, caddisflies, mayflies, and dragonflies), and fish (for example, chubs, suckers, and dace). Approximately 35 percent of the rare and endangered, threatened, and sensitive plant and animal species in the United States either reside in wetland areas or are otherwise dependent on them. Within the planning area terrestrial vertebrate species associated with wetland habitats include 28 neotropical migrant birds, 26 amphibians, and 2 reptiles (Terrestrial Database 1996). Seasonal wetlands are often shallow and fill up quickly in early spring with the onset of groundwater recharge or thawing conditions. These areas provide critical habitat for birds because conditions are favorable for production of invertebrates, an important food supply for migratory birds. Permanent wetlands are usually deeper water bodies that provide habitat and food for animals throughout the spring and summer.

Current Conditions of Riparian Areas and Wetlands

Fur trappers, early surveyors, and settlers during the early 1800s reported extensive stands of cottonwoods, willows, and alders growing across valleys and along moist gulches and draws; and wide, wet meadows along stream systems throughout the project area. Today, many riparian areas and wetlands are considerably altered from conditions noted by the first explorers.

Riparian Areas

In the western United States, 66 percent of inventoried BLM-administered riparian areas are either “non-functioning” or “functioning at risk” as defined in the process for assessing Proper Functioning Condition. Likewise, more than 75 percent of riparian areas administered by the Forest Service in the western United States are not “meeting or moving toward objectives” (Rangeland Reform '94 Draft EIS).

Key broad-scale trends identified in the Scientific Assessment (Landscape Ecology STAR 1996) are that riparian areas have been reduced in abundance and that there has been a significant increase in habitat fragmentation. Conversion of shrublands to cropland in deep soil areas, and to pastureland elsewhere, have been major factors reducing the present extent of riparian areas.

Proper Functioning Condition - A Definition

In response to the growing concerns over the integrity of ecological processes in many riparian areas and wetlands, the BLM has developed a process for assessing “Proper Functioning Condition.” The BLM’s Riparian-Wetland Initiative for the 1990s (USDI 1991) establishes national goals and objectives for managing riparian-wetland resources on BLM-administered lands. This initiative’s two-part goal is to: (1) restore and maintain existing riparian-wetland areas so that 75 percent or more are in Proper Functioning Condition by 1997, and (2) to achieve and provide the widest variety of habitat diversity for wildlife, fish, and watershed protection.

Riparian-wetland areas achieve Proper Functioning Condition when adequate vegetation, landform, or large woody debris is present to dissipate stream energy associated with high water flows. This thereby reduces erosion and improves water quality; filters sediment, captures bedload, and aids floodplain development; improves floodwater retention and groundwater recharge; develops root masses that stabilize streambanks against cutting action; develops diverse ponding and channel characteristics to provide habitat and water depth, duration, and temperature necessary for fish production, waterfowl breeding, and other uses; and supports greater biodiversity. The functioning condition of riparian-wetland areas is a result of the interaction among geology, soil, water, and vegetation (USDI 1993).

The major areas of riparian vegetation loss are in riparian shrubland, riparian woodland, and large riparian trees. Over the basin, 75 percent of the riparian shrublands have been lost in the past 75 years. The Blue Mountains, Owyhee Uplands, Columbia Plateau, Central Idaho Mountains, and Upper Snake ERUs have had the greatest losses. Parts of the Blue Mountains and Central Idaho Mountains historically had low abundance of riparian shrubland and have lost the majority of what was there. Most losses occurred on non-federally administered lands and are the result of land conversion to agriculture, inundation by reservoirs, and urban development, but some loss is the result of succession into forest cover types such as juniper, ponderosa pine, and Douglas-fir, mainly from fire exclusion. Riparian woodland areas have also declined, but to a lesser degree than shrublands. Loss of riparian woodland is most pronounced in the Owyhee Uplands, Upper Snake, and Snake Headwaters ERUs.

Another evident pattern is change in successional and structural stage development, often associated with fire exclusion and suppression combined with the harvest of large trees. This pattern is typified by the replacement of large, dominant, and persistent early seral tree species, notably ponderosa pine and western larch, with more shade-tolerant, late seral, smaller species including Douglas-fir, grand fir, and white fir. Also noteworthy is the reduction in the large tree component and late successional vegetation common across all ERUs, but is most pronounced in the Columbia Plateau and Snake Headwaters. In the Northern Glaciated Mountains and Lower Clark Fork ERUs, the large tree component in the riparian area increased. Some areas sampled showed an increase in riparian cover and large tree component although most sites were far below meeting the potential riparian vegetation and function.

Other patterns include the conversion of low-medium shrublands to juniper woodlands and to exotic grasses and forbs. The combination of grazing, reducing ground cover and fine fuels, and fire suppression and exclusion, have provided large areas for the establishment and development of juniper woodlands. Expansion of western juniper, particularly in the Blue Mountains ERU, has affected the rate of water interception and transpiration. Similarly,

surface disturbance from heavy grazing combined with fire suppression have resulted in extensive establishment of exotic grasses and forbs.

One other relatively uncommon, but ecologically important pattern is the conversion of the aspen/cottonwood/ willow (riparian woodland) type to conifer vegetation types, mainly Douglas-fir. The riparian woodland types are rare and have been greatly reduced from historical abundance.

On Forest Service- or BLM-administered lands within the planning area, major factors contributing to the decrease in riparian area function are improper livestock grazing, timber harvesting, fire management, conversion to crop and pastureland, road development, and dams, diversions, and/or pumping. On rangelands, improper livestock grazing has been the most important factor affecting riparian areas. On forested landscapes, silvicultural practices (including fire suppression) and road building have had the highest effects on riparian areas. Most of these activities have affected riparian area processes and functions by changing flow regimes and channel geometry, thus resulting in changed interactions between the channel and floodplain; and by changing the structure, pattern, and composition of riparian vegetation, thereby changing the functions and habitats provided by native riparian vegetation.

To a lesser extent, disturbances associated with recreational uses, urban development, and mining have also contributed to the decrease in functioning riparian areas. Increasing awareness of the importance of riparian areas to ecological health and resiliency of forest and rangeland ecosystems has resulted in halting and mitigation of many practices that have adversely affected the function of riparian areas.

Although declining riparian conditions occur in many areas, over the past decade land management agencies, working cooperatively with the land users, have concentrated restoration efforts in riparian areas, and many areas are recovering. An example of improved rangeland riparian condition is the Big Cottonwood Creek watersheds on the Sawtooth National Forest in Idaho, where an improving trend has occurred in the past five to seven

Big Cottonwood Creek ~ Then and Now

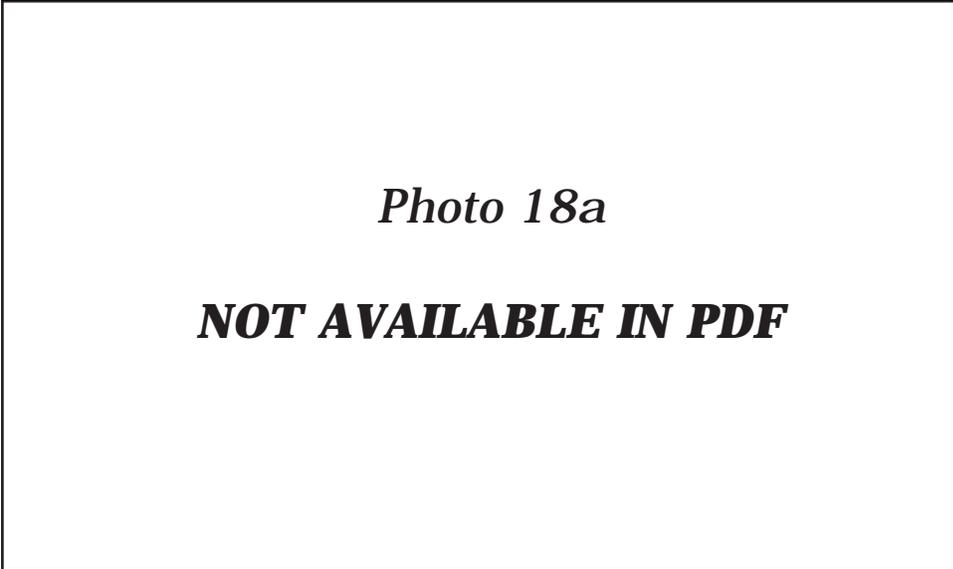


Photo 18A: 1986.
Big Cottonwood
Creek, Twin Falls
Ranger District.
Mature trees are
mostly dead, and
there's no regenera-
tion of willow or
cottonwood due to
heavy browsing by
cattle. Photo by
USFS/Sawtooth NF.

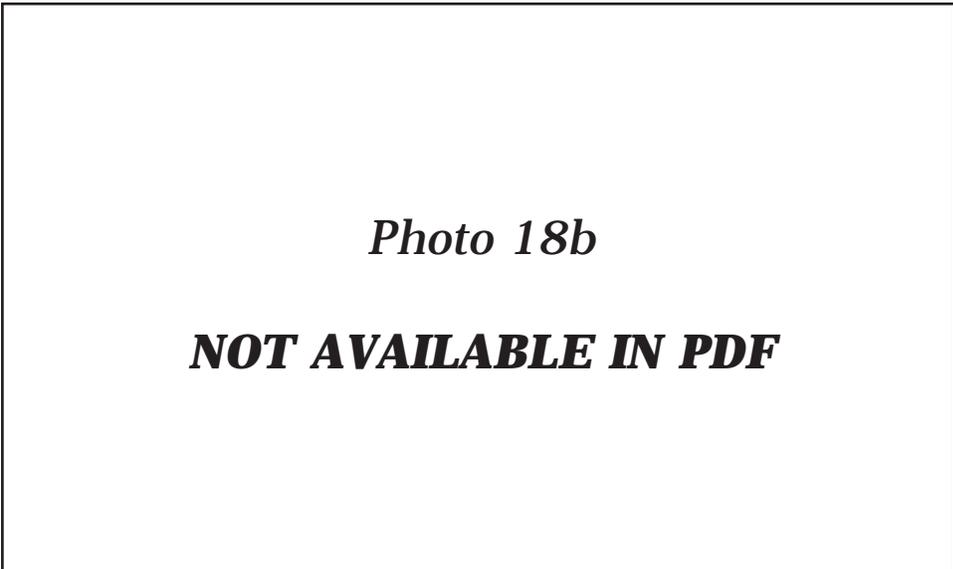


Photo 18B: 1990.
Total rest in 1988
and 1989 and light
fall use in 1990
allowed release of
willow and cotton-
wood. Photo by USFS/
Sawtooth NF.

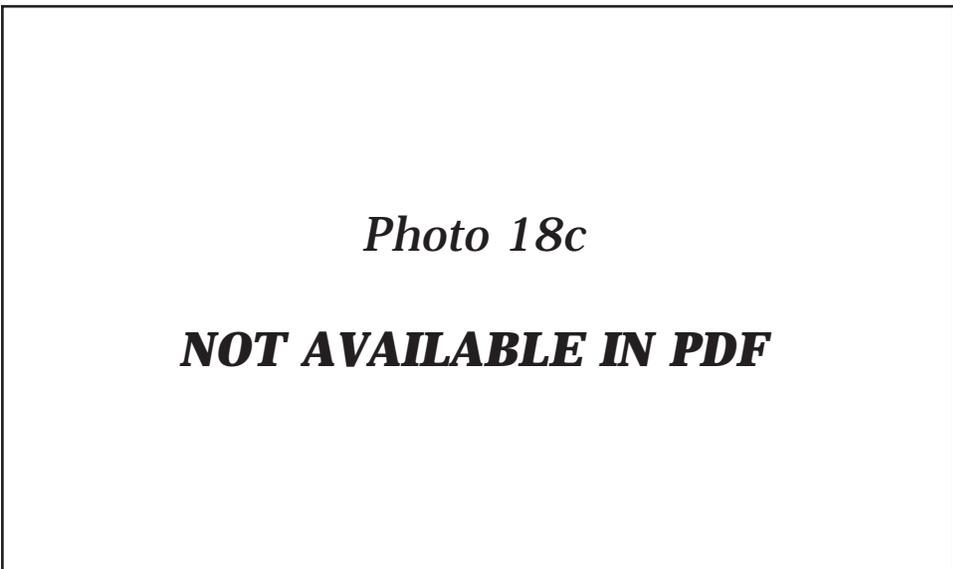


Photo 18C: 1992.
Light use in the
spring of 1991, and
spring use in 1992.
400 cow-calf pairs
used this unit for 10
days just prior to this
photo being taken.
Photo by USFS/
Sawtooth NF.

years. Bare soil and muddy wet areas are now covered with grasses, with wetlands being created and willows growing along the streambank. The improvement has resulted from improved management by the permittees.

Although total exclusion of livestock has been shown to improve conditions in riparian areas, land managers also can accomplish riparian area improvement with the presence of livestock grazing if there is an increased emphasis on compliance with suitable grazing strategies and practices. There are no cookbook or “one size fits all” prescriptions for livestock grazing in riparian areas, but Karl and Leonard (in prep) provide a review of many practices that can be used individually or in combination depending on the situation. In general, season-long (continuous), spring and fall, spring and summer, or summer grazing are not recommended strategies for producing successional advancement of riparian vegetation. Grazing during these times does not allow for residual vegetative cover to protect stream banks from floods and to collect sediment for building banks and narrowing the stream channel. In addition, vegetative structure such as different age classes of shrubs and trees is normally reduced when grazing occurs during these seasons. In general, it is recommended that grazing occurs during times when cattle do not congregate in riparian areas, such as in the spring when green forage is available on the uplands, temperatures are cool, and sufficient time is available for regrowth of riparian vegetation.

Wetlands

Since European settlement, many wetlands on private lands have been drained, filled, sprayed with herbicides and pesticides, or logged, primarily to develop lands for agriculture, but also for residential, commercial, and industrial development. Most of the remaining high quality wetlands in the project area are on BLM- or Forest Service-administered lands, primarily in alpine or sub-alpine environments, and on other federally managed lands such as National Wildlife Refuges managed by the U.S. Fish and Wildlife Service.

Artificial wetlands contribute significantly to wetland habitats within the planning area. These areas, such as Malheur Lake in eastern Oregon and those in the Columbia Plateau

(ERU 6), were created by flow impoundment, irrigation ponds, stream diversion, and agricultural wastewater. Additionally, wetland habitats have been affected by the invasion of non-native plants (such as purple loosestrife, saltcedar, and Russian olive) and introduced animals (such as bullfrogs). On many sites, these non-native species have become well established, commonly replacing native species or exerting large influences on the functional dynamics of existing native habitats.

Fish

Summary of Conditions and Trends

- ◆ The composition, distribution, and status of fishes within the planning area are different than they were historically. Some native fishes have been extirpated from large portions of their historical ranges.
- ◆ Many native nongame fish are vulnerable because of their restricted distribution or fragile or unique habitats.
- ◆ Although several of the key salmonids are still broadly distributed (notably the cutthroat trouts and redband trout), declines in abundance, the loss of life history patterns, local extinctions, and fragmentation and isolation in smaller blocks of high quality habitat are apparent.
- ◆ Wild chinook salmon and steelhead are near extinction in a major part of the remaining distribution in large part because of the construction and operation of mainstem dams on the Columbia and Snake rivers.
- ◆ Habitat, hydropower, harvest and hatchery management, and irrigation withdrawals all affect the survival of remaining anadromous fish populations within the interior Columbia River Basin to different extents. Land management activities have affected the habitat for wild chinook and steelhead and have limited their spawning and rearing success. The contribution of freshwater habitat to declines in anadromous fish populations would be least in central Idaho (for example wilderness areas and other

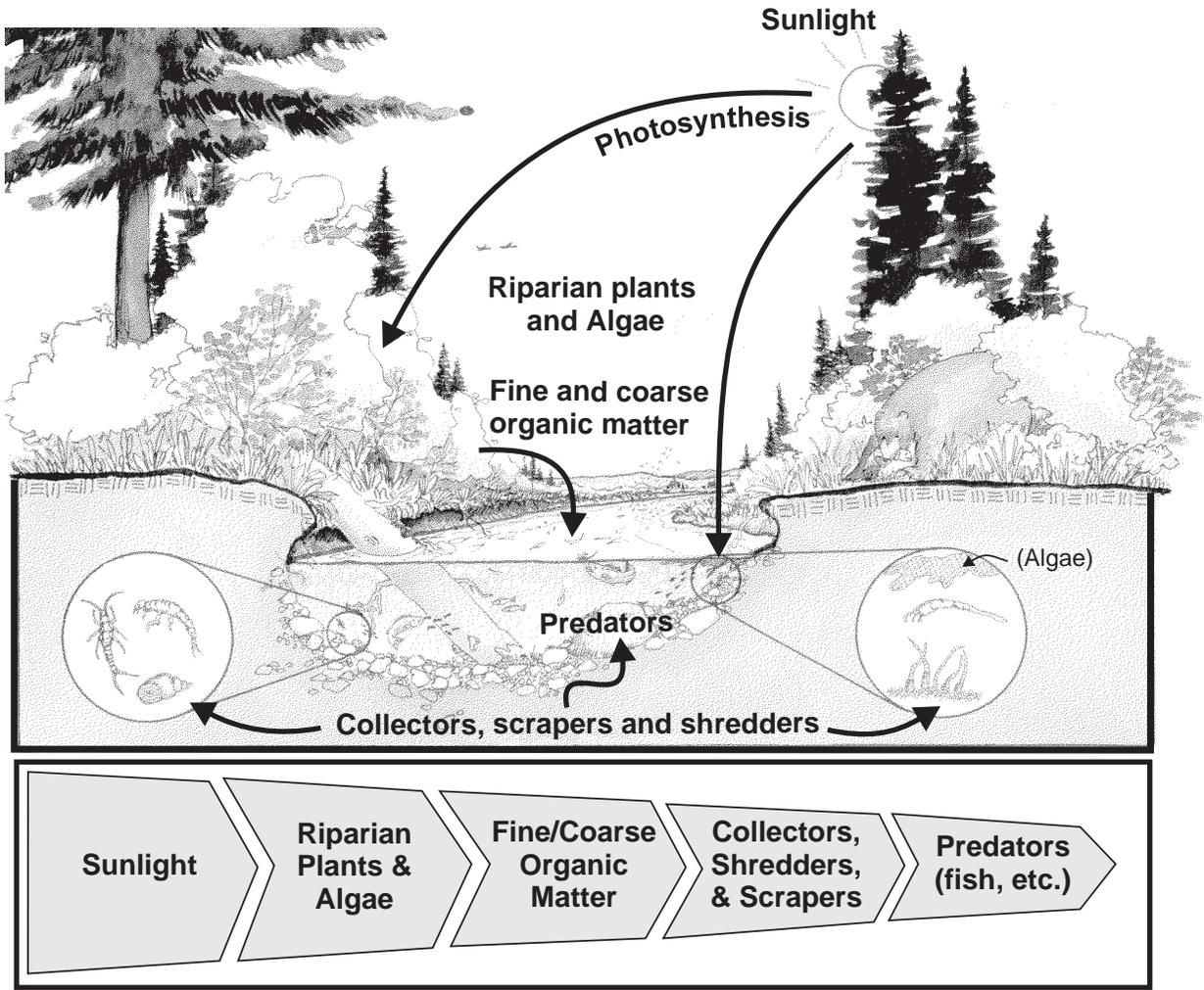


Figure 2-21. Aquatic Food Web. Fish are key components of aquatic ecosystems, where complex food webs include both aquatic and terrestrial plants and animals.

protected areas), which is affected by the most dams between spawning and rearing areas and the ocean, and the northern Cascades, but greater in the lower Snake and mid-columbia drainages. The influence of hydropower on anadromous fish populations increases upriver where there are more dams between freshwater spawning and rearing areas and the ocean. Harvest, which has been curtailed in recent years, has less effect today than it did historically. Hatcheries are an important element throughout the basin, but their effect on native stocks is variable.

- ◆ Core areas for rebuilding and maintaining biological diversity associated with native fishes still exist within the planning area.

Fish are the dominant aquatic vertebrate and a key component of aquatic ecosystems in the project area (figure 2-21, Aquatic Food Web). Fish are a critical resource to humans and have influenced the development, status, and success of social and economic systems within the project area. Fish are sensitive to disturbance, thus integrating the effects of landscape and watershed processes over large regions. The diversity and integrity of native fish communities provide useful indicators of aquatic ecosystem structure, function, and health.

Current Conditions

Like many portions of western North America, the project area has a moderately sized, locally

diverse fish fauna. The varied characteristics and distribution of native fishes mirror the diverse and dynamic physiography and geologic history of the region. The native fish fauna of the Columbia River drainage is unusual in that it clearly is not a single faunal unit, but rather is composed of several subbasin faunas with limited species overlap among subbasins. There are presently 142 recognized fish species, subspecies, or races reported within the project area.

Six aquatic snails federally listed as endangered or threatened are found in the project area (Frest and Johannes 1995), including the endangered Banbury Springs lanx (*Lanx* sp.), Snake River physa (*Physa natricina*), Idaho springsnail (*Pyrgulopsis idahoensis*), Bruneau hot springsnail (*Pyrgulopsis bruneauensis*), and Utah valvata (*Valvata utahensis*); and the threatened Bliss Rapids snail (*Taylorconcha serpenticola*). According to Frest and Johannes (1995), the lanx, Bliss Rapids snail, and Utah valvata may occur on BLM-administered lands in Idaho. All of these three latter species are local endemics with limited distribution and numbers; the major threats to these species are linked primarily to agriculture and river impoundments.

A recovery plan has been developed and approved for five listed Snake River snails that includes delineation of recovery areas. See Appendix E for recovery area maps.

Native Species

Eighty-seven of the project area fish species are native (55 species are non-native). Compared to other large river systems, species richness (number of species) within the project area is quite low, which may be a reflection of the isolation and geologic history of the project area compared to other large river basins with greater species richness.

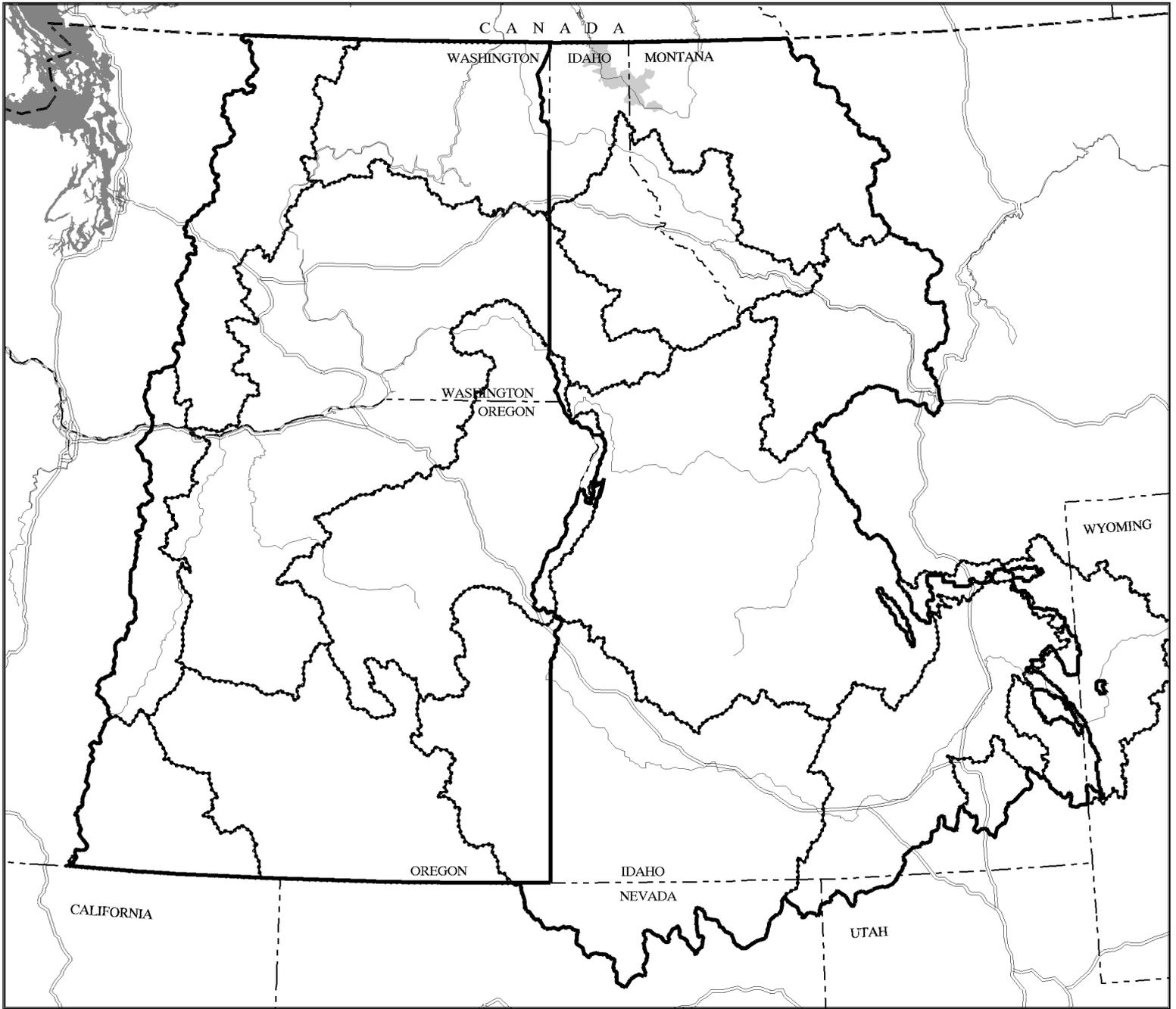
Native fish species tend to fall into two groups. The first group consists of 15 to 20 species that are widely distributed throughout the basin or are reported in 20 percent or more of the project area. The second group of roughly 60 species includes the narrow endemic or rarer species that have restricted ranges or are infrequently reported. These species are generally found in less than 5 percent of the project area. These species, commonly called narrow endemic species, are found principally

in Oregon and southern Idaho. Many of these species are associated with closed basins and many are truly isolated in relatively small watersheds.

In individual watersheds (fifth-code hydrologic units) within the project area, the total number of native species ranges from zero to 28. The largest number of native species is found in the large river corridors, particularly the lower and mid-Columbia and lower Snake rivers. Fewer native fish species are found in headwater watersheds in the Blue Mountains (ERU 6) and in the Columbia River Basin in western Montana.

Many species of native fish and other aquatic biota in the project area are considered imperiled. There are 47 special status species in the project area. Special status species include federally listed endangered or threatened species; candidate species for Federal protection; species recognized for special protection by the States of Oregon, Washington, Idaho, and Montana; species managed as sensitive species by the Forest Service and/or BLM; and species recognized by the American Fisheries Society. Ten species in the project area are formally listed under the Endangered Species Act of 1973; three qualify for listing (Category 1 - bull trout, coho salmon, and summer basin tui chub); and one has been petitioned for listing (steelhead). Within the UCRB planning area, two species are listed endangered under the Endangered Species Act: white sturgeon (Kootenai River), and sockeye salmon (maps 2-11 and 2-12); one species (fall/spring/summer chinook salmon [maps 2-22 and 2-23, later in this section] is listed as threatened.

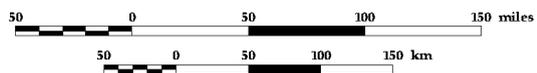
The list of special status species in the UCRB includes the white sturgeon (Acipenseridae); five lampreys (Petromyzontidae); sockeye, chum and coho salmon (Salmonidae); coastal and Lahontan cutthroat trout (Salmonidae); pygmy whitefish (Salmonidae); burbot (Gadidae); 11 minnows (Cyprinidae); six suckers (Catostomidae); eight sculpins (Cottidae); and Sunapee char, an important introduced species. Twenty-two of these species occur in the Great Basin and Klamath Basin portions of the project area. Within the Columbia River Basin, eight occur entirely or primarily in the mainstream river system, three are restricted to the upper Snake River system (including the Wood River), two are restricted to



Map 2-11.
Distribution of
White Sturgeon

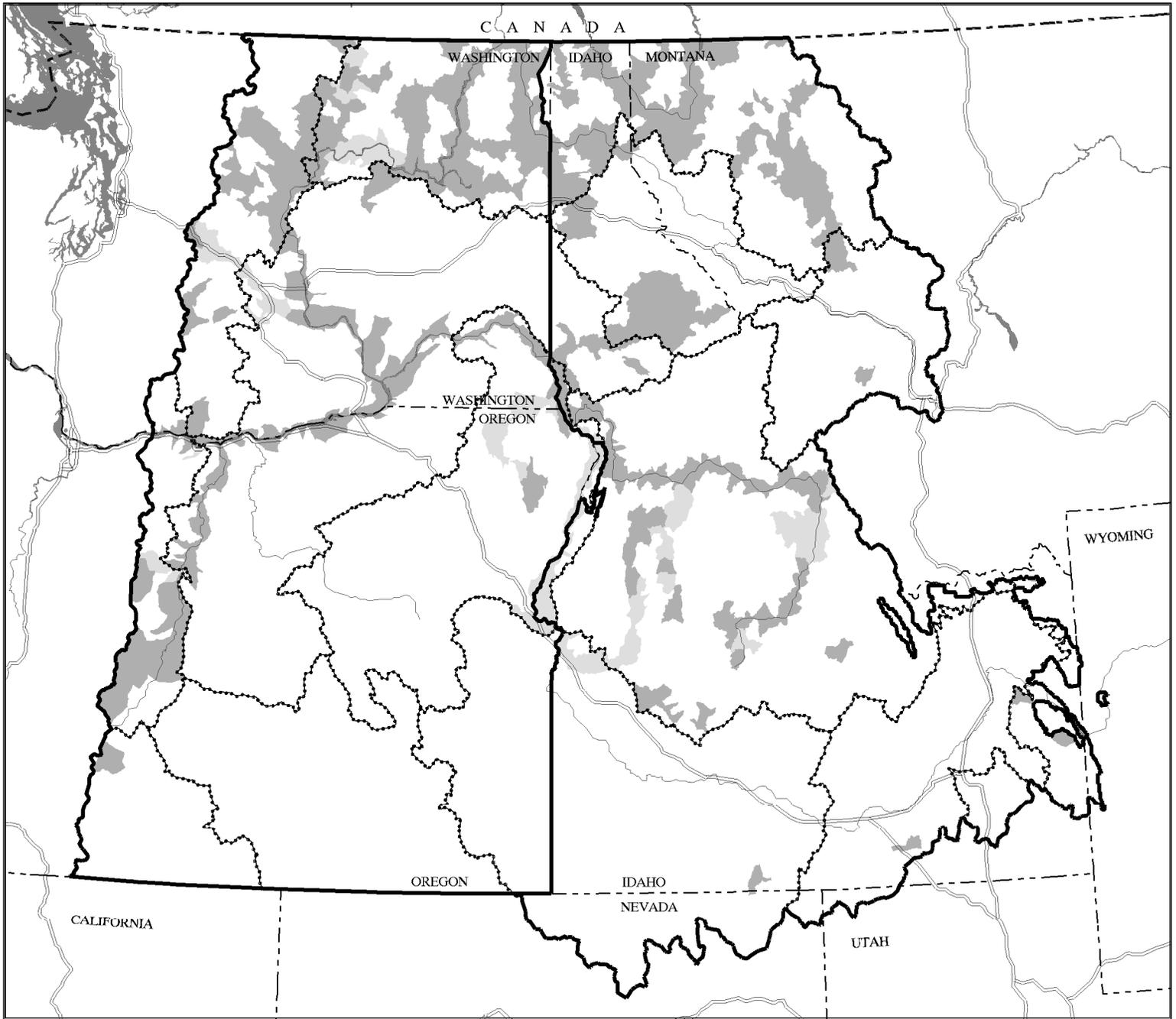
INTERIOR COLUMBIA
 BASIN ECOSYSTEM
 MANAGEMENT PROJECT

Project Area
 1996



-  Current Range
-  Major Rivers
-  Major Roads
-  EIS Area Border
-  ERU Boundaries

*Ecological reporting unit names and numbers are found on Map 1-1.



Map 2-12.
Distribution of
Sockeye (Kokanee) Salmon

INTERIOR COLUMBIA
 BASIN ECOSYSTEM
 MANAGEMENT PROJECT

Project Area
 1996



- Historical Range
- Current Range
- Major Rivers
- Major Roads
- EIS Area Border
- Ecological Reporting Unit Border*

*Ecological reporting unit names and numbers are found on Map 1-1.

the upper Columbia River (primarily in the Northern Glaciated Mountains ERU 7), two occupy streams in the middle and upper Columbia Basin, and one is restricted to the Blue Mountains in the middle Columbia River Basin. Twenty-five species, excluding the key salmonids, occur on more than one Forest Service or BLM administrative unit.

Many factors contribute to the current condition of depressed populations and reduced distribution of native species. Hydroelectric development disrupts migration of anadromous forms. Irrigation diversions and water withdrawal, and the loss of wetlands, marshes, and interconnected waterways, alter habitats for many species, especially in arid regions. Silvicultural practices, improper livestock grazing, and urbanization degrade habitat by changing flow patterns, changing patterns of sedimentation and erosion, increasing water temperatures, and causing eutrophication. Especially threatened are those species dependent on springs. Introduced species have also affected native fish by competition, predation, or hybridization.

Management of many special status fishes is hindered by a lack of basic information. The best information is for the salmonids, or for a few select species that have attracted the attention of researchers. In many cases, species distribution, life history, and habitat characteristics are uncertain. More detailed information for wide-ranging salmonids is presented in a subsequent section.

Introduced Species

In addition to the native fishes, numerous non-native fish species now occupy the project area. Most of these non-native species have been purposely introduced to promote sport fishing opportunities. Introduced salmonids (such as hatchery rainbow trout), centrarchids (such as bass and sunfish), and percids (such as walleye) now support much if not most of the sport fishing opportunity in the project area. The introduced species are now permanent components of the aquatic ecosystem with social and economic importance. They tend to be well-adapted to altered conditions in aquatic environments, and have contributed to the decline of native fish and other native aquatic organisms through competition, predation, and hybridization.

Some of these non-native fish species are now widespread. The most frequently reported fish species in the project area is the introduced rainbow trout, occupying 78 percent of the watersheds in the project area. Introduced brook trout are also well distributed, occupying 50 percent of the watersheds in the project area. Sixteen (32 percent) of the 50 most-reported species are introduced game fishes.

Recreation centered on non-native fisheries is highly valued within the project area, and many watersheds support important wild trout fisheries for introduced salmonids such as brook, brown, rainbow, and lake trout. Habitat in these watersheds remains suitable for natural reproduction of salmonids, although native salmonids may be depressed or extinct because of displacement by non-native fish. For example, in the Henrys Fork of the Snake River, Idaho, native Yellowstone cutthroat trout are virtually extinct in large portions of their historical range, yet wild, self-sustaining populations of introduced rainbow trout thrive and support an internationally recognized trophy trout fishery. Similarly, the upper Deschutes River in Oregon is a renowned wild trout fishery of non-native brook, brown, rainbow, and lake trout that has at least partly displaced native salmonids.

Salmonids

Historical Overview

Salmon, perhaps more than any other single resource, have helped define the Pacific Northwest. Historically, salmon occurred in nearly every stream and river not blocked by major falls. Most American Indians in the project area shared a major dependence on salmon as a subsistence and ceremonial resource. When the first European settlers arrived during the early 1800s, salmon were abundant and diverse. Estimates of historical run size for all species of salmon and steelhead in the Columbia River range from 10 to 16 million adults. The first commercial cannery operations began on the Columbia in 1866 and soon exceeded sustainable levels. Commercial catches of chinook salmon peaked during 1883, when 43 million pounds of fish were landed. Coho, sockeye, chum, and steelhead were also abundant in the Columbia River Basin. The catch of coho salmon peaked at 6.8 million pounds in 1895, whereas the catch of sockeye

and steelhead peaked at 4.5 million and 4.9 million pounds respectively.

Overfishing was blamed for broad declines in chinook salmon runs by the late 1800s, and by 1900 certain fishing gears were banned to provide some protection to spawning runs. By that time, however, impacts from mining, timber harvest, improper livestock grazing, and agriculture (including irrigation diversions) had begun. Construction of massive mainstream dams and dams on smaller streams followed. During and immediately after World War II, timber harvest and road building rapidly increased. Urbanization pressures, river channelization, pollution, and other impacts from the increasing human population began to become evident by the 1960s, as numerous stocks of all species of salmon, steelhead, and sea-run cutthroat trout declined.

Mainstream dams and hydropower operations currently are cited as dominant factors in the decline of the region's anadromous fisheries. However, many resident salmonids (non-anadromous forms such as bull trout), which are not subject to the migratory pressures exerted on anadromous fish by hydropower operations, are also declining. The bull trout, once widely distributed in central Oregon, Washington, Idaho, and western Montana has been determined by the U.S. Fish and Wildlife Service to warrant protection under the Endangered Species Act. Strong and genetically pure populations of westslope cutthroat trout now occupy only a fraction of their range in the project area. Redband trout within the Columbia Basin are poorly understood, yet many subbasins appear to contain declining populations of genetically unique strains. The significant declines in resident stream salmonid populations are indicative of broad changes in aquatic conditions within the project area. Overall changes in the distribution of salmonid species is portrayed in Maps 2-13 and 2-14.

For this discussion, "strong" watersheds have the following characteristics: (1) all major life-history forms that historically occurred within the watershed are present; (2) numbers are stable or increasing and the local population is likely to be at half or more of its historical size or density; (3) the population or metapopulation within the watershed, or within a larger region of which the watershed is a part, probably contains at least 5,000 individuals or 500 adults.

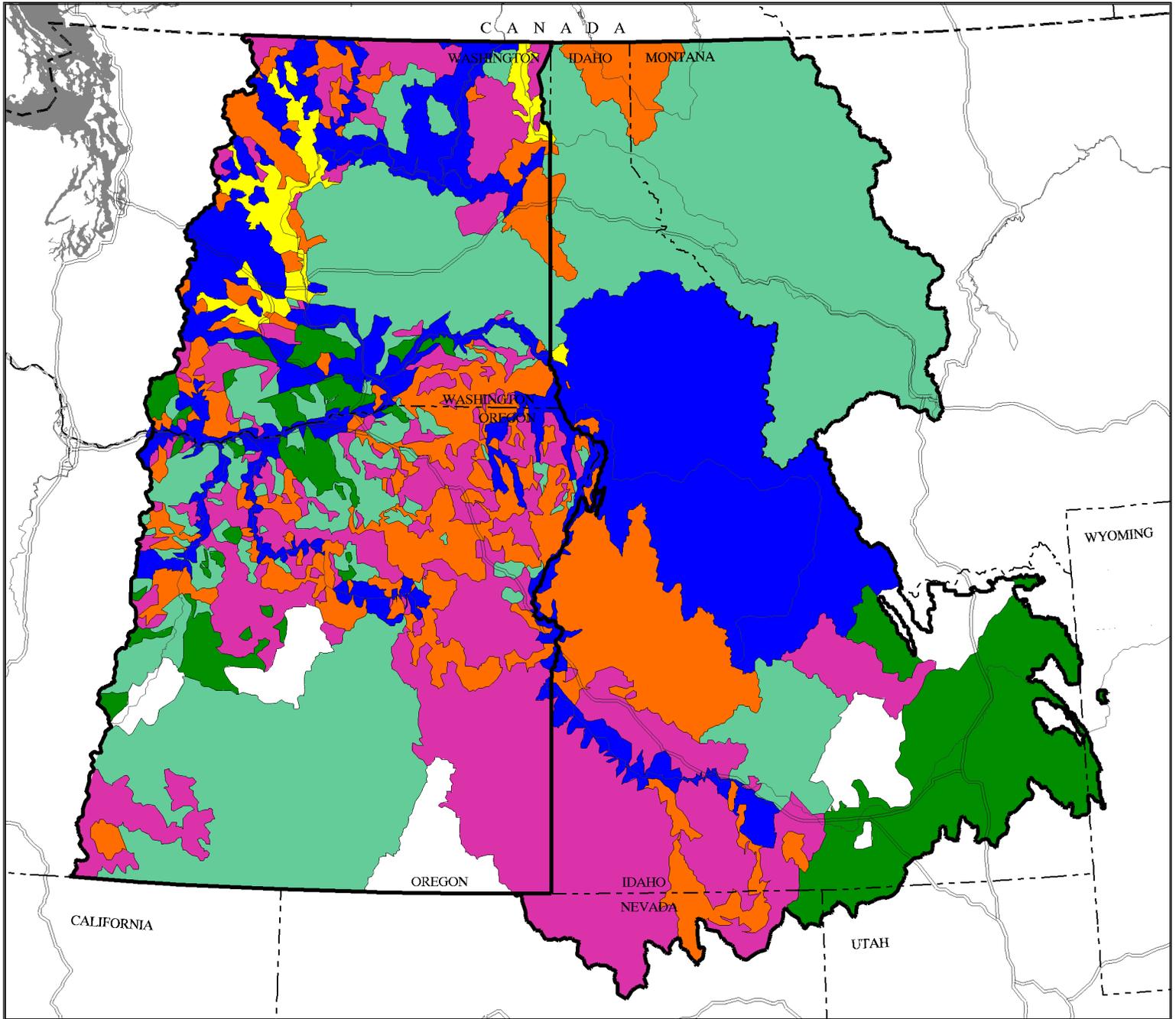
Key Salmonids

Bull trout, westslope cutthroat trout, Yellowstone cutthroat trout, resident redband trout, steelhead, and ocean-type and stream-type chinook are "key salmonids" that were selected by the Science Integration Team (Aquatic STAR 1996) as being *broadly* representative of the state of aquatic biota in the project area. The Scientific Assessment focused on a select group of salmonids for several reasons: (1) This group of fishes has important social and cultural values; (2) knowledge about these fishes is greater than for other species, and thus environmental relationships are likely to be more apparent; (3) these fishes are widely distributed, which allows for broad-scale comparisons; (4) salmonids act as predators, competitors, and prey for a variety of other aquatic and terrestrial species, and are therefore likely to influence the structure and function of aquatic ecosystems, and may serve as links to energy and nutrient flows with terrestrial systems; (5) different salmonid species and life stages often use widely divergent habitats that exposes individual populations to a wide variety of threats, thus integrating cumulative effects of environmental change over broad areas; and (6) the status of these key salmonids can be thought of as a general indicator of aquatic ecosystem health. Problems encountered by these species probably can be assumed to be similar to those facing many aquatic species throughout the project and planning areas.

Bull Trout

Bull trout are recognized as a species of special concern by State management agencies and the American Fisheries Society, and as a sensitive species by the Forest Service and BLM. The U.S. Fish and Wildlife Service considers bull trout a Category 1 Candidate Species under the Endangered Species Act. Bull trout are found in many of the major river systems within the Columbia Basin, but spawning and rearing populations are believed to be primarily restricted to cold and relatively pristine waters, often headwaters of most basins. Current and historical distributions of bull trout are illustrated on map 2-16.

The historical range of bull trout is restricted to North America. Within the project area, bull trout have been recorded in the Klamath River



Map 2-13.
Key Salmonids
Historical Distribution

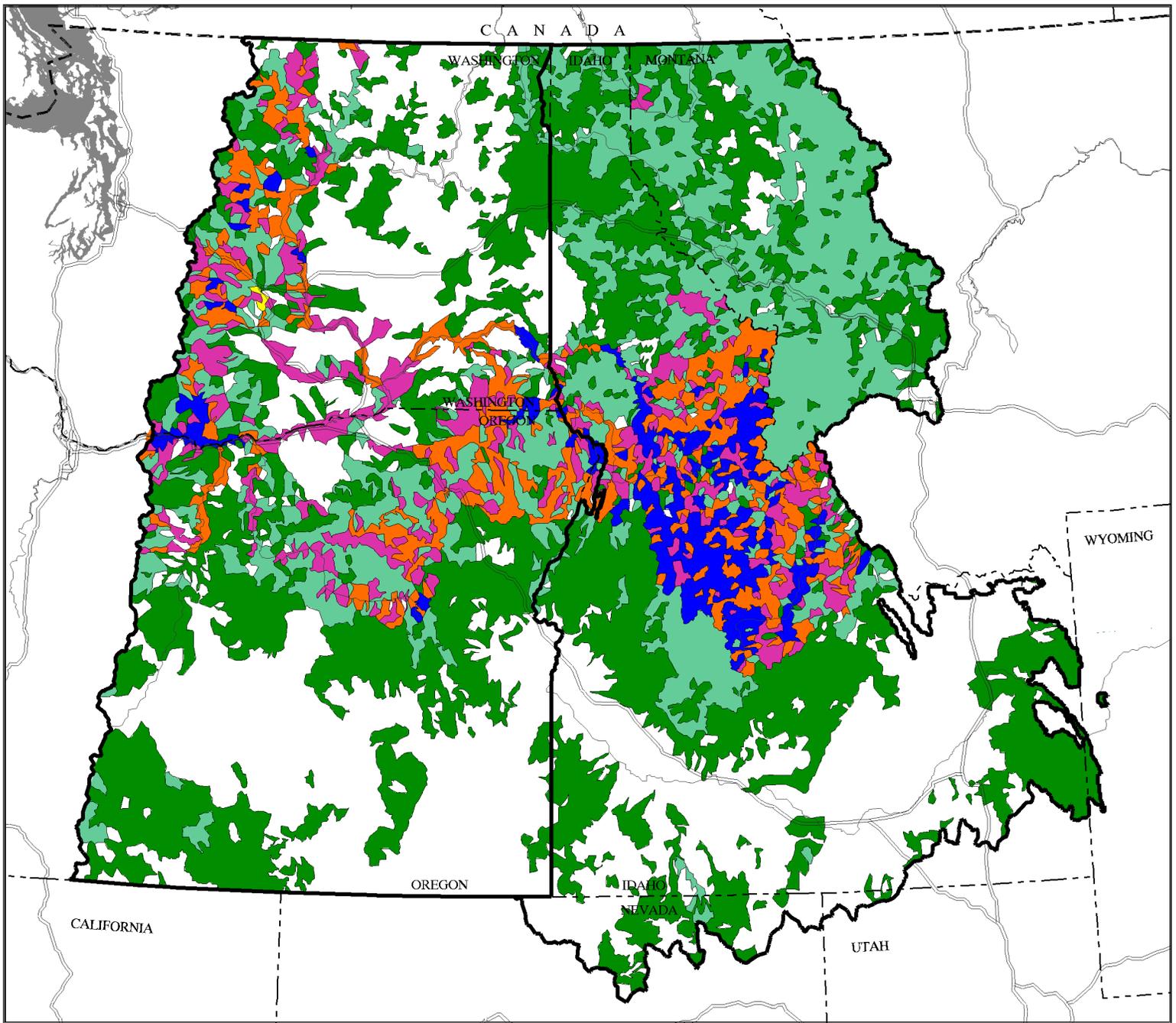
*BLM and Forest Service
 Administered Lands Only*

INTERIOR COLUMBIA
 BASIN ECOSYSTEM
 MANAGEMENT PROJECT

Project Area
 1996



- | | |
|---------|-------------------|
| ■ One | ~ Major Rivers |
| ■ Two | ~ Major Roads |
| ■ Three | ~ EIS Area Border |
| ■ Four | |
| ■ Five | |
| ■ Six | |
- Number of Species:

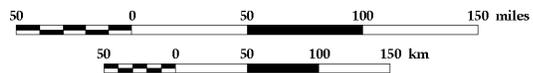


Map 2-14.
Key Salmonids
Current Distribution

*BLM and Forest Service
 Administered Lands Only*

INTERIOR COLUMBIA
 BASIN ECOSYSTEM
 MANAGEMENT PROJECT

Project Area
 1996



- | | |
|---------|-------------------|
| ■ One | ~ Major Rivers |
| ■ Two | ~ Major Roads |
| ■ Three | ~ EIS Area Border |
| ■ Four | |
| ■ Five | |
| ■ Six | |
- Number of Species:

The History of Forest Service/BLM Fish Management

Federally managed lands in the Columbia River Basin contain more than 60 percent of the remaining accessible spawning and rearing habitat for anadromous salmonids. In response to the evidence for declining populations, and the importance of Forest Service- and BLM-administered lands for maintenance and rebuilding of existing populations, these agencies have developed and implemented several strategies intended to maintain and enhance anadromous fish habitat. Another goal of these plans was to meet the goals and objectives of the Northwest Power Planning Council (NWPPC), which was chartered in 1981 to restore a sustainable anadromous fishery within the Columbia River Basin. The Forest Service and BLM have cooperated with the NWPPC, the Bonneville Power Administration (BPA), state fish and game agencies, and tribal governments in an effort to manage anadromous fish habitats.

The Forest Service and BLM have existing Land and Resource Management Plans that were prepared prior to 1990 which address anadromous and resident fish habitat management. These plans are not species or watershed specific. They provide for Forest Service and BLM management to maintain and enhance habitat and to meet existing federal laws such as the Clean Water Act.

In January 1991, the Forest Service developed a Columbia River Basin Anadromous Fish Policy which set forth a consistent plan for management of anadromous fish habitat within the Columbia River Basin. The policy contained a policy implementation guide, which outlined procedures for establishing objectives for anadromous fish production, described desired future conditions, identified habitat inventory needs, and developed monitoring strategies. This policy is still in place, but will be replaced by direction from the Record of Decision developed from this EIS.

The Forest Service and BLM participated in the Hatfield Salmon Summit coordinated by the NWPPC. On May 1, 1991, at the conclusion of the Summit, a Salmon Accord was signed by all of the participants. As a participant in the Accord, the Forest Service was committed to full implementation of the policy implementation guide. The Forest Service and BLM jointly committed to the following: (1) accelerate range management practices to benefit anadromous fish habitat, (2) provide the NWPPC with a listing of private land holdings within Forest Service- and BLM-administered lands that were possibly available for acquisition, (3) provide the NWPPC a listing of all unscreened irrigation diversions and require that when existing permits were renewed, screening would be a condition of the permit, and (4) intensify mineral management administration. Of these commitments, both the Forest Service and BLM were able to provide the NWPPC with a listing of diversions, their screening status, and a listing of lands potentially available for acquisition. Full implementation of the policy implementation guide, and accelerated range and mineral management were not achieved due to funding limitations and new priorities such as development of the Northwest Forest Plan, PACFISH, and Section Seven Consultation for listed sockeye and chinook in the Snake River Basin.

In 1992, the Regional Foresters requested the Chief of the Forest Service assist in the development of a comprehensive anadromous fish strategy for all lands administered by the Forest Service within Forest Service Regions 1, 4, 5, 6, and 10. Before completion of this task, however, Region 10 (Alaska) was withdrawn from this process. In March 1993, The Forest Service and BLM announced their commitment to develop a common strategy for management of Pacific salmon and steelhead habitats (PACFISH). The strategy encompassed approximately 15 million acres of Forest Service- and BLM-administered lands in the Columbia River Basin and 1 million acres of Forest Service- and BLM-administered lands in California.

The development of the Northwest Forest Plan preempted PACFISH in April 1993. The Northwest Forest Plan Draft EIS was published in July 1993, and the Record of Decision was signed April 13. The area covered by PACFISH was greatly reduced, because the Northwest Forest Plan aquatic strategy addressed those Forest Service- or BLM-administered lands within the range of the northern spotted owl, including many watersheds east of the Cascade Range.

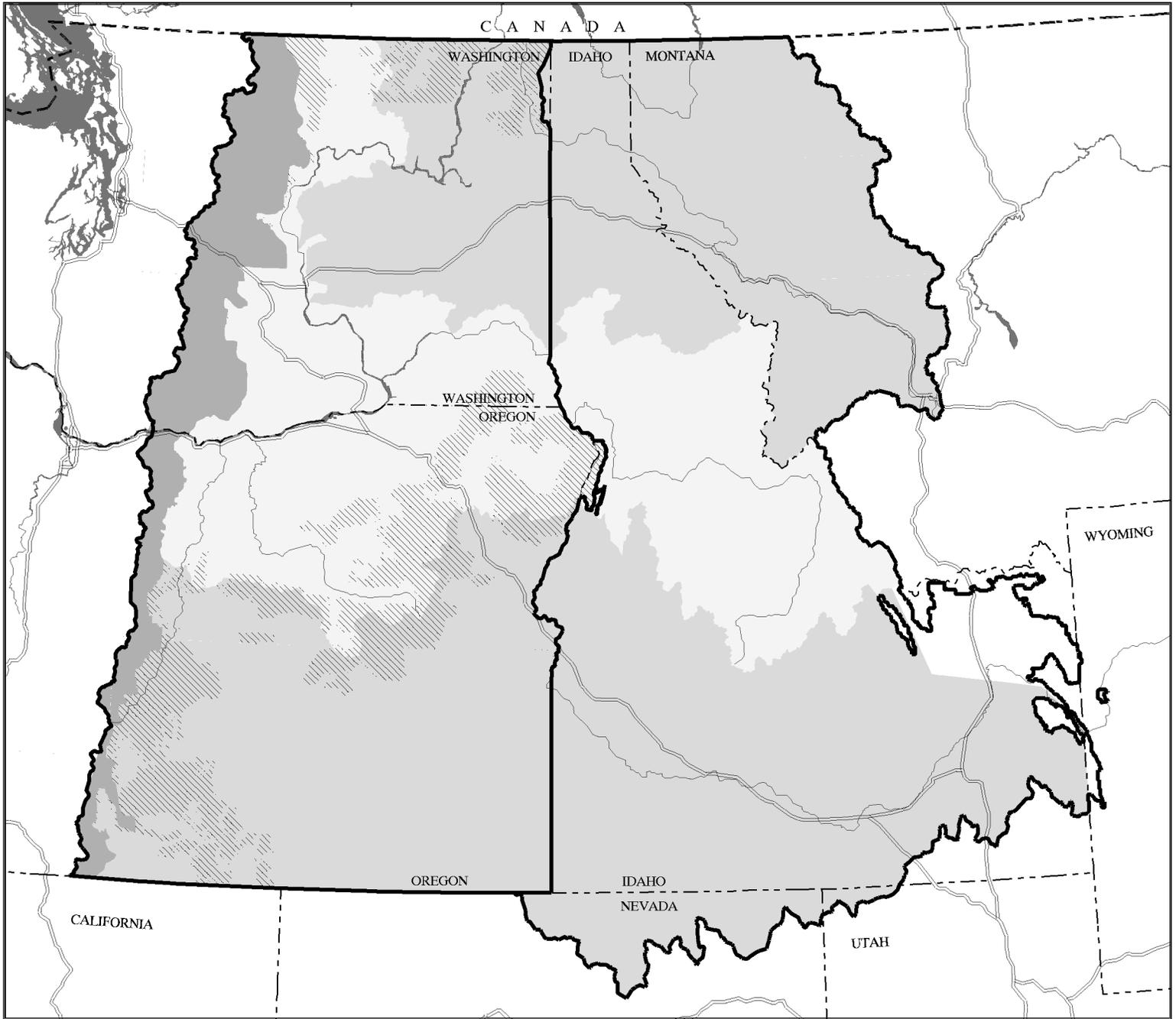
In 1993, the BLM developed their anadromous fish strategy. It remains in place and is being updated in 1996. Their strategy includes all BLM-administered lands supporting anadromous fish.

The PACFISH strategy, a joint document signed by the Chief of the Forest Service and the Director of the BLM in February 1995, outlined and established a strategy for anadromous fish habitat management. PACFISH establishes interim goals and objectives, identified areas that most influence the quality of water and fish habitat, provides special protective standards to guide management activities that may damage those areas, outlines monitoring requirements to track how well agencies follow the standards, and evaluates the effectiveness of these measures.

An inland native fish strategy (INFISH) was developed and implemented in July 1995 by the Forest Service to protect resident fish outside of anadromous fish habitat in eastern Oregon, eastern Washington, Idaho, western Montana, and portions of Nevada. This strategy is similar in content to PACFISH.

Both PACFISH and INFISH are interim for an 18-month period from the date of the Decision Notices until long-term direction is developed through the Eastside and UCRB Environmental Impact Statements.

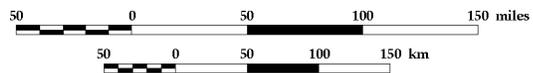
Map 2-15 illustrates PACFISH, INFISH, policy implementation guide, and Northwest Forest Plan areas.



Map 2-15.
Interim Management
Strategies and Northwest
Forest Plan

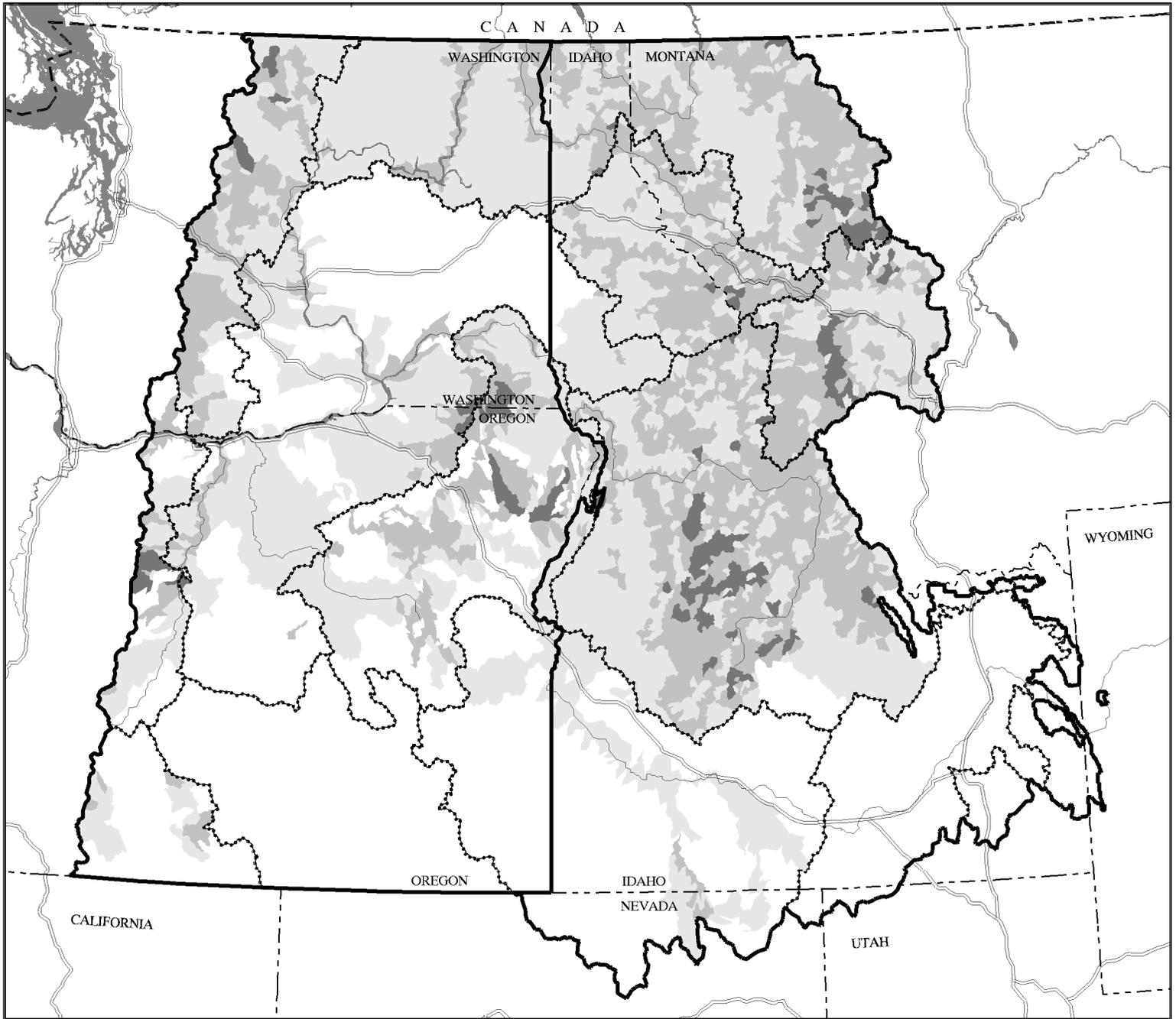
INTERIOR COLUMBIA
 BASIN ECOSYSTEM
 MANAGEMENT PROJECT

Project Area
 1996



- | | |
|------------------------------|-----------------|
| Northwest Forest Plan | Major Rivers |
| Inland Native Fish Strategy* | Major Roads |
| PACFISH | EIS Area Border |
| Eastside Screens | |

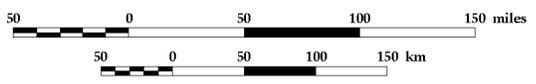
*The Inland Native Fish Strategy applies to only those lands administered by the USFS and to bull trout habitat on BLM-administered lands.



Map 2-16.
Distribution of
Bull Trout

INTERIOR COLUMBIA
 BASIN ECOSYSTEM
 MANAGEMENT PROJECT

Project Area
 1996



- Historical Range
- Current Range
- Known Strong Populations
- Major Rivers
- Major Roads
- EIS Area Border
- Ecological Reporting Unit Border*

*Ecological reporting unit names and numbers are found on Map 1-1.

Basin in Oregon, and throughout much of interior Oregon, Washington, Idaho, and western Montana. With the exception of the Little Lost and Big Lost rivers, bull trout are not known in the Snake River basin above Shoshone Falls. It is estimated that the historical range of bull trout included about 60 percent of the project area. It is unlikely, however, that bull trout occupied all accessible streams at any one time due to climate and habitat selection.

Bull trout are presently known or estimated to occur in 44 percent of historically occupied watersheds. Bull trout are still widely distributed throughout the project area, with the largest population blocks in north central Idaho and northwestern Montana. A small population still exists in the headwaters of the Jarbidge River, Nevada, which represents the present southern limits of the species range. Current information indicates that despite its relatively broad distribution, this species has experienced widespread decline. There is evidence of declining trends in some populations, and recent extinctions of local populations have been reported. Distribution of existing populations is often patchy, even where numbers are still strong and habitat is good.

Spawning and rearing of bull trout appears to be limited to the coldest streams or stream reaches. The lower limits of habitat used by bull trout are strongly associated with gradients in elevation, longitude, and latitude that may approximate a gradient in climate across the project area. The patterns indicate that variation in climate has influenced and will strongly influence habitat available for bull trout. While temperatures are probably suitable throughout much of the northern portion of the range, spawning and rearing habitat is restricted to increasingly isolated high elevation or headwater "islands" toward the south.

Management-related changes influencing stream temperatures and hydrologic regimes are all likely to be important to some, if not most, populations. Populations are likely to be most sensitive to changes in headwater areas encompassing critical spawning and rearing habitat and remnant populations.

More than 30 non-native species occupy the present distribution of bull trout. Brown trout, brook trout, and lake trout have probably

depressed or replaced many local bull trout populations. Brook trout are an especially important competitor and may progressively displace bull trout through hybridization and a higher reproductive potential. Brook trout now occupy the majority of watersheds representing the current range of bull trout. These non-native fish may pose the most risk to native species at sites where habitat has been affected by other disturbances.

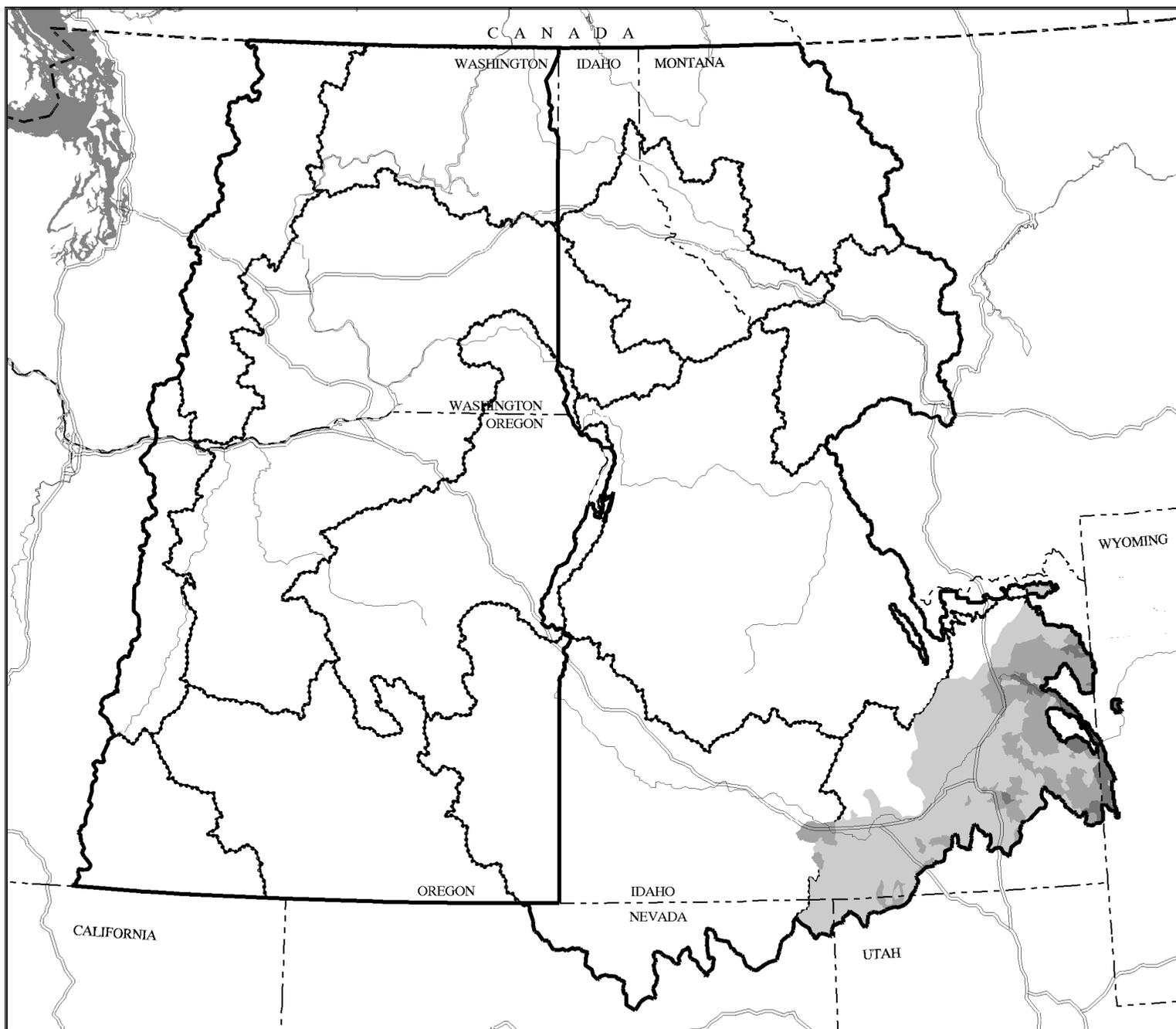
Historically, bull trout populations were well connected throughout the Columbia River Basin. Habitat available to bull trout has been fragmented, and in many cases, entirely isolated. Dams have isolated whole subbasins throughout the project area. Irrigation diversions, culverts, and degraded mainstem habitats have eliminated or seriously affected migratory corridors, thus depressing migratory populations and effectively isolating remnant populations in headwater tributaries. Loss of suitable habitat through watershed disturbance may also increase the distance between quality habitats and between strong populations, thus reducing the likelihood of effective dispersal and gene mixing. Further isolation of populations will probably lead to increasing rates of extinction that are disproportional to the simple loss of habitat area.

Summary by ERU:

The core of the remaining bull trout distribution is tied to the Central Idaho Mountains (ERU 13), with important strongholds still evident or likely within the Upper Clark Fork (ERU 8), Northern Glaciated Mountains (ERU 7), Lower Clark Fork (ERU 9), and Blue Mountains (ERU 6). Bull trout in the Owyhee Uplands (ERU 10) represent an important area of genetic diversity.

Yellowstone Cutthroat Trout

The Yellowstone cutthroat trout is more abundant and inhabits a larger geographical range than any other non-anadromous subspecies of cutthroat trout. Individual populations of Yellowstone cutthroat trout have evolved numerous life-history characteristics in response to the diverse environments in which they have been isolated since the Pleistocene ice age. There has recently been a substantial reduction in the distribution of this subspecies, and many unique local populations have been lost. As a result, the Yellowstone cutthroat



Map 2-17.
Distribution of
Yellowstone Cutthroat Trout

*BLM and Forest Service
 Administered Lands Only*

INTERIOR COLUMBIA
 BASIN ECOSYSTEM
 MANAGEMENT PROJECT

Project Area
 1996



- | | |
|--|---|
|  Historic Range |  Major Rivers |
|  Current Range |  Major Roads |
|  Known Strong Populations |  EIS Area Border |

**Ecological reporting unit names and numbers are found on Map 1-1.*

trout has been designated as a “Species of Special Concern - Class A” by the American Fisheries Society. This status has been officially recognized by the Montana Department of Fish, Wildlife, and Parks, and the Yellowstone cutthroat trout is recognized as a “Species of Special Concern” in Idaho. Both the Northern and Rocky Mountain Regions of the Forest Service and BLM consider the Yellowstone cutthroat trout a sensitive species. Current and historical distributions of Yellowstone cutthroat trout are illustrated on map 2-17.

Yellowstone cutthroat trout were historically found throughout the Yellowstone River drainage in Montana and Wyoming and in the Snake River drainage in Wyoming, Idaho, Utah, Nevada, and probably Washington. It is the only native trout in the Snake River above Shoshone Falls. Its historical range included primarily the Upper Snake (ERU 11) and Snake Headwaters (ERU 12) where 74 percent and 98 percent, respectively, of the watersheds once supported Yellowstone cutthroat trout.

Within the project area, Yellowstone cutthroat trout are presently the most narrowly distributed of the key salmonids. The current known and estimated distribution includes 70 percent of its historical range. Human activities such as introduction of non-native fishes, habitat degradation, and angler harvest have resulted in loss of populations of this subspecies. Losses have been particularly widespread in the Upper Snake (ERU 11). Large-river populations, in particular, have declined or disappeared. To promote fishing opportunities and to counter declines in natural distributions of Yellowstone cutthroat trout, stocking activities by agencies and private individuals have expanded the species range, particularly in mountain lakes throughout Idaho and Montana. Introductions of Yellowstone cutthroat trout outside their historical range have established them in 158 additional watersheds, accounting for 30 percent of the present range.

Despite their narrow distribution, Yellowstone cutthroat trout are judged to support the largest proportion of strong populations of any key salmonid. These estimates of strong populations may be misleading because of high probability of hybridization in most populations. Hybridization resulting from

introductions of rainbow trout and non-native subspecies or populations of cutthroat trout is the primary cause of the decline and extirpation of Yellowstone cutthroat trout. Genetically unaltered populations of Yellowstone cutthroat trout occur in approximately 10 percent of their historical stream habitats and approximately 85 percent of their historical lake habitats. Approximately 90 percent of the present range of genetically unaltered Yellowstone cutthroat trout is within Yellowstone National Park.

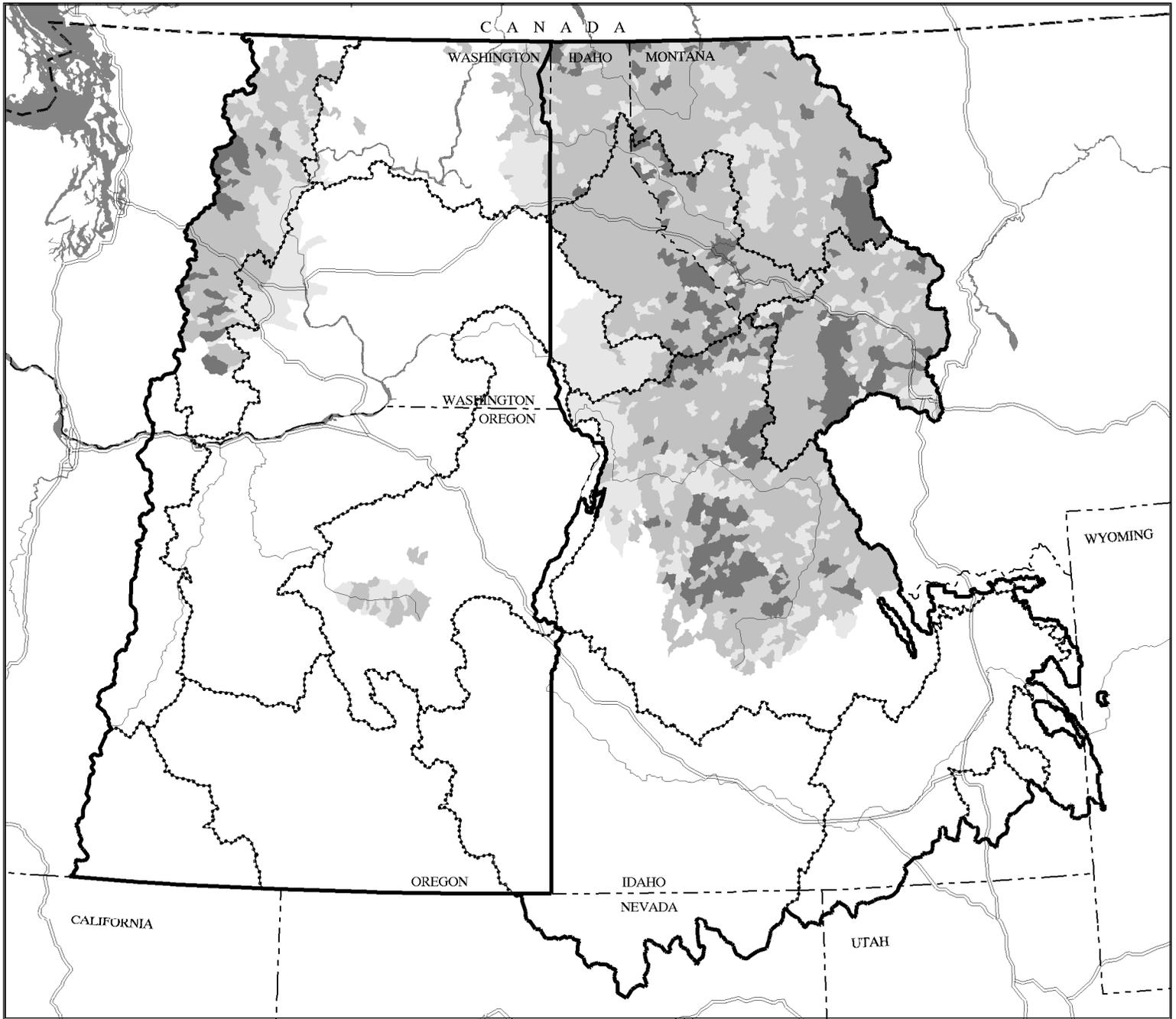
Human activities such as dam construction, water diversions, improper livestock grazing, mineral extraction, road construction, and timber harvest have degraded stream environments throughout the historical range of Yellowstone cutthroat trout. Recreational use can also be a source of disturbance. In the range of this species, improper livestock grazing on private and public lands in the upper Snake River Basin has caused degradation of riparian areas, including stream bank erosion and channel instability.

Summary by ERU:

The range of genetically unaltered populations of Yellowstone cutthroat trout has been reduced. The core of remaining populations is in the Snake Headwaters (ERU 12). Populations are widespread in the Upper Snake (ERU 11), but most are depressed. Remaining populations on the western edge of the range appear to be isolated in small areas. Population declines and losses have been most common in low elevation, higher order streams, as illustrated by the current distribution and status of Yellowstone cutthroat trout in the Upper Snake (ERU 11). Remoteness of portions of the native range probably contributes to the preservation of remaining populations. Many of these publicly owned portions of the native range, in the form of parks and reserves, have provided habitat protection that is lacking in low elevation portions of the range.

Westslope Cutthroat Trout

Westslope cutthroat trout were once abundant throughout much of the north and central interior Columbia Basin. Although still widely distributed, remaining populations may be seriously compromised by habitat loss and

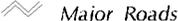


Map 2-18.
Distribution of
Westslope Cutthroat Trout

INTERIOR COLUMBIA
 BASIN ECOSYSTEM
 MANAGEMENT PROJECT

Project Area
 1996



- | | | | |
|--|--------------------------|---|-----------------------------------|
|  | Historical Range |  | Major Rivers |
|  | Current Range |  | Major Roads |
|  | Known Strong Populations |  | EIS Area Border |
| | |  | Ecological Reporting Unit Border* |

*Ecological reporting unit names and numbers are found on Map 1-1.

hybridization. The U.S. Fish and Wildlife Service currently lists the westslope cutthroat trout as a Category 2 species. They are presently considered a sensitive species by the Forest Service and BLM, and of special concern by State management agencies in Washington, Oregon, Idaho, and Montana. Current and historical distribution of westslope cutthroat trout are illustrated on map 2-18.

Westslope cutthroat trout had the largest historical distribution of all subspecies of cutthroat trout. Cutthroat trout were first recorded by the Lewis and Clark expedition. From early explorer accounts, it is believed they were extremely abundant. Where habitat is suitable and watersheds are accessible, westslope cutthroat trout are commonly found. Westslope cutthroat trout probably also occupied most of the large natural lakes within the range. The historical range of westslope cutthroat trout encompassed about 35 percent of the project area.

Westslope cutthroat trout are still widely distributed within their historical range, with some extension through hatchery introductions. It is estimated that westslope cutthroat trout are still present in at least 85 percent of their historical range. This broad distribution suggests that, overall, westslope cutthroat trout are secure, but this conclusion must be tempered by uncertainty regarding the genetic integrity of remaining populations. Most current wild populations are depressed, and hybridization, fragmentation, and the loss of migratory populations have limited healthy populations to a much smaller proportion of their historical range.

Cutthroat trout and rainbow trout are closely related, but they have remained reproductively distinct where they co-evolved. Where non-native rainbow trout have been introduced, hybridization is widespread. Yellowstone cutthroat have also been introduced into much of the westslope cutthroat trout range, and hybridization is common between these two species. Hybridization was believed to be the most important cause for decline of westslope cutthroat trout populations in Montana.

Westslope cutthroat trout are also a prized game fish, and fishing has probably led to the elimination of some small populations, especially migratory fish in some river systems.

Consequently, special harvest restrictions have been implemented to improve or maintain most westslope cutthroat trout populations.

Construction of dams, irrigation diversions, or other migration barriers have isolated or eliminated westslope cutthroat trout habitats that were once available to migratory populations. Resident forms may persist in isolated segments of streams, but the potential for long-term persistence is compromised by the loss of migratory life-history and lack of connectivity with other populations potentially important to gene flow or population dynamics.

Most existing strong populations are largely in roadless and Wilderness Areas or National Parks, suggesting that human disturbances have influenced distribution and abundance. In general, strong populations are thought to be primarily associated with areas of limited human influence and the associated potential effects of fishing, watershed disturbance, and non-native fish introductions.

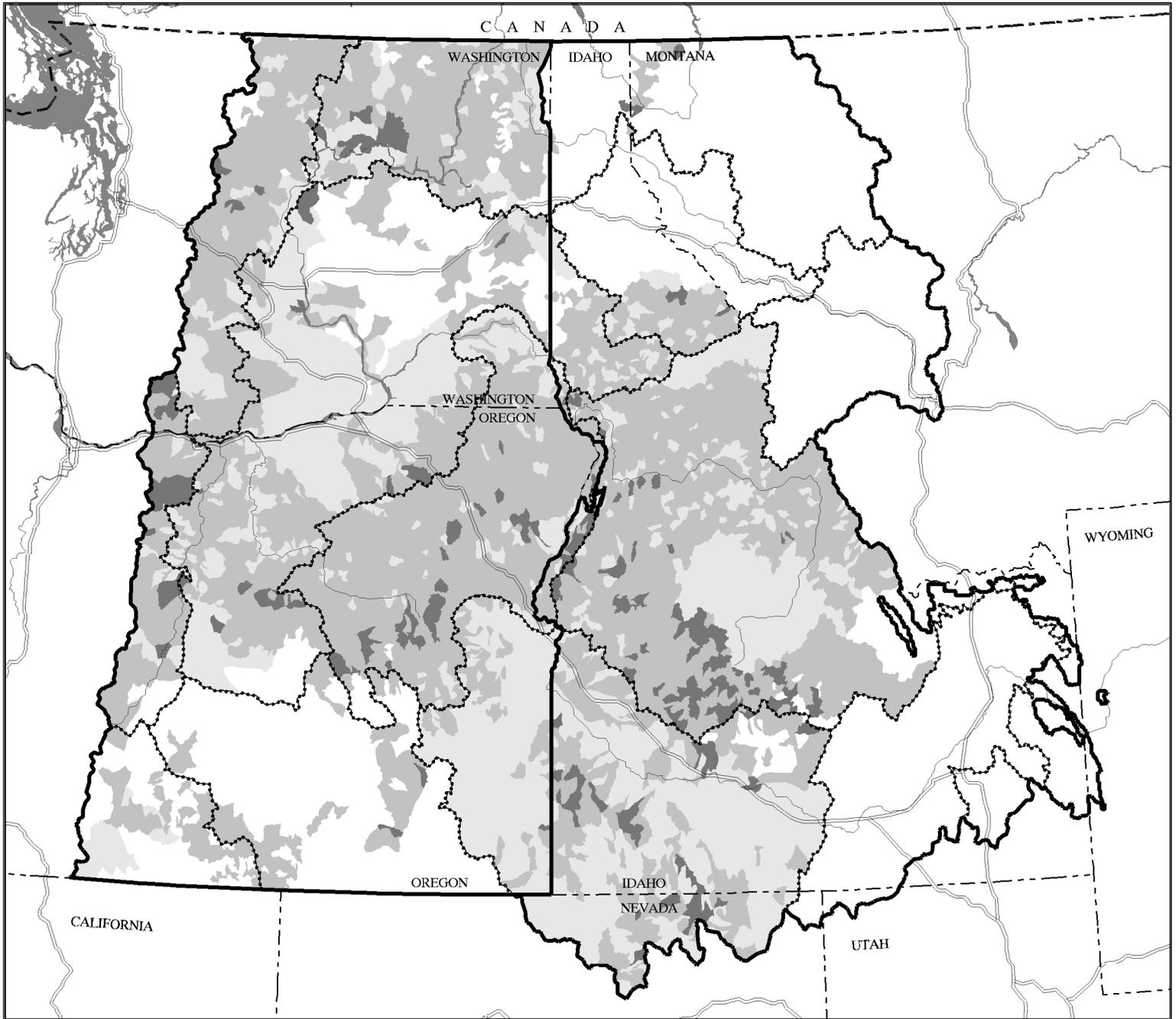
Summary by ERU:

The core of the distribution for strong populations is clearly associated with the Central Idaho Mountains (ERU 13), and many populations there do appear secure. Other important blocks of known or likely habitat are in the Upper Clark Fork (ERU 8) and Northern Glaciated Mountains (ERU 7). Persistence of westslope cutthroat trout in those areas also appears likely, although these areas are also more fragmented and restricted to a relatively small portion of the historical distribution.

Redband Trout (“Resident” and “Resident-Interior”)

The redband trout (native rainbow trout) is a widely distributed western North America native salmonid. Of the key salmonids, redband trout originally had the widest distribution, occupying 73 percent of the watersheds within the project area. The only major portions of the project area that historically did not support redbands were the Snake River upstream from Shoshone Falls, tributaries to the Spokane River above Spokane Falls, and portions of the northern Great Basin in Oregon.

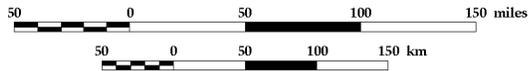
Redband trout within the project area have two distinct life histories, anadromous (steelhead)

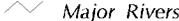
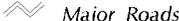
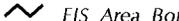


Map 2-19.
Distribution of
Redband Trout

INTERIOR COLUMBIA
 BASIN ECOSYSTEM
 MANAGEMENT PROJECT

Project Area
 1996



- | | | | |
|--|--------------------------|---|-----------------------------------|
|  | Historical Range |  | Major Rivers |
|  | Current Range |  | Major Roads |
|  | Known Strong Populations |  | EIS Area Border |
| | |  | Ecological Reporting Unit Border* |

*Ecological reporting unit names and numbers are found on Map 1-1.

or non-anadromous (freshwater resident). For purposes of the Scientific Assessment (1996), freshwater resident redbands were further divided into “resident-interior” (native non-anadromous redband trout outside the range of the steelhead) and “resident” (those populations that exist within the range of steelhead). Current and historical distributions of Redband Trout are illustrated on map 2-19.

Resident and resident-interior redband trout are considered species of special concern by the American Fisheries Society and all States within the historical range, and are classified as sensitive species by the Forest Service and BLM. The U. S. Fish and Wildlife Service lists redbands as a Category 2 species. In 1994, the Kootenai River redband stock in northern Idaho and Montana was petitioned for listing under the Endangered Species Act.

Collectively, resident and resident-interior redband trout currently may be the most widely distributed key salmonid in the project area. Resident redbands are the more widely distributed of the two forms; the known and estimated distribution includes 69 percent of the historical range. The largest areas of unoccupied historical habitat are in the Owyhee Uplands (ERU 10) and Columbia Plateau (ERU 5). Resident-interior redbands are not as widely distributed and are currently found or anticipated in 50 percent of the identified historical range.

Despite their broad distribution, less is known about the current distribution of redband trout than any of the other key salmonids. One reason for the lack of information is the inability to differentiate juvenile steelhead and resident redbands. Therefore the status of resident redbands was considered “unknown” when steelhead were present in a watershed. The known and estimated distribution of both forms of redbands includes 65 percent of the historical range. However, the distribution and status of native redband trout may be more depressed than the above estimates indicate because of hybridization with stocked rainbow trout. Preliminary status reviews in Idaho, Oregon, and Montana generally support this concern.

Despite their broad distribution, relatively few strong resident redband populations exist. Known or predicted strong areas included 17 percent of the historical range and 24 percent of the present range. Only 30 percent of the

watersheds supporting spawning and rearing populations were classified as having strong populations. The core distribution of resident redbands appears to be in the Northern Cascades (ERU 1), Blue Mountains (ERU 6), and Central Idaho Mountains (ERU 13). There are also known or suspected populations within the Owyhee Uplands (ERU 10) and Northern Glaciated Mountains (ERU 7), where steelhead have been isolated recently by dams. These populations appear to be far more fragmented and probably less secure than populations within the core. Because these latter populations are within the fringe of the range of redbands historically associated with steelhead, these populations may represent important sources of genetic diversity.

Resident-interior redband trout occupy parts of the Northern Great Basin (ERU 4), Northern Glaciated Mountains (ERU 7), Columbia Plateau (ERU 5), Central Idaho Mountains (ERU 13), and Owyhee Uplands (ERU 10). Remaining populations appear to be severely fragmented and restricted to small blocks of habitat. Resident-interior redband trout have few remaining strong populations; current strong populations encompass 10 percent of their historical range and 20 percent of their present range. Resident-interior redband populations appear to have declined most in the Northern Great Basin (ERU 4) and Columbia Plateau (ERU 5), where 72 percent of their historical range is presently unoccupied and there are few remaining strong populations.

Interior redband habitats have been altered by a variety of land-use practices. Reduction in streamflow because of water diversion for irrigation threatens many populations in the southern portion of the range. Increased water temperature has also been a factor, especially in drier and warmer areas. Temperature increases are largely due to loss or conversion of riparian vegetation resulting from grazing, timber harvest, urbanization, and agriculture.

Channel alterations associated with flood-control projects, floodplain development, and road construction have been extensive within the range of redbands. Channel alterations affect stream hydraulics, nutrient pathways, invertebrate production, and fish production. In Idaho, unaltered stream reaches supported eight to ten times the densities of redband trout observed in altered channels. Redband trout appear to have evolved over a broader

range of environmental conditions than the other key salmonids, and appear to have less specific habitat requirements. Their apparent persistence even in some heavily disturbed basins suggests they are more resilient than other species. Therefore, the loss of a redband population could be a strong indication of disruption in the aquatic ecosystem processes.

Summary By ERU:

Resident redbands are or are predicted to be widely distributed in large blocks of suitable habitat in the Northern Cascades (ERU 1), Blue Mountains (ERU 6), and Central Idaho Mountains (ERU 13). These watersheds represent the core of the distribution associated with or derived from steelhead and appear to be relatively secure, although hybridization with introduced rainbow trout is a potentially serious, but unevaluated threat. Populations in watersheds within the Owyhee Uplands (ERU 10) and Northern Glaciated Mountains (ERU 7) were isolated from steelhead in recent history by dams. These latter populations appear to be far more fragmented and probably less secure. Resident-interior redband trout within portions of the Northern Glaciated Mountains (ERU 7), Northern Great Basin (ERU 4), Columbia Plateau (ERU 5), Central Idaho Mountains (ERU 13), and Owyhee Uplands (ERU 10) have been isolated from steelhead over geologic time. Remaining populations appear to be severely fragmented and restricted to small blocks of known or potential habitat. These areas likely represent a critical element of the evolutionary history for this species.

Steelhead

Steelhead, the anadromous form of redband trout found within the project area, are distributed within the interior Columbia River Basin as two major forms, winter and summer, although interior steelhead are primarily summer-run. Winter-run steelhead enter freshwater three to four months prior to spawning, and summer-run steelhead enter freshwater nine to ten months prior to spawning.

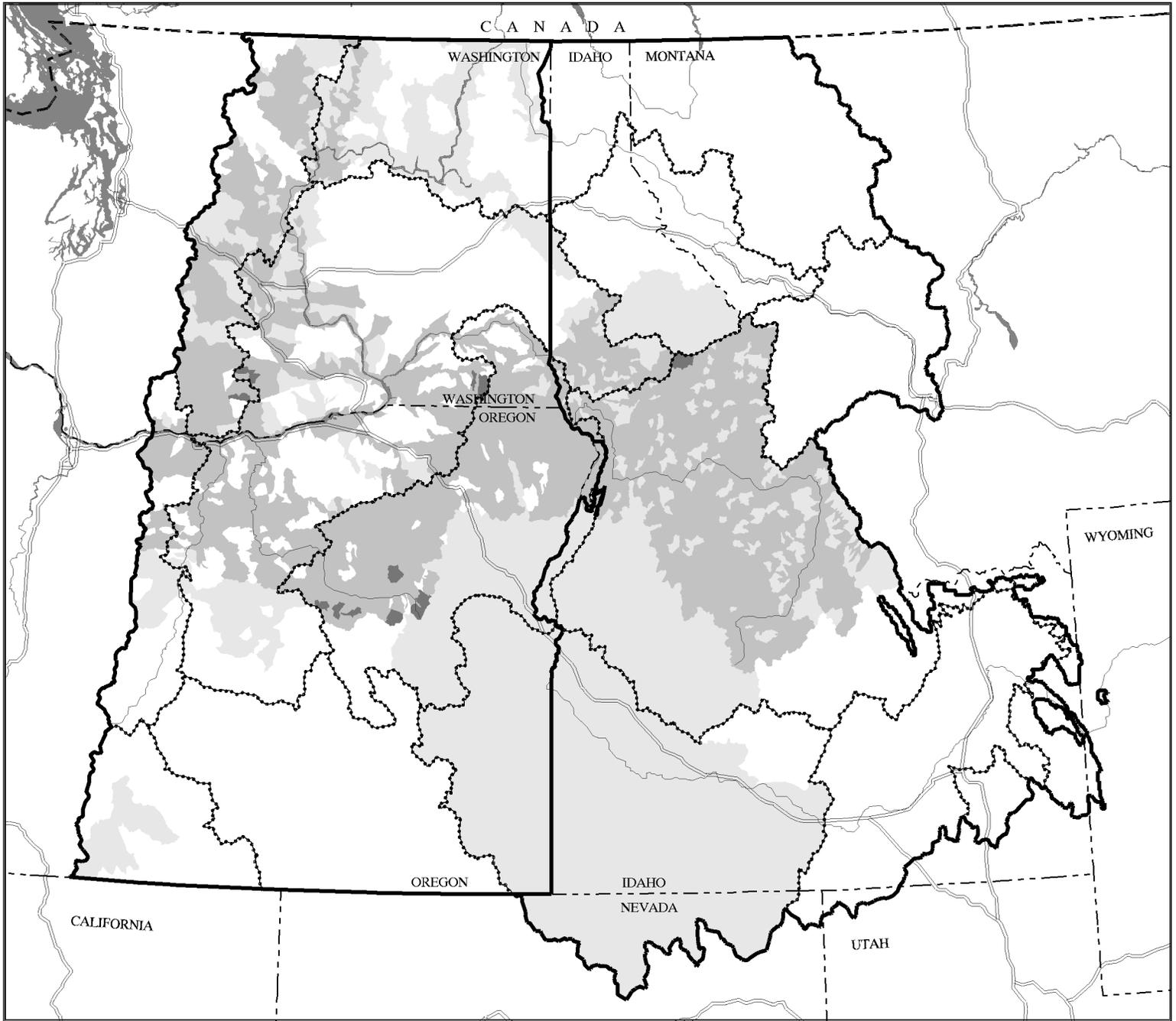
The distribution and abundance of steelhead have declined from historical levels as a result of mortality at and between dams, habitat degradation, loss of access to historical habitat, overharvest, and interactions with hatchery-reared and exotic fishes. Most of the current

populations are hatchery-reared. Numerous State and Federal management agencies list remaining wild steelhead populations as species of special concern. The American Fisheries Society considers all stocks of winter steelhead upstream from Bonneville Dam to be at high or moderate risk of extinction, and most summer steelhead stocks are considered to be at moderate risk of extinction or of special concern. Concern for the persistence of steelhead stocks resulted in 1994 petitions to the National Marine Fisheries Service for review of the species status under the Endangered Species Act. Steelhead represent a key species because of their broad distribution, value as a sport and commercial fish, and importance as a tribal ceremonial and subsistence resource. Current and historical distributions of steelhead are illustrated on Map 2-20.

The historical range of steelhead includes all freshwater west of the Rocky Mountains with access to the Pacific Ocean, extending from northwest Mexico to the Alaska Peninsula. Within the project area, steelhead were present in most streams, including many intermittent streams, that were accessible to anadromous fish, including all accessible tributaries to the Snake River downstream from Shoshone and Spokane Falls and accessible tributaries to the Columbia River. In total, approximately 10,523 miles of stream were accessible to steelhead in the Columbia River basin including Canada, although it is unlikely that steelhead occupied all reaches of all accessible streams because water temperature factors may have restricted distribution. Steelhead formerly ascended the Snake River and spawned in reaches of Salmon Falls Creek, Nevada, more than 900 miles from the ocean. Steelhead occupied about 50 percent of the watersheds in the project area.

Historical steelhead runs were large. It is reported that the commercial steelhead catch peaked in the late 1890s at 4.9 million pounds. Initial estimates of run sizes were derived after Bonneville Dam was constructed in 1938. In 1940, 423,000 summer steelhead passed the dam. Annual sport harvests averaged 117,000 summer-run and 62,000 winter-run fish from 1962 to 1966.

Steelhead are still the most widely distributed anadromous salmonid in the project area; however, steelhead are extirpated from large portions of their historical range. Presently occupied watersheds encompass approximately

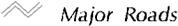
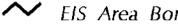
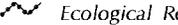


Map 2-20.
Distribution of
Steelhead Trout

INTERIOR COLUMBIA
 BASIN ECOSYSTEM
 MANAGEMENT PROJECT

Project Area
 1996



- | | | | |
|--|--------------------------|---|-----------------------------------|
|  | Historical Range |  | Major Rivers |
|  | Current Range |  | Major Roads |
|  | Known Strong Populations |  | EIS Area Border |
| | |  | Ecological Reporting Unit Border* |

*Ecological reporting unit names and numbers are found on Map 1-1.

45 percent of the watersheds historically occupied. Steelhead are extinct in the Lower Clark Fork and Owyhee Uplands. Within the Columbia River Basin in the United States and Canada, about 75 percent of the stream mileage within their historical range is no longer accessible. Within their current distribution, few healthy wild steelhead populations exist. Watersheds known or estimated to support strong spawning and rearing populations of wild steelhead represent 0.6 percent of the historical range and 1.3 percent of the current range. Some 98 percent of the watersheds where steelhead spawn and rear are classified as containing depressed populations of wild steelhead.

Existing steelhead populations are composed of four main types: wild, natural (non-native progeny spawning naturally), hatchery, and mixes of natural and hatchery fish. Production of wild anadromous fish in the Columbia River Basin has declined by about 95 percent from historical levels. Most existing steelhead production is supported by hatchery and natural fish as a result of large-scale hatchery mitigation production programs. By the late 1960s, hatchery production surpassed wild production in the Columbia River Basin. Wild fish, unaltered by hatchery stocks, are rare and are present in only 10 percent of the historical range and 25 percent of the current distribution. Remaining wild stocks are concentrated in reaches of the Salmon River in Central Idaho and the John Day River Basin in Oregon.

Construction and operation of mainstem dams on the Columbia and Snake Rivers is considered a major cause of decline of steelhead. Hydroelectric development changed Columbia and Snake River migration routes from mostly free-flowing in 1938 to a series of impoundments by 1975, and reservoir storage activities have reduced flows in most years during smolt migration. Steelhead must navigate past as many as eight mainstem dams. Adults are delayed during upstream migrations, and smolts may be killed by turbines; become disoriented or injured, making them more susceptible to predation; or become delayed in the large impoundments behind dams. Smolt-to-adult return rates declined from approximately 4 percent in 1968 to less than 1.5 percent from 1970 to 1974. In 1973 and 1977, low flows resulted in 95 percent mortality of migrating smolts. Map 2-21 illustrates the locations of mainstem dams on the Columbia River System.

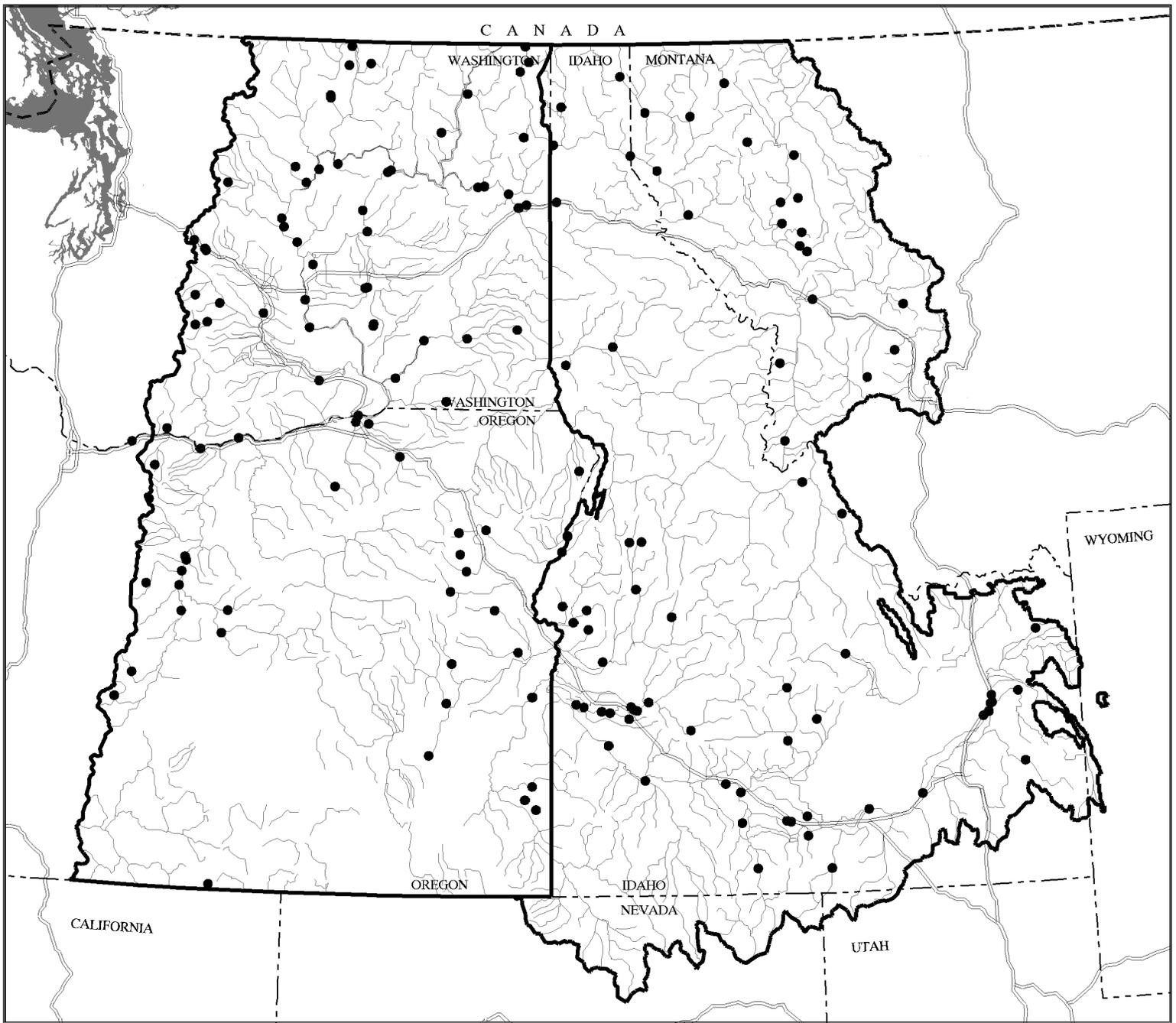
Non-native fish and hatchery operations have also affected wild steelhead populations. Hatcheries have been widely used in attempts to mitigate losses of steelhead caused by construction and operation of dams. Hatchery operations affect wild steelhead populations through genetic hybridization and loss of fitness, creation of mixed-stock fisheries, competition for food and space, and increased diseases. Introduced rainbow trout also have the potential to mature and hybridize with steelhead, and this species has been introduced throughout the current steelhead range. Supplementation of native stocks with hatchery fish have typically resulted in replacement, not enhancement, of native steelhead.

Biotic factors including predation and competition also may influence the abundance of steelhead. More than 55 exotic fish species have been introduced within the current range of steelhead. Because exotic fish species did not co-evolve with steelhead, there has been no opportunity for natural selection to lessen competition or predation. Dams have created habitat that is suitable for a variety of native (northern squawfish) and non-native predators and potential competitors. The abundance and distribution of native predators may also be influenced by human habitat alterations.

More than 95 percent of the healthy native stocks of anadromous fish are believed to be threatened by some degree of habitat degradation. Fish habitat quality in most watersheds has declined. As described in previous sections, pool frequency has decreased and fine sediment has increased in many project-area watersheds. In addition to hydroelectric development, most alterations of steelhead habitat can be attributed to human land-disturbing activities as a result of mining, timber harvest, agriculture, industrial development, and urbanization.

Summary by ERU:

Steelhead are still relatively widely distributed in the project area, but they are extirpated in nearly 60 percent of the historical range. Although steelhead are widespread throughout the remaining accessible range, most populations are depressed and influenced by hatchery supplementation. Wild stocks are rare; core areas for remaining wild populations include the Salmon and John Day river basins. The



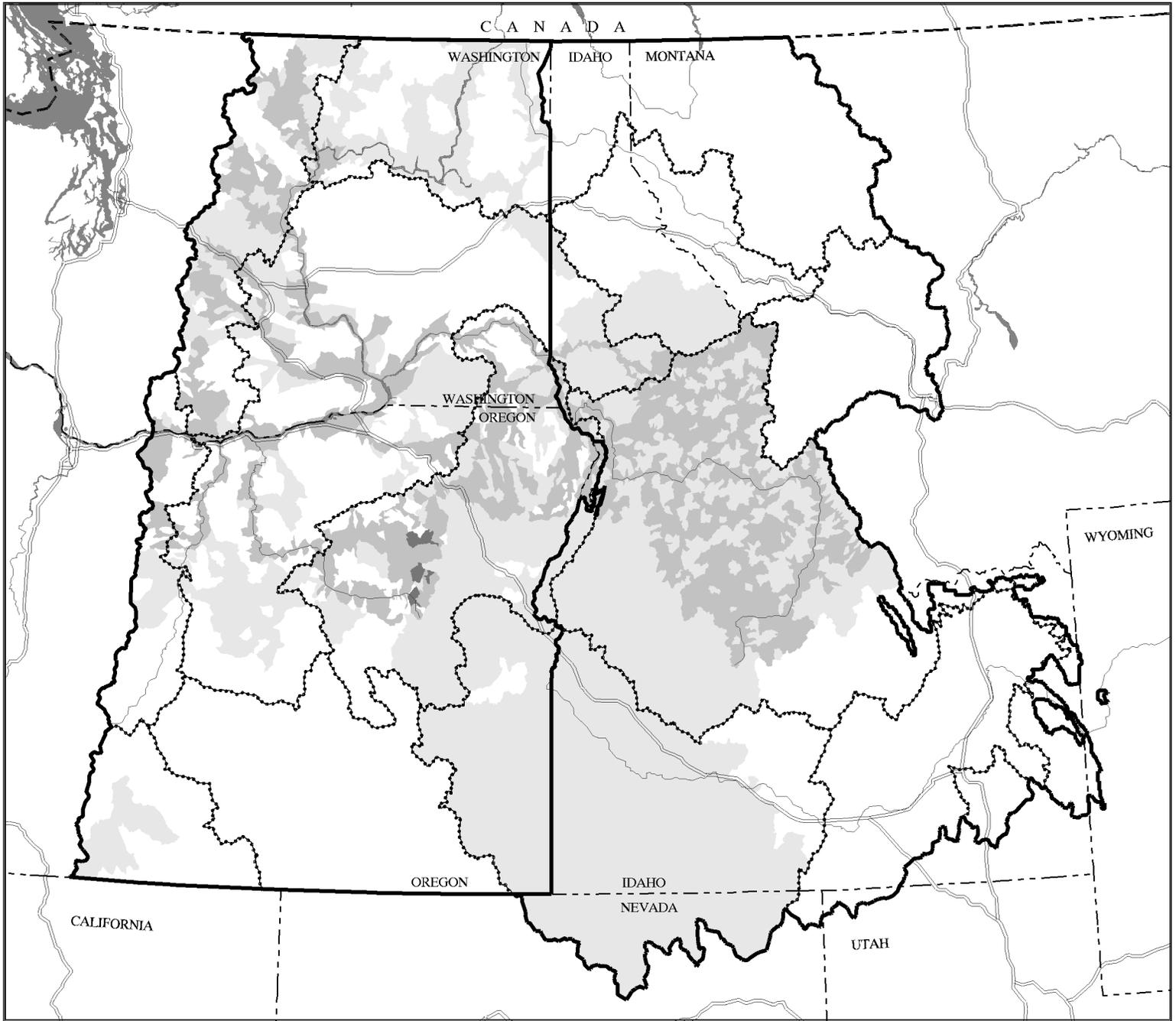
**Map 2-21.
Major Dams**

INTERIOR COLUMBIA
BASIN ECOSYSTEM
MANAGEMENT PROJECT

Project Area
1996



- Dam Location
(Capacity > 50 acre feet)
- ~ Major Rivers
- ~ Major Roads
- ~ EIS Area Border



Map 2-22.
Distribution of
Stream-Type Chinook Salmon

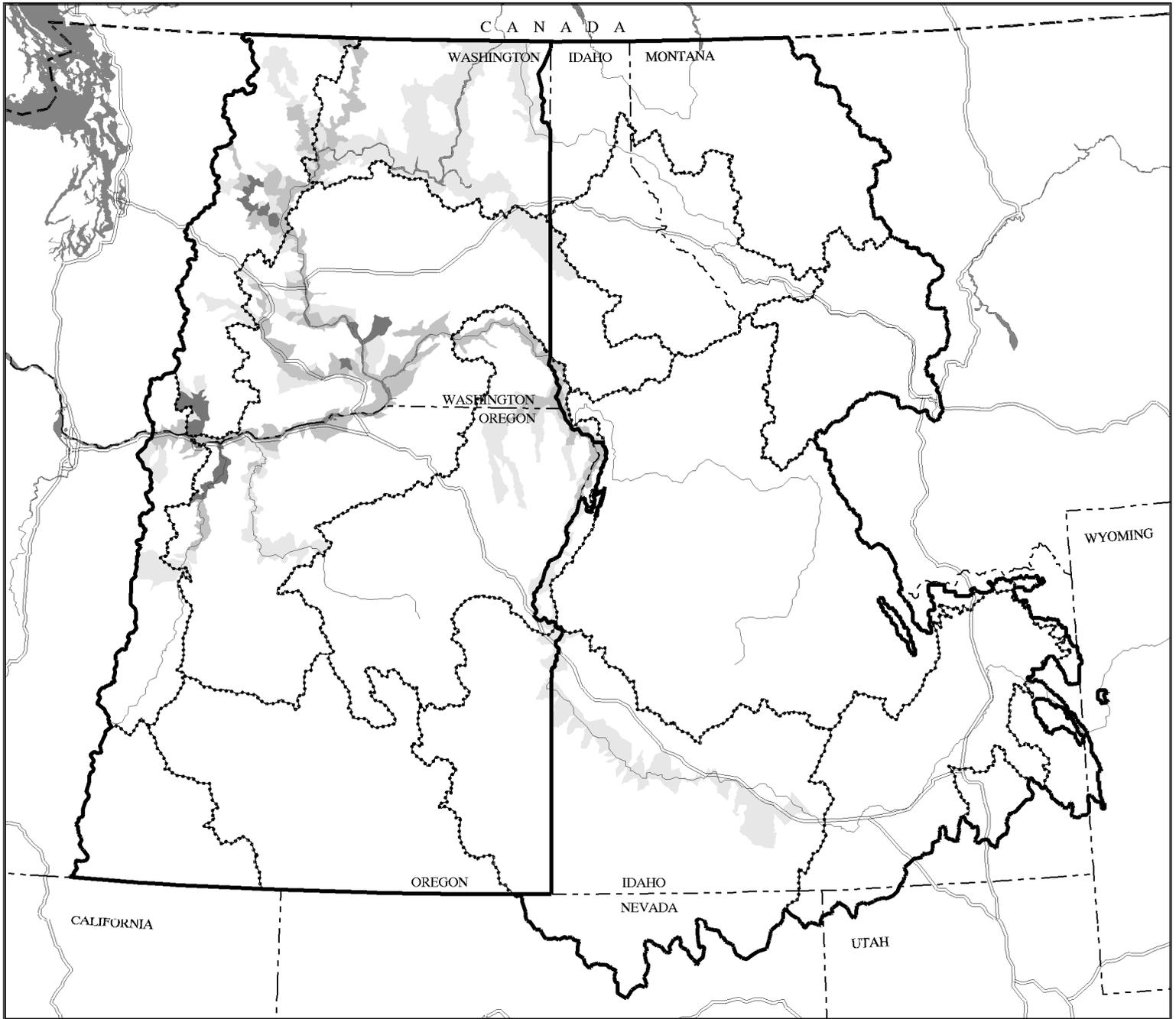
INTERIOR COLUMBIA
 BASIN ECOSYSTEM
 MANAGEMENT PROJECT

Project Area
 1996



- Historical Range
- Current Range
- Known Strong Populations
- Major Rivers
- Major Roads
- EIS Area Border
- Ecological Reporting Unit Border*

*Ecological reporting unit names and numbers are found on Map 1-1.

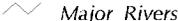


Map 2-23.
Distribution of
Ocean-Type Chinook Salmon

INTERIOR COLUMBIA
 BASIN ECOSYSTEM
 MANAGEMENT PROJECT

Project Area
 1996



- | | | | |
|--|--------------------------|---|-----------------------------------|
|  | Historical Range |  | Major Rivers |
|  | Current Range |  | Major Roads |
|  | Known Strong Populations |  | EIS Area Border |
| | |  | Ecological Reporting Unit Border* |

*Ecological reporting unit names and numbers are found on Map 1-1.

only remaining strong populations are found among wild stocks, primarily in the Columbia Plateau and Blue Mountains (ERU 6). Within the Central Idaho Mountains (ERU 13), recent steelhead runs have been critically low.

Chinook Salmon

The salmon problem is addressed in the National Research Council report *Upstream* (NRC 1996) as “the decline of wild salmon runs and the reductions in abundance of salmon even after massive investments in hatcheries. The declines ~ largely a result of human impacts on the environment caused by activities such as forestry, agriculture, grazing, industrial activities, urbanization, dams, hatcheries, and fishing ~ are widespread, although not universal.” Chinook salmon in the project area are traditionally described as spring, summer, and fall runs, distinguished primarily by their time of passage over Bonneville Dam. These names have led to some confusion because stocks of similar run timing may differ considerably between the Snake and Columbia rivers in their spawning areas, life histories, behavior, and genetic characteristics. For the purposes of the Scientific Assessment (Aquatic STAR 1996), chinook salmon that migrate seaward as yearlings are called “stream-type” and those that migrate as subyearlings are called “ocean-type.” Snake River chinook salmon (stream- and ocean- types) were listed as threatened under the Endangered Species Act in 1992, and critical habitat was designated in 1993. (See Appendix E for a critical habitat map.) Current and historical distributions of chinook salmon are illustrated on maps 2-22 and 2-23.

The historical range of chinook salmon in North America was the eastern Pacific and Arctic oceans and accessible freshwater. Like steelhead, chinook salmon were found in all accessible areas of the Snake River downstream from Shoshone Falls, and they formerly ascended and spawned in reaches of Salmon Falls Creek, Nevada, more than 900 miles from the ocean. An estimated 10,523 miles of stream were accessible to chinook salmon in the Columbia River Basin in the United States and Canada.

Stream-type chinook salmon were widely distributed, occupying about 45 percent of the watersheds in the project area, and occurring

in all ecological reporting units except the Northern Great Basin (ERU 4), Upper Clark Fork (ERU 8), Snake Headwaters (ERU 12), and Upper Snake (ERU 11) above Shoshone Falls. Ocean-type chinook salmon were much less widely distributed, occupying approximately 7 percent of the available watersheds and occurring in 6 of 13 ecological reporting units. Within accessible watersheds, chinook salmon distribution may have been restricted by unsuitable water temperatures at high elevations and the need for relatively large areas of suitable spawning gravel. Chinook salmon juveniles also prefer low gradient, meandering stream channels, which may have further restricted their distribution.

Historical runs of chinook salmon were immense; estimates of annual runs sizes prior to 1850 range from 3.4 to 6.4 million fish. Most American Indians in the project area shared a major dependence on salmon as a subsistence and ceremonial resource. Commercial harvest of chinook salmon in the mainstem Columbia River peaked in 1883 at 2.3 million fish, and the average yield was approximately 1.3 million fish from 1890 to 1920.

Chinook salmon are presently the most endangered of the key salmonids, with populations lost in large portions of their historical range. Construction of Grand Coulee Dam in the early 1940s and the Hells Canyon dam complex in 1967 eliminated chinook salmon from much of their former ranges within the Upper Columbia and Snake River drainages. In total, about 75 percent of historically accessible streams are no longer accessible to chinook, primarily because of dam blockages. Current known and estimated distributions of stream-type and ocean-type chinook salmon include 28 percent and 30 percent, respectively, of their historical ranges. Stream-type chinook are extinct in all of the Lower Clark Fork (ERU 9) and Owyhee Uplands (ERU 10); and in large portions of other ecological reporting units that currently support populations. Ocean-type chinook are extinct in large portions of several ecological reporting units, and in all of the Owyhee Uplands (ERU 10).

Most chinook salmon stocks in the remaining accessible range are severely depressed and at risk. For stream-type chinook salmon, watersheds known or estimated to support

strong spawning and rearing populations represent 0.2 percent of the historical range and 0.8 percent of the current range; approximately 99 percent of the current stream-type chinook spawning and rearing populations are classified as depressed. The only remaining strong populations appear to be restricted to small areas of the John Day River Basin in the Blue Mountains (ERU 6). Ocean-type chinook are found in a more restricted range associated mainly with the mainstem rivers and larger tributaries. For ocean-type chinook salmon, watersheds known or predicted to support strong spawning and rearing populations represent 5 percent of the historical range and 16 percent of the current range; approximately 70 percent of current ocean-type chinook salmon spawning and rearing populations are classified as depressed. In the Snake River, an estimated 1,882 naturally produced stream-type chinook salmon reached Lower Granite Dam in 1994 as compared to an estimated production of 1.5 million fish in the late 1880s. From 1985 to 1993, an average of 387 naturally produced ocean-type chinook salmon reached Lower Granite Dam.

Construction and operation of mainstem dams on the Columbia and Snake rivers is considered a major cause of decline of chinook salmon (map 2-21). Besides reducing accessible habitat, hydroelectric development changed Columbia and Snake River migration routes from mostly free-flowing in 1938 to a series of impoundments by 1975, and reservoir storage activities have reduced flows in most years during smolt migration. Like steelhead, chinook adults are delayed during upstream migrations, and smolts may be killed by turbines; become disoriented or injured, making them more susceptible to predation; or become delayed in the large impoundments behind dams. Development and operation of hydropower facilities in the Columbia Basin has reduced salmon and steelhead production by about eight million fish: four million from blocked access to habitat above Chief Joseph and Hells Canyon dams, and four million from ongoing passage losses at other facilities. Passage losses are cumulative depending on the number of dams; chinook salmon in the project area must pass one to nine dams. Losses of mid- and upper-Columbia ocean-type chinook salmon were estimated to be approximately 5 percent per dam for adults and 18 to 23 percent per dam for juveniles.

Like steelhead, many remaining chinook salmon populations have been influenced by hatchery-reared fish. Production of wild anadromous fish in the Columbia River Basin has declined by approximately 95 percent from historical levels. As a result, wild populations unaltered by hatchery stocks are rare; they are present in 4 percent of the historical range and 15 percent of the current range of stream-type chinook salmon, and 5 percent of the historical range and 17 percent of the current range of ocean-type chinook salmon. Only those watersheds in the project area containing spawning and rearing populations sustained by wild stocks are classified as strong.

The overall pattern of decline of chinook salmon suggests the species is sensitive to habitat degradation throughout its entire range. Improper livestock grazing, timber harvest, and irrigation diversions have been important factors. Reduced stream habitat diversity has been one of the most pervasive cumulative effects of forest management practices and may have altered fish communities. Forest management practices, including timber harvest activities, have reduced salmon habitat quantity, reduced habitat complexity, increased sedimentation, and eliminated sources of woody debris needed for healthy salmon habitat. In the Snake River Basin, more than 80 percent of the salmon production occurs on Forest Service- and BLM-administered lands. In portions of the Snake River Basin still accessible to salmon, management history on Forest Service-administered lands has reduced the suitability of approximately 1,926 miles of stream. Improving the quality of remaining refugia is less important than restoring connectivity in reaches of lower subbasins.

Predation is one of the major causes of mortality to juvenile chinook salmon. Exotic species may prey upon and compete with native fishes. Many of the middle and lower reaches of the Columbia River are dominated by exotic fish species. Northern squawfish, a native predator, has become well adapted to the habitat created by dams. It has been estimated that 15 to 20 million juvenile salmonids in the Snake and lower Columbia rivers are lost to northern squawfish predation.

The Effects of Hydropower, Hatcheries, Harvest and Habitat on Interior Columbia River Anadromous Fishes

Introduction

Anadromous fish are the focus of this sidebar because of their current scarcity resulting from influences of hydropower, hatcheries, harvest, and habitat. These four activities which impact or limit the survival of anadromous fishes, have been broadly grouped as the "Four H's" (Idaho Department of Fish and Game et al. v. NMFS et al. 1994). Due to the cumulative effect of the "Four H's" on Snake River spring/summer chinook salmon, the National Marine Fisheries Service (NMFS) listed the Snake River stock as threatened in 1992 pursuant to the Endangered Species Act (ESA). In public scoping for this draft EIS an important question surfaced about how hydropower, harvest, and hatcheries (factors outside the land management agencies' jurisdictions), would be considered in the development of alternative Forest Service and BLM land management strategies which affect anadromous fish habitat. The Executive Steering Committee for the ICBEMP directed that the EISs specifically address the following:

1. *What are the relative contributions of habitat, hydropower, hatcheries, and harvest on the current state of populations within the interior Columbia Basin?*
2. *If all other factors were held constant, would a further degradation of habitat increase the risks of extirpation or extinction?*
3. *If all other factors were held constant, would an improvement in freshwater habitat conditions increase fish abundance and reduce the risks of extirpation or extinction?*
4. *If nothing is done to restore habitat and mitigation of major factors such as the dams is successful, would there be sufficient habitat available to accommodate increasing fish numbers?*

Habitat for anadromous fish is also important for numerous other aquatic and riparian resources and human uses, including: native trout, amphibians, recreation, and clean water. Alternative land management strategies will consider these important resource values in addition to the anadromous fish issues discussed below.

This summary, based on a Science Integration Team report (Lee and Rieman In prep.) and other relevant sources cited in the text, responds to the above four questions. It provides an overview of the effects of habitat, harvest, hydropower and hatcheries on interior Columbia River anadromous fishes. It does not apply to resident native fish such as bull trout and cutthroat trout, which do not migrate to and from the sea. The information is generally applicable to spring/summer and fall chinook, sockeye, and steelhead in the interior Columbia Basin.

Hydroelectric development is generally regarded as a major factor in the decline of anadromous populations, irrespective of changes in freshwater habitat (Northwest Power Planning Council 1986 in Lee and Rieman In prep., Raymond 1988 in Lee and Rieman In prep.). Explicit recognition of the role of hydroelectric development contributed to passage of the Northwest Power Planning and Conservation Act of 1980, and to development of the Northwest Power Planning Council's Fish and Wildlife Program, a regional effort to simultaneously address the four principal factors affecting anadromous fish.

Habitat is another major factor in supporting anadromous fish populations. The information provided by the broad-scale assessment of aquatic habitats and species within the interior Columbia Basin and presented in the Aquatic STAR (Lee, D.; Sedell, J.; et al. 1996) lends support to a scientifically credible view that is emphasized repeatedly in the literature: habitat change is pervasive and at times dramatic, but impacts are not evenly distributed across the landscape. For instance, high-quality areas,

generally associated with wilderness or other protected areas, remain that are capable of supporting anadromous fishes at near historical levels in these areas. In many other areas habitat has been degraded and survival of the freshwater life stages has been compromised. To support recovery of populations of anadromous fish, it will be necessary to expand and reconnect areas of high quality habitat. Restoration of depressed populations cannot rely on habitat improvement alone, but requires a concerted effort to address causes of mortality in all life stages. These include freshwater spawning, rearing, juvenile migration, ocean survival, and adult migration.

1. What are the relative contributions of habitat, hydropower, hatcheries, and harvest on the current state of populations within the interior Columbia Basin?

The question of relative contributions of the "Four H's" to anadromous fish mortality cannot be answered precisely. Simultaneous changes in a variety of factors, combined with the lack of historical data, prevents estimation of the proportionate influence of each factor across the entire basin. It is expected that the contribution of freshwater habitat changes to declines in anadromous fish populations is least in the less disturbed areas of central Idaho (such as in wildernesses or other protected areas), where there are the most dams between spawning and rearing areas and the ocean, and in the northern Cascades, but greater in the lower Snake and mid-Columbia drainages. Similarly, the contribution of hydropower to fish mortality declines downriver where there are fewer dams between freshwater spawning and rearing areas and the ocean (Lee, D.; Sedell, J.; et al. 1996). Hatcheries are an important element throughout the basin, but their effects on native stocks are quite variable. Harvest, which has been much curtailed in recent years, has less of an effect today than it did historically. In some sub-basins such as the Umatilla, irrigation withdrawals may be the major contributor to declines in naturally reproducing populations.

2. If all other factors were held constant, would a further degradation of habitat increase the risks of extirpation or extinction?

Yes, regardless of the contributions of other factors, spawning and juvenile rearing habitat remains an important component in the viability equation. Freshwater habitat can be most important in ensuring viability of stocks that are depressed through a combination of other factors.

3. If all other factors were held constant, would an improvement in freshwater habitat conditions increase fish abundance and reduce the risks of extirpation or extinction?

Yes, although the magnitude of the effect would vary greatly from sub-basin to sub-basin. In areas where present habitat is degraded and hydropower effects are smaller, such as the John Day and Deschutes Rivers, habitat improvements could result in immediate increases in numbers of fish. In areas where habitat is degraded and hydropower effects are large, such as in the Grand Ronde River and some tributaries of the Salmon River (for example Panther Creek), increases in population numbers due to habitat restoration would be more modest and gradual. In other areas where there is abundant high-quality habitat but few adult spawners, such as in the middle Fork Salmon River, immediate increases in fish abundance would not be expected. One aspect of habitat improvement that could have long-term repercussions, if not immediate benefits, is that increased availability of high-quality habitats reduces the chances that a random, catastrophic event such as a large fire followed by flooding would wipe out all of the best available habitat. A wider distribution of high-quality habitats also improves the likelihood of increased genetic diversity ~ an additional benefit over the long term. In general, while additional high quality habitat alone could increase the abundance of individual fish, it would not likely reverse current negative population trends in the short term.

4. If nothing is done to restore habitat, and mitigation of major factors such as the dams is successful, would there be sufficient habitat available to accommodate increasing fish numbers?

The answer varies across the basin. Population numbers in much of the interior Columbia Basin are far below what current habitat conditions could likely support under a scenario of increased downriver survival. Some remote areas (for example central Idaho and northern Cascades) potentially could support hundred-fold increases or better in the number of adult fish, but this is not the case everywhere. There are disturbed areas where increased adult numbers would lead to compensatory declines in freshwater survival rates, thus reducing the per capita productivity of the population and limiting the effectiveness of downstream improvement efforts. If the objective is to fully realize the benefits of downstream improvements, then commensurate increases over current availability and distribution of high-quality habitat will be necessary.

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Summary by ERU:

Chinook salmon are the most imperiled of the key salmonids. Both forms of chinook salmon are extirpated in more than 70 percent of the historical range. The distribution of stream-type chinook appears to be widespread throughout the remaining accessible range, but most populations are depressed and influenced by hatchery supplementation. The only remaining strong populations are within the Blue Mountains (ERU 6) and are restricted to relatively small areas of the John Day River Basin. Within the Central Idaho Mountains (ERU 13), recent runs of stream-type chinook salmon have been critically low, and most populations are believed to be on the brink of extinction. Ocean-type chinook salmon are found in a more restricted range tied principally to mainstream rivers and larger tributary systems. Populations associated with the Snake River Basin in Idaho are also considered on the verge of extinction. The remaining distribution of spawning and rearing habitat includes very few watersheds in each occupied ecological reporting unit and the blocks of contiguous occupied habitat are small and disjunct.

Sockeye Salmon

Sockeye salmon were not considered a “key salmonid” as part of the Scientific Assessment (1996) because of their extremely limited present distribution. Nevertheless, they are an important species because of high associated social, economic, and ecological values.

Sockeye salmon exhibit two dominant life history forms, an anadromous form and a resident form called kokanee. The distribution of kokanee coincides with that of the anadromous form, probably indicating that kokanee populations have developed from anadromous populations. The historical range of sockeye extended across the northern rim of the Pacific Ocean, down the west coast of North America as far south as the Sacramento River in California (see map 2-12, earlier in this section). The historical range included large segments of the interior Columbia Basin where natural lakes and surrounding watersheds are connected by river systems to the Pacific Ocean. It is believed that 11 major watersheds

and at least 24 lakes supported sockeye salmon within the project area. Currently only Lakes Wenatchee and Osoyoos in the upper Columbia River produce large numbers of wild anadromous sockeye. A single remnant population of anadromous sockeye remains in Redfish Lake in the upper Snake River Basin. The number of adults returning to Redfish Lake has numbered from zero to 8 adults since 1990. This remnant population is federally listed as endangered under the Endangered Species Act.

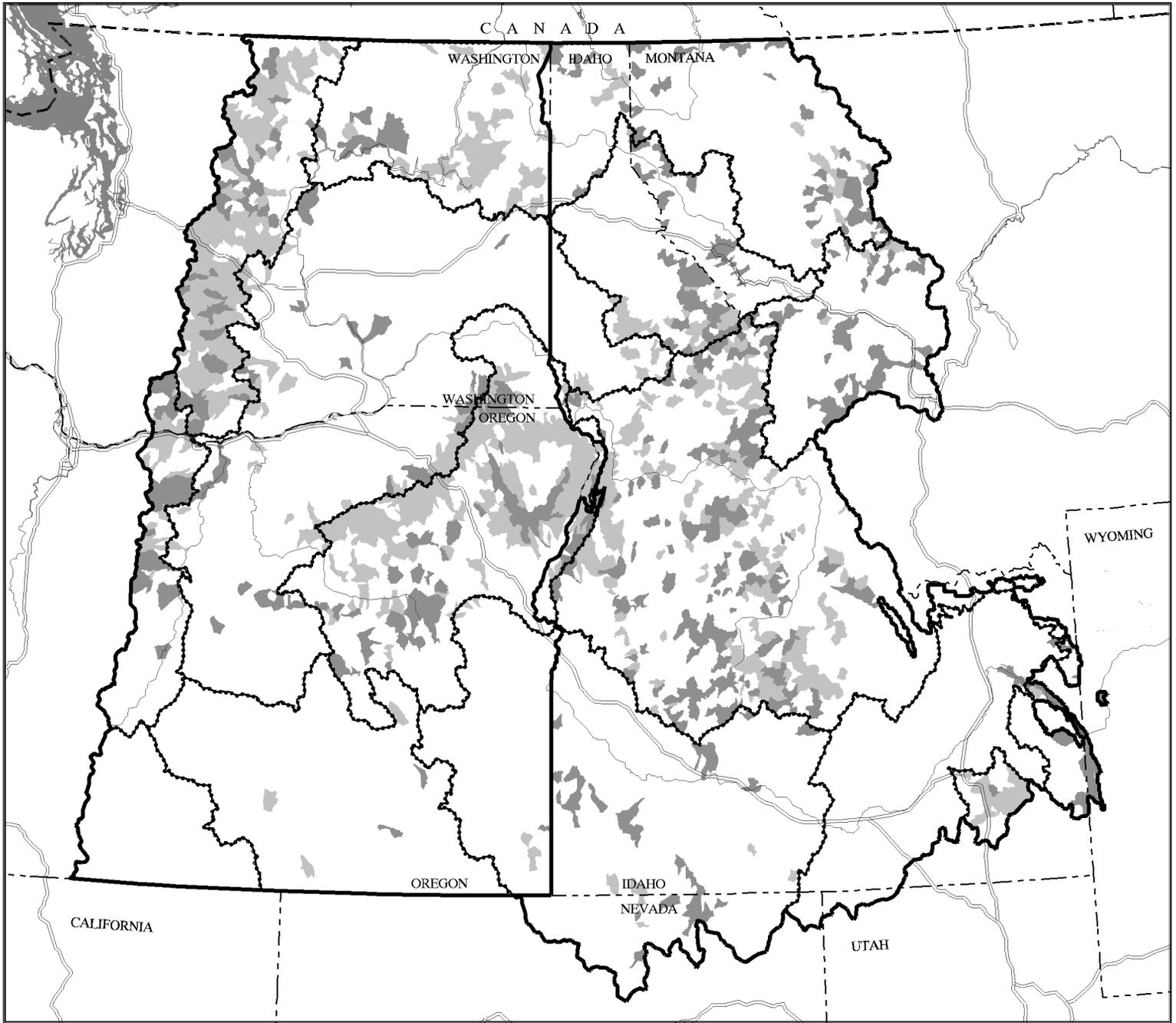
Similar to steelhead and chinook, much of the decline in anadromous sockeye is attributed to dams blocking access to spawning and rearing streams and increased mortality of juveniles in the migratory corridors of the Snake and Columbia rivers. Other factors influencing abundance include loss of lake habitat, historical commercial fisheries, ocean productivity, and forest management.

Native Species Richness, and Biotic and Genetic Integrity

The specific conditions regarding fish species and groups of fishes that are outlined in preceding sections can be integrated in various manners to provide an overall picture of aquatic conditions in the project area. Some key attributes include native species richness, and genetic and biological integrity. These views can help prioritize management actions through watershed categorization or designation of key watersheds. Key (or priority) watersheds have been identified for previous salmon recovery plans (see sidebar earlier in this section). For the purposes of this EIS, the Science Integration Team developed watershed categories that summarize current aquatic conditions, especially with regard to management opportunities and priorities.

Species Richness

The number of native fish species (species richness) present in a watershed is an important element of biodiversity. A high degree of overlap in species should be characteristic of strong habitat diversity. Even considering a fairly narrow group of species such as the salmonids, each species relies on

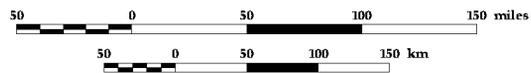


Map 2-24.
Salmonid Strongholds

*BLM and Forest Service
Administered Lands Only*

INTERIOR COLUMBIA
BASIN ECOSYSTEM
MANAGEMENT PROJECT

Project Area
1996



- | | |
|-----------------------|-----------------|
| Predicted Strongholds | Major Rivers |
| Known Strongholds | Major Roads |
| | EIS Area Border |
| | ERU Boundaries |

*Ecological reporting unit names and numbers are found on Map 1-1.

different habitats and environments. The occurrence of several salmonids indicates suitable habitats over relatively large landscapes. High richness may also indicate critical habitats that serve as common corridors, wintering areas, or seasonal refuges for varied life histories. The largest remaining regions of high species overlap considering *all* native fish species are associated with the Central Idaho Mountains (ERU 13), Blue Mountains (ERU 6), Northern Cascades (ERU 1), and their connecting river corridors.

Overlap of strong populations for multiple native *salmonids* indicates areas of high species richness that have not yet experienced extensive declines in fish population. Presently within the project area, less than 0.01 percent of the sub-watersheds concurrently support three strong salmonid populations, 3 percent support 2, and approximately 20 percent support 1. The largest block of contiguous or clustered sub-watersheds supporting strong populations is within subbasins in the Central Idaho Mountains (ERU 13), Blue Mountains (ERU 6), and Snake Headwaters (ERU 12). Smaller blocks are found in the Upper Clark Fork (ERU 8) and the extreme eastern fringe of

the Northern Glaciated Mountains (ERU 7). Most of the watersheds supporting strong populations are found on Forest Service-administered lands (75 percent), and a portion (29 percent) are located within protected areas represented by designated Wilderness or National Parks. Watersheds with multiple strong populations are more commonly under Forest Service management than other ownerships. Map 2-24 illustrates the current and estimated locations of key salmonid strongholds in the project area.

Biotic Integrity

The concept of biotic integrity has been proposed to evaluate the loss of natural diversity and to define those remaining portions of the landscape that could be most valuable in maintaining or closely approximating historical levels of natural diversity. Biotic integrity has been generally defined as “the ability to support and maintain a balanced, integrated, adaptive community of organisms having a species composition, diversity, and functional organization comparable to that of the natural habitat of the region ” (Karr and Dudley 1991 as cited in the Aquatic STAR 1996). Integrity specifically refers to *native* biota that reflect natural

Fringe Environments

“Fringe” environments at the extreme edges of a species distribution may support a disproportionately large part of the genetic diversity within a species because of the genetic adaptation needed to survive in a variable environment. Populations that represent native gene complexes and the widest possible diversity probably offer the best resources for reestablishing extinct populations in similar environments. They are also important for sustaining the most important components of overall genetic diversity characteristic of these species.

The fringe of the range for westslope cutthroat trout is in the Blue Mountains (ERU 6). Watersheds within the Columbia Plateau (ERU 5) technically qualify as part of the westslope cutthroat fringe distribution, but those watersheds are really part of a much larger distribution of cutthroat in the upper portions of that basin. For that reason the Columbia Plateau (ERU 5) was not included as part of the fringe for westslope cutthroat trout. The fringe defined for bull trout includes the Southern Cascades (ERU 2), the Upper Klamath (ERU 3), the Owyhee Uplands (ERU 10), and the Walla Walla and Umatilla drainages within the Columbia Plateau (ERU 5).

The Upper Klamath (ERU 3), Northern Cascades (ERU 1), and Owyhee Uplands (ERU 10) are recognized as fringe areas in the remaining distribution of resident-interior redband trout. No watersheds are considered to represent a fringe for Yellowstone cutthroat trout or resident redband trout. Any further loss of current distributions within the Upper Snake (ERU 11) or Upper Klamath (ERU 3) would make these areas of concern, however.

The Northern Glaciated Mountains (ERU 7) was identified in the Scientific Assessment (1996) as the fringe for steelhead. Population declines within the Southern Cascades (ERU 2) could make that area important for steelhead as well. The Southern Cascades (ERU 2) and Northern Glaciated Mountains (ERU 7) are important for stream-type chinook salmon. The distribution of ocean-type chinook salmon within the project area is so restricted that all of the remaining distribution qualifies as part of the fringe.

evolutionary and biogeographic processes. Several measures of biotic integrity have been developed, often reflecting different attributes for communities of invertebrates and amphibians as well as fish (Fisher 1989; Lyons et al. 1995 as cited in the Aquatic STAR 1996).

Because project-wide information was limited to fish in the Scientific Assessment, a relatively simple measure of integrity was developed reflecting the diversity and structure of the native fish community at both the life-history and species levels of organization (Aquatic STAR 1996). The highest concentration of high integrity values were found in the Northern and Southern Cascades (ERUs 1 and 2), Blue Mountains (ERU 6), Central Idaho Mountains (ERU 13), and the southern edge of the Columbia Plateau (ERU 5). Smaller blocks of high values were also found in the Lower Clark Fork (ERU 8). One readily apparent trend is that many of the high-value integrity areas are found in forested areas within the range of anadromous fish. Rangeland and agricultural areas tended to have lower integrity values.

Genetic Integrity

Hatchery programs may erode genetic diversity and alter certain gene complexes that evolved together and are characteristic of locally adapted stocks of salmonids. The effects may include a loss of fitness or performance (growth, survival, and reproduction) and a loss of genetic variability important to long-term stability and adaptation in varying environments. The analysis of genetic integrity is incomplete and would require a finer level of analysis for a consistent application to resident salmonids, but in general the areas important to the genetic integrity of the anadromous salmonids are found principally within the Blue Mountains and Central Idaho Mountains ERUs.

Watershed Categories

To assist with an ecosystem approach to the management of watersheds and aquatic resources, the Science Integration Team developed a simple classification of subbasins throughout the Interior Columbia Basin Ecosystem Management Project area (Aquatic STAR 1996). Subbasins were used as the primary classification unit because they commonly approximate complete aquatic ecosystems, supporting most of the life-history

diversity expected over larger river basins (see the Introduction to this chapter for an explanation of subbasins and fourth-field hydrologic unit codes). Three broad categories of subbasin condition (as it relates to aquatic ecosystems) have been defined, recognizing that a continuum of conditions exists.

Subbasins were categorized along a gradient of conditions relative to highly functional aquatic ecosystems. Highly functional systems were defined as subbasins with a full complement of native fish and other aquatic species, well distributed in high quality, well connected habitats.

The categorization is intended to set the stage for a broad-scale analysis of management needs and opportunities that can focus the need for finer-scale analysis. It is intended to facilitate the discussion of management opportunity and conflict by providing a description of aquatic issues and needs that could be associated with similar descriptions for terrestrial ecosystems. It is not intended to be all inclusive, final, or inflexible. The classification is based on the integration of current data as well as local knowledge of watershed connectivity and condition that is not expressed quantitatively. Map 2-25 shows the watershed categories developed by the Science Integration Team for analysis.

Category 1 Watersheds

These subbasins most closely resemble natural, fully functional aquatic ecosystems. In general they support large, often continuous blocks of high-quality habitat and watersheds with strong populations of multiple species. Connectivity is unimpeded among watersheds and through the mainstream river corridor, and all life histories, including migratory forms, are present and important. Native species predominate, though introduced species may be present. These subbasins provide a system of large, well dispersed habitats that are resilient to large-scale disturbances. They provide the best opportunity for long-term persistence of native aquatic assemblages and may be important sources for refounding other areas. In general, land management of these areas should be highly conservative and integrated with other agencies to minimize risk to aquatic resources. Because these areas are generally large and robust enough to deal with large-scale fire events and other uncertainties, they are not the place for large-scale experimentation.

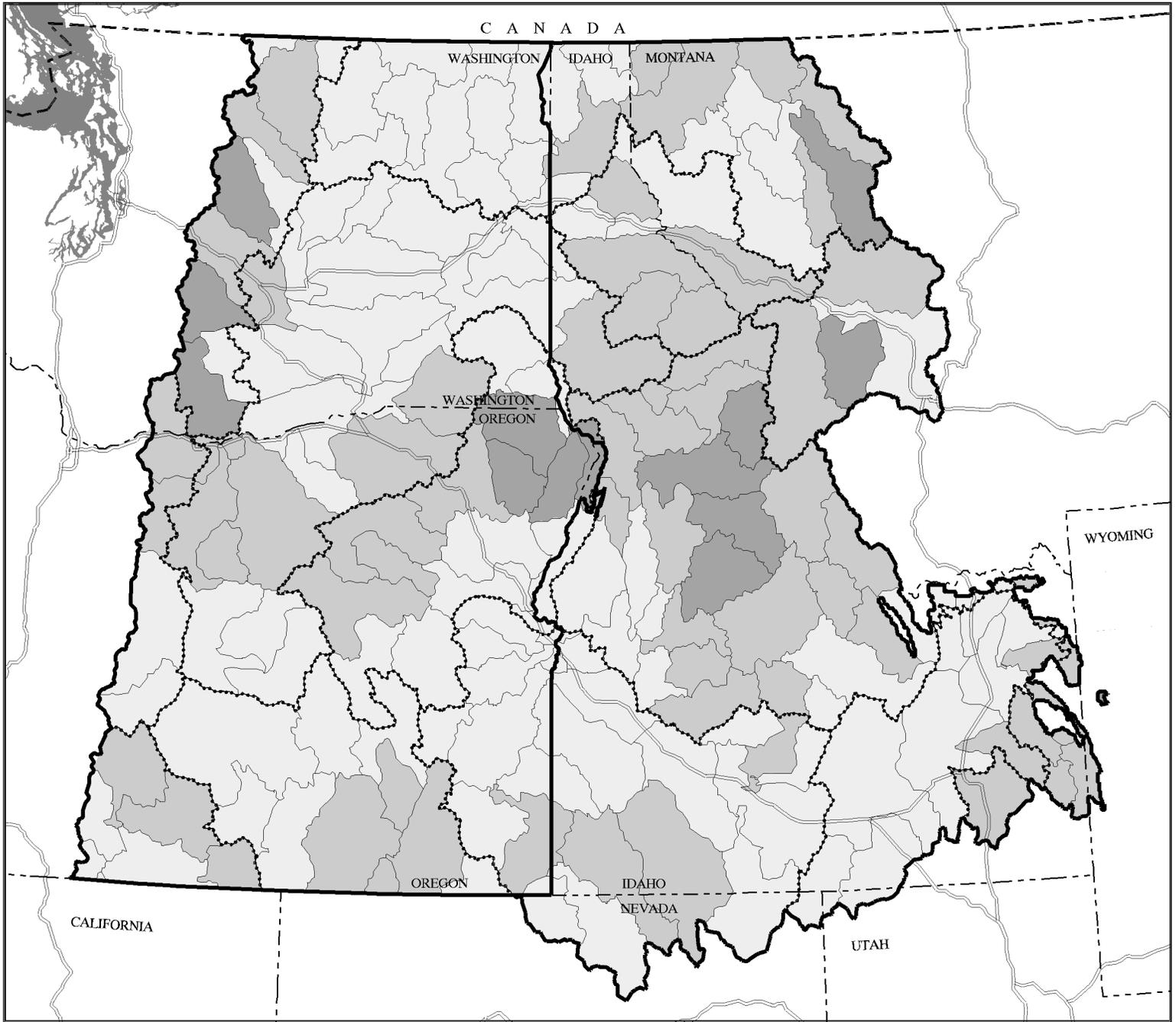
Category 2 Watersheds

These subbasins support important aquatic resources and often have watersheds classified as strongholds for one or more species scattered throughout. The integrity of the fish assemblage is high or moderate. The most important difference between Category 1 and Category 2 watersheds is increased fragmentation in Category 2 that has resulted from habitat disruption or loss. These subbasins have numerous watersheds where native species have been lost or are at risk. Connectivity among watersheds exists through the mainstream river system, or has the potential for restoration of life-history patterns and dispersal among watersheds. Reestablishing the necessary mosaic of habitats will often require conservation of existing high-quality sites, as well as the restoration of whole watersheds that still support remnant populations. Opportunities for conservation and restoration will rely heavily on more detailed analyses with finer-scale information. Because these subbasins commonly fall in some of the more intensively managed landscapes, they may have extensive road networks and the greatest need and opportunity for restoration of structure and composition of vegetation communities. There also may be opportunities to leverage active watershed restoration with active forest structural manipulation/treatment. For example, where extensive road networks exist, harvest and thinning activities might be focused over a relatively short period, and include road removal following completion. Because stronghold watersheds that require conservative protection are scattered rather than contiguous, intensive forest management might be prioritized and focused in areas that minimize risks to stronghold watersheds. These subbasins are more likely to have the opportunities to explore or experiment with watershed restoration through active manipulation, or through attempts to produce more episodic disturbance followed by long periods of recovery. Conceivably, these subbasins offer the greatest opportunity for positive solutions across multiple resource issues.

Category 3 Watersheds

These subbasins may support populations of key salmonids or have other important aquatic

values, such as threatened and endangered species, narrow endemics, and introduced or hatchery supported sport fisheries. In general, however, these watersheds are strongly fragmented by extensive habitat loss or disruption throughout the component watersheds, and most notably through disruption of the mainstream corridor. Major portions of these subbasins are often associated with private and agricultural lands not managed by the Forest Service or BLM. Although important and unique aquatic resources exist, they are usually localized. Opportunities for restoring connectivity among watersheds, full expression of life histories, or other large-scale characteristics of fully functioning and resilient aquatic ecosystems are limited or nonexistent in the near future. Opportunities for management of aquatic resources in these subbasins are primarily in conserving remaining habitats in specific locations, rather than restoration of a more functional mosaic. Although there may be greater flexibility in land-use management for subbasin areas outside of critical watersheds, some management conflicts may arise. Because the remaining aquatic resources are often strongly isolated, risks of local extinction may be high. Land-use activities within these watersheds may call for extreme caution to not aggravate present conditions. Conservation of the remaining productive areas may require a disproportionate contribution from Federal management agencies, because these subbasins often include large areas of non-Federal land.



Map 2-25.
Subbasin Categories

INTERIOR COLUMBIA
BASIN ECOSYSTEM
MANAGEMENT PROJECT

Project Area
1996



- Category 1 (High)
- Category 2 (Moderate)
- Category 3 (Low)
- 4th HUC Boundaries
- Major Roads
- EIS Area Border
- Ecological Reporting Unit Border*

*Ecological reporting unit names and numbers are found on Map 1-1.

Human Uses and Values

Key Terms Used in This Section

Allowable Sale Quantity (ASQ) ~ On a National Forest, the quantity of timber that may be sold from a designated area covered by the forest plan for a specified time period.

Amenity ~ Resource use, object, feature, quality, or experience that is pleasing to the mind or senses; typically refers to values for which monetary values are not or cannot be established, such as scenic or wilderness values.

Animal Unit Month (AUM) ~ The amount of feed or forage required by one animal-unit grazing on a pasture for one month. An animal-unit is one mature cow plus calf, or one horse, or five domestic sheep.

Community (human) ~ a group of people residing in the same place and under the same government. A "Community of interest" refers to people who share a common concern but may not be located in the same place.

In-migration ~ The movement of new residents into an area.

Out-migration ~ The movement of former residents away from an area.

Resiliency (human community) ~ The ability of a community to respond to externally induced changes such as larger economic and social forces.

Summary of Conditions and Trends

- ◆ The planning area is sparsely populated and rural, especially in areas with a large amount of agency lands. Some rural areas are experiencing rapid population growth, especially those areas offering high quality recreation and scenery. Population growth can stimulate economic growth, provide new economic opportunities, and promote economic diversity in rural areas.
- ◆ Development for new residents is encroaching on previously undeveloped areas adjacent to lands administered by the Forest Service or BLM. New development can put stress on the political and physical infrastructure of rural communities, diminish habitat for wildlife, and increase agency costs to manage fire to protect new development.
- ◆ A wide variety of uses of Federal lands in the UCRB contribute to the regional economy and to local economies. At the regional level recreation is an important use of Federal lands in terms of economic value and amount of use.
- ◆ Most recreation use is tied to roads and accessible water bodies, although primitive and semi-primitive recreation is important. At the local level there are communities that rely on economic contributions from forest products, livestock grazing, mining, and recreation. Forest products and livestock grazing, while no longer solely dictating the economic prosperity of the region, remain economically and culturally important in rural areas distant from population centers and not sharing in regional growth.
- ◆ The public has invested in building road systems on agency lands in the UCRB planning area, primarily to serve commodity uses. On National Forest System lands, commercial timber harvest has financed 90 percent of the construction cost and 70 percent of the maintenance cost. Recreation now accounts for 60 percent of the use. Trends in timber harvesting and new road management objectives make the cost of managing these road systems an issue of concern.
- ◆ Costs of fire suppression on Federal lands in the UCRB have increased markedly in recent years and are

expected to continue to increase, unless actions are taken to address fuel loading and vegetation structure, composition, and density.

- ◆ For those counties that have benefitted from Federal sharing of gross receipts from commodities sales on agency lands, changing levels of commodity outputs can affect county budgets.
- ◆ Agency social and economic policy has emphasized the goal of supporting rural communities, specifically promoting stability in those communities deemed dependent on agency timber harvest and processing. Even-flow of timber, bidding methods, export restrictions, and small business set-asides of timber sales have been the major policy tools on Forest Service-administered commercial forest lands. Regulation of grazing practices has been most important policy tool on BLM-administered rangelands.
- ◆ The factors that appear important in making communities resilient to economic and social change include population size and growth rate, economic diversity, social and cultural attributes, amenity setting, and quality of life. The ability of agencies to improve community resiliency depends on how land-use choices influence these factors.
- ◆ Predictability in timber sale volume from agency lands has been increasingly difficult to achieve. Advancing knowledge, changing societal goals, administrative and legal challenges of timber sales, and changing forest health conditions have undermined conventional assumptions about timber supply from agency lands.
- ◆ Residents in the interior Columbia River Basin indicate strong support for a variety of land-use activities, but public opinion is divided on some issues where a choice and trade-off are required. Trust or confidence in the Forest Service and BLM as land managers is strong at the national level, less so at the regional level. There is increased public interest in having a greater role in natural resource decision-making.

Introduction to Human Uses and Values

This section describes current social and economic conditions and trends in the interior Columbia River Basin, along with historical information needed to further explain how these conditions and trends developed. Unless attributed to other authors or sources, information for this section is drawn, primarily, from the Scientific Assessment Economic and Social Staff Area Reports (1996).

Information on current conditions and trends is presented at two main levels. The broadest level at which recent social and economic conditions are discussed is for the interior Columbia River Basin as a whole. A second level of analysis focuses on upper Columbia River Basin counties or communities grouped together either in terms of their perceived character (timber; recreation, tourism and retirement; ranching; mining; and, other) and/or based on their trading area within the UCRB, such as a large center of commerce like Boise and the surrounding counties that it serves.

The interior Columbia River Basin (project area) stretches from the crest of the Cascade Mountains in Oregon and Washington to the rugged peaks of the northern Rocky Mountains in Idaho, Montana, Wyoming, Utah and Nevada. It is very large, including 100 counties in parts of seven States and including 476 places (towns, villages, cities and census designated places) whose population is tracked by the U.S. Census. The project area is the heart of what was, in the early 1800s, known as the Oregon Country.

Historical Overview

American Indians have occupied the Columbia Basin for more than 12,000 years. It is likely that they were nomadic and followed and harvested the large mammals of the Pleistocene era (especially mammoths, mastodons, musk ox, and bison antitquus). After continued warming of the climate, American Indians changed their food sources to fishing and gathering practices, adapting to regional and local patterns of flora and fauna. Attachments formed to specific places for fishing, hunting, and gathering, and a yearly rhythm of seasonal rounds developed (figure 2-24, in the American Indians section of this chapter). By the time of

European settlement, the interior Columbia River Basin was home to an estimated 50,000 American Indians divided among several different language groups.

It is estimated that American Indians of the Columbia may have harvested 18 million pounds of fish annually, both for their own uses and for trade purposes. In the higher deserts and headwater areas, where fish were less abundant, American Indians hunted large wildlife species such as deer, pronghorn, bighorn sheep, moose, elk, bison, and bear for food and clothing. For some American Indians, edible plants (especially roots), celeries, berries, fruits, and nuts provided a significant amount of their nutritional needs. Some plants were used for ceremonial, medicinal, and/or commercial purposes. Hunting and fishing practices reflected a conservation ethic, such as catching principally male trout and salmon on the spawning beds and restricting fishing to nights or certain days, thus allowing a portion of fish to pass. Selective digging techniques employed in plant food harvesting and the time of harvests for native plants and animals also embodied conservation elements.

Contrary to many of the beliefs of non-Indian emigrants arriving in the region in the 19th century, the project area and adjoining areas were not pristine wildernesses, but ecosystems in which humans had an active role (MacCleery 1994; Woolfenden 1993). American Indians employed fire as a tool to manage vegetation, and these fires differed from fires ignited by lightning in terms of seasonality, frequency, and intensity (Lewis 1985). The low intensity, high frequency fires set by American Indians improved grazing; encouraged vegetation to provide browse for large mammals and berries for human and animal consumption; signaled other tribes or sent warnings; and became part of ceremonial events. The widespread use of fires by American Indians over long periods shaped the mosaic of vegetation and their associated animal communities in the interior West.

The abundant harvestable resources of the Columbia basin were the principal attraction for early European settlers. The 1840s brought profound change as the success of early missions, fur trade, and establishment of trading posts led families to make the nearly

2000 mile trek on the Oregon Trail from Independence, Missouri, to the Willamette Valley in Oregon. Massive migration to the interior Oregon Country, however, did not begin until the discovery of gold in the northern Rocky Mountains in 1859. The development of "local" economies that resulted from mining led to new territories being formed (Idaho in 1863 and Montana in 1864). Transportation systems (wagon roads, steamboats and later railroads) were rapidly developed to link the mines to trade centers and to the outside world.

The growing population in California's cities created a market for timber and food that could be produced in the Pacific Northwest and shipped south along the coast. Commercial salmon fishing and canning became successful. Similarly, the arrival of the railroads in the late 1800s made it possible for ranchers to ship cattle and sheep to the major cities of the Midwest and eastern U.S. This access to markets, coupled with the ability to acquire, through the Homestead Act and other settlement acts, limited areas of meadow land and the better watering places (Penny and Clawson 1962) led to rapid growth in livestock operations. The land grants given to the railroads also spurred development, with establishment of communities as transportation centers and with significant forest lands coming under private ownership, which also contributed to the establishment of a timber economy.

Following on the heels of mining and agriculture, a third leg of the interior Columbia Basin's economy, the timber industry, took off near the close of the 19th century. Serving only local markets in the early years after settlement, the industry paralleled development of mines and railroads. Railroads needed wood for ties and trestles, mines needed timbers for shoring, and lumber mills needed access to the woods to extract logs. Throughout the period from the mid 1800s till the early 1900s, a disposal philosophy of public lands was dominant in Congress, and thus management of the public domain were minimal (Clawson 1962).

By 1900, exhaustion of commercial timber from forests in the Great Lake States led timber investors to look southward and westward. The Pacific Northwest became the focus for wood supplies with large mills in Spokane, Washington, Potlatch, Idaho, and Klamath Falls, Oregon. Idaho sawmills supplied 745 million board feet annually by 1910 (Beckham 1995).

United States Government policies and presence of Federal lands have played a central role in control and settlement of the interior Columbia River Basin. Coupled with new Federal incentives to boost settlement in the West, the progressive movement at the beginning of the 20th century influenced leaders in government to emphasize “scientific” management of physical resources for more “efficient” development (Hays 1959). After nearly a century of policies to dispose of public lands, the Federal government began to view the remaining public domain as a storehouse to sustain productive values (Shannon 1991).

“The model was the U.S. Forest Service, established under the direction of Gifford Pinchot in 1905 to manage a growing inventory of Federal forest reservations that dated to 1891. Theodore Roosevelt entered office in 1901 with 41 million acres in reserves and left in 1909 with 151 million in the rechristened national forests. Pinchot’s goal was scientific management to ensure a sustained yield of timber as a lasting contributor to national growth and the stability of local economies. In his view, national forests could protect water supplies for irrigation and western cities, provide cheap grazing for stock raisers, and repay the U.S. Treasury with timber sales” (Adams 1994, p. 473).

The Taylor Grazing Act (1937) gave specific direction to the Bureau of Land Management. By leasing public lands to stockraisers, the act sought to “stop injury to the public grazing lands (excluding Alaska) by preventing overgrazing and soil deterioration; to provide for their orderly use, improvement, and development; (and) to stabilize the livestock industry dependent upon the public range.” Range improvement projects were undertaken by the Civilian Conservation Corps, and local advisory boards were set up to allocate and manage the rangelands.

New Deal programs were critical in sustaining and building infrastructure in the interior Columbia basin. Perhaps the most famous of the Federal programs were the dam projects along the Columbia and Snake Rivers. Although the Army Corps of Engineers had been involved in surveys, navigation, and flood control along the Columbia River since the 19th century, nothing compared to the Great

Depression and post World War II construction of major dams on the Columbia system. There was a broad public consensus to construct the dams, even though biologists recognized at the time that dams would be barriers to native salmon runs, a significant number which spawn in streams on BLM- or Forest Service-administered lands (Peterson 1995).

The Analytical Context for Human Uses and Values

A discussion of the comparative structure of economic, social, and political systems is necessary to provide the proper context for agency decisions regarding economic and social objectives. People-oriented policies of the Forest Service and BLM historically have had a local focus, emphasizing the well-being of individuals, user groups, and communities that are economically or socially connected to agency lands. This fact suggests that social rather than economic policy is the appropriate context for decisions affecting human uses of agency lands.

Human social, political, and economic systems are described and analyzed differently from one another. Social and political systems are made up of individually meaningful units that together form at least a rough hierarchical structure. Social units include individuals, families, small groups, societies, and cultures. Political units include communities, cities, counties, States, and the nation. The administrative units of the Forest Service and BLM are also political entities that exhibit a hierarchical structure. Politicians and agency managers seek to influence economic events within their respective jurisdictions. However, the nature of economic systems limits this influence. Economies change as resources constantly shift to more efficient uses according to market forces, changing technologies, and consumer preferences. Rather than a hierarchical structure of separate “units,” economies are a complex web of interdependent economic relationships operating across many jurisdictions, both public and private, over a large area. The ability of political leaders and agency managers to achieve local economic objectives is limited by their ability to anticipate, account for, and influence larger economic forces.

In pursuing economic and social objectives, another factor is specific to how a planning problem is framed: the size of the area over which planned land management activities and products are specified. Effects of land-use decisions are very difficult to reasonably predict for areas smaller than those for which uses are specified. For example, if the location of planned timber harvest is no more specific than a multi-county area, the effects on timber-related employment on a smaller area, such as a single county, city, or community can be difficult to predict, although attempts have been made for north central Idaho, for example (Robison, McKetta and Peterson, 1996). For this Draft EIS, activities and land uses will be specified by ecological reporting unit (ERU), which are areas equivalent in size to several counties, but which rarely follow county or State boundaries (see Introduction to this chapter for more discussion of ERUs).

Project economists concluded that multi-county trade regions developed by the Bureau of Economic Analysis (BEA) were the smallest geographic areas acceptable as a reasonably “closed” economic system. BEA regions are based on commuting distances and newspaper circulation (see map 2-26). Since this plan uses ERUs for displaying outputs, BEA-type data will be adjusted to these units. Neither BEA regions nor ERUs correspond to the boundary of the UCRB planning area. This chapter supplements the larger area information with more detailed county-level data in order to help describe the human affected environment, but its use to project future economic effects of alternatives is severely limited. The discussion that follows addresses either UCRB planning area or ICBEMP project area conditions as is appropriate to the context of the discussion and the available data.

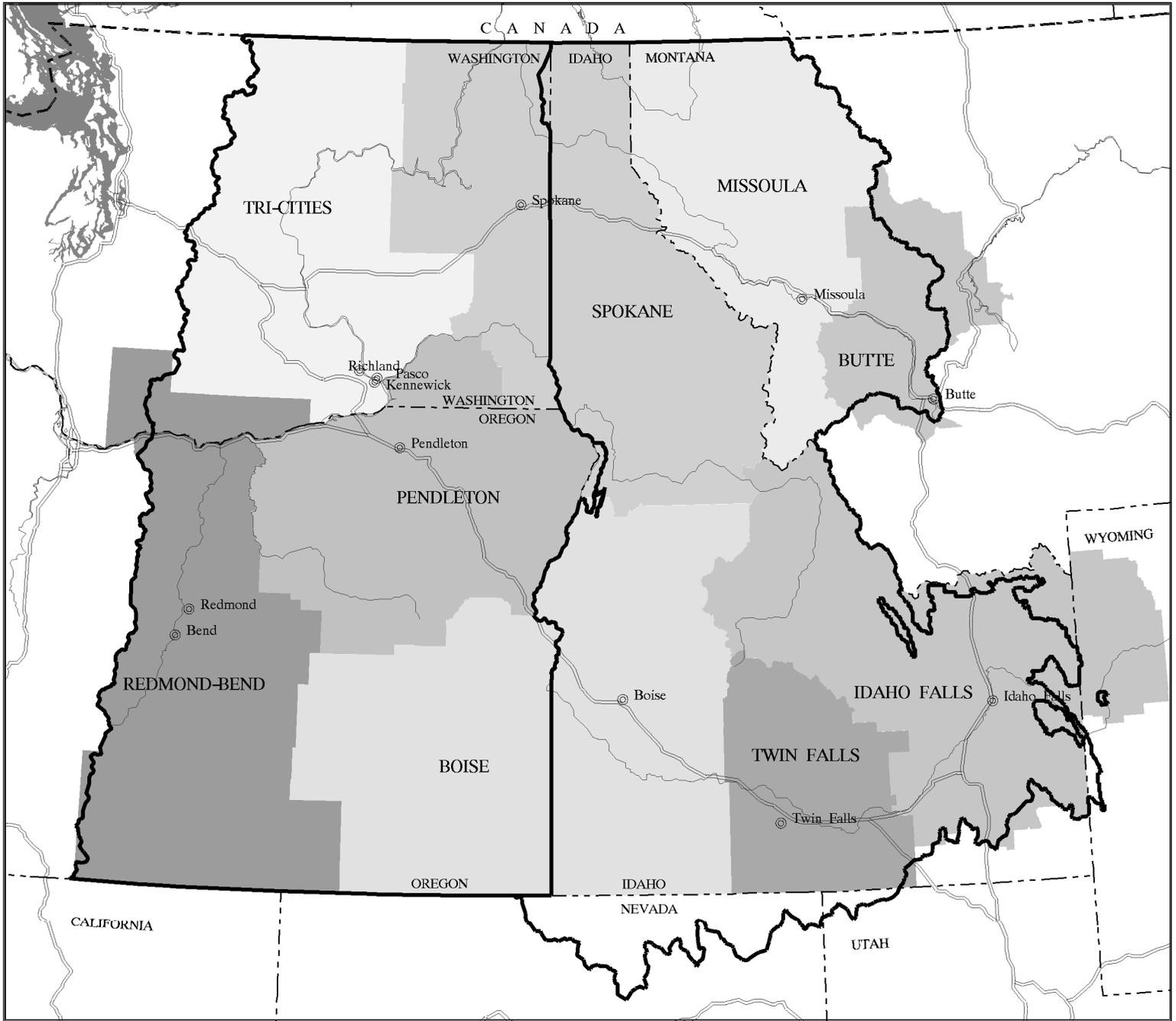
Population

From 1950 to 1990, the population of the ICBEMP project area grew substantially to well over two million people. While the basin as a whole saw increases in population in every decade, most rural counties in the project area experienced out-migration or loss of population

during the period between 1950 and 1970 as residents moved to urban areas (part of a nationwide trend). During the 1970s, most counties in the basin—including rural ones—reported population increases. In the 1980s, the trend towards migration from rural areas to the cities reemerged, and over 40 percent of the rural counties in the basin had population declines. Preliminary information from the early 1990s suggests that another urban-to-rural migration has begun (with substantially all counties in the project area gaining population between 1990 and 1994). Since 1990, the population in the basin has been growing faster than national averages for all types of settings. Small metropolitan counties grew the fastest, at 6.3 percent. Non-metropolitan counties adjacent to metro ones had the next fastest growth rate at 5.8 percent. In the basin, this trend is most apparent in rural counties that are attractive to retirees or are centers of recreation. Counties with substantial recreation accounted for only 16.7 percent of the basin’s population in 1990, yet they reported 21.7 percent of the total population increase in the project area from 1990 to 1994. Counties with high technology manufacturing (electronics, instruments, etc.) and services (medical, business, engineering and educational) also had relatively high growth rates during this period. As the population of the U.S. grows older and as more individuals and businesses access markets electronically or through airline and other shipping/delivery services, this trend of increasing migration to high quality of life rural areas is expected to continue.

Wildland-Urban Interface

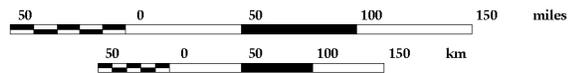
In many areas, population growth and consequent development can threaten the qualities that make such places attractive for recreation, retirement, and new businesses. At the urban-wildland interface, where growth is dramatic, fire protection is becoming a critical issue (map 2-27). The growth in numbers of residential dwellings near forested landscapes has presented new challenges in fire prevention and suppression for Federal and local agencies. Fire protection in the wildland/urban interface is a significant enough issue that the Western Governors’ Association recently initiated an effort with diverse interests to develop a “Wildland/Urban Interface Fire Policy Action Report. Federal land managers are called upon



Map 2-26.
Economic Subregions of the
Interior Columbia Basin

INTERIOR COLUMBIA
 BASIN ECOSYSTEM
 MANAGEMENT PROJECT

Project Area
 1996



-  Major Rivers
-  Major Roads
-  EIS Area Border
-  Trade Center(s) shown for each Economic Subregion (shaded in gray).

in the report to manage fuels in the interface areas (Western Governors' Association 1995).

Increased conflicts with wildlife have occurred in the interior basin. Large mobile wildlife species with extensive home ranges often run into conflicts with humans and livestock when wildlife habitat is reduced or affected by roads, and when wildlife populations increase. Elk and white-tailed deer have expanded their ranges in recent times, causing animal damage problems on some private lands, including crop damage during drought years. Mountain lion and coyote populations, reduced in some areas, are increasing in the rural interface and causing more concern for human safety. Large carnivores (wolf, grizzly bear) may move to seek prey and potentially move into areas with livestock and high human habitation, where potential conflicts intensify. Attitudes of humans towards carnivores is likely more important for their well-being than habitat conditions (Terrestrial STAR 1996).

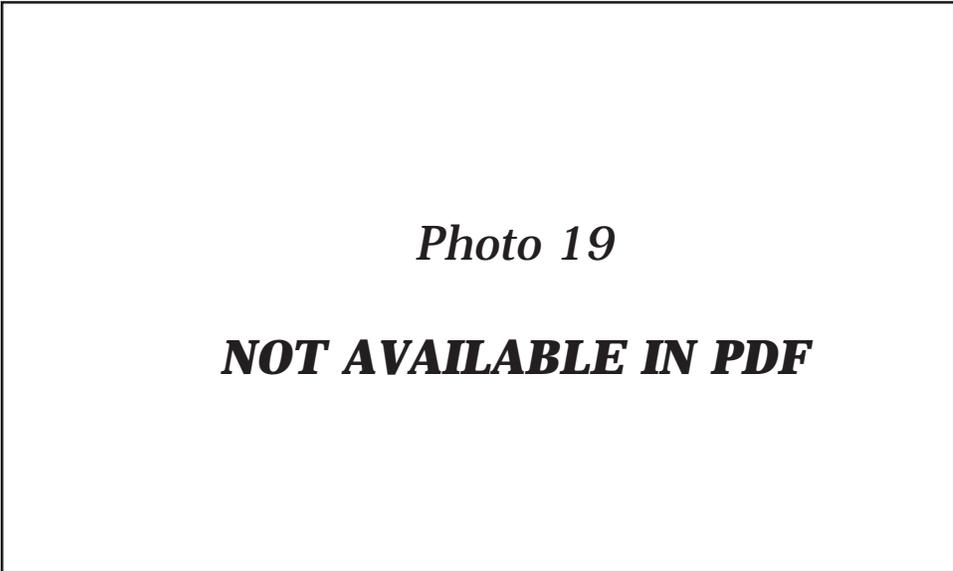
In spite of the increases in population discussed above, the basin remains far more rural than the U.S. as a whole: 77.5 percent of the U.S. population lives in urban areas compared to 31 percent of project area residents in urban areas, and over 90 percent of the 476 communities in the basin are considered to be rural (Harris, Brown and McLaughlin 1995). In keeping with its rural character, population density in the basin is less than one-sixth of the U.S. average (11 persons per square mile in the project area compared to 70 nationwide). The basin has a

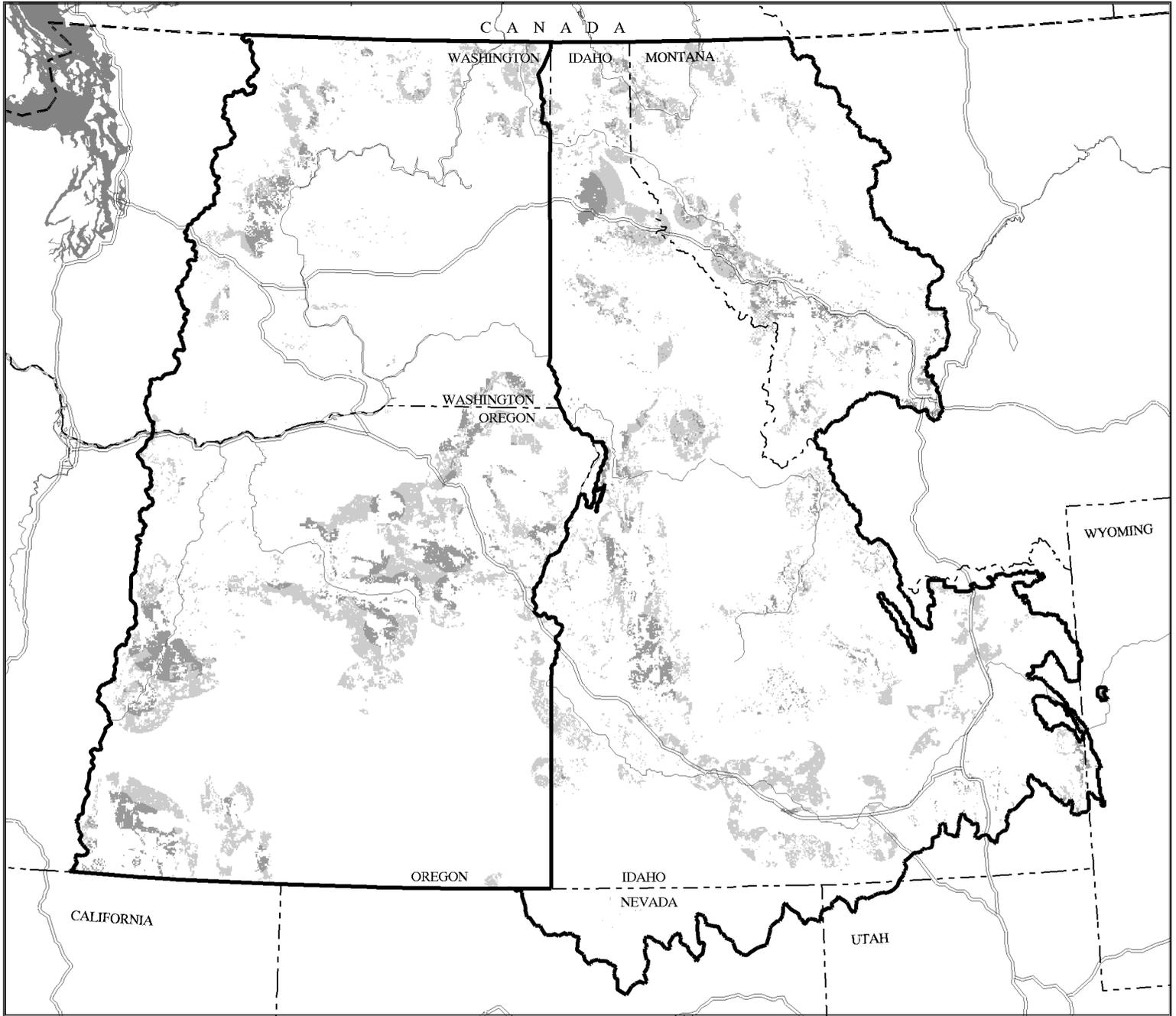
greater proportion of whites and Native Americans than the nation as a whole and a smaller proportion of African-Americans, Hispanics, and Asians. The percentage of residents of the project area with at least some college education is greater than the national average.

In the interior Columbia Basin, the rate of immigration differed among the counties. One type of county that showed large increases was that in which recreation and tourism play a large role in the county economy (Johnson and Beale 1995) (map 2-28). In these counties, about 77 percent of the population growth is accounted for by net migration (Johnson and Beale 1995), compared to 60 percent and 57 percent in metropolitan and other counties.

Although agriculturally based lifestyles dominate the interior basin, lifestyles differ significantly in rural counties where rapid population growth is occurring. Compared to households nationally, lifestyles in rural rapid growth areas appear to be oriented more toward the natural environment, occupations related to natural resources, and recreation opportunities on federally managed resources (McCool and Burchfield, 1995). Lifestyles within the 20 counties with significant recreation in the project area also differed from regional averages, suggesting the importance of environmentally based amenities to the lifestyles of many people moving to the interior basin.

Photo 19: The growth in numbers of homes near forested landscapes is presenting new challenges for fire prevention and suppression. Photo by Karen Wattenmaker.



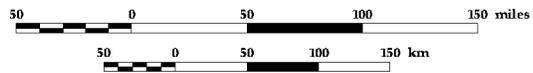


Map 2-27.
Urban/Wildland Interface
Fire Risk

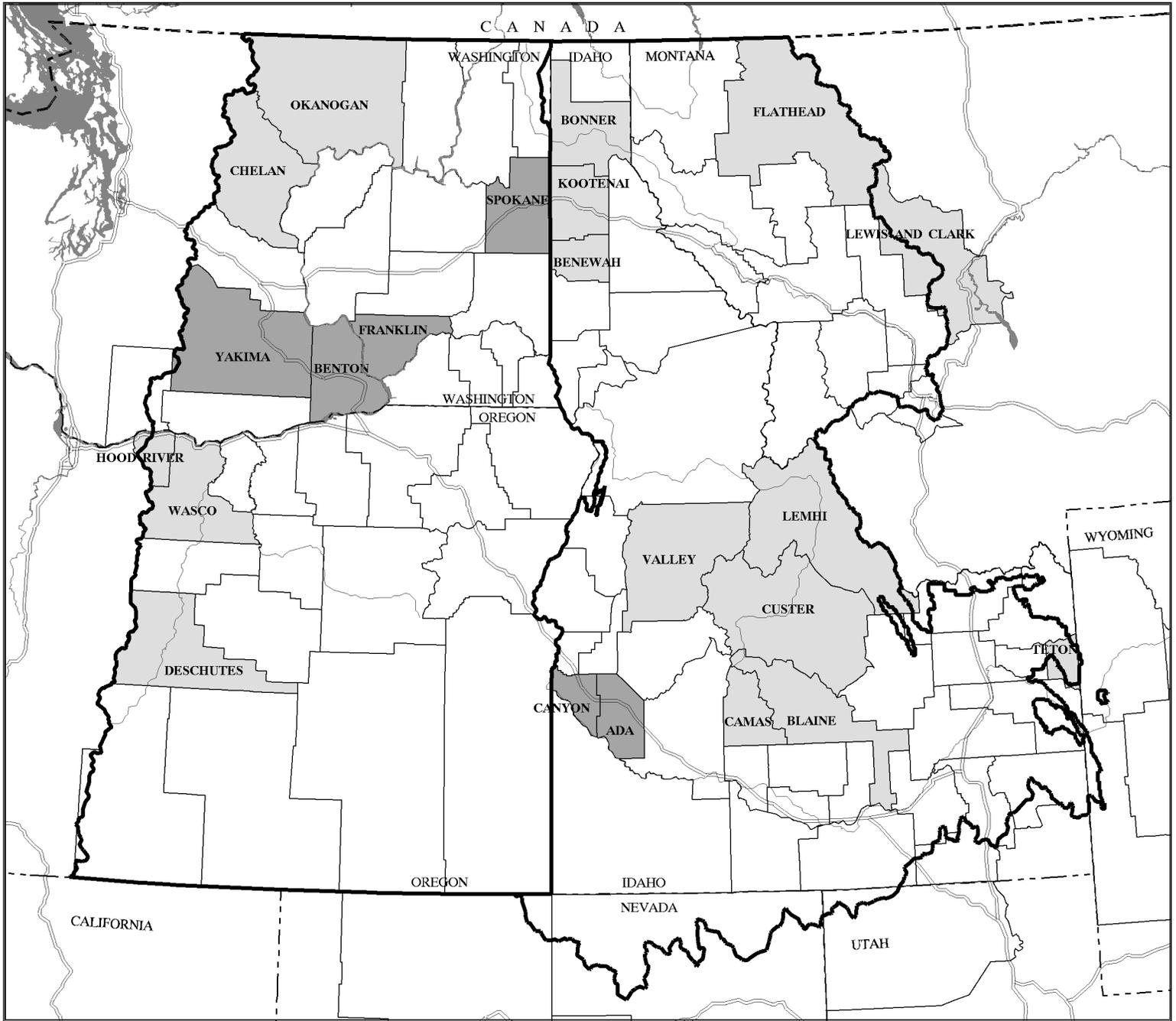
*BLM and Forest Service
 Administered Lands Only*

INTERIOR COLUMBIA
 BASIN ECOSYSTEM
 MANAGEMENT PROJECT

Project Area
 1996



- Moderate Risk
- High Risk
- Major Rivers
- Major Roads
- EIS Area Border



Map 2-28.
Recreation and
Metropolitan Counties



INTERIOR COLUMBIA
 BASIN ECOSYSTEM
 MANAGEMENT PROJECT

Project Area
 1996

- Recreation Counties
- Metropolitan Counties
- County Boundaries
- Major Rivers
- Major Roads
- EIS Area Border

Land Ownership and Major Uses

Forest Service- or BLM-administered lands make up a substantial portion of the upper Columbia River Basin, so their use is regionally important. These lands are also substantial assets nationally, making their use important outside the region as well. Of the 74 million acres of land in those portions of Idaho, Nevada, Montana, and Utah in the Columbia River Basin, almost 42 million acres, or 57 percent, are administered by the Forest Service or BLM.

Forest Service- or BLM-administered lands were either reserved from settlement or were considered part of the public domain during the early part of the century. Beginning in the 1890s following passage of the Forest Reserve Act, Forest Reserves were established in the UCRB. An organic act for the administration of forest reserves was passed by Congress in 1897. Presidents Grover Cleveland and Theodore Roosevelt acted to establish millions of acres of such forest reserves in the following years. The U.S. Forest Service was established in 1905. In 1946 the BLM was formed by merging the earlier Grazing Service and the General Land Office, which had been charged with managing the public domain and its transfer to qualified applicants pursuant to a number of laws favoring transfer. The BLM operated without an organic act until 1976, with the passage of the Federal Land Policy and Management Act.

Recreation and Scenery

Historical Overview

The Forest Service early recognized the public's demand for recreation, receiving authority in 1915 to issue 30-year leases for developing summer homes, hotels, and other commercial services for the recreating public. The need to formalize authority to manage recreation was also a primary driver for passage of the Multiple Use-Sustained Yield Act of 1960, since the legal basis for managing recreation and other uses was limited by the general wording of the Organic Act (1897). The Recreation and Public Purposes Act of 1954 encouraged disposal of BLM lands (often to States) that were valuable for recreation uses. National Recreation Areas (NRAs) were authorized for Federal lands by Congress in 1962. They were meant to improve and assure the quality and supply of outdoor recreation opportunities close to areas of high

population and growth. Two NRAs, the Sawtooth and Hells Canyon, are located in the Upper Columbia River Basin planning area. Congressional passage of the Wilderness Act in 1964 relied substantially on an argument that these lands provide, and should continue to provide, recreational opportunities. In 1968, Congress passed the Wild and Scenic Rivers Act and the and National Trails Act, which had major effects on both agencies' recreation programs. The Federal Land Policy and Management Act in 1976 and the amendments to the Land and Water Conservation also expanded the agencies' authorities to address recreation needs.

The project area provides recreational opportunities of local, regional, national, and international importance. The UCRB planning area has, on average, substantially greater amounts of available outdoor recreation opportunities compared to the national average, much of it supplied by Federal lands (Molitor and Bolon, 1995). Recreation opportunities on public lands in the project area have been inventoried using the Recreation Opportunity Spectrum (ROS), which considers characteristics such as road access, amount of development, density of recreationists, level of facility development, and natural resource management. Combined categories for this project include Primitive/Semi-Primitive (combining primitive, semi-primitive non-motorized, and semi-primitive motorized classes), Roaded Natural (roaded natural and roaded modified classes), and Rural/Urban (rural and urban classes). The ROS is a convenient way to inventory and display recreation settings, but it does not include the main attractions that draw people to recreation settings, such as water, fish, and wildlife. The presence of water has been and will continue to be the most important draw for recreation visitors. The project area contains an abundance of wild and remote water environments; the average for the project area is nearly three times the national average.

Federal lands supply large amounts of primitive and semi-primitive recreation opportunities, much of which has been given special status by Congress, such as in Wilderness or Wilderness Study Areas, Wild and Scenic Rivers, National Scenic Areas, and National Recreation Areas. The project area contains 70 percent of the unroaded areas 200,000 acres or greater in the lower 48 States, several in the UCRB. Few regions in the lower 48 States can match this combination of large-scale, undeveloped areas

and low human population density. Access to wildland-based recreation opportunities is important to the rural-oriented lifestyle of area residents and contributes importantly to the region's identity.

In the future, the project area is expected to continue to have proportionately greater amounts of available recreation resources compared to the nation as a whole. For most recreation environments, the resource base for the western portion of the United States is expected to grow more rapidly or decline more slowly compared to the eastern portion of the country (English et al. 1993).

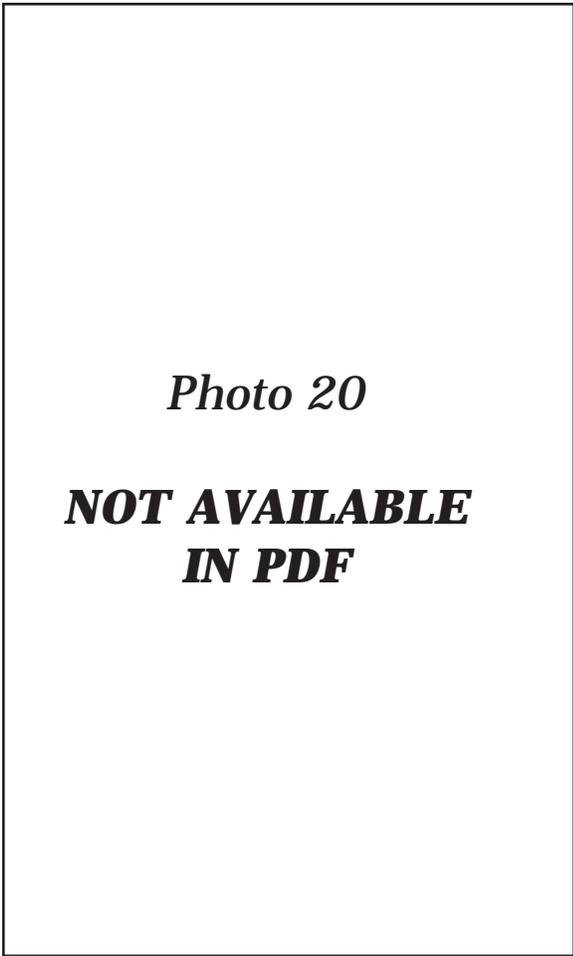


Photo 20: Trail use in less-developed settings is expected to be one of the fastest growing recreation activities in the project area. Photo by Doug Basford.

Recreation Use

Between 1991 and 1993 an average of 200 million recreation activity days per year occurred on Forest Service- or BLM-administered lands in the interior basin. Half of this use occurred in the UCRB, where day use and motor viewing accounted for 45 percent of the recreation activity days. Camping, fishing, trail use, and hunting were the next most popular recreation activities. Roaded natural settings receive about 75 percent of all activity days. Activities such as trail use occur mainly in primitive/semi-primitive areas, while camping is mixed, with about half of the visits occurring in roaded natural settings and one-quarter each in primitive/semi-primitive and rural/urban settings.

According to the National Survey of Fishing, Hunting, and Wildlife-Associated Recreation conducted by the U.S. Fish and Wildlife Service, just over six million people were estimated to have participated in wildlife-oriented activities within the project area. About 20 percent of these visitors were not residents. Wildlife viewing, photography, and related wildlife activities were more popular than hunting and fishing in the States of Oregon, Washington, Idaho, and Montana. Projections made by all four States in their Statewide Comprehensive Outdoor Recreation Plans showed that trail use, a majority of which takes place in less-developed settings, is expected to be one of the fastest growing activities.

A Harris and Associates (1995) public opinion poll covering Oregon, Washington, and Idaho found high participation rates for outdoor activities, notably higher among Idahoans questioned.

Percent who have fished or hunted in past year:

	<u>Northwest</u> <u>(3 States)</u>	<u>Idaho Only</u>
A lot	15%	28%
A little	28	28
Not at all	57	44

Percent who have hiked or camped in past year:

A lot	22%	28%
A little	46	52
Not at all	31	19

Source: Harris and Associates (1995)

Recreational fishing in the Project area includes chinook, coho, and steelhead salmon, and rainbow, bull and cutthroat trout. Introduced brown trout and brook trout also are popular recreational fish. As the quality of traditional fisheries has declined, some fishing enthusiasts have shifted to introduced warm water species such as bass.

Scenery

Scenery is important to both residents of and visitors to the project area, contributing to quality of life and supporting economic benefits through recreation and tourism. According to the 1990 Resources Planning Act (RPA) program update, viewing scenery has the highest participation rate of any recreation activity in the United States, with approximately 21 percent of the population participating. The supply of scenery in the project area was measured in terms of landscape themes and degree of scenic integrity. Landscape themes were also identified for 394 ecological subsections within the project area.

Issues in Recreation Management

The most recent Statewide Comprehensive Outdoor Recreation Plan (SCORP) for each of the four main States was surveyed to help define other current recreation issues for public agencies: (1) The need for cooperation and coordination among land management agencies; (2) funding problems; and (3) maintenance and development of facilities.

Landscape Themes

Landscape Themes range from an essentially natural landscape, such as Wilderness, to one that is highly developed, such as an urban area. Themes indicate how people perceive environments in a very general sense. Themes are images formed by combining landscape character (natural attributes) and scenic condition (human or cultural attributes). They are not goals for future management, but rather show what currently exists. The five themes used to describe project area landscapes are Forest and Shrub/Grasslands (Naturally Evolving), Forest Lands (Natural Appearing), Shrub/Grasslands (Natural Appearing), Agricultural Lands, and Developed Areas.

Several other common issues, though not among all State SCORPs, include access, education/information, and liability.

Perhaps the biggest issue is financial. The supply and quality of recreation opportunities will decline relative to increases in population and use without continued investment and maintenance of recreational resources and facilities. Forest Service and BLM budgets for recreation are declining, making it difficult to adequately staff and maintain existing facilities and setting (Lundgren 1995). In response, Federal land managers are contracting out more and more recreation operations, from large-scale recreation and wilderness planning efforts to management of campgrounds and reservation systems for river running and other activities.

Photo 21

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Photo 21: The project area contains world-class salmon and trout recreational fisheries. Photo by Doug Basford.

Scenic Integrity

Scenic integrity in the project area was described using five categories, ranging from very high, where the landscape is visually intact with only minute deviations, to low, where the landscape is heavily fragmented and human activities and developments strongly dominate the landscape character. Scenic integrity is not necessarily the same as high quality scenery. For example, large expanses of open grassland that contain few developments may score high on integrity, but may not be the type of landscape typically associated with high scenic quality. Similarly, landscapes may contain roads and other types of developments, and still be considered highly scenic.

A measure of Scenic Integrity for Federal lands was developed by the ICBEMP project by combining Geographical Information system (GIS) data on vegetative structure, landform, and road density. This inventory provides a broad depiction of existing scenic integrity within the project area. While scenic integrity is described as in good shape (just one percent was rated as very low and seven percent as moderately low), a comparison with location of areas of scenic integrity to the current forest conditions indicates that a significant portion of the areas rated with high or very high scenic integrity are also at risk from stand-replacing fire. While the impacts to scenery from some stand-replacing fires may be short-term (such as air quality and landscape fragmentation), many areas are at risk from a more severe fire regime uncharacteristic for that site, where longer term risks to soils and other resources affecting scenery could occur.

Cultural Resources

Federally administered lands must comply with a number of Federal laws and regulations protecting cultural resources, including the Antiquities Act and the National Historic Preservation Act.

Cultural resources are the nonrenewable evidence of human occupation or activity as seen in any area, site, building, structure, artifact, ruin, object, work of art, architecture, or natural feature, which was important in human history at the national, State, or local level. There is, however, more than one view of what constitutes cultural resources. The academic and legal definitions tend to focus on tangible evidence such as sites and artifacts.

American Indians find this definition too narrow. They view their entire heritage, including beliefs, traditions, customs, and spiritual relationship to the earth and natural resources as sacred cultural resources (Columbia River System Operations Review FEIS 1996).

The project area has been occupied by humans for more than 12,000 years, hence it has much evidence of human activity. By its very nature this evidence is site specific and beyond the scope of the broad-scale nature of this document, but this in no way detracts from the significance of cultural resources or the need to appropriately protect them. The inventory, detailed descriptions, and protection or mitigation of site-specific cultural resources are better discussed on a local basis, and will be addressed in BLM and Forest Service management plans, activity plans, and other local environmental and ecosystem analyses.

Livestock Grazing

Grazing has been an important part of the interior Columbia Basin since the mid-1800s. Until 1905, livestock operators used the public lands on an unregulated basis. Between 1905 and 1934, the Forest Service began to introduce allotments and grazing systems on lands they administered. From 1934 through 1946, with passage of the Taylor Grazing Act, allotment-based grazing was extended to the rest of the public domain. After World War II, both the Forest Service and BLM began to make expanded investments in range rehabilitation and management as authorized in the Multiple Use-Sustained Yield Act, the Federal Land Policy and Management Act, and the Public Rangelands Improvement Act of 1978.

Livestock operations are an important part of agriculture in the Project area. Cattle and calf sales account for 29 percent of total agricultural output in the basin as a whole. Table 2-14 presents some relevant facts about the role of agriculture in the nine BEA regions in the entire ICBEMP project area and the Upper Columbia River Basin planning area.

The data in Table 2-14 suggest that dependence on agriculture and on public land forage varies from region to region and county to county. Thus, changes in land management policies that affect stocking rates on Federal

Photo 22

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Photo 22: Livestock grazing has been an important part of the interior Columbia Basin since the mid-1800s. Photo by Melanie Miller.

lands, that limit or preclude grazing in certain areas, or that increase the costs of operating on leased or permitted allotments, would have impacts that vary from region to region and county to county, as well. Similarly, the ability of individual ranches to cope with changes in Federal grazing policies and practices would vary depending on the size of the herd, dependence on Federal forage, availability and cost of alternative sources of feed and forage, amount of debt, interest rates on that debt and the percent of household income coming from off-ranch employment or business activity(ies).

The departments of the Interior and of Agriculture expect the number of cattle grazing on public lands to decline by about one percent per year for the next 20 years. Evidence indicates as ranchers grow older, more operators are leaving the profession than are entering it. In some rural areas with population growth, base properties (home ranches) on which herds overwinter are being converted to resort or residential developments or to dairy operations. For sheep, the elimination of the wool subsidy resulted in some marginally profitable operations selling

Table 2-14. Role of Agriculture and Cattle and Calf Sales in Regional Economics of the Project Area.

Trade Regions	Farm/Ranch Income as percent of Total Labor Income	Value of Agricultural Products Sold (millions of 1992 \$)	Cattle/Calf Sales as percent of Total Agricultural Output	Dependency on Federal AUMs*
Tri-Cities	12.3	2,196	22.3	1.4
Spokane	3.0	646	14.5	2.5
Missoula	0.7	117	48.1	1.0
Idaho Falls	7.8	852	25.6	11.2
Twin Falls	17.2	962	30.1	6.1
Boise	4.5	1,098	45.4	11.9
Pendleton	9.5	780	30.0	6.6
Redmond-Bend	5.0	388	30.1	9.1
Butte	0.4	57	76.2	2.4
Total UCRB	6.6	7,096	28.8	7.0

* Dependency is defined as the portion of total feed consumed by cattle and sheep in an area provided by permitted use of Forest Service and BLM lands. The column displaying dependency on Federal land AUMs understates rancher dependency on Federal grazing permits due to the nature of seasonal grazing systems and the number of cattle in feedlots and dairies that also consume feed and contribute to total cattle/calf sales.

off all of their lambs, rather than retaining female lambs as replacement ewes. These, and other ongoing trends, are acting to reduce the size of herds and flocks operating on the public lands (USDI, USDA 1994).

Total Forest Service and BLM forage use does not wholly represent the reliance of permittees on this forage. Federal forage often is more significant to ranchers than suggested by total supply figures because of their seasonal grazing patterns. It is not the total feed, but the number of livestock feeding part of the year on Federal range that many stress as an important factor. Seasonal use of Forest Service and BLM lands occurs approximately 25 to 30 percent during spring, 24 to 30 percent during summer, 21 to 27 percent during fall, and 2 to 7 percent in during winter (Economics STAR 1996).

Grazing fees for most western public lands administered by the BLM and Forest Service will be \$1.35 per animal unit month (AUM) in 1996, down \$0.26 from 1995. The formula used for calculating the fee, established by Congress in the 1978 Public Rangeland Improvement Act, has continued under a presidential executive order issued in 1986, in which the grazing fee cannot fall below \$1.35 per AUM. The annually adjusted grazing fee, which takes effect every March 1, is computed by using a 1966 base value of \$1.23 per AUM, which is then adjusted according to three factors: current private grazing land lease rates, beef cattle prices, and the cost of livestock production. The fee decreased for 1996 because of lower beef cattle prices and higher production costs.

Commercial Timber Harvest and Other Forest Products

Timber supply and demand are determined by the simultaneous interaction of global, national, regional, and local consumers, producers, and land owners. Timber harvest levels in the project area have been declining since the early 1960s as a proportion of the total United States harvest, currently standing at ten percent of total. Combined timber harvests for all owners in the planning area declined by roughly seven percent since 1986 and are expected to decline by another five percent by the end of the decade (1990 RPA). In 1991, timber harvest from Forest Service-administered lands accounted for

34 percent of the total for the UCRB. Timber harvest from forest industry-owned land is larger than from other private lands.

Declining and less predictable Federal timber availability and technological and other changes in the forest products industry have affected people. These effects contribute to decreasing employment opportunities for forest products employment and have also contributed to economic and social hardships in communities with high employment in firms dependent on Federal timber. Declining timber availability has affected people directly through job losses and indirectly through effects on government, with reduced funds for schools and roads. Declining and less predictable Federal timber availability has resulted from: (a) actual reductions of timber caused by declining forest health and (b) the challenges and complexities of meeting current regulations and policies in an ever-changing legal environment, especially in relation to broader issues such as ecosystem health, anadromous fish, and other wide-ranging species of concern. National and regional consequences have resulted from less predictability of resource flows from Federal lands, with effects on the customs and cultures of communities dependent on public-land-based resources.

Local mills can no longer assume they can compete for local timber sales, even when the volume of timber for sale in an area is maintained or increased. As mills west of the Cascade Mountains have reached into eastern parts of Oregon and Washington, and as far as Idaho for timber, unprocessed logs have moved unprecedented distances. The "domino" effect of mills moving east for supply essentially meets a dead end in the upper Columbia River Basin, as the amount of commercial timber available to the east is very little. Sufficient concern led to proposals in 1994 for an "Inland Empire" sustained yield unit that encompassed most National Forests in the upper Columbia River Basin planning area. This proposal would have excluded the participation of timber purchasers from western and central Oregon and Washington in timber sales on National Forests in the upper Columbia River Basin, bringing relief to mills in the upper basin in competing for timber sales in the area.

Figure 2-22 displays annual timber harvest levels in the UCRB for Federal lands and the total.

Special Forest Products

Because of the long history and economic significance of logging and milling, the role of special forest products is sometimes overlooked. However, the collection of forest plants for commercial processing and trade in the project area is a small but growing industry. It is estimated that this infant industry is already producing several hundreds of million dollars per year in product sales. Above three-fifths of this value came from floral greens and Christmas ornamentals. Other significant special forest products include wild edible mushrooms, huckleberries, and medicinals. In this industry, an estimated 70 percent of jobs involve low-paying and seasonal harvesting activities. The other 30 percent of jobs, which are better paying, are in processing and marketing.

The number of permits granted to collect special forest and range products is expected to increase substantially. This will result in the need to manage the resource to assure it remains sustainable. Adjustments to silvicultural practices may be necessary to meet the sunlight and disturbance needs of species that comprise special forest products.

Photo 23: In 1991, timber harvest from Forest Service-administered lands accounted for 34 percent of the total for the UCRB.

Photo by Ravi Miro Fry.

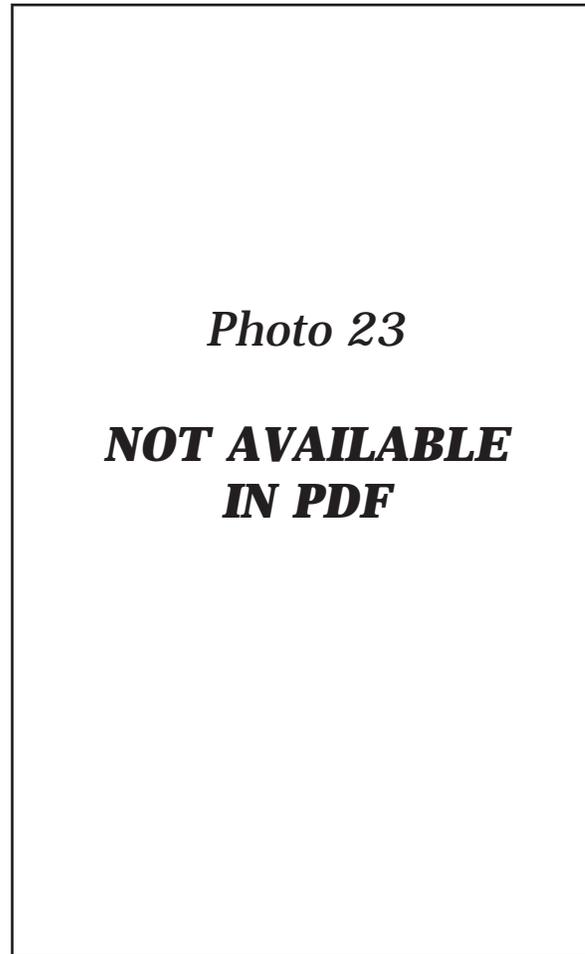
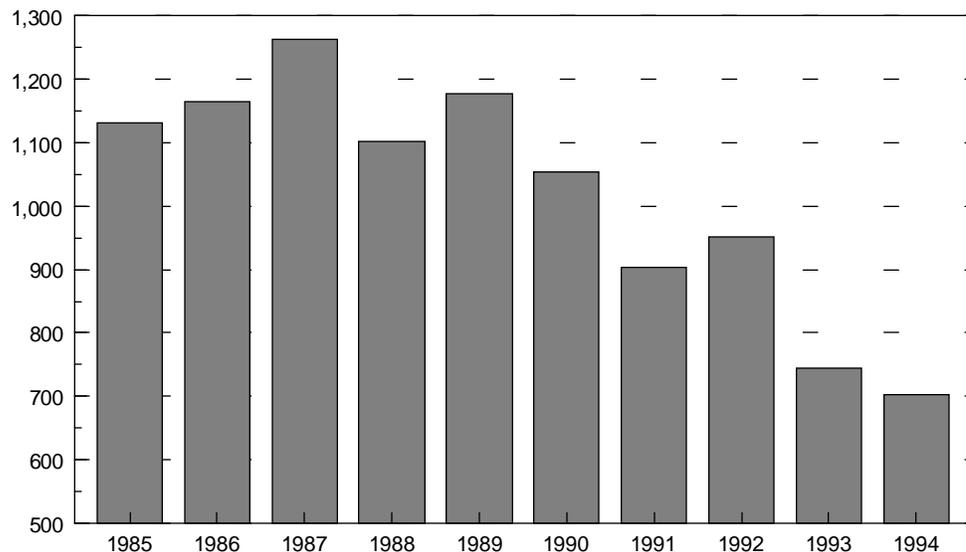


Figure 2-22. Estimated Annual Timber Harvest from Federal Lands in the UCRB Planning Area, 1985 through 1994.



Minerals and Energy

Deposits of gold, silver, and base metals, including copper, lead, and zinc, have for more than a century contributed to the regional economy. Gold placers have been worked in many places within the basin since before pioneer days. Other metals including aluminum, molybdenum, tungsten, nickel, chromium, magnesium, and antimony have played substantial roles in regional and local economies; potential for new discoveries is high. Non-metallic mineral products including phosphate rock, gemstones, and a wide range of construction and industrial minerals have been mined in the basin. Development of coal, oil, natural gas, and geothermal resources in the basin has been locally important. Exploration and development of minerals is authorized principally by the General Mining Law of 1872 for "locatable," primarily hard rock minerals, and the Mineral Leasing Act of 1920 for phosphate rock, and oil and gas. Mineral operations must comply with other Federal laws, including the Clean Water Act.

The value of recent mineral production in Idaho and Montana is shown in Table 2-15. In addition, the portion of the project area in Nevada is in close proximity to the mines which provide Nevada with its leading position in gold production (exceeding \$2.4 billion) in 1994. Mining directly contributes one percent of gross State product for Idaho and 6.5 percent for Montana. The mining contribution to overall output in the Interior Columbia Basin was 4.2

percent of the total (Micro IMPLAN for 1990). The majority of this was from nonfuel minerals, with the mineral fuels accounting for less than one quarter of the mining contribution.

Table 2-15. Value of Mineral Production for the Four Principal States in the Upper Columbia River Basin, 1992 through 1994.

State	Production (\$ million)		
	1992	1993	1994
Idaho	310	274	343
Montana	539	484	492

Dramatic increases in the value of mining outputs from the late 1970s to the present in Idaho and Montana can be attributed to price increases for metals, notably gold and silver, on world markets. This encouraged expansion of production in these States. Advancement in processing technologies, such as heap leaching of gold and silver ores using cyanide, has made many mineral sites economically viable, and in some areas such as Valley County, Idaho, the technology has led to the creation of mining employment in the past 15 years.

The 100 counties of Idaho, Montana, Nevada, Oregon, Utah, Washington, and Wyoming contain nonfuel minerals valued at \$912 million in 1992 (3 percent of total United States mineral

Photo 24

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Photo 24: Mining has contributed to the regional economy for more than a century. Photo by USFS/Boise NF

production value). Twenty of the 100 counties in the region (a few outside the basin) accounted for more than 90 percent of the value in the past decade. The production of metals represented the dominant portion (75 percent), mostly from the production of gold. The metals silver, copper, molybdenum, magnesium, lead, and zinc, and the industrial minerals phosphate and sand and gravel also feature prominently in the region. The top ten minerals-producing counties in the project area are Shoshone (ID), Custer (ID), Caribou (ID), Elko (NV), Owyhee (ID), Stevans (WA), Sliver Bow (MT), Lincoln (MT), Chelan (WA), and Ferry (WA).

While little if any bauxite mining occurs in the project area, aluminum reduction in the project area contributes a significant portion of world and United States production. Aluminum smelters in the interior basin include ALCOA in Wenatchee, Kaiser in Mead, and Columbia Aluminum in Goldendale, Washington; Columbia Falls Aluminum Co. in Columbia Falls, Montana; and Northwest Aluminum in The Dalles, Oregon. These plants have had between 16.7 and 20.6 percent of the U.S. operating capacity available since 1981.

Approximately 11 tons of sand, gravel, and stone are produced per capita in the seven-State region encompassing the Columbia River Basin. Sand, gravel, and stone form the base for infrastructure and other construction. Any economic or population expansion in the region will necessarily be accompanied by expanded demand for these construction materials, resulting in increased production at operating sites and possibly creating the need for developing new sites.

Minerals exploration and production activities now represent a small and declining (on a proportional basis) part of the basin's economy. In 1990, the value of the production of nonfuel minerals represented 4.2 percent of the project area economy. Mining is more significant in the Montana portion of the project area where it represents a higher share of domestic product. One argument mentioned for the decline in mineral exploration and development is that mining and mineral processing in the U.S. are subject to increasingly complex and time-consuming rules under Federal and State laws; as a result, the mining industry is shifting more and more of its exploration and production activities to other nations. Costs

include lost opportunities for income and employment, and possible environmental degradation at off-shore sites. Nonetheless, under current Federal law, it is difficult for the Forest Service or the BLM to prohibit mining of locatable minerals on the public lands if the deposit can be profitably produced. Thus, the focus of agency efforts on lands that will be mined is to prevent unnecessary and undue degradation and to assure reclamation of disturbed lands.

Utility Corridors

BLM- and Forest Service-administered lands in the interior Columbia River Basin contain thousands of linear miles where lands serve as transportation and utility corridors, including State and Federal highways, county roads, electric power lines, natural gas pipelines, and other infrastructure which link human communities in the region. Hydroelectric facilities on Federal lands are licensed pursuant to the Federal Power Act of 1920. Designation of "Scenic Byways" on BLM- and Forest Service-administered lands was recognized in the Intermodal Surface Transportation Efficiency Act of 1991. Designation of utility corridors through land-use plans was included in the Federal Land Policy and Management Act (FLPMA) of 1976.

Utility corridors (electric, pipeline, and communications) connect generation sources (such as hydroelectric dams) with customers. Regulations require the consideration of designating corridors in the land-use planning process. The designation of utility corridors through land-use plans can help minimize the proliferation of such rights-of-way that might occur if there were no planning. Congress recognized environmental and socio-economic concerns in the 1970s, at a time of rapid growth in energy development in the western United States, and authorized both the Forest Service and the BLM to issue regulations for lands they administer. In the Columbia River Basin, corridors associated with the development of the region's hydropower system have affected a substantial amount of land. Maintenance of the existing infrastructure, including reducing hazards from vegetation growth, requires access in order to maintain utility services. In addition to the existing corridors in use, other corridors have been designated for possible future expansion when warranted.

Road System

A discussion of the road system currently in place on National Forest- or BLM-administered lands is needed because road access is important to many users, supports the bulk of economic activity generated from agency lands, and represents a substantial public investment. This discussion describes the amount and type of roads on agency lands, construction and maintenance costs for the road system, and the human uses and values attributed to unroaded areas.

Road Inventory

The inventoried road system on Forest Service- or BLM-administered land in the project area includes approximately 91,300 miles of roads, 90 percent of which are on National Forest System lands. Most of the existing road system, some 63,000 miles, are in eastern Oregon and Washington National Forests, leaving approximately 24 percent of the road system in the UCRB. A large proportion of the roads serves high clearance vehicles (roads designed and maintained to a low standard), leaving less than 20 percent of roads for passenger vehicles (roads designed and maintained to a high standard). Low standard roads provide for most land and resource management and protection needs, and they also provide dispersed, roaded recreation. The remaining high standard roads serve both management and concentrated recreation use. It is estimated that up to 33 percent of the low standard roads are closed to the public by gates or earth barriers for all or most of the year.

Construction and Maintenance Costs

Roads represent a considerable public investment to facilitate use of Forest Service- or BLM-administered lands. Roads are tangible physical and financial assets that represent a substantial commitment of land and capital. The operation of this large road system is expensive, as shown by the following Forest Service-derived costs. Roads in the UCRB planning area typically cost from \$10,000 to \$150,000 per mile to construct and \$100 to \$1,600 per mile to maintain, depending on the topography and type of road built. Based on current construction costs, the road system would cost approximately \$1.75 billion to build today. Historically, commercial timber harvest

paid for 90 percent of construction costs and 70 percent of maintenance costs. The rest was paid for by congressional appropriations. In the absence of commercial use, maintaining the existing road system would continue to cost an estimated \$10 million annually. Maintenance costs are highest for high standard roads at \$550 per mile (Abernathy 1996). In addition to out-of-pocket costs, roads eliminate or reduce the productive capacity of those acres committed to the road prism and waste areas.

Currently in the Pacific Northwest, National Forests are approximately 30 to 50 percent short of funds for maintenance of the current road system to existing standards. Construction and reconstruction funds have decreased from about \$200 million in 1980 to \$25 million in 1995. This reflects both lower appropriated funding as well as declines associated with purchaser credits from timber sales (which declined from 5.2 billion board feet in 1980 to less than 1 billion in 1995). Use of the transportation system on Pacific Northwest National Forests has changed over the last decade. In the 1980s, system usage was approximately 70 percent timber harvest, 20 percent recreation, and 10 percent administrative traffic; since the reduction in timber sale programs, this has shifted to 35 percent timber, 60 percent recreation, and 5 percent administrative traffic (Kozlow 1995).

Roads have enabled almost all of the economic activity generated by Federal lands in the UCRB planning area, and will continue to be important in this respect. Roads also supply or enable the majority of recreation use, including winter recreation. However, increasing scarcity of unroaded areas and appreciation for unroaded benefits puts substantial, if intangible, value on unroaded lands. Benefits of unroaded areas can include high quality water, habitat for wildlife and fish, ecosystems with limited human disturbance, scenery, and primitive recreation. The extent of road development is critical for determining whether an area is considered for wilderness or similar designation. Building roads in areas previously valued for their unroaded condition generates a cost for lost opportunity, in addition to added benefits associated with automobile access. Looking to restore or protect certain environmental conditions, road management options now include various degrees of road closures, lower maintenance levels, and full road obliteration. This "disinvestment"

approach is also a logical response to reduced road maintenance funding that can be expected if commercial use decreases. Costs of this strategy include the cost of closing and obliterating roads, short-term environmental costs, and lost access to managers and the public. The total cost of lost access depends on miles of roads lost, road maintenance class, and location.

Fire and Fuels Management

The Organic Act of 1897 applying to Federal forest reserves directed that the “. . . Secretary of Agriculture shall make provisions for the protection against destruction by fire and depredations upon the public forests and national forests . . .” making abundantly clear the Government’s policy to suppress wildfires. The 1910 fire in northern Idaho and western Montana reinforced the policy to control wildfire, and additional congressional laws like the Weeks Law in 1911 and the Clarke-McNary Act in 1924 authorized fire protection in a cooperative manner with other land owners. In response, fire suppression on National Forests was actively implemented for several decades. Areas that may have otherwise burned without

active suppression have had fire excluded. Records show low amounts of acreage burned in UCRB through the middle part of this century, with an increasing and noticeable trend in increased fire size in the past ten years.

Along with the significant upward trend in the number of acres of forest land burned, as discussed in the Forestland section of this chapter and shown in figure 2-23, the Federal agencies have incurred large costs in fire suppression, as well as post-fire rehabilitation costs. Fire suppression costs on National Forests in the UCRB for fiscal year 1994 were a record 250 million dollars, surpassing the previous record in 1992.

Detailed information kept on fire suppression costs since 1989 shows that the costs of fire suppression of forest fires are higher on a per-acre basis than for range fires. Suppression costs increase overall with the size of fire, even though suppression costs on a per-acre basis decline with the size of fire due to the large costs of mobilization and initial suppression efforts. Despite the increased efficiency in suppressing larger fires, initial attack and mobilization efforts are cost-effective in the long

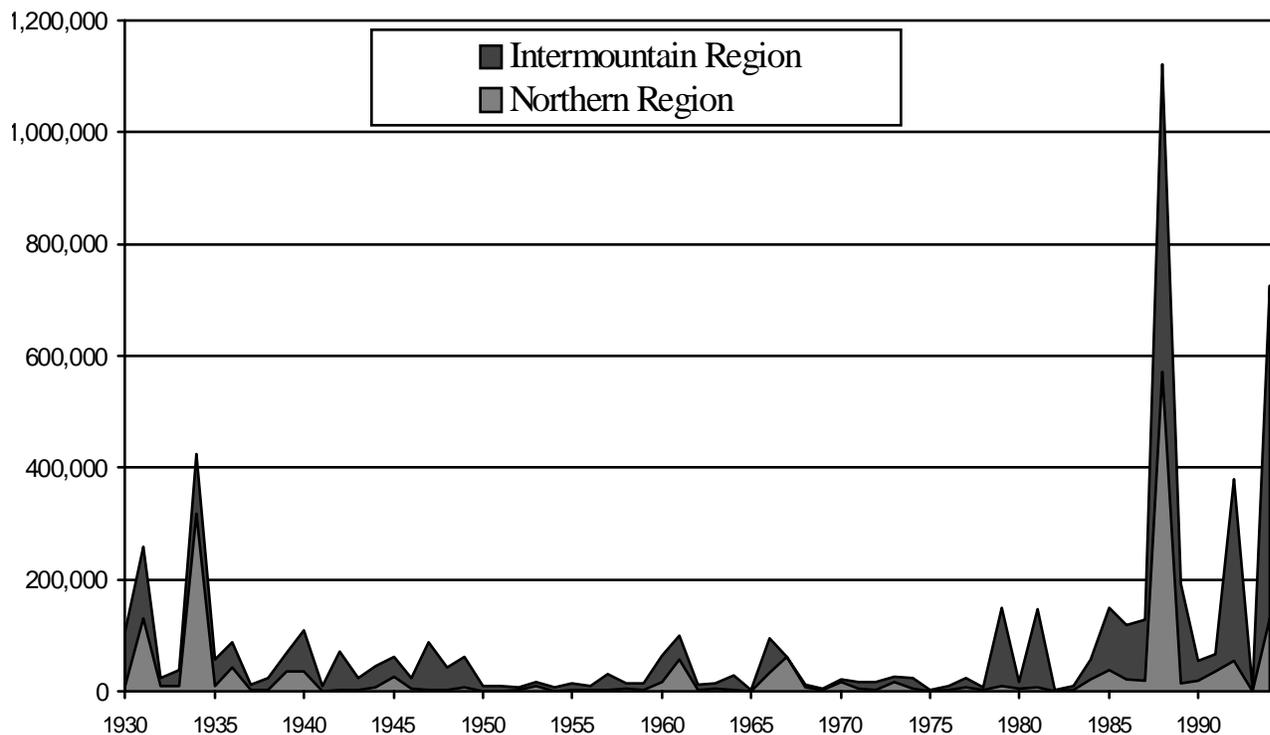


Figure 2-23. Wildfire acreage in forest Service Northern and Intermountain Regions: 1930 through 1994.

*Photo 25***NOT AVAILABLE IN PDF****Photo 25a**

Federal agencies have incurred large costs in fire suppression, as well as post-fire rehabilitation costs. Photos by Ravi Miro Fry (A) and Karen Wattenmaker (B).

Photo 25 b*Photo 25b***NOT AVAILABLE IN PDF**

run because total fire size still leads to overall higher costs. Additionally, initial attack efforts are necessary for fires that start in or near a wildland-urban interface. In contrast, large range fires achieve their final size in a fairly short period of time, generally only a few days. Duration of suppression activities for a large range fire is much less than for a forest fire of equivalent size.

Economic effects of fires and fire suppression activities include benefits to seasonal fire fighting employees and to contractors who supply fire fighting and support services to the Federal agencies. In larger fires, locally affected communities may experience a temporary increase in retail business due to the presence of fire fighters. Local areas may also experience negative consequences during

and after fires because local public lands may be closed to livestock grazing, recreation and hunting. Federal agency outlays for fire suppression equipment and services often do not accrue to a local area because contractors which supply Federal fire suppression efforts are not necessarily associated with the fire location.

With larger fires, Federal agencies often must temporarily reallocate staff to fire suppression and recovery efforts, away from other programs. Resources lost or negatively affected by severe fires (watersheds, fisheries, wildlife, scenery, timber, forage) represent another economic and social cost to society from fires. Efforts to salvage burned timber must occur in a short time in order to extract the value. Low intensity surface fires, on the other hand, may actually provide economic and social benefits

beyond the short-term impacts such as additional forage for wildlife and reduction of fuels that can contribute to stand-replacing fires.

Given the recent trends in fire activity, future costs for fire suppression can be expected to maintain their high level, or even increase under adverse conditions in dry years. A recent Forest Service study on fire suppression costs on large fires found that, even after accounting for inflation, agency expenditures are increasing. Nationwide, emergency fire suppression costs are expected to rise by \$20 million annually in order to fund annual Forest Service emergency suppression expenditures each year into the future (Truesdale et. al. 1995). Actions that reduce fuels through prescribed burning, thinning and commercial timber harvest may change the prospects for future uncharacteristic fires and these expected increases in emergency fire suppression costs.

Local, Regional, and National Use

A discussion of the different kinds of economic contributions that National Forest- or BLM-administered lands provide society is important because land-use choices will benefit people differently. Recognition of these differences is important for achieving economic and social goals.

Generating Wealth versus Generating Value

There is a difference between valuing Forest Service- or BLM-administered lands based on how they serve national demands versus economic contributions they make locally. The economic value and societal importance of these lands continues to increase as use increases, and as the unique attributes they provide become more scarce. However, this increased value does not necessarily generate local income or funds to support local government investments in infrastructure or social services. Much of the value is captured by those living elsewhere, who either travel to Federal lands to recreate, use water downstream from Federal lands, catch fish spawned in federally managed streams, or benefit from the protection of important federally managed ecosystems. A complete

accounting of economic benefits would include value obtained by people who may not ever visit the project area, but who benefit from knowing it exists now and in the future. Often referred to as existence or preservation values (Duffield 1994), these indirect benefits can range from 3 to 20 times greater than benefits flowing from direct use of a resource. The magnitude of the numbers are subject to dispute, but there is no question that project area resources have national value aside from their role in the marketplace.

Traditional commodity uses of Forest Service- or BLM-administered lands have favored local use and generated local income. Uses that are growing in importance favor regional and national users and generate benefits accordingly. This can be interpreted as a shift of Forest Service- or BLM-administered lands from being primarily local and regional assets to being national assets. While these lands have always been national assets by definition, the actual use and way the lands are valued increasingly reflect this.

Payments to Local Government

The Forest Service and BLM make payments to local governments to compensate them for the non-taxable status of the Federal lands in their jurisdiction. The formulas used to calculate the amount of money received varies by agency and product. Generally there is a "per acre" payment associated with county population (PILT, payments in lieu of taxes) plus an additional "revenue-sharing" amount available if revenues exceed a certain threshold. While the PILT payment is fixed, the extra money from revenue sharing is important to some counties. Potential reductions in these payments caused by changes in agency land uses are a concern to county governments accustomed to this revenue. For counties within the jurisdiction of the Northwest Forest Plan (Oregon, Washington, California), Congress has legislated special appropriations to partially offset revenue losses stemming from reductions in agency timber sale receipts.

The governments of rural communities may be relatively unprepared to deal with the kinds of changes that might result from fundamental shifts in Federal land management policies. Rural governments are mostly part-time governments. For example, in the State of Idaho, there are 199 incorporated cities, 179 of

which (90 percent) have populations below 5,000 persons. Of these 179 communities, only 7 have full-time city administrators. Many municipalities with populations under 5,000 have a city clerk as their only full-time employee. Mayors and city council members in the typical rural community receive little to no pay. Budgets are small and discretionary dollars are non-existent. These attributes of smaller, rural communities may make it difficult for them to withstand complex changes. This can lead local governments to rely more heavily for technical and financial assistance from higher levels of government (Harris, Brown and McLaughlin 1995), which may limit local initiative, autonomy and creativity, and create a predominant role for interest groups in the policy process.

Economic Importance of Agency Timber and Forage to Counties

Relating the use of agency lands to economic conditions locally (the county or community level) is important to the public and to government entities. While economic systems operate over much larger areas, agency economic and social policy generally focuses on communities. The “timber and forage importance index” presented in table 2-16 provides a partial but useful picture of the historical relationships between agency land uses and local economic activity.

Overview of Employment

A discussion of the contribution that agency lands make to economic growth and employment is important because they are affected by agency land use choices and are key elements of major public issues.

Regional Employment Status

The economy of the project area has undergone substantial change over the past three decades (table 2-17). In terms of job formation, the project area has grown much faster than the nation as a whole. Total jobs have increased even during periods when employment in manufacturing (other than instruments and electronics), mining, logging, farming, and

ranching was either stagnant, falling, or moving erratically (Rasker 1995). Employment in service industries has increased significantly in that the number of households receiving “nonlabor income” (income from transfer payments, dividends, interests, and rents) has grown. Increases in service employment includes gains in recreation and tourism plus gains in business, education, management, and engineering services generated by new residents that moved to the area for its amenities and small town character. Evidence of this change is shown in part by the 61 percent of the job growth since 1969 in services, retail sales, and finance, insurance and real estate. Rapid employment growth is also found in advanced technology, retail trade, transportation services, and construction.

Much of this economic growth has been centered in metropolitan counties and counties experiencing rapid population growth. Analyses which focus exclusively at regional levels, such as Rasker (1995), Niemi and Whitelaw (1995), and Power (1996), however, only tell part of the story. By focusing on the region as a whole, studies can overlook the significant differences between large cities and small rural communities in the region (Harris, Brown and McLaughlin 1995), and even between small communities (Robison, McKetta and Peterson 1996) most affected by Federal land management policies. In principle, both regional and local information is important.

Employment Associated with Forest Service- or BLM-administered Lands

Direct employment generated from Forest Service- or BLM-administered lands falls mostly into job categories such as manufacturing (especially wood products), agriculture (especially livestock grazing), agricultural services (including forestry services), mining, and Federal employment. Another important employment sector affected by agency land use is recreation and tourism, an industry not directly measured by employment data. Together, these employment categories are the ones most likely to be measured as an effect of changing agency land uses. Currently, over 220,000 jobs are associated with livestock

Table 2-16. Factors Used to Score Timber/Forage Importance Index for Upper Columbia River Basin

County	% Federal Land ¹	% Timber from National Forests ²	% Forage from Federal Land ³	% Population Change (80-92) ⁴	% Nat Resource Employment ¹	Economic Diversity ⁵	% Federal Payments ⁶	Importance Rating
Idaho								
Ada	46	71	1	29	3	High	.3	Low
Adams	65	71	24	6	20	Low	29	High
Bannock	33	N/A	6	5	3	Medium	.6	Low
Benewah	10	18	1	-2	7	Low	2.6	Medium
Bingham	29	N/A	3	7	12	Low	.6	Medium
Blaine	76	N/A	14	51	8	Medium	5.7	Low
Boise	77	71	17	35	12	Low	36	High
Bonner	45	45	1	3	5	High	6.3	Medium
Bonneville	54	N/A	8	17	4	Medium	.7	Low
Boundary	61	45	1	19	12	Medium	17.3	High
Butte	86	N/A	20	-12	19	Low	10	High
Camas	65	N/A	39	-8	23	Low	12	High
Canyon	6	71	0	15	10	High	.08	Low
Caribou	40	N/A	15	-18	20	Low	9	
Cassia	56	N/A	9	4	22	Medium	6	
Clark	66	N/A	34	0	34	Low	10.5	High
Clearwater	59	33	4	-17	9	Low	16.4	High
Custer	93	N/A	36	20	23	Low	21	High
Elmore	73	N/A	9	-5	10	Low	35.6	Medium
Fremont	60	75	11	4	21	Low	7	High
Gem	38	71	3	5	16	Medium	4	
Gooding	53	N/A	1	1	29	Medium	4.2	
Idaho	83	65	6	-4	16	Medium	44.4	High
Jefferson	53	N/A	1	14	15	Low	2.4	
Jerome	26	N/A	1	4	22	Medium	2	
Kootenai	32	37	1	30	5	High	3	Low
Latah	17	19	8	11	7	Low	5.3	Low
Lemhi	91	75	17	-5	17	Medium	19.2	High
Lewis	3	33	.5	-18	16	Low		Medium
Lincoln	75	N/A	4	0	20	Low	8	Medium
Madison	20	75	2	23	12	Low	.6	Low
Minidoka	36	N/A	1	2	17	Low	2.2	
Nez Perce	4	19	0	5	5	High	.2	Medium
Oneida	53	N/A	16		21	Low	3.6	

Table 2-16. Factors Used to Score Timber/Forage Importance Index for Upper Columbia River Basin (continued).

County	% Federal Land ¹	% Timber from National Forests ²	% Forage from Federal Land ³	% Population Change (80-92) ⁴	% Nat Resource Employment ¹	Economic Diversity ⁵	% Federal Payments ⁶	Importance Rating
Owyhee	76	N/A	23	3	40	Low	6	High
Payette	26	N/A	1	10	10	Medium	.7	
Power	34	N/A	4	10	25	Low		
Shoshone	75	45	12	-29	28	Low	36.7	High
Teton	33	N/A	4	33	24	Low	3.6	
Twin Falls	52	N/A	8	6	12	High		Medium
Valley	88	71	17	24	8	Medium	38.7	Medium
Washington	37	N/A	7	-1	19	Medium	6	
Montana								
Deer Lodge	39	N/A	2	-20	6	Low	.8	
Flathead	74	47	1	21	4	High	1.6	
Granite	64	14	4	-6	20	Low	3.6	High
Lake	18	14	0	16	10	Medium	.5	
Lewis and Clark	48	23	1	15	4	Medium	1.2	
Lincoln	76	N/A	17	0	9	Medium	9.4	High
Mineral	83	69	3	-6	10	Low	4.2	High
Missoula	43	14	1	8	4	High	.6	Low
Powell	49	66	1	-2	13	Low	4.4	High
Ravalli	73	66	1	22	9	Low	3	High
Sanders	52	69	0	2	13	Medium	4.2	Medium
Silver Bow	52	66	10	-10	8	Low	.4	High
Elko, Nevada	??	N/A	38	16		Low		
Humbolt, Nevada	??	N/A	38			Low		
Teton, Wyoming	??	N/A	24	31		Low		

Sources: ¹Percent Federal Lands. Source: Machlis, G. et al. 1995.

²Percent Timber from NFS. Sources: Keegan, C.E.; et al. 1990; Keegan, C.E., et al., 1992.

³Percent Forage from Federal Land. Source: Frewing-Runyon, 1995

⁴Percent Population Change (80-92). Source: EA REIS CDROM

⁵Shannon Weaver Diversity Index using employment data. Source: Greg Alward and IMPLAN database.

⁶Percent Federal Payments. Sources: Williams, 1995; Schmit 1996.

Table 2-17. Employment By Industry in the Project Area.

Item	1969	1992	% Change
Total Employment	908,954	1,619,923	78.2
Farm & Ranch Employment	120,504	112,264	-6.8
Nonfarm Employment	788,450	1,507,659	91.2
Agriculture Services, Forestry, Fisheries & Other	9,308	35,208	278.3
Mining	8,590	10,372	20.7
Construction	42,243	81,929	93.9
Manufacturing	119,703	176,067	47.1
Transportation, Communications & Utilities	44,931	67,304	49.8
Wholesale Trade	38,110	72,826	91.1
Retail Trade	141,661	279,555	97.3
Finance, Insurance & Real Estate	51,879	90,684	74.8
Services	153,587	411,911	168.2
Federal Civilian	29,178	37,965	30.1
Military	28,188	25,391	-9.9
State & Local	116,924	206,629	76.7

Source: Bureau of Economic Analysis, Regional Economic Information System (CDROM)

grazing, recreation, and timber harvest on lands administered by the Forest Service or BLM. It was estimated that recreation accounts for 87 percent of these jobs, timber harvest for 12 percent, and livestock grazing for one percent (Economic STAR 1996).

Manufacturing

Manufacturing is important to discuss because wood products manufacturing, a job category closely tied to agency timber harvest, falls into this category. It is also still perceived by many to dictate the economic health of the overall regional economy, though this view no longer fits. The reduced regional importance of wood products manufacturing is due more to rapid growth in other sectors of the economy than to decline in the wood products industry. Wood products manufacturing employment is still locally important to some places in the UCRB planning area.

Manufacturing jobs in total make up a smaller percent of total employment in the planning area than nationally, suggesting that the area is not comparatively strong in manufacturing. This is not the case for wood products manufacturing (one component of the

manufacturing sector), where all BEA regions covering the planning area have wood products employment above national levels. The highest percentage is found in the Missoula BEA region at five percent, while the lowest in the UCRB are the Twin Falls and Idaho Falls BEA regions both at 0.5 percent. The national level is also approximately 0.5 percent. Since 1982 timber industry employment for the UCRB (Idaho and Montana) has ranged from 18,500 to 22,000 jobs (Haynes 1995). Timber industry employment peaked in 1978 in the UCRB at 28,000 jobs. Reductions in employment were due to several factors, including legally imposed reductions on Federal timber sales, the recession of 1990, technological improvements, and changes in the mix of products manufactured by the region's timber industry. Changes in milling technology and competitive product marketing are longer-run forces gradually reducing the industry's employment.

The view of future timber-related employment in the project area is thus somewhat unclear. If the salvage program approaches the harvest objective set for it by Congress, timber employment may rise. In the near future, declining harvests in the project area and ongoing reductions in the number of workers needed as new technologies

substitute capital for labor can be expected to continue a trend first evident in the 1970s and 1980s (Brunelle 1990) leading to a decreased timber employment. Over the longer term (20 to 50 years), timber employment is expected to stabilize and then increase as harvest levels rise in response to the demand of the increasing U.S. and worldwide human population for housing and business construction.

Not reported in the Economic Assessment is the pulp and paper manufacturing sector, which is also sensitive to forest products harvest from BLM- or Forest Service-administered lands. Major employment centers are in Lewiston, Idaho, and Missoula, Montana. While only a small percentage of harvested timber is directly consumed by pulp plants, a significant amount of mill residue from sawmills and plywood plants are routed to pulp manufacturing facilities in the UCRB, resulting in over 40 percent of the volume of timber products harvested in Idaho and Montana constituting raw material for pulp, paper, and board products. Pulp and paper mills outside the UCRB also use forest products from the area. Pulp plants are therefore likely to be affected by changes in available saw timber from Federal lands, as well as potentially available timber from thinning activities that, because of species composition or diameter, are not of saw timber quality.

Agricultural Services and Farm Employment

Unlike the manufacturing group, the agricultural services group has a higher percent of total employment in the planning area than nationally (2.5 percent versus 1.1 percent), showing the comparative economic importance of this employment in the planning area. Individually, all BEA regions except the Spokane BEA region show an employment percentage greater than national levels. The highest percent employment in agricultural services for the UCRB is the Twin Falls BEA Region at 4.7 percent of total. Farm employment for the project and planning areas is greater than nationally. Project area-wide farm employment is 7.8 percent compared to national farm employment of 2.2 percent. Farm employment in the Twin Falls BEA Region is at 14 percent, while in the Idaho Falls BEA Region it is at 7.3 percent, and in the Boise BEA region is at six percent.

Mineral Resources

The mineral industry generally provides less employment in the planning area than nationally. The Spokane region, where mining contributes 0.61 percent, still less than the 0.66 percent nationally, but more than the project area-wide level of 0.45 percent. Highest in the UCRB is the Butte BEA Region at 1.47 percent of total, followed by the Idaho Falls BEA Region at 0.83 percent of total.

Recreation

Recreation-based employment, while not directly measured by the Bureau of Economic Analysis, is estimated to generate approximately 15 percent of employment in the planning area (Economics STAR 1996). Recreation employment must be estimated from the proportion of other industry group employment that supports recreation, for example, amusement, retail, lodging, eating and drinking, and gas stations.

Project area-wide recreation supports an estimated 190,000 jobs. Hunting supported the greatest number of jobs (49,000), followed by driving for pleasure (40,000), and day use (34,000). A regional economic study conducted by the Forest Service in the central Rocky Mountains recognized the export nature of some tourist-related service industries. The effect of these service/tourist industries on the local economy was found to be similar to the earnings returned to a local firm from the export of physical commodities (DeVilbiss 1992).

Information on the distribution of economic effects of recreation-related spending in the basin is limited. Quinn (1985) found on the Boise National Forest that recreation-related expenditures occur primarily in the Boise area (where most of the recreationists reside), and that economic effects in the rural communities surrounding the Boise National Forest were modest. Robison and Freitag (1994) concluded that existing approaches to estimating forest recreation economic impacts may exaggerate economic benefits of recreation in rural communities.

Most of the basin is occupied by one or more ungulate species such as elk and mule deer, which are important both for social reasons (recreational hunting and viewing), and for economic returns to local communities through

expenditures during hunting seasons. For example, approximately 450,000 hunters pursue elk annually within the basin and in 1991 were estimated to have spent \$111 million, yielding a total economic effect of about \$225 million and 3,467 jobs. Although the permit numbers may be limited for some other ungulate species such as mountain goat or bighorn sheep, the public, at least some individuals or corporations, are willing to pay up to \$300,000 for the opportunity to harvest a single bighorn sheep. Viewing ungulates is also important to many people.

Forest Service and BLM Employment

Federal employment associated with Forest Service or BLM administration of public lands can be important locally, both in terms of job numbers and wages per job. This importance results from agency policy, particularly with the Forest Service, to locate administrative units in small, rural communities. The estimated 9,000 to 10,000 jobs in the project area may not be substantial regionally, but 250 jobs in Salmon, Idaho, or 120 in Darby, Montana, are very important to the vitality of these rural communities.

In addition to contributing to local governmental revenues or economic activity in rural counties in the ways discussed above, both the BLM and the Forest Service have programs which result in direct spending within their jurisdictional areas. This spending by the agencies contributes to economic activity in rural settings. For example, the BLM and the Forest Service annually spend an average of \$3.99 per animal unit month of forage grazed by livestock on lands they administer. There are an estimated three million AUMs of Federal forage permitted by the two agencies in the project area. Thus, by extension, the two agencies are generating an estimated \$12 million per year in economic activity in the project area and in national (Washington, D.C.) and regional offices through their spending on rangeland programs. The two agencies also spend considerable amounts annually on their recreation, timber, fire management, and minerals programs (estimates of this spending were not developed for this EIS). Wages and salaries of Federal employees stationed in rural communities in the region, and purchases of goods and services from local businesses to support the offices, also contribute to local economies.

Employment and Income

Economic activity can be measured by number of jobs or by income (choices being per capita income, personal income, and household income). Income is generally more difficult to measure than employment. Recognizing that wages differ by job type, it is often noted that the types of jobs created or lost might be more important than the number of jobs. The generation or protection of “family wage jobs” in a community is often stated to be important.

One way to examine the importance of Forest Service- or BLM-administered land uses to local income is to compare the industries most likely to be directly affected by Federal land management choices with the industries that contribute the highest total wages and wages per job. For the top five wage jobs in six eastern Oregon counties having important ties to lands administered by the agencies, lumber and woods products manufacturing and Federal Government employment are the most frequently occurring high wage jobs (Oregon Employment Department). Wood products manufacturing and Federal government employment also show up in the top five for total income (wage per job times the number of jobs). Most other high wage and high total income job categories for these counties are not directly tied to lands administered by the agencies. Frequent top five finishers for “per job” wages include utilities, local and State government, communications, heavy construction, and trucking. Frequent top five finishers for total income include State and local government, utilities, health services, and automobile related industries.

Recreation, a recognized growth industry tied to Forest Service- and BLM-administered lands in the project area, illustrates a different story told by employment versus income. An estimated 15 percent of employment in the project area is supported by recreation—more than either wood products manufacturing or mining (Economics STAR 1996). However, many service industries supported by recreation activity, such as amusement, retail, lodging, eating and drinking, gas stations, and others, generally experience lower wages than manufacturing, mining, forestry and Federal employment, the other employment sectors closely tied to land uses of the agencies (Oregon Employment Department). In fact, the

Economic Assessment reported the total value in recreation willingness-to-pay at roughly \$1.1 billion, and that recreation-related employment in the project area at 190,000 jobs. Assuming that the willingness-to-pay translates to wages and salaries, each job has a value of \$5,800, well below the per capita income for the region.

Counties strong in manufacturing jobs earn high wages but experience a lower per capita income than counties strong in other job categories (McGinnis and Horne 1995). This suggests that manufacturing jobs are supporting more single-income households than other job categories, a factor related to labor force participation rates, age and family structures, and commuting patterns (Economics STAR 1996).

Population and Income Change by Trading Area

Data developed for the project suggest that economic and social factors differ in character at the county level based on the settings within the basin. Specifically, between 1980 and 1990, settings that were highly dependent on government programs and/or mining performed below average in terms of retaining jobs and population. Rural counties with a great deal of natural or naturally appearing landscape(s) experienced above average job and population growth performance as did urban and metropolitan areas with diversified economies—especially ones with strong high technology and business, engineering, medical or educational services components. Settings dependent on timber, farming, and ranching finished in the middle, growing more than mining- and government-dependent areas but less than high amenity rural locations or settings with diversified economies. To illustrate this relationship, the UCRB was divided into six regions (map 2-29). These regions vary in terms of their dependence on differing industries and/or are diversified to varying degrees.

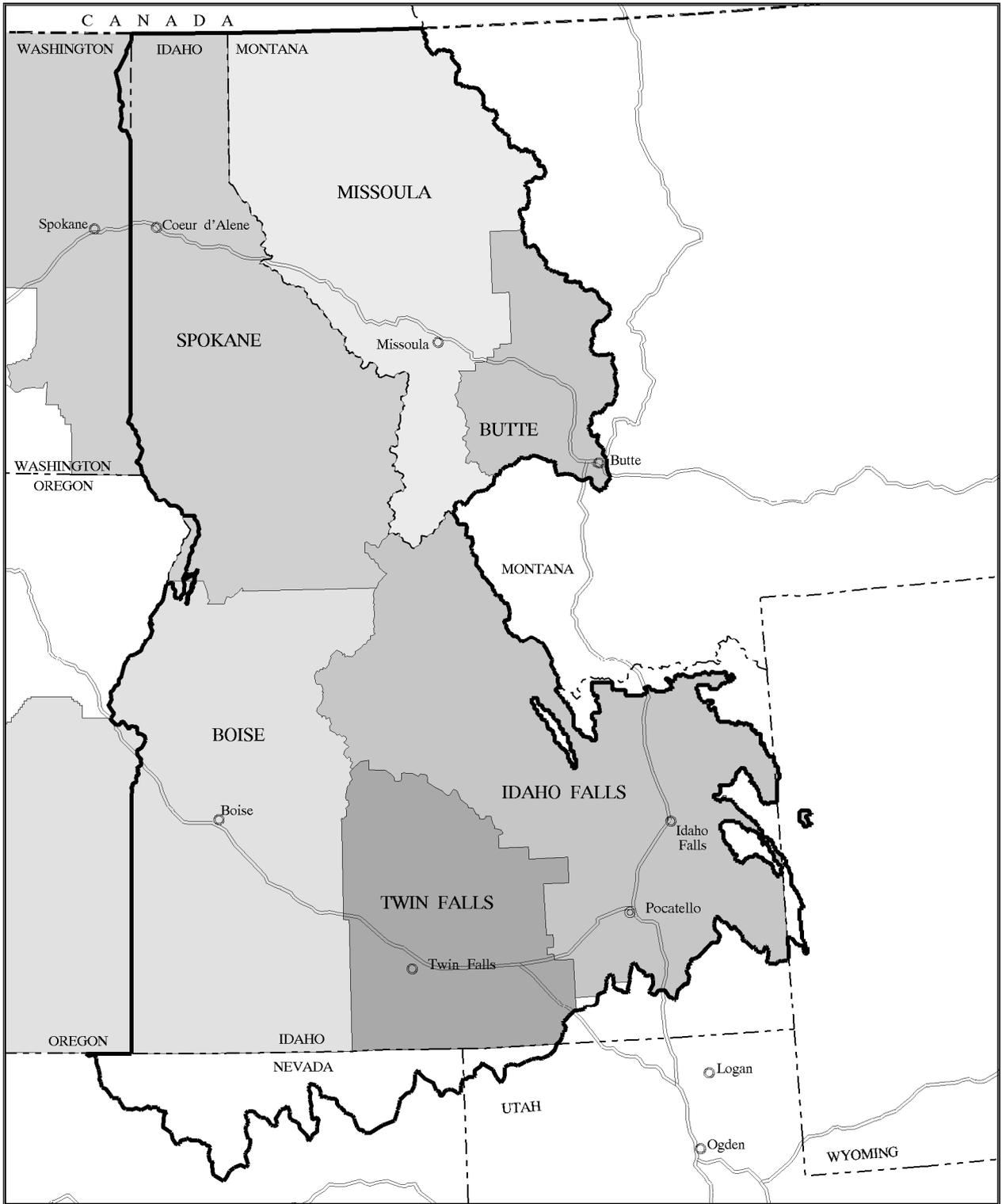
The 10 counties north of the Salmon River and part of the Spokane BEA Region are heavily dependent on timber, but recreation, tourism, and retirement are a growing force in the economy of the area. The region as a whole posted a modest increase in population between 1980 and 1992 (+7.5 percent). However, substantially all that growth occurred in two very scenic and rapidly diversifying counties,

Kootenai (+30 percent) and Boundary (+19 percent), where recreation-related employment and retirement migration are stimulating growth, and in Latah county (+11 percent), home to the University of Idaho. In this region, half of the counties lost population between 1980 and 1990. However, in a partial reversal of fortune, 80 percent of the counties in this region recorded population increases between 1990 and 1992.

The Boise BEA Region (ten counties in southwest Idaho) is the most diversified. It is the only region with a metropolitan area (Ada and Canyon Counties). In addition, high technology (electronic and instrument) manufacturing and business, educational, engineering and management services are significant and growing components of the region's economy. This diverse setting was the fastest growing UCRB region from 1980 to 1992, with a 21.8 percent increase in population. Likewise, 60 percent of its counties gained population between 1980 and 1990, and 90 percent saw growth between 1990 and 1992. The one county that didn't grow from 1990 to 1992 was the one most dependent on government.

The Twin Falls BEA Region (seven south central Idaho counties and Elko County, Nevada) is diverse in another way. It includes a strong travel and recreation component (Sun Valley at its north end is a world-class resort and Elko, Nevada, to the south is a major casino/night club leisure destination). Its farm and ranch economy has also matured with the addition of a number of food processing, dairy, cheese, and feedlot operations. This diverse region grew in population by 19.9 percent from 1980 to 1992. Additionally, 50 percent of its counties recorded population increases between 1980 and 1990, and all of them grew between 1990 and 1992.

The Idaho Falls BEA Region (13 eastern Idaho counties) is highly dependent on farming, food processing, and government. However, it also is home to the Idaho National Engineering Laboratory, one of the largest facilities of the Department of Energy. It also includes one major public and one large private institution of higher education (Idaho State University in Pocatello and Ricks College in Rexburg). It includes two large trade centers (Pocatello and Idaho Falls), is the Idaho gateway to Yellowstone and Teton National Parks, and has several communities with tourist-based economies (Jackson Hole, Wyoming, and



Map 2-29.
Economic Subregions of the
Upper Columbia River Basin

INTERIOR COLUMBIA
 BASIN ECOSYSTEM
 MANAGEMENT PROJECT

Draft UCRB EIS
 1996

-  Major Rivers
-  Major Roads
-  EIS Area Border
-  Trade Center(s) shown for each Economic Subregion (shaded in gray).

Stanley and Lava Hot Springs, Idaho). This region grew in population by 10.8 percent from 1980 to 1992. During that decade, 71 percent of the counties in this region recorded population increases. Likewise, 93 percent of the counties in the region had growing populations between 1990 and 1992.

The Missoula BEA Region (7 counties in northwest Montana) is heavily dependent on timber and government. It posted a population increase between 1980 and 1992 of 12.6 percent. However, nearly 70 percent of that growth occurred in the very scenic and rapidly diversifying Flathead and Missoula Counties (where recreation-related employment and retirement migration are stimulating growth). In this region, 57 percent of the counties gained population between 1980 and 1990. All counties in this region recorded population increases between 1990 and 1992.

The five counties making up the Butte/Helena BEA Region one highly dependent on government. It is the only region which lost population between 1980 and 1992. (Additionally, 80 percent of the counties in that region lost population from 1980 to 1990, and 40 percent lost population from 1990 to 1992.)

Economic Character of UCRB Counties and Communities

While the regional scope of this analysis does not permit presentation of information on every individual community, it is possible to extrapolate from existing data to understand where communities might be found that are dependent on timber, mining, ranching, and travel and retirement (Harris et al. 1995).

Communities dependent or reliant on timber industry activities are most likely to be found in the Spokane and Missoula BEA Regions (which are, respectively, 21 and 11 percent dependent on forestry for earned income). However, a number of timber-dependent communities are also likely to be present in Adams, Boise, Gem, and Valley Counties in the Boise BEA Region and in Granite and Powell Counties in the Butte BEA Region.

Mining dependent and/or reliant communities are most likely to be found in Caribou, Custer, Shoshone, and Power Counties in Idaho; Elko

County, Nevada; and Lincoln and Silver Bow Counties in Montana.

Tourism, recreation and retirement growth communities are most likely to be found in Bonner, Idaho, Kootenai, Latah and Nez Perce Counties in the Spokane BEA Region; Valley County in the Boise BEA Region; Blaine (ID) and Elko (NV) Counties in the Twin Falls Region; Madison (ID) and Teton (WY) in the Idaho Falls BEA Region; Flathead and Missoula Counties in the Missoula BEA Region; and Lewis and Clark County in the Butte BEA Region.

The BEA Regions most likely to include ranching communities are Boise, Twin Falls, and Idaho Falls. These three regions accounted for 90 percent of the cattle and calf sales in the upper Columbia River Basin in 1992. These three regions are also home to 75 percent of the working ranches that graze their herds or flocks on public lands. Within these three regions, Owyhee, Washington, Adams, Gem, Cassia, Twin Falls, Blaine, Gooding, Lincoln, Lemhi, Custer, Bingham, Jefferson, Butte, Bonneville, Power, and Fremont Counties in Idaho, and Elko County in Nevada are most likely to have public land ranching-dependent communities. While it lies in a region where only three percent of earned income comes from farming and ranching, Idaho County is also likely to have several communities that depend on public lands livestock operations.

Communities

The well-being of rural communities economically or socially connected to Forest Service- or BLM-administered lands has been an important, perhaps dominant, factor driving the social policy of these agencies. Given this, an understanding of the relationship between past agency social policy, land-use choices, and rural communities is an important component of the affected environment. Concern about the future of rural communities, especially those with high employment in industries that rely on management of resources on Forest Service- and BLM-administered lands, was reflected by a congressional hearing in Grangeville, Idaho (July 5, 1995), where the subcommittee discussed its concerns about "Endangered Communities."

Communities

The term community has several definitions. Communities can be groups of like-minded people who gain strength from their relationships and associations. Communities of interest are people employed in a similar profession, people who participate in the same activities, or those who share a set of values ~ for example, the “ranching community” or the “environmental community.” As used in this chapter, the term community has a more traditional definition: spatially-defined places such as towns. This is an important scale because the community is where people socialize, work, shop, and raise their children. It is often the focus of their social lives. Counties are an important political scale to consider, but leaving the discussion at that level would mask many differences among communities within a given county.

The Bureau of Census recognizes 476 communities within the project area, including 29 cities with more than 10,000 people and 49 Census-Designated Places—locations that are unincorporated but have an identity to the local population. Of the other 398 small rural communities, 68 percent are communities of 1,500 or fewer people, which is the smallest size class. These range from 22 to 1,500 people, with an average population of 520.

For the Interior Columbia Basin Ecosystem Management Project, many types of information about communities in the project area were collected. Harris (1995) contains a complete description of this information, which included Community Self-Assessments—interviews with 1,350 community leaders and residents in nearly half (198 out of 476) of the project area’s communities. Profiles of the economic structure of each community were developed (Robison, as cited in Harris 1995). These will be a valuable source of information for the Forest Service and BLM to use in future planning, and for communities themselves.

Conventional Notions of Community Stability

The concept of stability, in reference to both economic and community stability, has long been the dominant theme of social and economic policy for the Forest Service, and somewhat less so for the BLM. In examining community economic stability, the distinction between the business needs of industry and community economic needs is often overlooked (Society of American Foresters Report 1989). While employing local residents, industry interests inevitably differ somewhat from the communities in which they are located. Both communities and industry are substantially affected by forces beyond their control. For communities, the problem is cumulative. The

community has little influence on the business decisions made by firms operating in their area, while the firms have little influence on macroeconomic forces that influence their operations. As such, rural communities often find themselves vulnerable to boom/bust cycles, commodity price fluctuations, and national and regional recessions (DeVilbiss 1992).

Berck et al. (1992) sought to examine the influence of timber industry characteristics against that of larger business cycles by separating the effects of being a small, isolated county with an open economy from the effects of being dependent upon timber. Results showed that the timber industry has surprisingly low variation in employment, not much above that of manufacturing as a whole and much lower than agriculture or fisheries. What is different about forestry is the historical extreme reliance of communities on the timber industry alone, and that forestry is usually practiced in isolated areas (Berck 1992).

A study that included several counties in the project area by Ashton and Pickens (1995) found it was not the presence of resource use employment in a county that caused communities to be vulnerable to change, but the absence of other jobs that would contribute to a more diverse economy. Ashton found that areas with proportionately high resource use employment and Forest Service involvement tend to be less diverse. More favorably, Ashton found that these counties tend to be diversifying more rapidly than others.

Some important economic factors that affect the relationship between a community and local wood products firms includes alternative sources of supply, geographic isolation (proximity to larger labor markets), inter-mill competition for timber supply, inter-community competition for jobs, and changing technology.

Timber Dependency

An issue closely tied to community stability is timber dependency, commonly put in the context of “timber-dependent communities.” Timber dependency is a broadly recognized and studied economic relationship between Federal lands (most notably National Forest System lands), rural communities, and regional economies. It is an issue deeply entrenched in the conventional wisdom of Federal land use in the West and frequently mentioned by the public in the project area. The issue of community dependency on the livestock grazing industry has not received the same attention as timber dependency, and is not specifically dealt with here.

Defining the resource dependency of communities generally stems from two factors. First is the size of the community ~ a variable usually representing rural, geographically isolated communities highly influenced by outside economic forces and typically tied to one or few resource-based industries. Second is the percent of employment associated with timber harvest and processing. Dependency of wood processing mills on Forest Service timber became important after World War II when National Forests increased the volume of timber available for sale. This made it possible for an increasing number of facilities to get established without any timber land of their own, relying only on Forest Service timber (Dana and Fairfax 1980).

In 1987, the Forest Service identified communities thought to be dependent on National Forest timber, as required by the National Forest Management Act of 1976, including communities in the UCRB. This list was re-examined in the context of new information to see if the listing appeared valid today. The original criteria for listing communities was that forest products employment was at least 10 percent and that local wood processing firms used at least 50 percent National Forest timber. Harris (1995) concluded that 41 communities in the UCRB planning area (32 in Idaho and 9 in Montana) have greater than 10 percent employment in timber processing. The percentage of National Forest timber used could not be determined. Mill surveys for Oregon and Washington showed that the number of mills relying heavily on National Forest timber has generally decreased in the last decade.

Isolated Timber Dependent Communities

Recognizing that the 1987 list of 66 timber-dependent communities (17 of which were in Idaho, 13 in Montana) developed by the Forest Service did not account for population growth and geographic isolation, project economists reassessed the list using these criteria. The rationale was that communities judged to be most at risk to changes in Federal forest policy were those with small populations, located in counties with low population densities, and judged to be relatively isolated (Rheiner 1996). The result was the identification of 29 “isolated timber-dependent communities” thought most dependent on Forest Service timber sales (Economic STAR 1996). This revised list, together with the additional community assessments provided in the Social STAR (1996) provides information useful for identifying “priority areas” where the Forest Service might emphasize land uses that serve economic and social needs of these communities.

Predictability of Supply and Processing of National Forest Timber

Public scoping has shown that predictability in the volume of timber offered for sale from agency lands is an important public issue. Predictability is important to industries that harvest and process timber and to communities with substantial employment in these industries. An explanation of this issue is important to understanding the economic and social conditions relevant to agency decisions.

Predictability in timber sale volume offered from lands administered by the Forest Service and BLM is difficult to achieve. Declining and less predictable Federal timber availability has resulted from: (a) actual reductions of timber caused by declining forest health and (b) the challenges and complexities of meeting current regulations and policies in an ever-changing legal environment, especially in relation to broader issues such as ecosystem health, anadromous fish, and other wide-ranging species of concern. Unpredictable natural disturbances such as wind storms, forest fires, insect and disease epidemics, and even volcanic eruptions can change the amount and rate of timber volume that can be offered for sale. The same holds true for social change from lawsuits, new laws resulting from realignments of political

power, and changing national budget priorities ~ all of which can affect the volume of timber offered for sale.

Expectations of Timber Supply

Historically, the timber industry assumed that national forest allowable sale quantity (ASQ) projections were indicative of future supply. Though ASQ represents a maximum capability rather than planned output, the industry position was reinforced by Forest Service even-flow supply policies; historical agency timber outputs at ASQ level; timber program funding by the Congress; and specific supporting language in NFMA regulations (36 CFR 219.16). Also, ASQ projections were the only numbers offered to represent potential future supply until the Northwest Forest Plan first used the term “probable sale quantity” or PSQ to portray the likely level of sustainable harvest as opposed to a theoretical upper limit (ASQ). Like ASQ determinations, the probable sale quantity was based on regulating the acres available for timber harvest to calculate a “sustainable” supply, but timber volume reductions were factored in to account for new silvicultural practices and operational limitations (Johnson et al. 1994).

Even if the flow of timber sale volume were predictable, it could not be assumed ~ absent agency policies that emphasize local resource use ~ that local mills would be the successful bidder for agency timber sales, nor that local communities would receive logging and processing jobs as a result of those sales. In the mid 1990s, the destination of Forest Service timber was less predictable as processors reached farther than normal for timber to supply their mills. Log sorting yards and high efficiency mills disperse logs differently than was customary, directing logs to their most profitable use. These conditions undermine confidence that Forest Service timber supply policy alone is capable of supporting jobs in specific communities.

Timber Projections for the Upper Columbia Basin Draft EIS

The timber supply estimates developed for the UCRB DEIS are different than the ASQ-type projections found in land management plans and the PSQ-type projection used in the

Northwest Forest Plan. UCRB Draft EIS estimates are derived from a vegetation succession model rather than a traditional harvest regulation model as used in land management plans. Using a conventional interpretation of sustained yield, the sustainability of these timber volume estimates cannot be verified at this scale. The timber volume estimates in this plan are not specific to National Forests or BLM Districts, nor do they account for changes in land allocations that may result from upcoming land management planning. NFMA-mandated ASQ determinations, not applicable to this Draft EIS, will be calculated through the land management planning on individual National Forests. Similar determinations will be made on BLM Districts with a commercial timber component. It is expected that probable sale quantities (PSQs) will be determined and displayed in supply schedules separate from land management plans.

Federal Policy and Actions Supporting Community Stability

Supporting rural communities through management of public lands is primarily a social goal, though it is often framed in economic terms such as jobs and income. An examination of past agency policy and efforts supporting this goal helps to establish a basis for future decisions. Key factors include the capability and willingness of the Forest Service and BLM to manage the forests and rangelands under their jurisdiction for the benefit of communities.

Neither the Forest Service nor the BLM has a specific legal mandate to provide economic stability to rural communities. Both agencies have legislative direction that permits and encourages consideration of community economic stability when planning or implementing plans. Contemporary legislation guiding both agencies (NFMA and FLPMA) is oriented toward planning methodology rather than specifying economic or social policy goals (Dana and Fairfax 1980). Thus, the Forest Service and BLM have discretion, absent additional guidance from Congress, to establish economic and social goals appropriate to their agency’s missions and available resources.

Rangelands Administered by the BLM

The dominant use on BLM-administered rangelands has been livestock grazing, a use that preceded by 60 years the Taylor Grazing Act of 1934, which is the law that brought regulation to livestock grazing on the public domain lands. The Act gave the BLM a legislative mandate to “stabilize the livestock industry dependent on the public range (Dana and Fairfax 1980).” The strong ownership felt by the livestock operators for the public range did not diminish with regulation. The relatively low productivity of the public domain rangelands under the jurisdiction of the BLM has limited other commodity uses of these lands in addition to livestock grazing. Thus, regulating livestock users has been the primary focus of the BLM on these lands.

In the 1960s the BLM began to expand from regulating grazing to a more comprehensive land management approach. This trend continued with the passage of the Federal Land Policy and Management Act of 1976 (FLPMA), which promoted multiple-use and sustained yield management. This act also sought to promote stability in livestock grazing by authorizing 10-year grazing permits and requiring two-year notices of cancellation. It readjusted the distribution of grazing fee funds, with 50 percent going towards range improvements; at least half had to be spent in the BLM District where it was collected. The act also authorized loans to State and local governments to relieve social and economic impacts of mineral development (Dana and Fairfax 1980).

Forest Service Timber Policy and Communities

Use of the National Forests for national and regional growth and development was the Federal policy when the Organic Act was passed in 1897, and such use has remained important. Early policy represented a belief that resources existed for the benefit of the local residents who needed them. The 1905 Forest Service’s Use Book listed “protecting local residents from unfair competition in the use of forest and range” as a principal objective of the Forest Reserves, apparently in response to concern about the influence of big industry.

The Forest Service was an early promoter of using a sustained yield even-flow timber policy to promote the stability of forest communities (USDA 1933). Congress, in the White Pine Blister Rust Protection Act of 1940, mentioned for the first time maintaining community stability as the purpose of an act of the Federal government. The idea of community stability was firmly connected to timber supply in terms of sustained yield, in the Sustained Yield Forest Management Act of 1944. This Act gave authority to establish Cooperative Sustained Yield Units to “promote the stability of forest industries, of employment, of communities, and of taxable forest wealth” intending to support the stability of communities primarily dependent on Federal timber. This act applied equally to forest lands administered by both the Forest Service and BLM.

The Morse Amendment of 1968 prohibited the export of unprocessed logs from National Forests west of the 100th meridian, with the intent to protect domestic wood processing jobs. Beginning in the early 1970s the Forest Service and the U.S. Small Business Administration implemented a Small Business Set-Aside program. This program set aside a certain percentage of Forest Service timber sales for exclusive bidding by small firms (companies with fewer than 500 employees). Observers of the program believe it helped solidify a timber supply for small firms and maintained a segment of the timber industry operated by small businesses.

The National Forest Management Act (NFMA) of 1976 added substantially to Forest Service community stability policy. It solidified a traditional, but contentious even-flow timber supply strategy for National Forests through the sustained yield and nondeclining even-flow (NDEF) provisions in section 11 (36 CFR 219.16) of that law. Both sustained yield and nondeclining even-flow were designed in part to address community stability issues (Dana and Fairfax 1980). Community stability also surfaced in section 14 (e)(1) of NFMA, requiring bidding methods for timber sales to “consider the economic stability of communities whose economies are dependent on such National Forest materials,” with regulations requiring “dependent communities” to be one of several factors considered (36 CFR 223.88). From this, in 1977 and 1987 the Forest Service developed lists of communities expected to better retain

wood products employment if nearby National Forests had the option of using either oral or sealed bidding to sell timber (from Forest Service correspondence 1977 and 1987).

The National Forest-Dependent Rural Communities Economic Diversification Act in the 1990 Farm Bill sought to provide assistance to rural communities located near National Forests that fit a specified definition of “economically disadvantaged” due to the loss of jobs or income derived from forestry, the wood products industry, or related commercial enterprises such as recreation and tourism in the National Forest (Ashton 1995).

Even Flow and Timber Supply

The remedy for the “boom and bust” cycles favored by the Forest Service has been to maintain an even flow of timber sales, transferring a large share of cyclic economic adjustment costs from the community to the Federal Treasury (Boyd 1989). As applied to the community stability problem, this meant maintaining a constant supply of timber so that macroeconomic-induced changes in timber demand did not shut down the mills (and jobs) in rural western communities.

The even-flow approach was also used to support existing processing capacity (and jobs) in rural areas aside from dampening the effects of business cycles. In one case, this was formally pursued by authorization of sustained yield units under the 1944 law. In other cases, it became a consideration in agency decisions. A proposed 1991 Forest Service policy on below-cost timber programs (timber that the Forest Service sold at a financial loss) specifically allowed extending below-cost programs to lessen effects on dependent mills. The 1977 and 1987 NFMA lists of timber-dependent communities were based more on sustaining customary use than the notion of dampening cyclical effects.

Literature is ambiguous regarding the relationship of sustained timber yields and community stability, as measured by employment in the timber industry (Force 1993). Many factors undermine the potential use of even-flow supply of timber to stabilize rural communities regarded as timber-dependent. Important macroeconomic forces are at work that are beyond local control.

Federal managers are unable to deliver an even-flow of timber according to projections because of the need to manage for other uses and meet changing public desires. Stabilizing an industry is not the same as stabilizing a community. Lastly, Federal timber can be purchased and transported long distances rather than purchased locally and used to provide jobs in the community.

Community Resiliency

Recently, many social scientists documenting challenges facing rural communities throughout the country have concluded that stability is just one way to achieve the broader goal of prosperous, vital communities:

“Community adaptability may be a more useful concept than community stability in assessing which communities will thrive in our rapidly changing world. Levels of human capital, the imagination of community leaders, the ability to access information, and the availability of a flexible, diverse resource base are variables that will likely affect community adaptability” (Beckley 1994).

Community resiliency ~ the ability to successfully deal with the inevitable multiple social and economic changes that are evident in our society ~ is one of the most important indicators of a community’s health and vitality. Harris and others (1995) described resiliency as consisting of population size, economic strength and diversity, attractiveness and surrounding amenities, strong leadership, and other factors such as a community residents’ ability to work together and be proactive toward change. This definition of resiliency is similar to the concept of community capacity (FEMAT 1993).

Harris and others (1995) used the Community Self-Assessment information to develop a relative scale of community resiliency for rural communities of less than 10,000 people in the project area, to measure how well-equipped communities are to deal with change. The most resilient communities tended to be larger in population, have an economy based on a mix of industries, view themselves as autonomous, and have worked as a community to develop strategies for the future. Many communities are beginning to work together to identify ways of capitalizing on their location and other characteristics to cope with the many changes affecting their

health and vitality. The data showed that there are many paths to achieving resiliency.

Population Size and Growth

The population of a community and rate of change of that population are often used as indicators of economic diversity, economic resiliency, community vitality, and whether the community is prospering or in decline. Haynes used population growth as a proxy for economic growth (Economics STAR 1996). The “Forest Service/BLM timber and forage importance index” introduced earlier in this section does the same. Generally, this assumption is reasonable.

Communities with larger populations lead to more businesses such that many industries are represented with many firms in each industry. Employment opportunities follow. This economic diversity provides a cushion to job losses in declining industries because the economy does not depend heavily on any single industry or firm. A larger economy also means that less money leaks from the local economy to pay for goods purchased from outside. The result is a more economically resilient community. It is unlikely that land-use decisions of the Forest Service or BLM will substantially affect communities with larger populations and diverse economies.

The converse of the above is generally true for communities with small populations, having fewer industries and fewer firms per industry. Even where many industries are represented, each may include only a few firms. A decline in one industry or loss of a firm, especially if a major employer, can mean high job loss in the community until adjustments are made. This can be especially disruptive if the community is geographically isolated with few alternative employment opportunities. This situation describes many rural communities with a high proportion of employment in agriculture and natural resource commodity industries. It is reasonable to expect that the Forest Service’s and BLM’s land-use decisions can affect industries that are important to smaller communities near lands administered by these agencies, especially where the communities are geographically isolated.

Population growth is usually associated with economic growth and vice versa. However, this

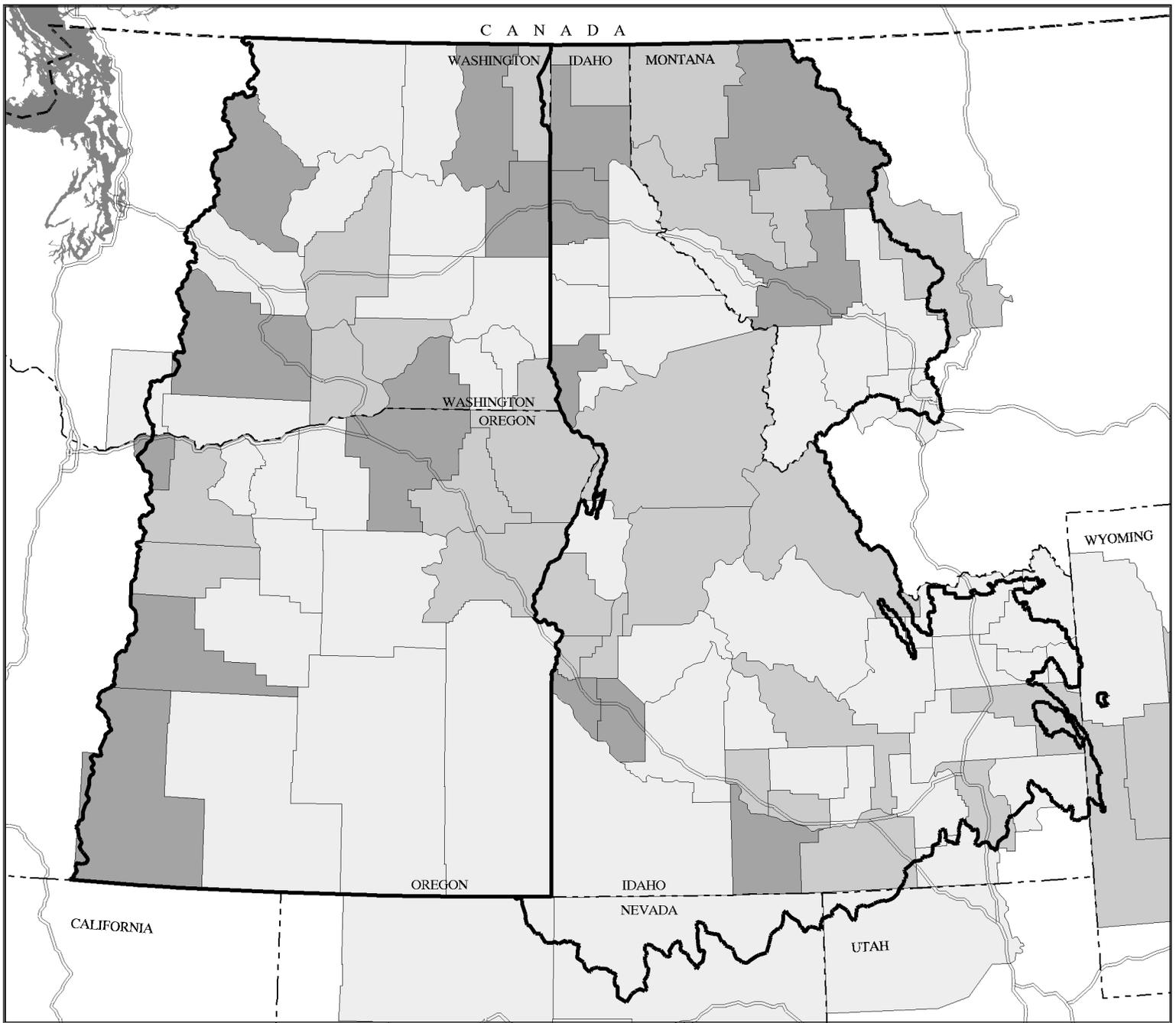
is an incomplete explanation. Some agricultural communities are losing population as greater efficiencies in farming decrease labor demands without decreasing economic output. Gilliam County in Oregon is thought to be an example of this condition. Additionally, a community can experience rapid growth followed by rapid decline (“boom and bust”), a situation well known in the West. Finally, it must be determined whether economic growth is driving population growth or the other way around. The Economic STAR (1996) assumed the latter. The premise was that high levels of environmental amenities, such as clean water and scenic views (mostly attributed to Federal lands), rather than high levels of resource commodity use, provides a quality of life that invites in-migration. Economic growth is thought to follow this amenity-driven in-migration, with substantial credit given to empowering computer and communication technologies.

Analysis of population change by Haynes and McCool (unpublished) could not determine that expected high population growth in the project area would be affected by land-use decisions of the Forest Service or BLM (Economic STAR 1996). Projections of population growth were not done for areas smaller than BEA multi-county regions.

Economic Diversity

Economic diversity is considered an important component of economic resiliency, whether measured at community, county, or regional levels. Economic diversity is considered important to quality of life attributes provided by economic opportunity and services, including infrastructure, medical care, education, commercial services, and the critical presence of job opportunities (Rojek et al. 1975). The following discusses economic diversity at different geographic scales.

A measure of economic diversity using the Shannon-Weaver Diversity Index (Alward 1995) is available for each county in the planning area and for BEA trade regions (map 2-30). Using IMPLAN data, this index is derived from the number and variety of industry sectors and associated employment. Given that economically diverse systems are thought to be more resilient, the index is used here to characterize the ability to absorb and rebound within the planning area.



Map 2-30.
Economic Resiliency Ratings

INTERIOR COLUMBIA
BASIN ECOSYSTEM
MANAGEMENT PROJECT

Project Area
1996

- | | |
|--|---|
|  High |  County Boundaries |
|  Moderate |  Major Roads |
|  Low |  EIS Area Border |

The size of area over which economic diversity is measured is important. The larger the area considered, the greater the economic diversity and expected economic resiliency, especially if it means including a large metropolitan area (trade center). Neither counties nor communities are considered “functional” economies because they do not include enough parts of the economy to be even a moderately complete system. This is why trade regions like those developed by the Bureau of Economic Analysis consist of large multi-county areas. This is illustrated by the fact that the Shannon-Weaver diversity index for every individual county in a BEA region is considerably less than the diversity index for the region as a whole. This also shows why a multi-county region can be highly resilient while many individual counties within that region have low resilience. This is a condition found in the project area.

Community Economic Diversity

The employment profiles of nearly 400 communities with less than 10,000 people in the project area were measured to develop local indices of economic diversity. The methodology followed that developed by Robison in his work on community economic impact analysis (Robison 1995). The resulting economic diversity values represent a relative index of the employment structure of the measured communities. It is a construction based on the number of industries reported in a town and the proportion of the workforce in any single industry. The greater the number of industries and the higher the distribution of the workforce across industries, the higher the index value. This index is a useful characterization of the current employment structure. It is less useful for predicting future change.

Perceptions of Economic Diversity

As part of the Community Self-Assessment (Harris et al. 1995), participants were asked about their perceptions of the economics of their community. People perceived farming and agriculture as most important in terms of dependence of communities on natural resources, followed by grazing and ranching, outdoor recreation and tourism, forest products, and mining and mineral resources. People perceived that most towns’ economies were linked to a mix of natural resources; only nine percent of the communities were perceived as highly independent of farming and ranching,

13 percent independent of tourism and recreation, and 37 percent independent of timber. About 25 percent of all communities were viewed as having a mixed economy, with no dominant industry.

Perceptions were compared with the actual economic profiles of each community. Overall, people were fairly accurate in their perceptions, but they tended to underestimate the diversity of their economy and overestimate the importance of traditional industries. There could be several explanations: people could simply be overestimating dependence on timber; people could be basing their perceptions on income effects or social influence instead of percent of employment; or job growth in non-traditional industries has not been fully recognized.

Community Social and Cultural Attributes

Population size and growth, employment and wages, and economic diversity have been identified as important to resiliency. Based on the responses of participants in the Community Self-Assessment Workshops, community social and cultural attributes are important. These include:

Strong civic leadership ~ A high commitment of individual leaders and groups to community and active involvement in creating and/or responding to change; a strong sense of local control regardless of external events or influences.

Positive, proactive attitude toward change ~ Residents either promote change and thus vitality in community development or, if change is occurring on its own, residents respond positively and create a desirable future.

Strong social cohesion ~ A high degree of consensus in values and goals for a desired future; working together to achieve goals.

Based on these data, together with economic profiles (measuring diversity) of each community, Harris developed a relative scale of community resiliency for rural communities of fewer than 10,000 people in the project area. His intent was to use the resiliency index to measure how well-equipped the community is to deal with change. The communities were divided into four classes, with 25 percent of the communities in each class: low, moderately

low, moderately high, and high resiliency. This methodology is new and as yet unreviewed, but is felt to be a useful in that some common characteristics emerged: more resilient communities tended to be larger, have an economy based on a mix of industries, be more autonomous, be rated by residents as having a local government responsive the public, and have plans for dealing with change (Harris 1995).

Some of the things people typically base their evaluations on include feeling a part of the community, having a sense of control over decisions that affect their future and the future of their community, knowing that local government is acting in ways that benefit people equitably rather than acting for a privileged few, living without fear of crime or environmental hazards, and feeling confident that one's children have a fair start in life (Branch et al. 1982). Forest Service and BLM land uses have little direct effect on these conditions.

Amenity Setting

A high degree of physical amenities ~ the historical character and attractiveness of a community's downtown, the attractiveness of the community's setting regarding scenic and recreational opportunities, and the lack of negative elements such as air or water pollution ~ is another important component of resiliency (Harris et al. 1995).

The presence of desirable environmental amenities, and especially the types supplied by public lands, can contribute to an area's population and economic growth. Scientists differ in their interpretation of the importance of this benefit, which can differ depending on the scale at which it is measured. Because tourism and recreation, retirement settlement, and other uses of Forest Service- or BLM-administered lands can provide significant sources of jobs, income, and personal enjoyment, communities value these agency and other public lands for these uses (Society of American Foresters Report 1989). Some evidence to support this relationship is the high population growth occurring in areas with high recreation use (Johnson and Beales 1994). Ashton found that recreation counties tend to be diversifying more rapidly than others, attributing this to Forest Service and BLM multiple-use policies which provide an environment that attracts both tourists and permanent residents to the area (Ashton 1995).

Rasker (1994), Power (1994), and others have emphasized the role of a high quality natural environment, scenic beauty, and recreation opportunities in influencing population growth and shaping the emerging economy of the project area. For example, Rasker (1995), writing about the project area, stated that,

“As we approach the twenty-first century, there is a striking change in how the region's forests, mountains, streams, rivers, and grasslands contribute to the economic life of its residents. Once, settlers were attracted to the region by the promise of logging, ranching, mining, and farming. Now, the magnet that draws new residents and holds the region's existing inhabitants is environmental quality: clean air and water, handsome scenery, and native wildlife...the region's economy is growing less dependent on resource extraction and more dependent on less tangible qualities: environmental quality, education, entrepreneurship, and capital.”

There is evidence for a positive relationship between environmental quality, amenities, and economic advancement. This relationship focuses in part on the free services the environment provides to the economy (Templet 1995). A study of all 50 States demonstrated that poorer economic conditions exist where environmentally risky activities are more intense (Templet 1995). Other studies (Meyer 1992, Cannon 1993, Hall 1994) similarly found positive relationships between environmental preservation and economic well-being. For example, people migrate to areas based on a variety of factors including environmental quality. McBeth (1995) found that a vast majority of rural citizens chose to remain in or move to their communities because of the environment. Harris (1995) found that 40 percent of new arrivals in Idaho cited the environment as a reason; 63 percent cited “quality of life,” and 22 percent stated they moved to Idaho because of a job. Power (1991) concluded that individuals choose where to live based on attractive natural and (rural) social environments and then economic activity follows. The Rudzitis (1995) survey, however, found that 36 percent of residents in the project area cited job opportunity for living in the region, while 28 percent were in the region because they wanted to live there and then looked for or created a job.

It should also be noted that if environmental quality of the region as a factor attracting new arrivals is occurring after more than a century of land use, then it may be useful to establish whether the region is now attractive in spite of land uses, or whether historical land uses have occurred in a manner and to the degree that there is compatibility with amenity values. Ideally, land-use practices should be designed, and in many cases have been designed, to achieve both maintaining use of natural resources while not contributing to a deterioration of the amenity values of the region.

Quality of Life

Machlis and Force (1994) identified a number of indicators of social conditions regularly monitored by various agencies that provide indirect measures of quality of life. Usually collected at the county level, these indicators include conditions such as crime rates, income and employment levels, pollution, and voting rates. Only employment and income have been closely linked to uses of Forest Service- and BLM-administered lands.

Quality-of-life assessments take into account people’s perceptions. Considerations include perceptions about the attractiveness and aesthetics of the local environment (Pulver 1989) and the quality of services such as infrastructure, medical care, education, and commercial services (Rojek et al. 1975). Many of these characteristics could be summed up in the project area as “small town values.” However, many local residents who participated in the Interior Columbia Basin Ecosystem Management Project suggested that many other factors were meaningless if they did not have a job.

One measure of baseline conditions regarding quality of life in rural communities was provided by participants in the Community Self-Assessment workshops (Harris et al. 1995; the Community Resiliency section describes these data). These community leaders and residents generally rated quality of life in the project area as high; 80 percent believed that their community was “safe, friendly, and a good place to live; few rural communities can match its quality of life.”

A Harris and Associates (1995) public opinion poll covering Oregon, Washington, and Idaho asked people if a major reason they moved to the region was because of a job, because of the environment, or because of family and quality of life. The responses, for the three States as a

whole and for people in Idaho, indicate a clear difference in that the environment and family/quality of life received a higher response than job-related reasons (note that respondents could choose more than one reason). In fact, only in the State of Washington did respondents cite a job as a major reason more than the environment. Idaho led the three States citing the environment and family/quality of life as major reasons for moving. Finally, it should be noted that the difference between citing the environment versus citing family/quality of life as a major reason indicates that people’s perceptions of quality of life include more than environmental considerations, but also take into account family, crime, schools, and other things.

One major reason moved to the Pacific Northwest:

	Northwest (3 States)	Idaho Only
A Job	31%	22%
The Environment	32	40
Family/Quality of Life	50	63

Attitudes, Beliefs, and Values

Most people in the United States today (more than 75 percent of respondents in a recent survey) express attitudes supporting conservation and a high priority for environmental protection in general. Over time, the political and social environment of the United States has become increasingly concerned about preservation and restoration of the environment (McBeth 1995). A 1995 survey of Idaho, Oregon, and Washington residents (Harris and Associates, 1995) found that 57 percent considered themselves “an environmentalist” while 41 percent did not.

Survey research typically finds differences in opinions between residents of small, rural towns in the interior basin and residents of larger urban areas. National samples tend to be stronger on environmental protection, be less sympathetic to local economic impacts, and have greater trust in the Forest Service and environmental organizations than do local residents. For example, residents of small towns in the Pacific Northwest were less likely than city

residents to favor strengthening the Federal role in resource protection (Harris and Associates 1995). The same survey also showed a larger percentage of respondents from small towns and rural areas in Idaho, Oregon, and Washington believe current Government policies tend to favor the environment too much over jobs, relative to their urban and suburban counterparts. When rural community leaders were asked, “what is the biggest problem facing rural communities,” the most frequent response focused on the need for balancing the environment and the economy (McBeth 1995).

The fact that support for environmental protection is somewhat less in small communities and rural areas does not mean, as some may have concluded, that residents of the countryside do not favor protection of the environment. Recent researchers have found, in fact, that rural residents do favor clean and healthy environments (McBeth and Foster 1994; Alm and Witt 1995; Fortmann and Kusel 1990; Rudzitis and Johansen 1991), but the differences between rural and urban/environmental attitudes are real.

Citizens in rural communities are aware that environmental and economic concerns must be balanced. For instance, in studies of over 20 communities of southern and southeastern Idaho, respondents selected “air quality,” “water quality,” and “open spaces” as the three most satisfying aspects of their community life (Idaho State University Surveys 1990–1995). Conversely, respondents chose a “lack of employment opportunities” and a “lack of retail shopping” as the most dissatisfying features of rural life (Idaho State University Surveys 1990–1995). The respondent’s emphasis on the environment shows that the traditional sense of place and attachment to the land still plays the most significant role in rural life. Furthermore, the emphasis on employment opportunities is also rooted in the desire to preserve the community. Specifically, rural citizens largely desire increased employment opportunities so their children will be able to remain in the community.

Both locally and nationally, people believe that local residents and others most affected by public land management should participate and have a strong say in the outcome. The 1995 Harris poll, for example, found that support for increased environmental protection is significantly greater when State or local governments take the initiative than when the Federal government does.

When polled about the lands managed by the Forest Service and BLM, residents in the interior

Columbia River Basin (Rudzitis et.al. 1995) or Idaho (IFPC 1992) indicate strong support for a variety of land-use activities, notwithstanding perceived or real conflicts between these uses. IFPC (1992) found that Idahoans strongly or somewhat approve of ranching (78 percent), mining (60 percent), timber harvest (75 percent), recreation (92 percent), and wilderness protection (86 percent) on the Federal lands in Idaho. Rudzitis et al. (1995) asked interior Columbia River Basin residents how important various uses and management strategies were on Federal lands. Respondents who felt that specific land uses were important (as opposed to an opinion of neutral or unimportant) for the following uses were as follows: protect water/watersheds (82.1 percent), protect fish and wildlife habitat (78.6 percent), recreation (77.3 percent), preserve wilderness values (72.6 percent), protect ecosystems (71.6 percent), timber harvest (65.4 percent), ranching (56.2 percent), protect endangered species (48.1 percent), and mining (31.4 percent).

Public opinion is divided, however, over specific issues or over questions where choices or trade-offs are required, including but not limited to issues such as additional Wilderness designation, trade-offs between jobs and Wilderness designation, construction on new roads in roadless areas, and clearcutting practices.

Attitudes, beliefs and values can also be expressed by how people and groups define ecosystems and specific locations in the landscape based on the meanings and images of those places. This information is referred to as “sense of place,” based on Galliano and Loeffler (1995b), who concluded that ecosystem management should incorporate the many meanings people have assigned to various geographic locations on public lands in the project area into land management planning, implementation, and monitoring. This is one way of translating ecosystem management into terms that have meaning for people.

Role of the Public in Public Land Management

Public participation is guided by the National Environmental Policy Act (NEPA), National Forest Management Act (NFMA), Federal Land Policy and Management Act (FLPMA), their guidelines, and other laws that contain legal requirements for incorporating public input into natural resource decision-making.

Despite legislative mandates for public involvement and agency efforts to meet these requirements, the underlying goals of public involvement are not being met (FEMAT 1993). These goals include not just informing people and soliciting their opinions on proposed actions, but integrating peoples' concerns into decisions to be responsive to the public for whom the Forest Service and BLM are administering public lands under their jurisdiction. It has proven difficult for Federal agencies to demonstrate how public concerns were incorporated into decisions (FEMAT 1993). There is evidence that fuller participation is being demanded by the public and that it is often successful where implemented.

A survey conducted for the Social Assessment (Social STAR 1996) found public preference was greatest for the opportunity to act as a full and equal partner (chosen by 32–39 percent) and serving on advisory boards (chosen by 30–32 percent). Providing suggestions and having the public make the decisions were chosen by roughly equal numbers (about 1–18 percent), with “none” (letting resource professional decide) chosen by just 1–3 percent). This widespread public interest in having a greater role in natural resource decision-making is consistent with the public participation philosophy of ecosystem management, which requires close and frequent collaboration with the public and stakeholders in public land management (Krannich et al. 1994).

Many collaborative groups have formed in the past few years to jointly address natural resource issues. Wondolleck and Yaffee (1994) studied what they called building bridges—public participation activities designed to increase collaboration among Forest Service and non-Forest Service boundaries. Examples of such groups in the UCRB include the Henry's Fork Watershed Council and the local groups formed

under Gov. Marc Racicot to address protection of bull trout in Montana. The authors stated that bridges were necessary for a variety of reasons: they allow agencies to acquire needed information from the public; they generate good resource decisions that will endure; they build support for forest management decisions; they influence public knowledge and values; they broaden the workforce available to get things done on the ground; and they make the agency a better neighbor.

The Federal Advisory Committee Act (FACA) has posed a barrier to effective public/private efforts to assist with public land management planning, implementation, and monitoring. Congress recently enacted an exemption to FACA for State, local and tribal elected officials in Section 204 of the Unfunded Federal Mandates legislation, allowing Federal agencies to receive advice and recommendations from elected officials and not violate FACA. The ICBEMP subsequently signed an MOU with the associations of counties in Idaho, Montana, Oregon and Washington, which details how county commissioners will provide advice and recommendations to the project. County interest in Federal land management stems from a local area having an economic and cultural reliance on the Federal lands and the variety of goods and services produced.

The Northwest Forest Plan created Province Advisory Committees to improve public participation. The BLM, as part of new regulations on livestock grazing, are developing Resource Advisory Councils (RAC), each one covering a distinct geographic area. Formed under the Federal Advisory Committee Act, the RACs are designed to make recommendations to the Forest Service and BLM on ecosystem management, watershed planning, and other local or regional natural resource issues.

Photo 26

NOT AVAILABLE IN PDF

Photo 26: Public participation in natural resource decision-making is a key feature of ecosystem management. Photo by USFS/Boise NF

American Indians

Key Terms Used in This Section

Band ~ A band is a group of people who share a culture, territory, and sense of mutual recognition. Bands are primarily those pre-treaty-making-period American Indian groups.

Beneficiary ~ The recipient of payment or entitlement based upon an agreement, contract, or treaty. Indian tribes in the project area signed treaties and agreements with the United States in exchange for promises by the United States to “secure” or guarantee rights the Indians reserved in these treaties and agreements.

Ceded lands ~ Lands that tribes ceded to the United States by treaty in exchange for reservation of specific land and resource rights, annuities, and other promises in the treaties.

Consultation ~ (1) An active, affirmative process which (a) identifies issues and seeks input from appropriate American Indian governments, community groups, and individuals; and (b) considers their interests as a necessary and integral part of the BLM and Forest Service decision-making process. (2) The federal government has a legal obligation to consult with American Indian Tribes. This legal obligation is based in such laws as NAGPRA, AIRFA, and numerous other Executive Orders and Statutes. This legal responsibility is, through consultation, to consider Indian interests and account for those interests in the decision. (3) Consultation also refers to a requirement under Section 7 of the Endangered Species Act for federal agencies to consult with the U.S. Fish and Wildlife Service and/or National Marine Fisheries Service with regard to federal actions that may affect listed threatened or endangered species or critical habitat.

Lifeways ~ The manner and means by which a group of people lives: their way of life. Components include language(s), subsistence strategies, religion, economic structure, physical mannerisms, and shared attitudes.

Tribe ~ Term used to designate a federally recognized group of American Indians and their governing body. Tribes may comprise more than one band.

Trustee ~ One that holds legal title to property to administer it for the benefit of another. The Federal Government’s trust responsibility arises from promises made in treaties, executive orders, and agreements. Certain lands and resources of Indians are entrusted to the United States Government through those treaties and agreements.

Summary of Conditions and Trends

- ◆ There is low confidence and trust that American Indian rights and interests are considered when decisions are proposed and made for actions to be taken on BLM- or Forest Service-administered lands.
 - ◆ American Indian values on Federal lands may be affected by proposed actions on forestlands and rangelands because of changes in vegetation structure, composition, and density; existing roads; and watershed conditions.
 - ◆ Indian tribes do not feel that they are involved in the decision-making process commensurate with their legal status. They do not feel that government-to-government consultation is taking place.
 - ◆ Culturally significant species such as anadromous fish and the habitat necessary to support healthy, sustainable, and harvestable populations constitute a major, but not the only, concern. American Indian people have concern for all factors that keep the ecosystem healthy.
-

Introduction to American Indians

This section describes the cultural history, legal context, and existing Federal agency relations with the project area's affected American Indian tribes. The ways American Indians use Forest Service- or BLM-administered lands are discussed in the context of their cultural, social, economic, religious, and governmental interests. The United States Government has a unique responsibility to Indian tribes. Implications from this responsibility for Forest Service or BLM decision-makers are described as they relate to ecosystem-based management in the project area.

Cultures

People rely on their culture in order to live, relate to others as collective groups, and know how to both understand and function in their world. A culture includes religious, economic, political, communication, and kinship systems. Together these guide group behaviors and instruct members of the group. Culture is the whole set of learned behavior patterns common to a group of people, their interactive behavior systems, and their material goods. A Culture Area is an area where groups of people and their cultures, in this case American Indian tribes or bands, share similar cultural traits and networks.

Most of the prehistoric cultures of the project area belonged to either the Plateau or Northern Great Basin Culture Areas. The Pit River and Shasta tribes, who are associated with the Klamath Tribe, are grouped within the

Californian Culture Area. Thirty-two Plateau bands historically occupied the northern portion of the interior Columbia Basin and part of the Klamath Basin. The three Northern Great Basin bands—the Bannock, Northern Paiute, and Shoshoni—occupied most of the project area's southern half. Differences existed among cultures, especially between tribal culture areas. An example of how diverse these cultures were can be seen in the area's 13 distinct native languages, which were associated with 8 separate language families. (In comparison, Europe has only 3 native language families.) Jargon and sign languages helped people communicate across language and cultural barriers, especially for trade purposes. Table 2-18 shows the project area's federally recognized tribes in each Culture Area and the bands within each tribe.

The economic, political, religious, and social systems of First Nations were interdependent and integrated. Native peoples traditionally organized by families, autonomous villages, and to a lesser degree, bands. Their associations and alliances were greatest with neighboring villages. Political, economic, and subsistence strategies were focused on local environments. However, trade networks, trade centers, and task groupings, which interacted with surrounding Culture Areas, extended the focus of bands and villages.

Access to and availability of natural resources was crucial to native people. Many places were visited during a yearly cycle of seasonal migrations (seasonal rounds, see figure 2-24) to collect food, medicines, and other materials, as well as for religious practices and social gatherings. Plants, usually gathered from scablands, meadows, canyons, aquatic environments, and forests, are thought to have provided over half of native people's diets. The

Native Americans, First Nations, and American Indians

Native Americans, First Nations, and American Indians are all terms used to describe Indian people in the project area. Native Americans are people who were the first inhabitants of the western hemisphere. American Indian is a legal term in Federal law and regulation referring, for the most part, to members of federally recognized tribes. First Nations refers to pre-European Native Americans who were self-governing, independent (sovereign), and organized, with social and/or political structure. A "band" is a group of people who share a culture, territory, and sense of mutual recognition. Bands are primarily those pre-treaty-making period American Indian groups. A "tribe" is used to designate a federally recognized group of American Indians and their governing body. Tribes may comprise more than one band.

Table 2-18. Affected Tribes and Bands in the Project Area.

Name of Federally Recognized Tribe¹	Culture Area	Names of Bands Within Tribe
Blackfeet Tribe	Plains	Southern Piegean, Bloods, Siksika, Northern Piegean
Burns Paiute Tribe	Great Basin	Wada Tika, Hunipui, Walpapi, Koa'agai, Kidu
Coeur d'Alene Tribe	Plateau	Coeur d'Alene, Spokane, San Joe (St Joseph) River
Confederated Salish & Kootenai Tribes	Plateau	Salish (Flathead), Kootenai, Upper Pend d'Oreilles
Confederated Tribes of the Colville Reservation	Plateau	Methow, Sanpoil, Lakes (Senijextee), Colville (Sweelpoo), Kalispel, Spokane, Entiat (Pisquouse), Nespelem, Chelan (Kow-was-say-ee), Columbia (Senkaiuse), Chief Joseph band of Nez Perce, Wenatchee (Wenatshapam/Pisquouse), Southern Okanogan (Sinkaietk), Palus (Palouse)
Confederated Tribes of the Umatilla Indian Reservation	Plateau	Umatilla, Cayuse, Walla Walla
Confederated Tribes of the Warm Springs	Plateau	Wasco, Dalles (Kigal-twal-la), Dog River, Reservation Warm Springs (Taih) or Upper Deschutes, Lower Deschutes
	Great Basin	Wyam, Tenino, John Day River (Dock-Spus) Northern Paiutes
Confederated Tribes of the Bands of the Yakama Indian Nation	Plateau	Klickitat, Klinquit, Liay-was, Kow-was-say-ee, Oche-chotes, Palouse, Shyiks, Pisquouse, Seap-cat, Skinpah, Wishram, Wenatshpam, Yakama, Kahmilt-pah
Fort Bidwell Indian Community of Paiute Indians	Great Basin	Gidutikad
Fort McDermitt Paiute and Shoshone Tribes	Great Basin	Northern Paiute, Shoshone
Kalispel Tribe of Indians	Plateau	Aqulispi'lem, Slate'ise
Klamath Tribe of Oregon	Plateau Great Basin	Klamath, (Ma'klaks), Modocs, Yahooskin, Wal-pah-pai
Kootenai Tribe of Idaho	Plateau	Upper and Lower Kootenai
Nez Perce Tribe	Plateau	Nez Perce (Ni mi pu), Upper and Lower Wallowa (Pikunema, Lamata)
NW Band of Shoshoni Nation	Great Basin	Eastern Shoshone (Washakie)

Pit River Tribe of California	California	Ajumawi, Aporige, Astariwawi, Atsuge, Atwamsini, Hammawi, Hewisedawi, Illmawi, Itsatawi, Kosalektawi, Madesi
Quartz Valley Indian Community	California	Shasta, Karok
Shoshone Tribe of the Wind River Reservation	Great Basin	Eastern Shoshone, Arapahoe (not affected)
Shoshone-Bannock Tribes (Fort Hall Reservation)	Great Basin	Eastern Shoshone (including Lemhi), Bannock
Shoshone-Paiute Tribes (Duck Valley Reservation)	Great Basin	Western Shoshone, Northern Paiute
Spokane Tribe	Plateau	Upper Spokane (Snxwemi'ne), Middle Spokane (Sqasi'lni), Lower Spokane (Sineka'lt), Chewelah
Summit Lake Paiute	Great Basin	Paiute

Band names in parentheses are either used in treaty or executive order documents, or are names recognized by tribes. Legally recognized or the most common spellings were used for most tribe and band names.

¹ A tribe is a federally recognized distinct grouping of American Indian people, with a continuous political organization. Federal recognition has implications for trust obligations and entitlement to many federal Indian services. Federal recognition may arise from treaty, statute, executive order, administrative order, or from the course of the federal governments dealing with a group as a political entity.

Source: Keith and Perkins (1996).

Cultural Significance

Cultural significance refers to a whole set of relationships between a group of people, their culture, and their world (landscapes, places, and living and inanimate things). These relationships define and are defined by the values, uses, meanings, and relevance people hold for their world, behaviors, activities, or events. Culturally significant things should be understood and treated within the context of the culture that identifies, manages, and values them.

The cultural significance of salmon in American culture is multi-dimensional. It is a food source, a symbol of persistence and fortitude in a life cycle struggle, an economic industry, a prized game fish, a regional political and environmental issues, and a symbol of the Pacific Northwest region. Additional significance of salmon for many American Indians is founded in their religions, socio-cultural values, and identity as a community or a people.

A better understanding of significance is found in how people relate to salmon through any of the above ways. For sports fishermen, salmon is revered for its size and fight; a single large catch brings individual esteem. Fishing stories provide social bonding and bravado. Indian fishermen revere salmon (steelhead included) as a divinely provided food; it is a "lead-fish" essential on the tables at community dinners. A large catch of fish (enough to both sell and give away) brings social esteem to both the fisherman and the skilled salmon handlers who prepare and serve the catch. Stories about salmon bond individuals, family, society, places, and land together.

rest of their diet came from fish, mammals, and birds, which were available in varying amounts. These and other natural resources were an integral part of tribal culture, and are still culturally significant to American Indians.

Well-traveled routes between villages, temporary camps, resources, and gathering places were used for seasonal migrations. Winter and summer villages, which served as residential bases, were established based on the availability of water, shelter, food, and other resource needs. Resources were not found in the same abundance in each band's subsistence area. The annually varying abundance of anadromous fish, subsistence animals, and food plants in known gathering areas was balanced by trade with other bands.

The geography and distribution of resources in each band's subsistence areas along with differing family strategies created unique seasonal migration patterns.

Both Plateau and Great Basin groups had resource areas that drew bands together to share resources in particularly rich places. The Columbia, Snake, and Klamath Rivers; and The Dalles/Celilo Falls, Kettle Falls, Upper Klamath Lake, and Boise Falls had premier fisheries. Well-known plant gathering places in the project area included the Grande Ronde Valley in Oregon, Idaho's Camas Prairie, and meadows and prairies south of the Spokane River in Washington. These places were also significant meeting areas, trade centers, or habitation sites.

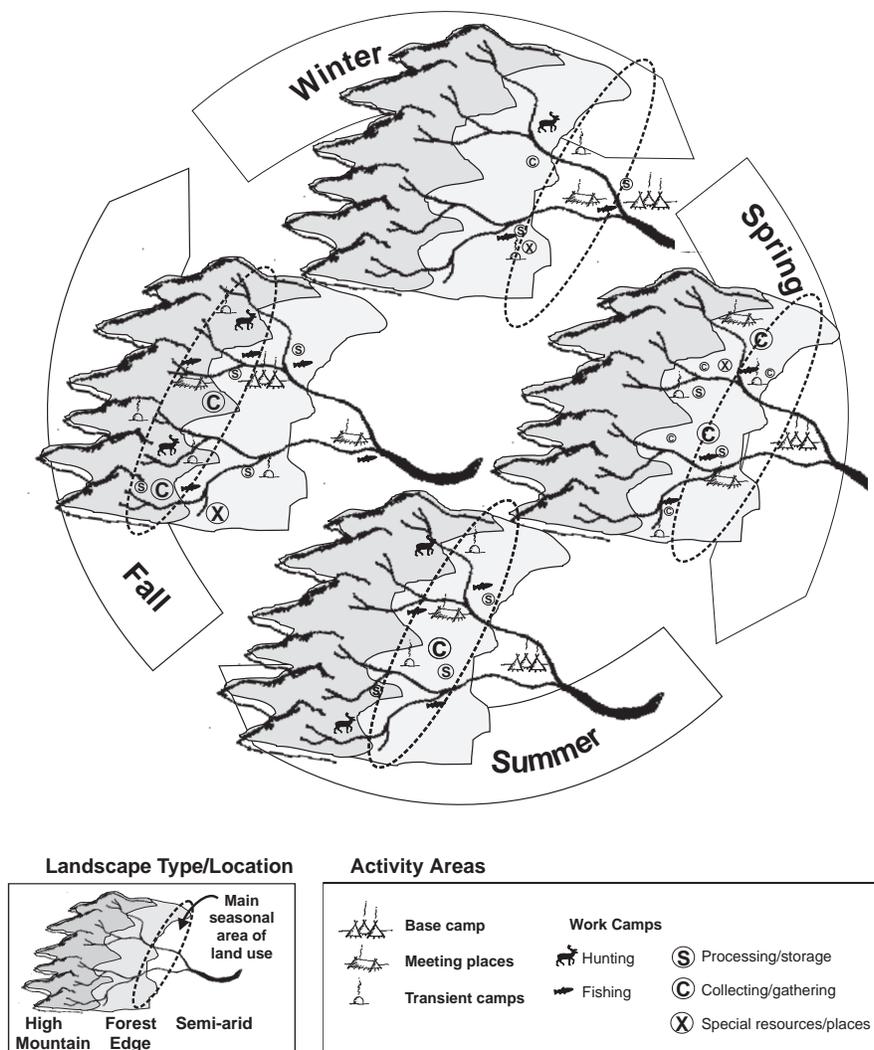


Figure 2-24. Seasonal Rounds - An example of how a Native American band might have travelled across the land within and beyond their homeland. As each season progressed, family units left their lowland winter residence and followed the seasonal cycle of plant, animal, and aquatic life forms as they became available for harvest.

Changes in Uses of and Relationships with the Land

Although early populations are difficult to estimate, the project area's tribal population was likely highest in the mid- 1700s. American Indian populations have passed through a number of cycles, generally increasing in areas and time periods that had abundant natural resources, and decreasing during long periods of scarce resources.

The introduction of the horse in the 1700s and early 1800s increased people's ability to collect and store food, increasing native populations. In the 1800s, diseases introduced by European settlers and missionaries significantly reduced native populations by as much as 90 percent in large regions in the project area. This decimated societies and cultures.

By the 1860s, the Oregon Trail and military roads opened the way for mass Euroamerican settlement, and Indian people were no longer the majority population in the project area. The culture and philosophy of these new people were quite different from the native people's system of seasonal migrations and interdependence with natural resources. In general, the new Americans settled in one place year-round, which created different impacts on the landscape compared to the seasonal migratory patterns of American Indians.

Native people set fires to modify their environment at certain times of the year. These fires differed in intensity, timing, and location from current fires in project area ecosystems. The new settlers introduced additional disturbances to native systems, including sheep and cattle grazing, large-scale resource extraction, and fire suppression, among others. Specific modifications to native systems are described briefly in the introduction of this chapter, in more detail throughout this chapter, and in still greater detail in the Science Integration Team's Scientific Assessment (Quigley and Arbelbide 1996).

Land uses and seasonal migration patterns for Indian people were altered as a result of the influx of new settlers with new cultures. The steady growth of Euroamerican populations caused conflicts over resource use and

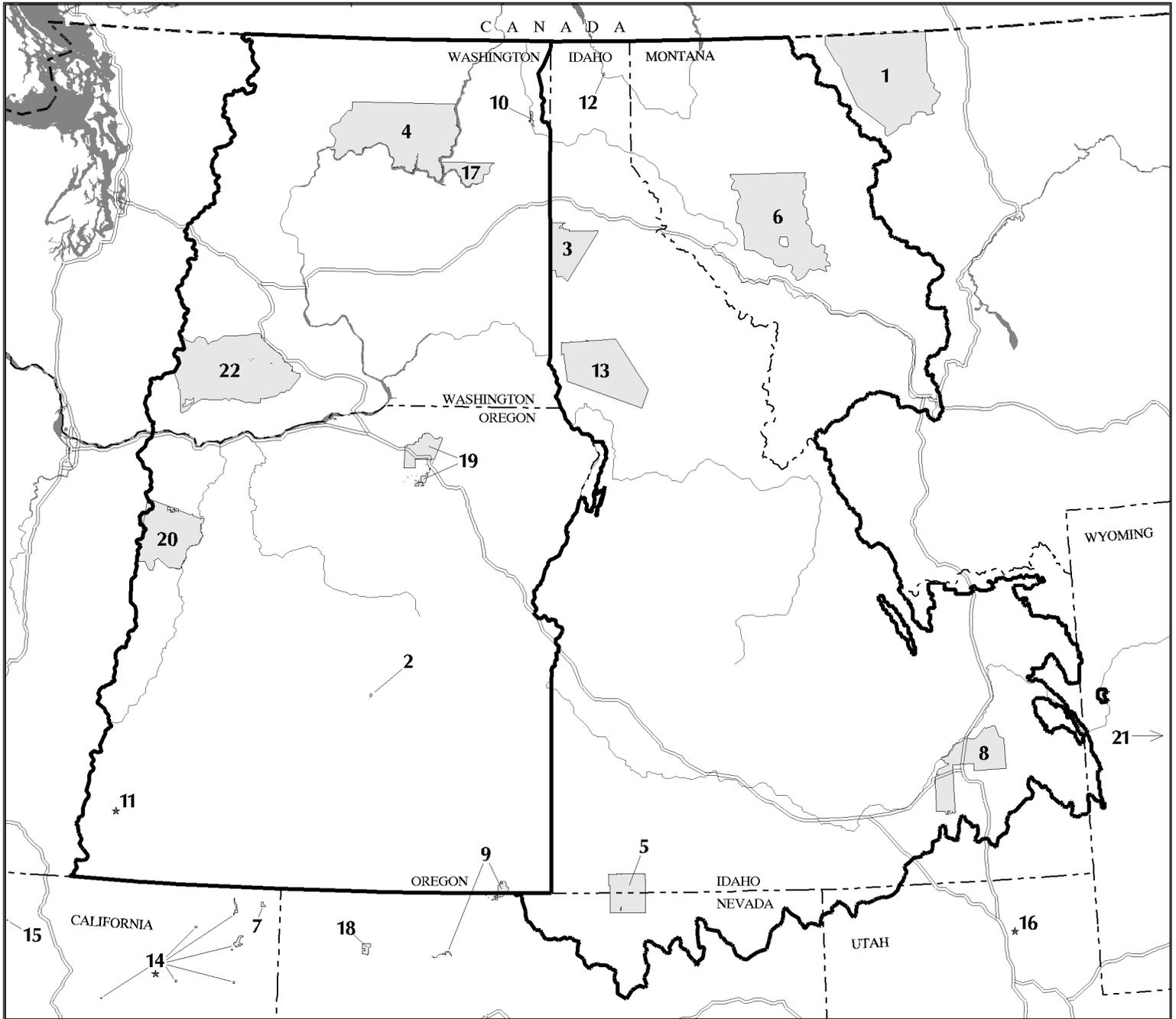
availability, as well as pressure to change American Indian cultures.

The competition and conflict between native and Euroamerican people in the 1800s resulted in a treaty-making period between tribes and the United States Government. Treaties are agreements between sovereign nations and are considered the supreme law of the land in the United States Constitution (Article VI). When the Federal Government signed treaties with American Indians, it assumed a legal obligation in which the Indians trusted the United States to fulfill commitments given in exchange for cessation of Indian claims to land.

In signing treaties, most tribes ceded lands in exchange for set-aside, exclusive-use reservations (map 2-31), services, and promises of access to traditional land uses such as hunting, fishing, gathering, and livestock grazing. The tribes hoped this would preserve their cultural and subsistence activities and traditional economic lifeways for current and future generations. Indian reservations were seen by both tribes and the Government as a way to limit conflicts and allow tribes to have their own land.

American Indian use of the land became restricted by removal from their homelands and a shift onto Indian reservations. Many tribes lost their ability to remain self-sufficient because they were deprived of a land base large enough to supply a subsistence, and they became dependent on Federal Government assurances in the treaties. Bands, communities, and even families were divided among reservations, often further separating them from their traditional use areas and resources. However, many Indians continued off-reservation use of their homelands, and some even maintained off-reservation communities.

Traditional lifeways persisted even as the Indians increasingly conformed to regional non-Indian lifestyles. The largely separate reservation communities often imitated and interacted with counterpart, non-Indian communities. Even the internal conflicts and divisions that accompanied cultural changes were limited by social forces based on family ties, a shared heritage, and cultural background. These same factors bound people and their communities to certain off-reservation lands.



Map 2-31.
Federally Recognized Tribes

INTERIOR COLUMBIA
 BASIN ECOSYSTEM
 MANAGEMENT PROJECT

Project Area
 1996



- | | | |
|------------------------|-----------------------------|----------------------------|
| Tribal Lands | 5 Duck Valley | 14 Pit River |
| Major Rivers | 6 Flathead | 15 Quartz Valley |
| Major Roads | 7 Fort Bidwell | 16 Shoshoni NW Band |
| EIS Area Border | 8 Fort Hall | 17 Spokane |
| Tribal Headquarters | 9 Fort McDermitt | 18 Summit Lake |
| 1 Blackfeet | 10 Kalispel | 19 Umatilla |
| 2 Burns Paiute | 11 Klamath | 20 Warm Springs |
| 3 Coeur d'Alene | 12 Kootenai of Idaho | 21 Wind River |
| 4 Colville | 13 Nez Perce | 22 Yakama |

American Indians seasonally sought out familiar resources and places, regardless of ownership. They developed understandings with landowners and trade opportunities with those communities they encountered. During economically depressed periods, such as the Great Depression, renewed reliance on traditional foods and other practices helped sustain many tribal economies. Inevitable conflicts over land use led to reduced tribal access to resources and traditional places.

American Indians changed along with regional developments and governmental regulations. For example, many Indian families came to depend increasingly on automated modes and routes of travel. Various new Federal agencies' management actions and policies for public lands in the early 1900s have changed and continue to change American Indian uses of lands in many ways. By the mid-1900s, the effect of assimilation policies and influences caused traditional cultures and values to become narrower aspects of American Indian life. Most traditional uses of public lands today, however, continue to have roots in earlier native cultures and socio-economic practices.

Legal Agreements

Federal Trust Responsibility

The trust responsibility is difficult if not impossible to define. Pevar in his book says "The Federal Government obligation to honor its trust relationship and fulfill its treaty commitments is known as its trust responsibility" (Pevar 1992). The legal concept known as "trust" originated in England in the Middle Ages. It meant that ownership of land placed in trust was in the hands of one person, the trustee, who had the responsibility to manage the land for the benefit of another person, the beneficiary.

The modern concept of trust responsibility grows out of the 1814 Treaty of Ghent, in Chief Justice Marshall's decision in *Cherokee Nation v. Georgia* 1831. Justice Marshall characterized American Indian tribes as "domestic dependent nations" involving (1) the government or nation-state status of tribes, and (2) a special tribal relationship with the United States (Cohen 1982). Marshall described the trust relationship as one

that "resembles that of a ward to his guardian." This relationship has been consistently recognized by Federal courts ever since and has been described as "special," "unique," "moral," and "solemn" (Indian Tribes 1981).

In addition, the rights reserved by the tribes in treaties and agreements, or which were not expressly terminated by the Congress, continue to this day. These governmental rights and authorities extend to any natural resources which are reserved by or protected in treaties, executive orders, and Federal statutes. The courts have developed the Canons of Construction, guiding premises, that treaties and other Federal actions "should when possible be read as protecting Indian rights in a manner favorable to Indians (Cohen 1982).

The interpretation of tribal rights and treaty language continues to evolve and define Federal legal responsibilities. For example, a 1994 court decision involving shell fishing rights determined that treaty-reserved resources were not limited to those actually harvested at treaty time because the right to take any species, without limit, pre-existed the treaties (*United States v. State of Washington* 1994).

The primary focus of the Federal Government trust responsibility is the protection of Indian tribes' natural resources on reservations, and the treaty rights and interests that tribes reserved on off-reservation lands. In fulfilling the trust obligation, the Congress also adopted laws and policies that protect tribes' rights to self-determination, and promote the social well-being of tribes and their members. Under various laws and policies, agencies have a responsibility to implement Federal resource laws in a manner consistent with a tribes' ability to protect their members, to manage their own resources, and to maintain themselves as distinct cultural and political entities. These responsibilities can be readily applied to resources and lands administered by the Forest Service and BLM. Forest Service and BLM trust responsibilities apply to those actions under their authority. For example, they can affect activities on lands they administer relative to plant and animal habitats.

The Federal Government trust responsibility compels agencies to conduct their activities consistent with obligations set forth in treaties and statutes. In carrying out their trust

responsibilities, the BLM and Forest Service must assess proposed actions to determine potential impacts on treaty rights, treaty resources or other tribal interests. Where potential impacts exist, the agencies must seek consultation with affected tribes and explicitly address those impacts in planning documents and final decisions. Consultation with the tribes, described later in this section, is essential in carrying out that trust responsibility. A key issue is the Federal government's trust obligation to ensure that tribal treaty rights and interests will be protected. Agencies often consider that trust is carried out when tribal interests have been considered prior to making land use decisions. However, consultation and consideration in and of themselves may not be enough to fulfill Federal trust responsibilities. Tribes contend that treaty resources must actually be protected before land management activities can proceed. Despite the legal disputes between processional duties associated with project decision-making processes and substantive duties consisting of guarantees, Federal fulfillment of trust is ultimately measured by the actual effects of Federal actions.

Meeting the purpose and need for action as described in Chapter 1 of restoring and maintaining the long-term ecosystem health and integrity on the lands administered by the Forest Service or BLM, while still supporting the economic and/or social needs of people, cultures, and communities at sustainable and predictable levels of products and services from those lands, is consistent with, if not equal to, meeting the government's Federal trust responsibilities.

Other Agreements

Although the treaty-making era ended in 1871, negotiations with tribes continued and resulted in agreements ratified by both houses of Congress. Like treaties, agreements and statutes are the supreme law of the land, creating rights and liabilities that are virtually identical to those established by treaties (Cohen 1982). Executive orders were signed in the late 1800s and early 1900s with the intent to reserve lands for tribal use, identify certain services, and occasionally to identify rights for non-treaty tribes. With regard to the applicability of the basic trust doctrine, Congress has not drawn distinctions between treaty and non-treaty tribes (Cohen 1982).

Tribal Governments

Tribal governments have broad social and natural resource responsibilities toward their membership and often operate under different cultural and organizational goals than Federal agencies. Enrolled tribal members are entitled to exercise those reserved rights and benefits held by a tribal government, but are subject to tribal government regulations. Differences in the character of tribal organizations exist among tribes based on how they were given Federal recognition, provided reservations, and whether they adopted the Indian Reorganization Act of 1934. This act encouraged tribes to organize themselves under formal constitutions approved by the Federal Government.

Tribes have interest in reservations (owned communally by a tribe), Indian allotments (owned by an individual), and off-reservation lands, where no legal title to the land remains; however, the nature of interest and legal rights varies. Some tribes have a legal right to fish at all usual and accustomed places (specified in treaties) for both on and off-reservation ceded lands, regardless of property ownership.

In the past, the Bureau of Indian Affairs (BIA) represented virtually the entire governing authority over Indian tribes, including housing, schooling, and various other aspects of their social structure. The Self-Determination and Education Assistance Act, passed in 1975, authorized the tribes to contract to operate BIA programs. Since then, the act has been amended three times (1988, 1991, and 1994), giving participating tribes even broader authority to manage and operate Bureau of Indian Affairs and other Department of interior agency programs.

Tribes' traditional and complex cultural ties to public lands still generate tribal concerns on how those lands are managed. Tribal governments, now with enhanced governing authority, directly address the broad social and natural resource concerns of their citizens. Most tribes have evolving internal organizations and deliberative skills to deal with land

management agencies. Many are asking Federal agencies to take a more proactive role on their behalf, especially in areas of treaty rights, trust resources, and ecosystem health.

Current Federal Agency Relations

The existing relationships between tribes and Federal agencies have evolved rapidly in the past three years. Empowerment of tribal governments and numerous Federal court cases involving treaty-reserved fishing rights in the past two or three decades are partially responsible. The momentum to advance Federal agency-tribal relations in the project area has increased since 1993. This evolution responds to new legal interpretations, legislation, executive orders, and departmental direction that encourages acknowledgment of tribal government issues, government-to-government consultation, and resolution of tribal concerns through consensus-seeking approaches. A chronology of these events can be found in Appendix C.

Current Forest Service and BLM relations with tribes vary across the project area. The frequency of agency-tribe contacts often depends more on the nature of an established relationship than on whether an agency is proposing actions with potential effects on tribal interests. When an agency such as the BLM or Forest Service initiates an action, such as developing this EIS, the agency consults with affected American Indian tribes. Agencies tend to consult only those tribes which have overlapping ceded lands or neighboring reservation lands, although affected Indian groups are those with interests in land management action(s)—even if they are non-federally recognized American Indian communities.

Federal law requires the BLM and Forest Service to consider tribal interests when conducting actions that may affect natural resources on tribal lands and/or the socio-economic well-being of its people. Examples of these interests and assets include, but are not limited to, air quality, water quality and quantity, anadromous fish runs, migrating wildlife, and cultural and religious interests of the tribe. Agencies must carry out their activities in a manner that protects Indian trust assets, avoids adverse impacts when possible, and mitigates impacts where they

cannot be avoided. Federal policies also require explicit discussion and consideration of Indian trust assets in environmental assessments and impact statements (Columbia River System Operations Review FEIS 1995).

American Indian Issues

“Secretarial Order No. 3175 and Executive Order 13007 directs agencies to consult with potentially affected tribal governments concerning possible impacts on tribal interests and to explicitly address anticipated effects in the planning, decisional and operational documents that are prepared for the project. Agencies are also directed by the Secretarial Order to consult with the Bureau of Indian Affairs and the Office of the Solicitor if any impacts on tribal interests are identified. The following issues have been identified and assessed through implementation of such an approach since December 1993.

Many tangible and intangible resources and values that interest American Indians are the same as those that interest members of the general public, which are described in Appendix D and summarized in Chapter 1. Some issues are unique to American Indians because of tribal interests, land ownership, and other characteristics that are different from those of the general public. Many of these issues are complex and often sensitive, and each tribe emphasizes issues specific to its interests. Although many of these issues are similar among tribes, how they would like them addressed by land management agencies may vary. A number of Federal agencies have developed revised policies to respond to Indian issues. Tribal expectations are defined and understood through consultation.

Trust Obligation

The most fundamental tribal issue identified during the course of the project involves differing perceptions between the tribes and the Federal Government regarding “trust obligations” of the Federal government in regard to off-reservation settings. The U.S. courts have been reluctant to define the precise scope of the Federal-Indian trust relationship. Tribes consider the trust obligation as a substantive duty, one that should ensure protection of tribal interests on public lands as

well as trust lands, or at least an adherence to a policy of prioritization in which protection of tribal interests enjoys a standing priority over certain forms of other interests. Tribes contend that the Federal land management agencies have not historically and currently manage natural resources in accordance with Indian treaty rights or Federal trust responsibility. Tribes assert Federal agencies must exercise their authorities in a manner which will protect and restore the habitat needed to support resources on which meaningful exercise of treaty rights depends.

Because trust responsibilities remain undefined, agencies are unsure when a responsibility is met. Therefore, the Federal interpretation of trust obligations primarily focuses on a procedural duty in which protection of treaty rights and tribal interests is taken into account by the agencies commonly through a government to government consultation process with tribal governments. This interpretation of trust responsibilities has been recently identified in Department of Interior Manual release 512 DM 2 (December 1, 1995). The Department of Agriculture has similar policies expressed in Departmental Regulation No. 1020-6 (October 16, 1992). Agencies must identify if any proposed activity poses an impact on Indian interests on public or trust lands, ensure such impacts are explicitly addressed, consult with affected tribes and document potential conflicts fully incorporating tribal views, and explaining how a decision is consistent with the Government's trust responsibility. Resources located outside reservation boundaries are considered "in common" resources in regard to treaty rights, hence considered as "treaty resources" rather than "trust resources." From this Federal perspective, off-reservation resources of interest to tribes may be subject to competing and conflicting uses which in some circumstances may be more compelling and supersede the tribal rights and interests. Aside from these divergent legal interpretations, treaty rights and trust obligations do serve to establish a unique inter-governmental relationship requiring at minimum that Federal agencies must identify tribal interests and needs and fully account for these in their decisions.

Consultation/Participation

As noted above, the intergovernmental consultation process serves as the primary

means for the Federal agencies to carry out their trust obligations. Historically, agencies, when they have attempted to consult with tribes, have pursued consultation on the agencies' perception of what consultation constitutes. In sum, consultation is often an ill-defined, erratically implemented process at best. In actuality there are as many definitions for consultation and fulfillment of trust as there are Indian nations. For that reason, consultation is conducted with each tribe individually. For example, the Confederated Tribes of the Umatilla Indian Reservation define consultation as a formal process of negotiation, cooperation and policy-level decision-making between sovereigns on a government to government basis aimed at reaching mutual decisions that will protect tribal lifestyle, culture, treaty rights, religion and economy. Tribal governments cannot formally consult on every site-specific federal project. Thus policy level decision making that will be applied to all projects must ideally occur. A need exists for government to government coordination to establish mutually agreeable procedures.

While most tribes appreciated the direct contact with ICBEMP staff and project leaders, many tribes feel they should have had a more integral role in the whole ICBEMP process, with tribal scientist involvement and tribal participation in development of alternatives. Funding was identified as one factor in this failure. The tribes assert that the agencies are not meeting their trust responsibilities because of not funding tribal participation. From the tribal perspective, effective project participation must include participation in the project implementation process as well with full representation on intergovernmental oversight groups that may be established.

Community Well-Being

Project area tribal issues need to be viewed relative to agency effects on Indian reservations and allotments, ceded lands, traditional homelands, areas of tribal interest, and areas of mutual interest with other tribes; cultural survival; treaty rights; trust assets and resources; American Indian religious practices; cultural heritage resources and places; and tribes' socio-economic well-being. Tribal community health and well-being are based on a number of factors, including economic growth, freedom to pursue traditional uses of the land, effective trust relationship with the federal government, and

lack of infringements on religious practices. Shortfalls in any of these areas can lead to effects on community well-being, and may be reflected in social measures such as unemployment, substance abuse, and suicide.

Sensitive Tribal Species

The availability of culturally significant species and access to socially and/or traditionally important habitats (ethno-habitats) support the well-being of Indian communities as many social, cultural, and economic activities center on the harvest, preparation, trade, and consumption of such resources. The occurrence of culturally significant species can be predicted through their known associations to types of landscapes and habitats. The presence and health of ethno-habitats can be assessed by using ecological information and the cultural expertise of a tribe and traditional users. The degree of access to resources and places can be determined by examining the potential effects of physical obstacles, administrative barriers, and/or behavior constraints that management actions may impose.

Restoration

Restoration of native species' habitats is central to many tribal interests. However, the tribes have asserted that "restoration" means many things to many people. Consequently, the tribes wish to see that a definition of restoration be developed, then objectives and standards be written to implement restoration activities. However, the tribes have voiced concerns that the ICBEMP concept of restoration includes more habitat degradation, for example sacrificing fish and wildlife values in efforts to restore an historic mix of tree species. The tribes are concerned that timber and grazing activities still predominate land management considerations to the detriment of other resources. Many tribes are dissatisfied with the lack of adequate protection measures and absence of restoration in PACFISH (from which much of the aquatics strategies are derived). There is great concern that what comes out of the ICBEMP will be even less protective than PACFISH. Most Tribes have their own restoration plans, the Upper Grande Ronde Plan is an example. They assert that significant restoration of degraded habitats must occur before other land use activities that would degrade the habitat are allowed.

Tribes contend that the Federal trust responsibilities and statutes require the development and adoption of an alternative that allows unimpeded recovery of all damaged habitats and complete protection of high quality habitat. In regard to riparian protection, measures are recommended including: (1) provision that only actions that have low risk be allowed in riparian areas; (2) prohibition of new roads, logging or mining, in riparian areas; (3) suspension of grazing until habitat standards are met in watersheds; (4) establishment of riparian reserves as actual land allocations in agency land use plans; and (5) creation of minimum buffers, such as the lesser of 300' slope distance from floodplain or top of topographic divide on all streams (Classes I-IV).

Tribes place emphasis on the analysis of cumulative effects, including: (1) assessment of ongoing impacts in watersheds resulting from current and past BLM/Forest Service land management activities; (2) full inventory of watershed/riparian conditions and activities, such as stream crossings, road density, grazing, mining, logging and estimated sediment delivery; (3) correlation of stream conditions with habitat standards based on surveys of all listed fish bearing streams; and, (4) suitability determination for grazing. In regard to the latter, tribes contend that agencies should not employ "Proper Functioning Condition" as a standard for grazing compatibility or riparian health.

Tribes assert that the real forest health crisis is associated with degraded conditions of watersheds, decreased salmonid populations, and loss of old growth ponderosa pine and general old growth structure, as opposed to current stand composition and fuel load conditions. They, therefore, believe that forest health should be re-defined as watershed health and emphasize the use of fire as a tool for changing stand conditions. The tribes are concerned that significant logging will occur under the name of salvage. Various tribes recommend no further cutting of larch and ponderosa pine. Salvage logging should be limited to small diameter, remain outside roadless and riparian areas, not develop new roads, and not enter after fire until the ecosystem is stabilized.

Place Attachment

Indian people have long held pronounced and special attachments to the land, which are understood and expressed through their relationships with culturally significant places. Consequently, traditional land uses usually occur in the context of culturally significant places, through which place attachments and values have become embedded elements in Indian cultures and religious beliefs. Tribal interests in the integrity of such places involve a range of area types: areas of interest, landscapes, traditional use areas and localities such as ethno-habitats, burial sites, and archeological sites. Cultural places may be valued at the community, tribal, and inter-tribal levels.

Harvestability

The health and availability of resources are of great interest to American Indian cultures. A key issue raised by tribes for this project relates to sustainability of tribally sensitive species and involves the concept of “harvestability” which serves as an expansion on Federal concepts of species “viability.” A difference of opinion exists between the Federal Government and tribes regarding what constitutes “harvestability.”

The tribes assert that the BLM/Forest Service must comply with Federal obligations under the Pacific Salmon Treaty and *U.S. v. Oregon* as well as the rebuilding goals established by the Northwest Power Planning Council and conformance with the Clean Water Act, NFMA, and ESA. The Columbia River tribes seek agency conformance with the Tribal Restoration Plan which contains specific, quantified objectives. The tribes make use of “harvestable” species population to define a desired level of harvest for subsistence, commercial, spiritual and cultural needs. Harvestable populations of salmonids and other fish, wildlife and plant species important to the tribes must be the goal of any adopted alternative. Harvestability, in this manner, constitutes a tribal desired future conditions. The Forest Service management responsibilities are to provide for “viable populations” of existing native and nonnative vertebrate species. The determination of a “viable population” level also defines the level of escapement required for conservation

purposes, which in turn is used to determine the “harvestable population.” Certainly, the disparity between viability and harvestability is most critical for anadromous fish species as opposed to terrestrial big game and cultural plant species. The extent to which there may be a legal obligation imposed on the Federal Government to provide habitat capable of supporting “harvestable” levels of resources from the public lands is not an issue which will be resolved in this document. Information and population trends for a sample of species of concern are shown in Table 2-19.

Cultural Resource and Cultural Practices Protection

Agencies and tribes offer differing definitions for cultural resources as addressed in Chapter 2. In addition to protection of archaeological sites, agencies should include efforts to rehabilitate gathering sites and restore native plant communities and restore watershed health and function by meeting minimum legal requirements such as water quality standards. In addition, tribes have requested that all Forest Service and BLM administrative field offices develop and implement agreements on implementing legal requirements for cultural resource protection (such as NAGPRA, NHPA and ARPA), including plans for locating and evaluating Traditional Cultural Properties (pursuant to NPS Bulletin 38) under Section 106 of NHPA, and allow for full participation of tribes in performance of cultural resource inventories.

Accountability

Tribes consider that the draft ICBEMP standards and objectives give too much flexibility to local decision makers to do activities that may damage aquatic and other resources to which the tribes retain rights or interest. Leaving development of objectives and standards to site-specific projects, or allowing changes in the standards and objectives following watershed analysis, leads to subjective, inconsistent decision making that can result in further degradation. Consequently, tribes assert that standards must be enforceable, measurable and accountable, rather than simply advocating more assessment processes. Tribes contend that standards must ensure full protection of high quality habitat and restoration of degraded habitat. Such standards for fish habitat should include threshold values for substrate, bank

stability and water temperature that require management changes needed to meet these standards, such as foregoing and suspending activities that retard attainment in watersheds where standards are not met.

Consultation

Consultation is not a single event, it is a process that leads to a decision, for example, the Record of Decision for this EIS.

Consultation means different things to different tribes. It can be either a formal process of negotiation, cooperation, and policy-level decision-making between tribal governments and the Federal Government, or a more informal process. Tribal rights and issues are discussed and factored into the decision. Consultation can be viewed as an ongoing relationship between an agency (or agencies) and a tribe (or tribes), characterized by consensus-seeking approaches to reach mutual understanding and resolve issues. It may concern issues and actions that could affect the Government's trust responsibilities, or other tribal interests.

Consultation serves at least five purposes:

- ◆ to identify and clarify the issues,
- ◆ to provide for an exchange of existing information and identify where information is needed,
- ◆ to identify and serve as a process for conflict resolution and,
- ◆ to provide an opportunity to discuss and explain the decision.
- ◆ to fulfill the core of the Federal trust obligation.

Legal requirements for federal agencies to consult tribes and American Indian communities has its basis in federal law, court interpretations, and executive orders (see Appendix C).

Table 2-19. Species Population Trends in the Project Area.

Species Name	Population Trend	Regulation	Comments
Anadromous salmonids	Declining	Federal, state, and tribal	Primary cause for decline is due to human-caused effects on habitat from hatcheries, dams, and harvests. Some species are currently listed as threatened or endangered, such as Snake River sockeye, and spring and fall chinook salmon.
Resident salmonids, whitefish	Declining	Federal, state, and tribal	Primary cause for decline is human-caused degradation of headwater and main-stem habitat and hatchery influences. Research on metapopulation interactions of species is still needed.
Sturgeon, lamprey	Declining	Federal, state, and tribal	Main-stem hydroelectric dams have changed free flowing systems into slack water environments, and these dams impede local migration. Much information is still needed on these species. Freshwater habitat degradation is thought to have a negative effect.
Sucker, sculpin, mussel	Unknown	Federal, state, and tribal	Detailed, accurate information is lacking on many of these species. Species endemic to portions of the project area are facing immediate threats to survival because of poor recruitment and water rights issues.
Mule deer, elk, black-tailed white-tailed deer, pronghorn, and moose	Significant increase from over-hunting in late 1800s. Current populations stable. White-tailed deer and elk increasing range. Pronghorn and moose recovering some lost historic range.	State and tribal for hunting numbers and seasons	In general, these ungulates have increased due to control of commercial hunting in the late 1880s and their adaptability to early seral vegetation and edge habitat created by logging. Intensive management of habitat, as well as control over harvest, have increased populations. Roads, dogs, fire management, urban sprawl into winter ranges, poaching, and grazing competition with livestock are all concerns which could cause declining populations in the future.
Mountain goat	Declining populations, although historic range has increased into other habitats.	State and tribal for harvest	This species was impacted by competition for forage from domestic sheep and trophy poaching. Forage has not regenerated well due to fire suppression.
Bighorn sheep	General decline from historic populations, although some local gains in recent decades.	State and tribal for harvest	Bighorn sheep have declined due to disease transmission from domestic sheep, conifer encroachment, and fragmentation of seasonal range by roads and houses. They have also been impacted by competition for forage from domestic sheep and trophy poaching. Forage has not regenerated well due to fire suppression.

Table 2-19. Species Population Trends in the Project Area (continued).

Species Name	Population Trend	Regulation	Comments
Grizzly bear, gray wolf	Declining since the mid 1800s to near extinction. In the past 30 years, increasing due to protection and immigration from Canada. Populations stable.	Protected by U.S. Fish and Wildlife Service as threatened (grizzly) or endangered (gray wolf)	Grizzly bears are isolated in large blocks of relatively undisturbed moist and cold forest in northern Washington, Idaho, Montana, and the Yellowstone ecosystem. Wolf populations are increasing in the same habitat areas and starting to move into other habitats in northern portions of the project area. There is concern for poaching, public fear of predators, road access to habitat, prey base stability, isolation of populations, and conditioning of predators to human foods and livestock.
Black bear	Variable by state. Some states have changed hunting regulations, and populations have increased. Stable elsewhere.	State and tribal for harvest	Black bears are habitat generalists and have benefitted from early seral vegetation and edge habitat created through logging. Population trends are not well known, nor is the impact of baiting, human conflicts, and harvest. Fire suppression and changes in berry production and habitat structure may impact bears. Competition between bears and domestic sheep for vegetation is a concern.
Jackrabbit, Nuttall's cotton-tail, pygmy rabbit, snowshoe hare, sage grouse, sharp-tailed grouse, marmot	Decreasing	State for harvest	Significant decline in shrub steppe and desert salt shrub communities, along with exotic species invasion and livestock grazing, have seriously decreased forage and cover for grouse and rabbits. Snowshoe hares have been impacted by fire suppression and decreases in young lodgepole pine, riparian shrub, and hardwood stands.
Forest grouse (blue grouse, spruce grouse, and ruffed grouse)	Decreasing	State and tribal for harvest	Fire suppression, increasing stand density, decreasing shrub and riparian vegetation, and a decreasing large tree component have all impacted blue and spruce grouse. Ruffed grouse may be increasing in dense mid-seral stands, but there is a lack of data.
Bald eagle, golden eagle, other raptors, Swainson's hawk, ferruginous hawk	Most are increasing. Rangeland hawks decreasing due to conflicts for winter range.	U.S. Fish and Wildlife Service and tribal	Raptors that declined due to pesticide use and human mortality have generally increased with regulation of pesticides and public education. Decline in the large tree component; old-forest, open stand structure; and prey species is still a concern. Swainson's and ferruginous hawks and others dependent on large open areas have declined due to conflicts in winter range.
Canada goose, ducks, coot, heron, swans	Geese are increasing. Ducks declined until a recent upward trend.	State, tribal, and U.S. Fish and Wildlife Service	Canada geese have responded well to artificial nest boxes, grazing, agriculture, and domestic grasses. All waterfowl have been impacted by a decline in wetlands, de-watering, lead shot, disease, and poaching.

Bitterroot, biscuitroot, mariposa, yampah	Stable, some locally impacted.	Tribal	Scabland species are generally not affected by livestock grazing or fire. Some areas are impacted by road construction and other ground disturbances. Some local losses noted for mariposa and yampah from past intensive grazing. Grazing time can conflict with tribal gathering practices.
Willows, tules, cattails, wocas (lilyponds), wappatoo	Decreasing	EPA, U.S. Fish and Wildlife Service, and tribal for wetlands	Degradation and loss of riparian and wetland habitat due to grazing, timber harvest, dewatering, mining, and roads have all caused declines in these species.
Camas, yampah, beargrass	No data	Tribal	In general, upland herblands and meadows have decreased due to fire suppression, grazing, conifer encroachment, soil disturbance and compaction due to logging, and exotic species invasions. Impacts on herbs from historically heavy sheep grazing are gradually showing recovery.
Mushrooms, elephant ears, morels, and other fungus sporocarps and beargrass	Unknown, wild mushrooms are a product of diverse and complex interactions within natural ecosystems.	Federal and state (wild mushroom harvesting falls under tribal regulation)	Commercial mushroom harvest, land management activities, and catastrophic events such as fire, disease, and insect epidemics all play a role in fungi productivity. There has been an increase in the harvest of special forest products and conflict with tribal gathering practices. There is a need for long-term study and monitoring of many commercially harvested species to understand their role in the productivity of ecosystems.
Huckleberry, elderberry, buffalo berry	Decreasing	Some units limit huckleberry gathering	These species and other forested shrubs have declined due to suppression of fire, grazing, increased stand density (limiting light, water, and climate), and competition for harvest.
Chokecherry, serviceberry	Variable. Serviceberry expanded in some areas, but age and structure diversity is lower. Chokecherry in riparian areas has declined.	None	Changes to berry production and other qualities important to tribes are unknown. There have been increases in chokecherry harvests by the public. Increasing ages of shrubs due to fire suppression is a concern.
Juniper	Increasing in distribution, but decreasing structural diversity.	None	Juniper has invaded other habitat types and stands have become denser, older, and less diverse with fire suppression and livestock grazing
Mountain mahogany	Declining	None	Mountain mahogany is declining in some places and not regenerating. Stands are becoming older and lack structural and age diversity. Some areas are heavily browsed. Research on regeneration is needed.

Integrated Summary of Forestland, Rangeland, and Aquatic Integrity

Key Terms Used in This Section

Cluster ~ In this EIS, refers to a group of sub-basins denoting forestland and rangeland ecosystems where the condition of the vegetation and ecological functions and processes are similar, and where management opportunities and risks are similar.

Ecological integrity ~ In general, ecological integrity refers to the degree to which all ecological components and their interactions are represented and functioning; the quality of being complete; a sense of wholeness. Absolute measures of integrity do not exist. Proxies provide useful measures to estimate the integrity of major ecosystem components (forestland, rangeland, aquatic, and hydrologic). Estimating these integrity components in a relative sense across the project area, helps to explain current conditions and to prioritize future management. Thus, areas of high integrity would represent areas where ecological function and processes are better represented and functioning than areas rated as low integrity.

Subbasin ~ Equivalent to a 4th-field Hydrologic Unit Code (HUC), a drainage area of approximately 800,000 to 1,000,000 acres.

Subwatershed ~ Equivalent to a 6th-field HUC, a drainage area of approximately 20,000 acres. Hierarchically, subwatersheds (6th-field HUC) are contained within a watershed (5th-field HUC), which in turn is contained within a subbasin (4th-field HUC). This concept is shown graphically in Figure 2-2 in Chapter 2.

Strongholds (fish) ~ Watersheds that have the following characteristics: (1) presence of all major life-history forms (for example, resident, fluvial, and adfluvial) that historically occurred within the watershed; (2) numbers are stable or increasing, and the local population is likely to be at half or more of its historical size or density; (3) the population or metapopulation within the watershed, or within a larger region of which the watershed is a part, probably contains at least 5,000 individuals or 500 adults.

Introduction

Unless otherwise noted, information in this section is based on the *Integrated Scientific Assessment for Ecosystem Management in the Interior Columbia Basin and Portions of the Klamath and Great Basins* (Quigley et al. 1996a) and a more detailed paper describing the integrity work (Sedell et al. on file at the Walla Walla Office of the ICBEMP).

Up to this point, Chapter 2 has presented background descriptions of historical and current conditions of various components and processes in the project area. Information on forestland, rangeland, and aquatic ecosystems was organized by potential vegetation groups or watersheds and summarized by ecological reporting unit (ERU) where possible.

While ERUs provide a convenient way to summarize initial scientific information by geographical area, understanding the bigger picture across a large, complex landscape requires a more integrated summary to show how the existing conditions relate to each other and to identify where overall ecological conditions, opportunities, and risks are similar. To provide this integrated picture, the Science Integration Team evaluated all the information available and summarized current conditions around groupings or “clusters” of 4th-field Hydrologic Unit Codes (HUCs), also known as subbasins. (See Introduction to Chapter 2, and table 2-13 in the Aquatics section for more information on HUCs. See maps 2-32 and 2-33 later in this section for maps of clusters.)

Each subbasin was rated for various levels of “integrity” from separate aquatic, terrestrial, and hydrological viewpoints. These viewpoints, or integrity layers, were then analyzed together, or integrated, to provide a more unified view. This effort revealed groups or clusters of subbasins that exhibit a similar set of conditions or characteristics, reflecting a common management history; terrestrial and aquatic conditions, and management needs, opportunities, risks, and conflicts.

The integrated cluster summaries provide a project-wide context for the EIS Teams to tailor alternatives and evaluate their effects on a more site-specific scale (a few million acres) within the 144-million-acre project area. The cluster analysis also provides a context for evaluating cumulative effects. The information will help provide a context for land managers to set priorities and assess opportunities to contribute goods and services to the nation, by answering relevant questions such as:

- ◆ What is the current condition of the project area?
- ◆ Where are the areas in the best or worst shape?
- ◆ Where are forestlands and rangelands least departed from (most similar to) historical conditions?
- ◆ Where are fish communities and/or species most connected?
- ◆ Where are the healthiest watersheds from a hydrological perspective?
- ◆ What opportunities and risks present themselves on the current landscape for future management?

Measuring Integrity

Precise definitions of “integrity” or wholeness of a system do not exist. Estimates of integrity are derived using proxies that represent the ecological functions and processes, and whether they are present and operating. In general, for the purposes of the Interior Columbia Basin Ecosystem Management Project, aquatic and terrestrial systems with “high integrity” were defined as those that consist of a mosaic of plant and animal communities, and have well connected, high quality habitats that support a diverse

assemblage of native and desired non-native species that adapt to a variable environment. Measures were developed by the Science Integration Team using direct and indirect variables to indicate how much various elements have departed from historical conditions. For the purposes of this analysis, “high departure” signifies that an area is significantly different than the condition expected for its biophysical environment, and roughly indicates “low integrity.”

In measuring integrity, the Science Integration Team looked primarily at landscape features and fish communities, because they encompass most of the significant planning issues that were identified through the scoping process. (See Chapter 1 for a description of the issues and the scoping process.) The emphasis on landscape features and fish provides a geographically explicit, ecologically-driven context for discussion of management alternatives. This approach allowed an evaluation of the range of integrity of forestlands, rangelands, watersheds, fish communities, and terrestrial habitats.

Landscape Features

- ◆ *Potential vegetation* ~ how vegetation has changed through time, historic and current; how structure and composition changed through time.
- ◆ *Fire and other disturbance regimes* ~ how fire and other disturbance regimes have changed; how they affect vegetation, aquatics, and other resources; and how they might respond to future management actions.
- ◆ *Road densities* ~ degree of roaded access; how integrity relates to roads.
- ◆ *Hydrologic function* ~ resiliency of watersheds to disturbance; degree of past management disturbance.

Fish Communities

- ◆ *Connectivity* ~ how well current fish communities represent the full range of diversity and life histories; how well fish communities are still connected in high quality habitats (which also represents in part the condition of hydrologic systems and other aquatic species).

Integrity Layers

The following are the individual integrity layers developed by the Science Integration Team:

- ◆ **Aquatic systems with high integrity** (highly functional) were held to be those with a full complement of native fishes and other aquatic species, well distributed in high quality, well connected habitats. (See discussion of Watershed Categories in the Aquatic Ecosystems section of this chapter.) Category 1 Watersheds have the highest integrity; Category 2 Watersheds have intermediate integrity; and Category 3 Watersheds have the lowest integrity.
- ◆ **Hydrologic integrity** was measured on the basis of resiliency of watersheds to disturbance, and estimates of past management disturbances. Hydrologic resiliency (the ability to recover following impacts) was further rated according to degree of impact already incurred, the sensitivity of stream and riparian vegetation to impacts, and probable riparian area disturbance on rangelands. Areas with high hydrologic impact and high stream and riparian sensitivity are considered to have the lowest probable hydrologic integrity across the project area.
- ◆ **Forest ecosystem subbasins with highest integrity ratings** were those that are largely unroaded and comprised of moist and/or cold forest potential vegetation groups. Forest integrity measures included the percent in each potential vegetation group, proportion in wilderness, unroaded areas impacted by fire exclusion, and proportion of the area where fire severity increased and/or fire frequency declined significantly from historical to current times.
- ◆ **Range ecosystems with the highest overall integrity** ratings were those upland shrublands that are less developed, less roaded, and more remote. In addition to these measures, rangeland integrity was based on the proportion in dry grasslands and dry shrublands, and the proportion of area in cover types affected by encroachment of western juniper and big sage.

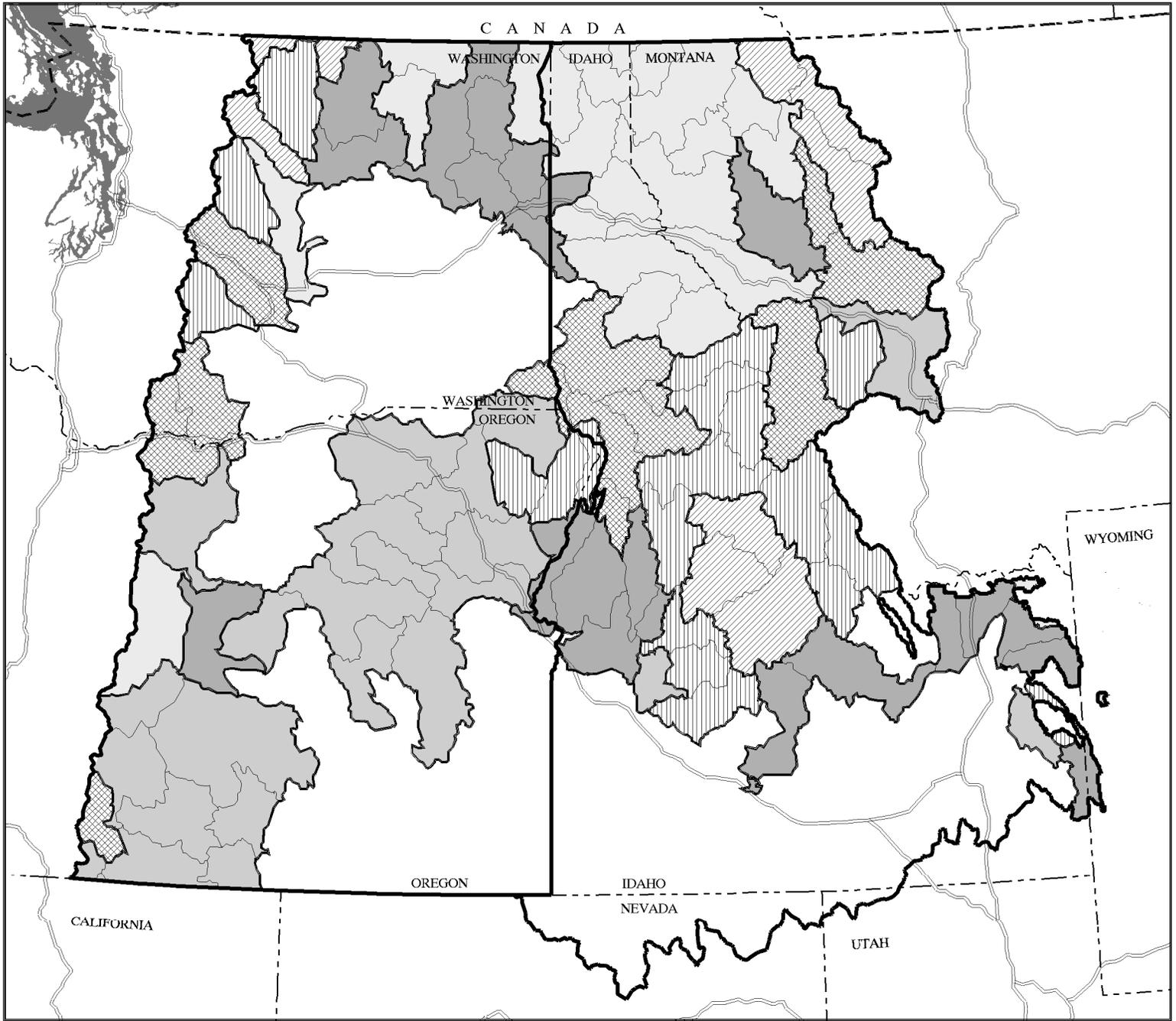
Terrestrial Habitat Departures

Departure values for terrestrial community types were developed to estimate the magnitude of broad-scale habitat changes in forestlands and rangelands within sub-basins. This was done to infer risks to current and future species viability. The availability of habitat within a sub-basin was compared to the historic range of conditions. It was assumed that species persistence within a sub-basin was not at risk if the current area of that species' primary habitat was within 75 percent of the data for historical condition. Risk to species persistence was assumed to increase substantially when current habitat availability fell below the 75 percent range of historical data, and persistence likelihood within a sub-basin was considered to increase as habitat availability exceeded the 75 percent range of historical data. Departure values were not determined for cropland, exotic, urban, alpine, rock, or riparian community types.

The Clusters

When the Science Integration Team analyzed individual sub-basin conditions (levels of integrity) together, several common patterns were revealed across the landscape. Six dominant clusters or sets of conditions focus on forestlands (sub-basins containing at least 20 percent forestland potential vegetation groups ~ dry, moist, and cold forests; see Map 2-32), and six clusters focus on rangelands (subbasins comprised of at least 20 percent rangeland potential vegetation groups ~ dry forest, dry grasslands, dry shrublands, cool shrublands, woodlands, riparian shrublands, and riparian woodlands; see Map 2-33).

The clusters are neither mutually exclusive nor all encompassing. Some subbasins contain both range and forested landscapes, which may be in very different ecological condition; where a sub-basin falls into both range and forest clusters, the implication is that the forest parts of that subbasin were evaluated as part of a "forest cluster," and the range parts of the subbasin were evaluated as part of a "range cluster" analysis. Some subbasins thus represent a clear set of conditions, while others are a mix of several conditions and risks.



**Map 2-32.
Forest Clusters**

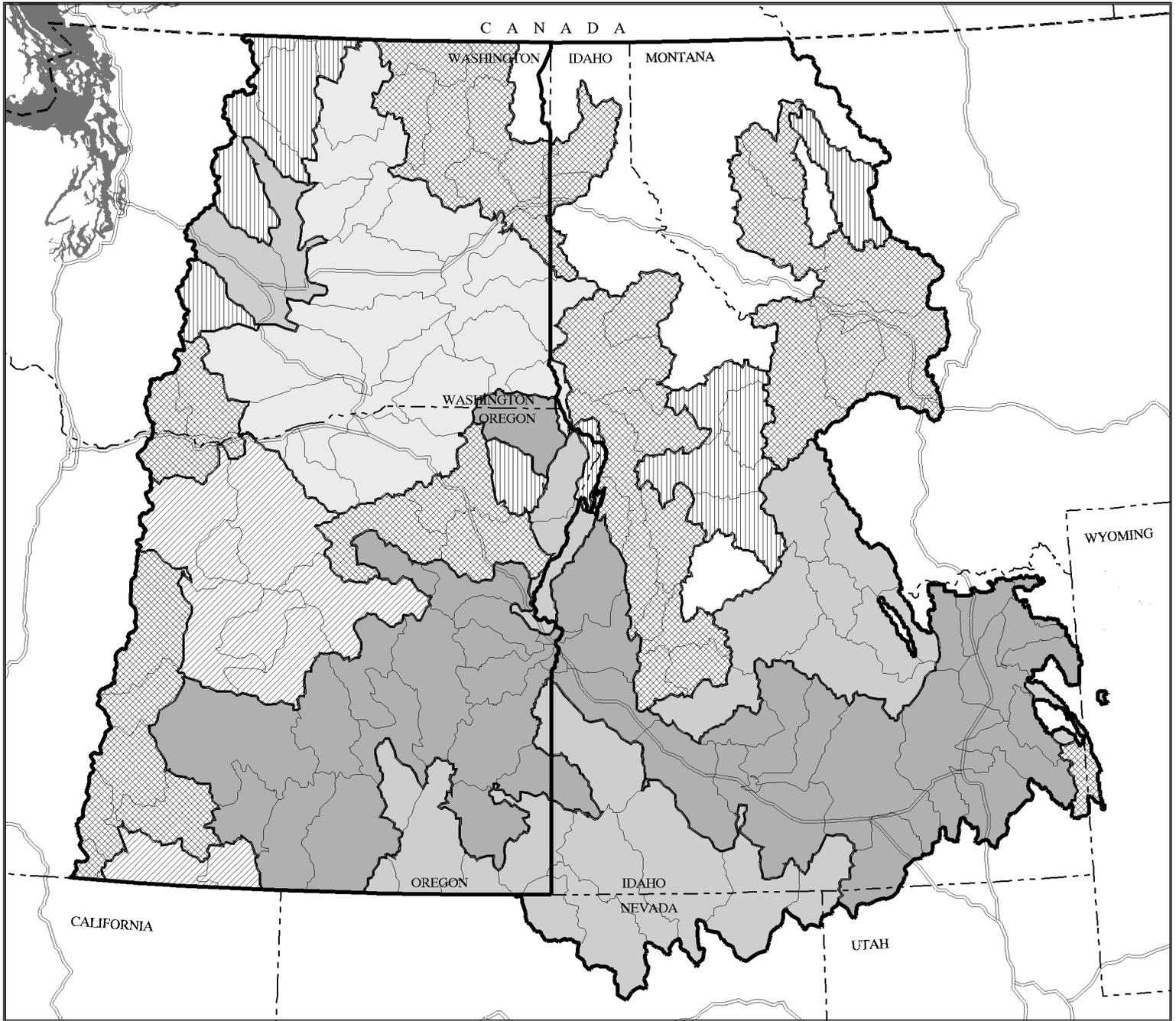
*BLM and Forest Service
Administered Lands Only*

INTERIOR COLUMBIA
BASIN ECOSYSTEM
MANAGEMENT PROJECT

Project Area
1996



- | | | | |
|--|-----------|--|------------------|
| | Cluster 1 | | Major Roads |
| | Cluster 2 | | EIS Area Border |
| | Cluster 3 | | Cluster Boundary |
| | Cluster 4 | | 4th HUC Boundary |
| | Cluster 5 | | |
| | Cluster 6 | | |

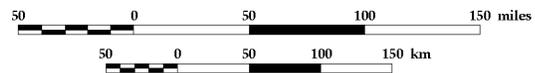


**Map 2-33.
Range Clusters**

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INTERIOR COLUMBIA
BASIN ECOSYSTEM
MANAGEMENT PROJECT

Project Area
1996



- | | | | |
|--|-----------|--|------------------|
| | Cluster 1 | | Major Roads |
| | Cluster 2 | | EIS Area Border |
| | Cluster 3 | | Cluster Boundary |
| | Cluster 4 | | 4th HUC Boundary |
| | Cluster 5 | | |
| | Cluster 6 | | |

For the cluster analysis, conditions within forest clusters and range clusters are summarized for the entire landscape, including both terrestrial and aquatic components. Within any cluster, the predominant conditions are an average ~ some locations within the cluster may have specific conditions that are better or worse than what is indicated.

Forest Clusters

Subbasins with at least 20 percent of their area comprised of dry forest, moist forest, or cold forest potential vegetation groups were classified as forest clusters. Relationships among variables reflecting vegetative conditions, hydrologic sensitivity, and human-caused disturbance of native forests were studied to identify dominant patterns and differences. What emerged were six forest “clusters” of subbasins with similar conditions. Differences among clusters were summarized in terms of forest conditions, departures in terrestrial communities, implications for terrestrial vertebrate species, hydrologic conditions, aquatic community status, and opportunities for management. Abbreviated forest cluster descriptions follow.

Forest Cluster 1

Subbasins in Forest Cluster 1 represent those that are most intact ecologically, with the least loss of integrity in both forest and aquatic ecosystems. They are predominantly high elevation and tend to be dominated by wilderness or roadless areas, and by cold, or moist and cold forests.

Forest ecosystems in this cluster are the least altered, although forest structure and composition have been simplified primarily by fire exclusion. These subbasins have the lowest mean changes in fire frequency and severity.

Forest habitats in this cluster provide a relatively high degree of security for a variety of species vulnerable to human exploitation and/or disturbance. The decline of late-seral forest structures within moist and cold forests in Forest Cluster 1 has likely had detrimental effects on available habitats for species associated with those structures. Conversely, an increased area in early-seral structures has likely increased the abundance of primarily summer foraging habitat for many forest ungulates (big game species).

This cluster has the highest hydrologic integrity of any forestlands in the project area. All subbasins have high or moderate aquatic integrity, with the best overall fish conditions and the best watershed conditions. They support some of the largest blocks of watersheds supporting strong salmonid populations and high measures of fish community condition. Although introduced fishes are often present, they rarely dominate communities. Connectivity among watersheds supporting native fish strongholds is good, and strongholds for multiple species often exist in subwatersheds throughout these subbasins.

Forest Cluster 2

These subbasins tend to have a mix of areas of moderate-to-high forest and aquatic integrity. Moderate to large blocks of wilderness or roadless areas and cold or moist forests are associated with the best conditions. Whereas, roaded non-wilderness areas and dry and moist forests often coincide with more altered vegetation conditions.

Forests in these sub-basins tend to be moderately to highly productive. The headwater areas are likely to be primarily moist and cold forests with the least altered structure and composition. Changes have been more substantial at mid- and lower-elevation, dry and moist forests where road densities are moderate to high and fire regimes have changed from non-lethal to mixed and lethal.

Forests in this cluster provide relatively secure habitats for those species vulnerable to exploitation and/or human disturbance. Risks to species persistence likely have increased for terrestrial vertebrates that rely heavily on early- or late-seral structures, or for species that prefer small openings of non-forest, canopy gaps, or open understories. The overall decline of early-seral forest structures has probably reduced habitat availability for dry, moist, and cold forest species.

Hydrologic integrity of the forests within these sub-basins is relatively high. Subbasins have high or moderate aquatic integrity, with both strong and unproductive watersheds present. Blocks of strong and high integrity watersheds are associated with the wilderness and roadless areas. Fish populations show relatively little influence from introduced species and thus have good potential for long-term persistence.

Forest Cluster 3

Subbasins in Forest Cluster 3 are represented by aquatic ecosystems that are in relatively good condition, but forests that are in highly altered and poor condition. Wilderness or roadless areas play a relatively insignificant role, and roading is moderate to extensive. Forests in this cluster are dominated by moist and dry forest potential vegetation groups.

The moderately to highly productive forests in this cluster appear to have substantially changed structure, composition, and fire regime.

Terrestrial species vulnerable to human disturbance and/or exploitation have a relatively limited amount of secure habitat. Risks to species persistence have likely increased for terrestrial vertebrates that rely heavily on early- or late-seral structures, and for species that prefer small openings of non-forests, canopy gaps, or open forests. The overall decline of early-seral forest structures in dry and moist forest probably has reduced habitat availabilities for species associated with those structures.

Hydrologic integrity of these subbasins is low to moderate. Most subbasins in Forest Cluster 3 have moderate aquatic integrity, but roading densities present an uncertain influence on watershed conditions. There are pockets of high integrity fish communities and relatively large numbers of strongholds, and most communities are still dominated by native species. Current conditions may indicate highly productive and resilient aquatic ecosystems; however, their association with low-integrity forest landscapes may indicate that cumulative effects of disturbance in streams may not have been expressed yet.

Forest Cluster 4

Subbasins in Forest Cluster 4 have relatively low forest integrity and low or moderate aquatic integrity. The highly altered forests are mostly comprised of the productive moist forest potential vegetation group. They tend to have the highest road densities in the project area, with few wildernesses or roadless areas.

Forest structures and composition have been altered. These forests generally show moderate to strong change in fire severity, but less change in fire frequency.

Terrestrial species vulnerable to human disturbance and/or exploitation have a relatively low amount of secure habitat presently available. Risks to species persistence have likely increased substantially for terrestrial vertebrates that rely heavily on early- or late-seral structures, and for species that prefer small openings. The overall decline of early-seral forest structures in moist forests has probably reduced habitat availabilities for moist forest species associated with those structures.

Hydrologic integrity of these sub-basins is moderate. Aquatic integrity is low or moderate. Although the aquatic systems often have some connectivity, the distribution of productive or strong watersheds is often fragmented.

Forest Cluster 5

Sub-basins in Forest Cluster 5 have low forest integrity and low or moderate aquatic integrity. Forest Cluster 5 is dominated by dry forests that are extensively roaded and have little, if any, wilderness.

Forest structure and composition have been substantially altered from historical conditions. These subbasins show large changes in fire frequency but less change in fire severity.

Relatively low amounts of secure isolated blocks of habitat persist for species vulnerable to human exploitation and/or disturbance. The substantial increase of late-seral forest structures has likely benefitted species preferring more densely stocked forests with a greater composition of shade-tolerant conifers; these same changes have likely reduced the habitat available for species preferring more open, park-like structures.

Hydrologic integrity of these sub-basins is low to moderate. Productive watersheds are often patchy in distribution. Native fish strongholds are poorly distributed, and the likelihood of widely distributed fish strongholds in the future is low.

Forest Cluster 6

Sub-basins in Forest Cluster 6 are in relatively poor condition from both a forest and an aquatic perspective, with especially fragmented aquatic systems. Forests in this cluster are comprised of a variety of dry, moist, and cold

forest potential vegetation groups. Subbasins are heavily roaded with little, if any, wilderness or roadless areas.

Forests are similar in composition and condition to those in Forest Cluster 5, but in Forest Cluster 6 there are more subbasins with moderate and high forest integrity. There is also a greater mix of dry and moist forests, and the change in fire frequency is not as dramatic.

Terrestrial wildlife species vulnerable to human disturbance and/or exploitation have a relatively low amount of secure habitat presently available. The risks to species persistence have likely increased for terrestrial vertebrates that rely heavily on early- or late-seral forest structures, and for species that prefer small openings. The overall decline of early-seral forest structures has probably reduced habitat availability for forest species that are associated with these structures.

Hydrologic integrity is the lowest of any Forest Clusters. Aquatic systems are especially fragmented, with few, widely scattered native fish strongholds, and the poorest overall conditions for fish communities. For the most part, remaining native fishes exist in remnant and isolated populations scattered throughout the subbasins. Many of the watersheds have been heavily influenced by non-native fish species. Some watersheds do support remnant strongholds and isolated populations of listed or sensitive fish species, or narrow endemic species.

Table 2-20 summarizes conditions in the six forest clusters.

Range Clusters

Selected subbasins that historically had at least 20 percent of their area comprised of dry grass, dry or cool shrub, and woodland potential vegetation groups were classified as range clusters. Relationships among variables reflecting vegetative conditions, hydrologic sensitivity, and human-caused disturbance were also used in a similar, but not identical, way as forest clusters. Range Cluster analysis identified dominant patterns and differences between subsets of these variables. What emerged were six range clusters, where subbasins within clusters were more like each other than subbasins in other clusters.

Differences among clusters were summarized in terms of range conditions, departures in terrestrial communities, implications for rangeland vertebrate species, aquatic community status, and opportunities for management. Abbreviated range cluster descriptions follow.

Range Cluster 1 ~ Juniper Woodlands

Rangeland and aquatic integrity are low to moderate in Range Cluster 1, which is distinguished by having large areas of western juniper woodland. These subbasins support the highest average road densities. Very little is managed as wilderness or roadless, and over half the area is managed in range allotments.

There has been a substantial reduction in areal extent of herblands and shrublands, and large increases in woodland area. The average area in cropland and pasture is low. Fire frequency has declined in at least half of the subbasins, while fire severity has increased in 20 to 50 percent of the area.

Decline of herbland and shrubland types within this cluster suggests that persistence of terrestrial vertebrates such as the western sage grouse, pygmy rabbit, Brewer's sparrow, and loggerhead shrike is currently at risk. Conversely, increases in western juniper woodlands suggest that species such as the plain titmouse and the Townsend's solitaire would be favored.

Hydrologic integrity of these sub-basins ranges from low to moderate, and the riparian environment integrity commonly is low. A few areas support above average numbers of fish species or important salmonid stocks and habitats that could be connected to larger functional networks, but overall aquatic integrity is low to moderate, with watersheds in Categories 2 or 3.

Range Cluster 2 ~ High Integrity Dry Forest Ranges

Rangeland and aquatic integrity are high in Range Cluster 2. There are large blocks of wilderness and minimally roaded areas. These dry, forested ranges are generally in the lower elevations and have little area managed as range allotments.

Table 2-20. Summary of Forest Clusters (all lands).

Variable	Forest Cluster					
	1	2	3	4	5	6
	<i>percent</i>					
BLM/FS-administered Forested Lands	80	86	40	58	50	35
Potential Vegetation Groups						
Dry Forest	16	37	35	18	81	51
Moist Forest	27	27	52	73	11	21
Cold Forest						
Road Density Classes	57	36	13	9	8	28
Low or none	85	62	32	20	22	36
Moderate or higher	15	38	68	80	78	64
Fire frequency change	37	60	66	51	60	60
Fire severity increase	36	50	57	47	35	36
High wildland/urban fire interface risk	0	17	6	1	29	10
Moderate wildland/urban fire interface risk	29	61	36	13	30	23
Forest Integrity						
Low	0	10	67	86	79	59
Moderate	0	43	33	10	21	17
High	100	47	0	4	0	24
Aquatic Integrity						
Low	5	0	8	54	52	87
Moderate	38	59	85	46	44	13
High	58	41	7	0	4	0
Hydrologic Integrity						
Low	0	4	47	12	39	76
Moderate	4	30	49	54	41	17
High	96	66	4	34	20	7
Composite Ecological Integrity						
Low	0	0	4	83	96	100
Moderate	0	3	96	17	4	0
High	100	97	0	0	0	0

Source: ICBEMP GIS data (converted to 1 km² raster data).

Herblands, shrublands, and woodlands (mixed conifer and juniper) declined significantly in this cluster. In some areas conifers have invaded historical meadows, grasslands, shrublands, and savannah woodlands, creating high fire fuel conditions.

The decline of shrubland and hermland community types suggests that wildlife species relying on the boundaries between shrubland or hermland habitats and dry forests would be most affected by the vegetation changes in this cluster. The progression of mixed-conifer woodlands to dry

forest types would affect species that prefer habitats comprised of sparse trees.

Hydrologic and riparian integrity of these subbasins are high. Measures of fish community integrity and numbers of fish strongholds are among the highest in the project area, with most watersheds in Category 1 and most subbasins having two or more sensitive fish species. Connectivity of subwatersheds that function as native fish strongholds is good. Fish populations and communities associated with these subbasins are among the most resilient in the project area

and represent core distributions for many of the sensitive salmonids.

Range Cluster 3 ~ Moderate Integrity Dry Forest Ranges

Dry, forested ranges in Range Cluster 3 have moderate rangeland integrity and mixed aquatic integrity. These subbasins contain little or no wildernesses or roadless areas. Less than half of the subbasins are managed as public land range allotments.

These subbasins are among the most altered forested rangelands of the project area. Dry forest areas have experienced changes in structure and composition. Meadows, grasslands, shrublands, and savannah woodlands have been invaded by conifers, creating elevated fuel conditions for fires. Some areas are improving, but are still challenged by expansion of introduced exotic grasses and herbs. Average sub-basin cropland area is low to moderate.

Terrestrial wildlife changes are estimated to be similar to Range Cluster 2.

Hydrologic and riparian environment integrity of sub-basins within this cluster is low. For the most part, fish populations are fragmented and represented by remnant and isolated populations scattered throughout the subbasins. Some subwatersheds support remnant native fish strongholds, isolated populations of listed or sensitive species, or narrowly endemic species. Many areas are influenced by non-native fish species. Subbasins that straddle the Columbia River at the base of the Cascade Mountains represent the migration corridor for all anadromous fishes entering the Columbia River Basin, and contain the highest number of sensitive species in the project area. Other areas have low to moderate watershed integrity and contain important populations of key salmonids.

Range Cluster 4 ~ Columbia Shrub Steppe/Croplands

Range Cluster 4 is composed of 33 percent rangelands and 56 percent croplands. The landscape pattern is islands of native habitat surrounded by agricultural lands. The BLM and Forest Service manage only five percent of this cluster.

Subbasins in Range Cluster 4 have the lowest rangeland and aquatic integrity of all rangelands in the project area. One wilderness lies within this cluster. Range allotments on public lands are minimal. Subbasins in this cluster are distinguished from other clusters by being comprised primarily of cropland and pasture.

Herblands and shrublands decreased significantly in these subbasins. Of the grassland and shrubland areas that have not been converted to cropland or pasture, most have been overgrazed and invaded by exotic grass and forbs.

Conversion of native herblands and shrublands to agricultural types has diminished habitat for a large number of wildlife species. Species associated with mixed-conifer woodlands have likely increased as a whole across the cluster.

Hydrologic and riparian integrity of these subbasins is low. Some subbasins in Range Cluster 4 contain major stretches of the mainstem Columbia and Snake Rivers, and contain the highest values for numbers of fish species in the cluster. Other aquatic systems have been radically altered, and most native fishes in the subbasin currently exist as very isolated populations, with some scattered salmonid strongholds.

Range Cluster 5 ~ Moderate Integrity Upland Shrublands

Subbasins in Range Cluster 5 are comprised of upland shrublands with moderate integrity and mixed aquatic integrity. These subbasins represent the bulk of the high elevation ranges. They are less developed, less roaded, more remote, and tend to be less disturbed by agricultural conversion or grazing than cropland-dominated subbasins.

Large areas are in the cool shrubland potential vegetation group, with the lowest area in cropland of the range clusters. Herbland habitats have decreased significantly.

Declines in herbland and shrubland habitats in this cluster have contributed to observed declines in populations of several species of upland game birds, songbirds, raptors, ungulates, and small mammals. An increased area in exotic grasses and herbs and croplands has likely benefitted some non-native vertebrates.

Hydrologic and riparian integrity of these subbasins is high and moderate, respectively. Among rangeland clusters, these subbasins support the highest diversity of salmonids and a relatively higher proportion of population strongholds. Introduced species have played an important role, but overall aquatic integrity remains moderate in some places, and good to excellent in others. Several subbasins still have relatively high quality river corridors designated under the National Wild and Scenic Rivers Act. Moderate or better water quality suggests that the potential for connection among some subwatersheds is still good.

Range Cluster 6 ~ Low Integrity Upland Shrublands

Both rangeland and aquatic integrity in these sub-basins are low. The dry shrubland potential vegetation group dominates upland shrublands. Road densities are relatively high. Most rangelands on public lands in this cluster are managed as range allotments.

Subbasins in this cluster are highly altered and have been invaded by exotic species, or converted to crested wheatgrass and other desirable exotic grasses. Herblands and shrublands decreased significantly. The amount of croplands varies.

Declines in hermland and shrubland habitats have contributed to declines in populations of several wildlife species. The overall increase of mixed-conifer woodland area across the cluster has likely increased habitats for other species.

Hydrologic integrity of these sub-basins ranges from low to moderate, and riparian integrity is commonly low. Subbasins in this cluster represent some of the most strongly altered aquatic systems in the project area. Aquatic communities vary greatly, with a few salmonid strongholds, but with overall highly fragmented habitat and isolated fish populations. Introduced warm water fishes have influenced many lakes, and recreational fisheries throughout much of the area currently focus on introduced races.

Table 2-21 summarizes conditions in the six range clusters.

Composite Ecological Integrity

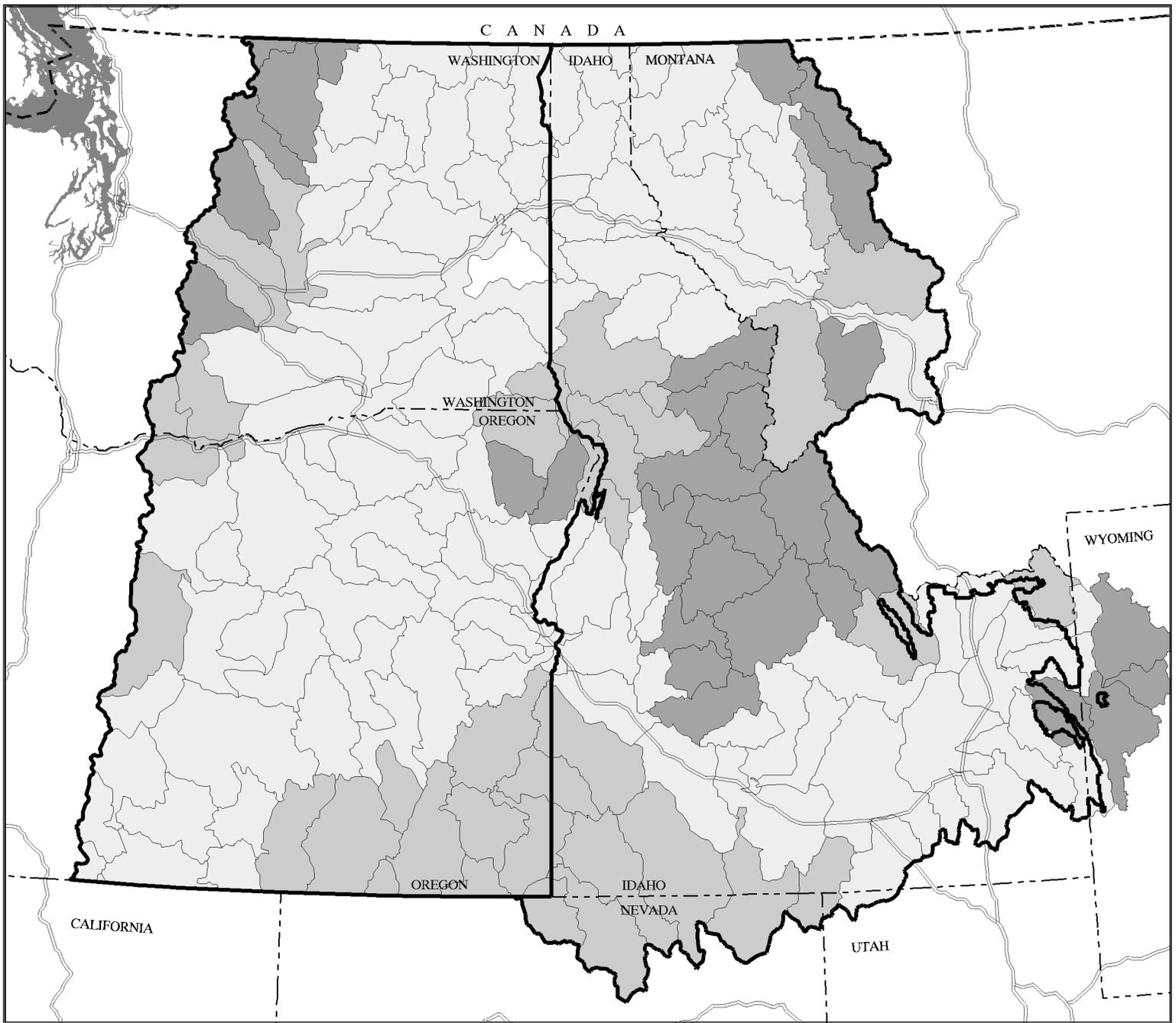
The SIT recognized that there are no direct measures of ecological integrity and that assessing integrity requires comparisons against a set of ecological conditions and against a set of clearly stated management goals and objectives as described in the alternatives. The SIT also recognized that this process is not a strictly scientific endeavor (Wickium and Davis 1995), because to provide meaning, ecological integrity must be grounded in desired outcomes. The initial estimates were based on current understanding and information, and are not presumed to be absolute.

Current ecological integrity was based on the analysis of the 164 subbasins within the project area. Relative integrity ratings (high, moderate, low) were assigned by subbasin for forestlands, rangelands, forestland and rangeland hydrology, and aquatic systems. The analysis was based on information from the *Scientific Assessment* (Quigley and Arbelvide 1996 and Quigley, Graham, and Haynes 1996) and understandings of conditions and trends. At present, 26 percent of the BLM- or Forest Service- administered lands is in high, 28 percent is in moderate, and 46 percent is in low ecological integrity. Map 2-34 displays this information.

Table 2-21. Summary of Range Clusters (all lands).

Variable	1	2	Range Cluster		5	6
			3	4		
			<i>percent</i>			
BLM/FS-administered	36	81	44	5	75	55
Rangelands	54	5	6	29	65	59
Rangeland Vegetation Groups						
Dry Rangeland	49	34	17	30	61	61
Cool Rangeland	34	8	8	3	27	11
Other	17	58	75	67	12	28
Road Density Classes						
Low or none	20	71	30	62	64	30
Moderate or higher	80	29	70	38	36	70
Cropland/pasture	9	3	14	56	5	17
<12" annual precipitation	23	1	2	51	33	38
Fire frequency change	37	51	67	17	24	17
Fire severity increase	18	47	49	13	16	9
High wildland/urban fire risk interface	32	7	12	0	6	8
Moderate wildland/urban fire risk interface	10	59	33	4	58	39
Change in juniper woodland	+ 12	0	0	0	0	0
Range Integrity						
Low	100	6	76	100	26	79
Moderate	0	37	15	0	50	21
High	0	57	9	0	24	0
Aquatic Integrity						
Low	39	4	43	84	37	79
Moderate	61	24	50	16	57	18
High	0	72	7	0	6	3
Hydrologic Integrity						
Low	34	6	49	100	7	44
Moderate	66	16	35	0	35	34
High	0	78	16	0	58	22
Composite Ecological Integrity						
Low	100	0	58	97	8	80
Moderate	0	3	32	3	63	20
High	0	97	10	0	29	0

Source: ICBEMP GIS data (converted to 1 km² raster data).



Map 2-34.
Composite Ecological Integrity

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- | | |
|----------|---------------------------------|
| High | No BLM/FWS Lands Present in HUC |
| Moderate | 4th HUC Boundaries |
| Low | Major Roads |

