WHITE SALMON

Subbasin Plan

Prepared for the Northwest Power & Conservation Council

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5/28/2004

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1.1 Subbasin Contributors

1.1.1 Organizations

Lead entities for this subbasin plan are the Yakama Nation, Klickitat County, and Washington Department of Fish and Wildlife. The lead entities are supported by the Washington Office of the Northwest Power and Conservation Council and its contractors Normandeau Associates, Laura Berg Consulting, and Dick Nason Consulting.

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1.2 Subbasin Plan Approach and Public Involvement

1.2.1 Description of Board or Planning Unit

Lead entities for this subbasin plan are the Yakama Nation, Klickitat County, Washington Department of Fish and Wildlife. The lead entities are supported by the Northwest Power and Conservation Council.

Infrastructure and Organization

Assessment - The subbasin assessment is a technical analysis to determine the biological potential of the subbasin and the opportunities for restoration. It describes the existing and historic resources, conditions and characteristics within the subbasin. The bulk of the assessment work was done by the Yakama Nation and WDFW with support and involvement of Klickitat County. Separate teams of fish and wildlife scientists developed the assessment.

Inventory - The inventory includes information on fish and wildlife protection, restoration and artificial production activities and management plans within the subbasin. The Inventory work was done by the Yakama Nation and WDFW with support and involvement of Klickitat County.

Management Plan - The management plan is the heart of the subbasin plan-- it includes a vision for the subbasin, biological objectives, and strategies. The management plan embraces a 10-15 year planning horizon. The Yakama Nation, WDFW, Klickitat County and a range of stakeholders were contributors to the management plan.

1.2.2 Vision Statement

We envision healthy self-sustaining populations of indigenous fish and wildlife that support harvest and other purposes. Decisions and recommendations will be made in a community based, open and cooperative process that respects different points of view, and will adhere to all rights and statutory responsibilities. These efforts will contribute to a robust and sustainable economy.

White Salmon Subbasin Plan

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2 Executive Summary

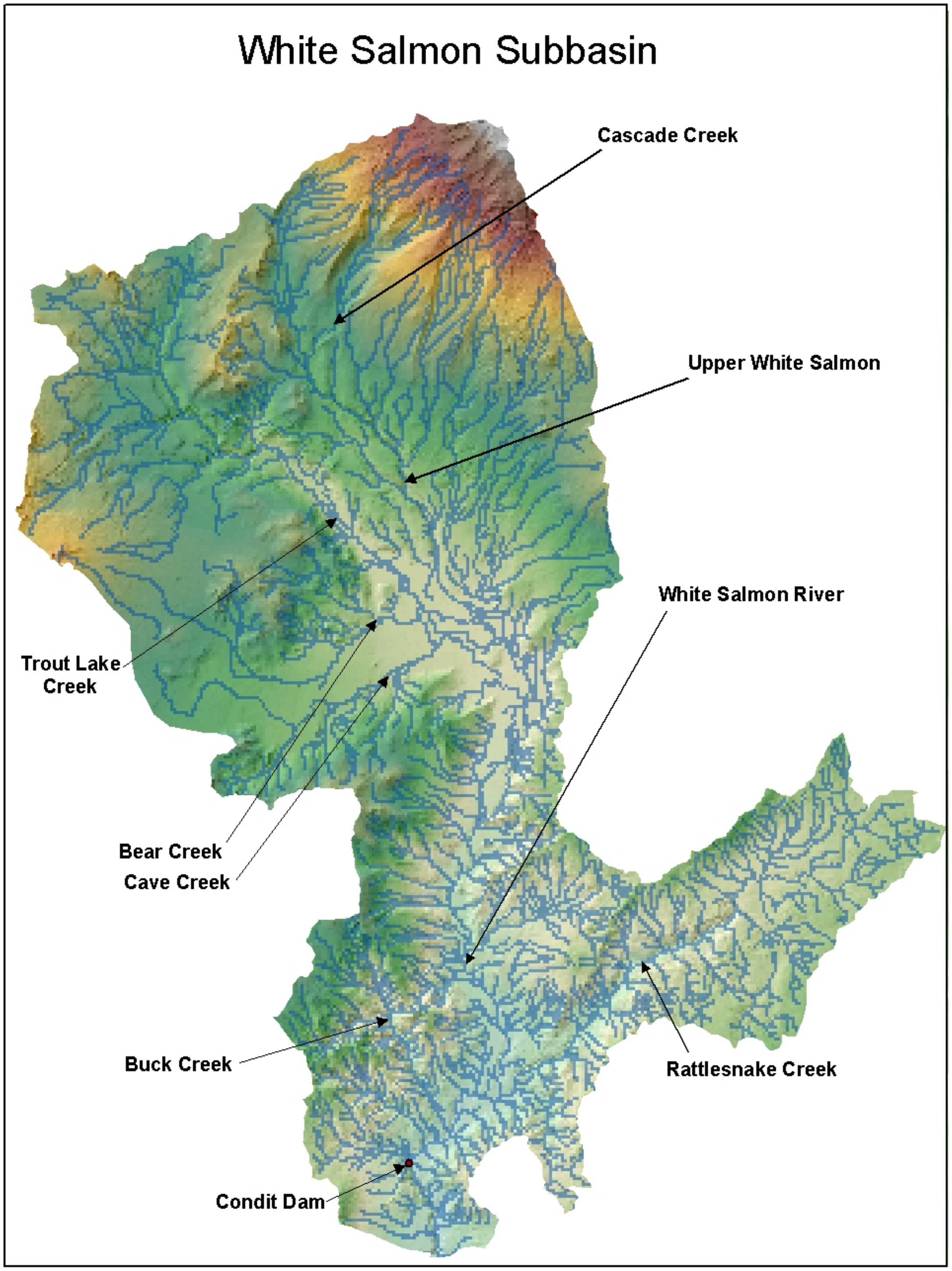

Figure 1 Location of White Salmon subbasin, topography, vegetation, demographics, and hydrology

2.1 Purpose and Scope

The White Salmon subbasin management plan—along with the supporting assessment and inventory -- is one of nearly 60 management plans that have developed throughout the Columbia River Basin for the Northwest Power and Conservation Council (NPCC). This subbasin plan was crafted by the same team that is currently working on the Klickitat and Lower Middle Mainstem Columbia subbasins, and thus shares many elements in common with those plans. The plans will be reviewed and adopted as part of the NPCC's Columbia River Basin Fish and Wildlife Program. They will help prioritize the spending of Bonneville Power Administration (BPA) funding for projects that protect, mitigate and enhance fish and wildlife that have been adversely impacted by the development and operation of the Columbia River hydropower system.

The primary goal of subbasin planning in the Columbia Basin is to respond to the Independent Scientific Group's Return to the River report to the NPCC. Notable conclusions from that report were:

> "Our review constitutes the first independent scientific review of the Fish and Wildlife Program…"
>
> "The Program's…lack of a process for prioritization provides little guidance for annual implementation…"
>
> "We recommend incorporation of an integrated approach based on an overall, scientifically credible conceptual foundation…"

The NPCC responded to the ISG by creating the subbasin planning process, within the context of the 2000 Fish and Wildlife program. Subbasin plans provide the first basin-wide approach to developing locally informed fish and wildlife protection and restoration priorities.

Another important goal of subbasin planning process is to bring people together in a collaborative setting to improve communication, reduce conflicts, address problems and, where ever possible, reach consensus on biological objectives and strategies that will improve coordinated natural resource management on private and public lands.

The plan could potentially have a great effect on fish and wildlife resources in the subbasins, and could also have a significant economic impact on the communities within the subbasins. For these reasons, public involvement is considered a critical component in the development of the subbasin plans.

An important objective of this subbasin plan is to identify management actions that promote compliance of the federal Endangered Species and the Clean Water acts. None of the recommended management strategies are intended nor envisioned to compromise or violate any federal, state or local laws or regulations. The intent of these management strategies is to provide local solutions that will enhance the intent and benefit of these laws and regulations. The NPCC, BPA, NOAA Fisheries and the U.S. Fish and Wildlife Service (USFWS) intend to use adopted subbasin plans to help meet requirements of the 2000 Federal Columbia River Power System Biological Opinion. NOAA Fisheries and the USFWS have stated their intent to use subbasin plans as a foundation for recovery planning for threatened and endangered species.

The White Salmon management plan's purposes include providing benefits to fish and wildlife where that help is most needed. The broad purposes of the plan and of the NPCC program mesh regarding fish and wildlife species.

From the Columbia River Basin Fish and Wildlife Program (NPPC 1994):

> The development of the hydropower system in the Columbia River Basin has affected many species of wildlife as well as fish. Some floodplain and riparian habitats important to wildlife were inundated when reservoirs were filled. In some cases, fluctuating water levels caused by dam operations have created barren vegetation zones, which expose wildlife to increased predation. In addition to these reservoir-related effects, a number of other activities associated with hydroelectric development have altered land and stream areas in ways that affect wildlife. These activities include construction of roads and facilities, draining and filling of wetlands, stream channelization and shoreline riprapping (using large rocks or boulders to reduce erosion along streambanks). In some cases, the construction and maintenance of power transmission corridors altered vegetation, increased access to and harassment of wildlife, and increased erosion and sedimentation in the Columbia River and its tributaries.
>
> The habitat that was lost because of the hydropower system was not just land; it was home to many different, interdependent species. In responding to the system's impacts, we should respect the importance of natural ecosystems and species diversity."
>
> Some species, such as some waterfowl species, have seemed to benefit from reservoirs and other hydropower development effects, but for many species, these initial population increases have not been sustained.

2.1.1 Public Involvement

The White Salmon plan could potentially have a great effect on fish and wildlife resources in the subbasin. It could have significant economic impacts on the communities within the subbasin as well. For these reasons, public involvement is considered a critical component in the development of the subbasin plans. Considerable time and effort was spent from the earliest meetings to craft a statement or "vision" of what the participants would like to see in their subbasin as the result of efforts to restore, protect and enhance fish and wildlife populations and their habitat.

Public involvement in the subbasin planning processes for the Klickitat, White Salmon and Lower Middle Mainstem Columbia River (including Rock Creek) included a public mailing, public meetings held at different locations and times throughout the subbasins, regular conference calls, use of a ftp site to store draft documents, posting draft subbasin plans on the NPCC website, and development and use of extensive e-mail lists that were intended to keep members of the public informed regarding the status of the subbasin planning process.

The subbasin planning team, as a part of its public outreach effort, developed a brochure for the public mailing. The brochure was sent as bulk mail and delivered to all postal customers residing in the three subbasins.

There were also a total of seven public meetings held as a part of the subbasin planning effort. These meetings were held on March 9 and May 6 in Goldendale, on March 11 and May 4 in White Salmon, on March 10 and May 5 in Bickleton, and on May 3 in Klickitat. Numerous technical and planning meetings, announced and open to the public, were held in many locations throughout the subbasins to facilitate collaboration, information flow and involvement by as diverse a group as possible. Throughout the subbasin planning process, participants worked on a vision statement that reflects their vision of the subbasin in 10 – 20 years. The vision statement for the White Salmon subbasin is as follows:

2.2 Subbasin Goals, and Vision Statement

2.2.1 Vision Statement

We envision healthy self-sustaining populations of fish and wildlife indigenous to the Columbia Basin that support harvest and other purposes. Decisions and recommendations will be made in a community based, open and cooperative process that respects different points of view, and will adhere to all rights and statutory responsibilities. These efforts will contribute to a robust and sustainable economy.

2.2.2 Subbasin Goals

- Protect or enhance the structural attributes, ecological function, and resiliency of habitats needed to support healthy populations of fish and wildlife.
- To restore and maintain sustainable, naturally producing populations of chinook, coho, and steelhead that support tribal and non-tribal harvest and cultural and economic practices while protecting the biological integrity and the genetic diversity of the subbasin.

2.2.3 Biological Objectives

Fish and Wildlife

- The larger, long-term objectives for fish and wildlife and wildlife habitat are to:
- increase reduced populations of native fish and wildlife to sustainable sizes;
- increase quantity and quality of reduced and degraded fish and wildlife habitat to amounts that will sustain native fish and wildlife species;
- decrease fragmentation of wildlife habitat, to restore connectivity of populations and historic migration routes, within and between subbasins, and
- increase presence of native plants in their historical distribution and reduce exotic plant distributions.

2.2.4 Major Findings and Conclusions

The White Salmon assessment analysis and management plan biological objectives and strategies compares two scenarios -- one with the subbasin segmented by Condit Dam and by water falls farther upstream and the other with access restored for salmon and steelhead that spawned in the river and tributaries above the dam before access was blocked.

Condit Dam was built in 1913 at river mile 3.4. A settlement agreement is now pending before the Federal Energy Regulatory Commission to have the hydroproject removed as soon as 2006. Its owner, PacifiCorp, has said that providing the fish passage FERC would require for relicensing of the project is cost-prohibitive. A cheaper solution is removal, the utility has said.

The topic has been controversial locally with residents protesting the potential loss of Northwest Lake, which backs up behind the dam. Klickitat County -- which participated in the development of the White Salmon subbasin assessment, inventory and management plan -- and Skamania County governments have opposed the settlement agreement removal plan and the fisheries agencies and tribes support the removal plan in the settlement agreement.

There are numerous changes in ecosystem processes within the White Salmon Subbasin that have been identified as a part of the subbasin planning process. They will be the target of the plan's strategies to improve conditions for fish and wildlife.

Because of the large number of wildlife species and habitats present in the subbasin, biologists could not provide adequate descriptions and status reports for each. Instead, they chose to select focal habitats on which to focus assessment and management analysis. The focal habitats are montane coniferous wetlands, ponderosa pine/Oregon white oak forests and interior riparian wetlands. The focal species include the Western gray squirrel, Lewis' woodpecker, the Oregon spotted frog, the American beaver, the yellow warbler and the Western pond turtle. Focal fish species include fall and spring chinook salmon, coho salmon, steelhead and resident rainbow trout.

The WDFW has proposed biological objectives for salmon performance based on a rehabilitated White Salmon subbasin. These goals explicitly recognize the White Salmon subbasin will not be returned to pristine condition and human impacts are and will continue, but salmon performance would reach the "healthy and harvestable levels" desired in Washington's Statewide Salmon Strategy (JNRC, 1999).

The suggested management plan strategies for anadromous fish follows two paths. One set of recommendations offers strategies and "assessment opportunities" to provide anadromous fish access above Condit Dam. The other focuses on improving salmon and steelhead habitat above the dam.

The WDFW analysis indicates that the present-day fall chinook population is actually increased over what it would have been historically. That's because the reservoir created by the Columbia River mainstem's Bonneville Dam inundates the lowest reaches to create additional juvenile rearing habitat and decreased bed scour and incubation survival in the bypass reach is increased since Condit Dam reduces sedimentation and peak flows. All other anadromous fish species performance improves as conditions move from present day back toward historic condition (with Condit Dam removed and habitat restoration and protection strategies being implemented) The steelhead and reintroduced spring chinook would refill their historic niche above the hydroproject if anadromous access were provided.

The primary aquatic habitat attributes that to be addressed are: the removal of obstructions and wood, degraded riparian function, increased maximum temperature, higher % fine sediment in spawning gravel, higher peak flow, and lessened channel stability. The watershed processes that control these attributes are fish access, riparian zone condition, sedimentation, and hydrology.

Fish access improvement is controlled by Condit Dam and is being addressed through the FERC relicensing. The riparian process is in good shape except for riparian function in Rattlesnake and Indian Creeks. There is a lack of wood in all reaches due to reduced recruitment and removal. The sediment and hydrology processes are dominated by the effects of roads and forest clearing.

The most challenging watershed processes to return to more normative conditions will be the sediment and hydrology due to higher road densities. Much of the upper assessment unit is under federal ownership and managed by the USFS and their watershed analysis recommendations include reducing road densities. The riparian function in the mainstem is good and can be improved with landowner co-operation in the tributaries. Wood recruitment will develop naturally as protected riparian areas mature. However, there is a challenge in the mainstem White Salmon River striking a balance of leaving sufficient wood in the river for fish habitat and maintaining enough open channels for whitewater recreation.

A key finding from the White Salmon analysis is that habitat in the subbasin above the dam is capable of supporting anadromous fish. Therefore, the prime strategy is for protection of functional habitat and watershed processes throughout the basin.Another prime strategy is to carry out the necessary evaluations to fill data gaps and key uncertainties with population monitoring, physical habitat monitoring, road analysis, and in-stream water monitoring.

For restoration and rehabilitation actions, those actions that have the highest certainty regarding effectiveness in restoring habitat quality were projects in Rattlesnake and Indian Creeks designed to reduce maximum water temperatures, stabilize banks and provide potential wood recruitment through plantings in the riparian zone. Other primary actions include screening and water conservation strategies in Buck Creek and decommissioning of roads identified in the USFS watershed analysis.

The remaining anadromous fish strategies involve an update to the re-introduction plan including risk assessment for genetic diversity and population maintenance during dam removal, hypothesis testing for strategies, population monitoring and evaluation, and adaptive management sections. In general, the Washington Department of Fish and Wildlife biologists that conducted the analysis felt that a monitoring and evaluation strategy is needed to guide adaptive management

A general theme across the subbasin is a reduction in the quantity and quality of all types of wildlife habitat that the focal and other species need to flourish.

Riparian wetlands have been lost as floodplain habitats have been converted to human uses. That loss of riparian wetland habitat structure and hydrology reduces or ecological function.

This plan's objectives and strategies recommend efforts to restore riparian wetland habitat in order to bring benefit to both fish and wildlife. Those actions involve both restoring habitat by increasing native vegetation and creating adequate hydrological conditions to reconnect habitats in tributary and mainstem floodplain areas.

Strategies to restore beaver habitat are possible and will bring populations closer to historic levels, helping to achieve the goal of restoring hydrological function to floodplains. The restored habitat would benefit beaver, whose activities would in turn benefit the salmon and steelhead that visit the watershed. Beaver dams result in the creation of off channel habitat and increased channel stability.

Shrub steppe habitat has been reduced in quanitity and quality. Land conversion and changes in fire intervals has resulted in fragmentation and reduction in size of functional shrub steppe habitat. Shrub steppe has been replaced by agriculture and grassland. Grassland quality has been reduced and in many places is mostly a monoculture of cheatgrass and other noxious weeds.

Habitat quality and ecological function in Ponderosa pine / Oregon white oak habitat has been reduced because of altered forest species composition and age structure. Historic harvest practices and fire suppression have resulted in a replacement of late seral stands and large overstory trees with smaller trees and denser stands.

Objectives include retaining any surviving late seral stands and large decadent wildlife trees and managing stands to restore functional habitat. Such strategies include identifying areas where thinning and/or prescribed burning would help achieve habitat objectives and thinning appropriate stands to decrease stand density.

3 Subbasin Overview

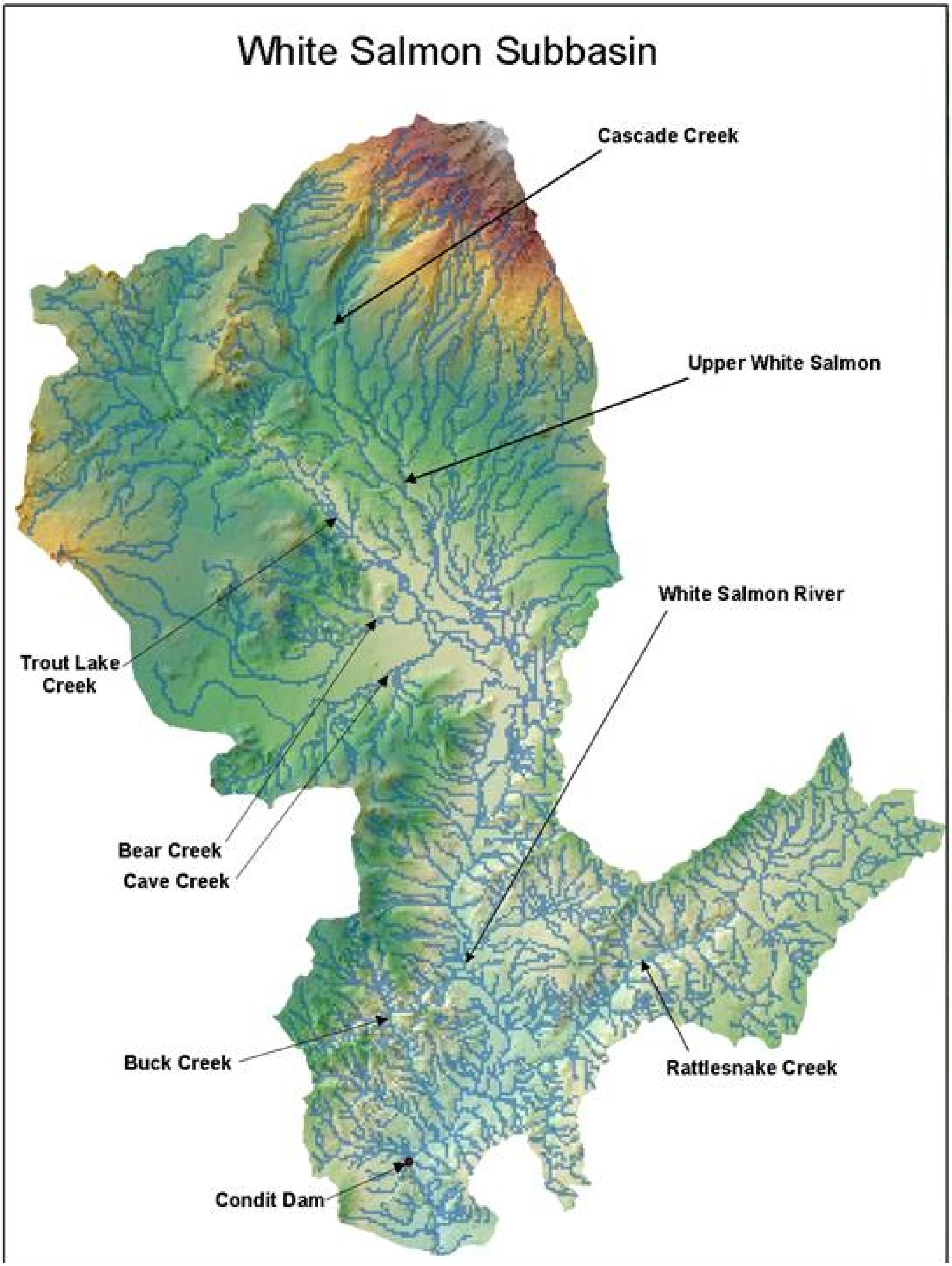

Figure 2 The White Salmon River and its tributaries

3.1 Subbasin in Regional Context

For planning purposes, the Northwest Power and Conservation Council (NPCC) divided the Columbia River Basin south of the Canadian border and its more than 50 subbasins into 11 eco-regions. NPCC is responsible for implementing the Pacific Northwest Electric Power Planning and Conservation Act of 1980 (P.L. 96-501) and the Fish and Wildlife Program mandated by the Act.

The 11 provinces, beginning at the mouth of the Columbia River and moving inland, are: Columbia Estuary; Lower Columbia; Columbia Gorge; Columbia Plateau; Columbia Cascade; Inter-Mountain; Mountain Columbia; Blue Mountain; Mountain Snake; Middle Snake; Upper Snake. These 11 eco-regions include the entire Columbia River basin in the United States, and together cover approximately 25,000 sq. mi. in Washington, Oregon, Idaho and Montana.

Each of the 11 provinces will develop its own vision, biological objectives, and strategies consistent with those adopted at the subbasin level. NPCC's intent is to adopt these elements into the 2000 Fish and Wildlife Program during later rulemaking. The biological objectives at the province scale will then guide development of the program at the subbasin scale.

The provinces are made up of adjoining groups of ecologically related subbasins, each province distinguished by similar geology, hydrology, and climate. Because physical patterns relate to biological population patterns, fish and wildife populations within a province are also likely to share life history and other characteristics (NPCC 2000). The White Salmon subbasin is in the Columbia Gorge Province.

3.1.1 Columbia Gorge Province

The Columbia Gorge Province extends over an area of approximately 3,305 sq. mi. It encompasses the Columbia River and associated watersheds between Bonneville Lock and Dam and The Dalles Dam. The Gorge Province includes a small portion of Washington and Oregon, composed of seven subbasins. Five lie within south central Washington: Klickitat, Little White Salmon, Big White Salmon, Wind River, and Columbia Gorge. Two subbasins, Fifteenmile Creek and Hood River, cover portions of Hood River and Wasco Counties in north central Oregon. The cities of Portland, Oregon and Vancouver, Washington are about 40 east of Bonneville Dam.

The province is dominated by the Columbia River Gorge National Scenic Area (Gorge Scenic Area), a spectacular river canyon the Columbia River cut through the Cascade Mountains. The province is a transitional environment between the relatively moist western region and the drier interior portion of the Columbia Basin. The mountainous regions, which form the province's western border, are predominantly coniferous forests, while the arid regions are characterized by sagebrush steppe and grassland. Many of the same fish and wildlife species are found in each of the six subbasins in the Columbia Gorge Province.

Archaelological evidence in the Columbia Gorge suggests human occupation for over 30,000 years. Excavations at Five Mile Rapids, a few miles east of The Dalles, show humans have occupied this ideal salmon fishing site for more than 10,000 years (Gorge Scenic Area 2004). For thousands of years, Indian people throughout western North America traveled to this area to trade for dried, smoked salmon. The people and villages indigenous to the province include the Cascade, White Salmon, Hood River, Klickitat, Wasco, Wishram, Tenino, Wyampum, and Tygh.

Other groups such as the Yakima, John Day, Umatilla, Nez Perce, Cayuse and others used the area, particularly for fishing, and figured significantly in trade and marriage with those whose territory this was. The descendants of these native peoples are now members of the Confederated Tribes of the Warm Springs, Confederated Tribes of the Yakama Nation, Confederated Tribes of the Grand Ronde Community of Oregon, Confederated Tribes of the Umatilla Indian Reservation, and the Nez Perce Tribe.

In 1843 about 900 European Americans braved the 2,000 mile Oregon Trail to reach the Willamette Valley. By 1849 approximately 11,500 pioneers had arrived in Oregon, forever changing life in the Columbia Gorge. Today significant urban centers within the Columbia Gorge Province include the incorporated cities of Goldendale, White Salmon, and Stevenson, Washington, and The Dalles, and Hood River, Oregon.

The Columbia Gorge Province is an important recreational, agricultural, and timber area and is a major source of hydroelectric power. Two major hydropower dams are located in the Gorge: The Dalles and Bonneville. Indian and non-fishing also make a significant contribution to the local economy. The area has many traditional Indian fishing sites that were reserved for use by the tribes and their members in 1855 treaties between the United States and the Warm Springs, Yakama, Umatilla and Nez Perce tribes.

3.1.2 White Salmon Subbasin

The White Salmon River originates in the Gifford Pinchot National Forest in south central Washington along the south slope of Mt. Adams in Skamania and Klickitat counties. It drains approximately 386 square miles and flows south for 45 miles before entering the Columbia River (Bonneville reservoir) in Underwood, Washington at RM 167. Elevation in the subbasin ranges from the 12,307 foot Mount Adams to 72 feet at the mouth. Condit dam is located at RM 3.25, the resultant reservoir extends to approximately RM 5.0 (Haring 2003).

A settlement agreement entered into between PacifiCorp, state and federal agencies, tribes and environmental groups, was finalized on Sept. 22, 1999. The settlement documents agreement on a proposed removal plan for Condit Dam and demolition and removal of all Condit Hydroelectric Project facilities with the exception of the project's powerhouse. The settlement calls for the removal in 2006.

The settlement agreement is now pending before the Federal Energy Regulatory Commission (FERC) while awaiting a decision regarding a Clean Water Act Section 401 Water Quality Certification that, if issued, would describe the actions required to mitigate for water quality effects, such as increased sedimentation, resulting from dam breaching.

The Washington Department of Ecology (Ecology) is the delegated entity authorized to issue or deny the 401 permit. Ecology has also determined that a stormwater NPDES permit under the Clean Water Act, which Ecology has state jurisdiction to issue, will likely be required for the project. At the time of this writing Ecology has gathered the scientific information necessary to begin preparation of a State Environmental Policy Act (SEPA) Supplemental Environmental Impact Statement (SEIS) to support its permitting activities. The SEIS will supplement the National Environmental Policy Act (NEPA) Final SEIS issued by FERC in June 2002. Ecology anticipates the SEIS will be complete in mid-2005; with the 401 permit following shortly thereafter. There will be opportunities for public comment during development of the EIS.

In comparison to other subbasins in the Columbia Basin, the White Salmon watershed is lightly to moderately developed. However, historical logging practices and associated road building, unscreened irrigation diversions, and inappropriate riparian grazing have resulted in increased sedimentation, reduced riparian vegetation, loss of large woody debris, and increased summer temperature in some areas.

3.1.3 Terrestrial/Wildlife Relationships

The different habitats found in the Big White Salmon subbasin support a varied array of wildlife. Our Oregon white oak and ponderosa pine habitats support a diversity of species, including western gray squirrels (*Sciurus griseus*). Klickitat County has the healthiest and most stable population of western gray squirrels in Washington State. This population, which is located in the lower Klickitat River Subbasin, may play an important role in the recolonization or reintroduction of squirrels into habitats they were formally found but are depleted. Despite some land conversion of oak and pine habitat in Klickitat County, a habitat vital to western gray squirrels, there are still large amounts of suitable and unfragmented habitat available.

Klickitat County supports many neotropical migratory birds. Many of them breed in the White Salmon subbasin. Lewis' woodpecker (*Melanerpes lewis*) is a migratory bird that breeds in Washington State, including our subbasin. The wintering grounds consist of the southern portion of the breeding grounds from Oregon, Utah, and Colorado south to the U.S.-Mexican border and into northern Baja California (Audubon 2002).

3.1.4 Fish & Aquatic / Wildlife & Terrestrial Relationships

Riparian areas are a unique habitat that connects aquatic and terrestrial ecosystems providing an important link between fish, wildlife and wildlife habitat. Riparian areas perform a number of functions vital to the watershed and water quality. These functions are important to salmon habitat and wildlife that are dependent on salmon for food and nutrients.

Anadromous salmon provide a rich, seasonal food and nutrient resource that directly impacts the ecology of both aquatic and terrestrial consumers and the vegetative landscape. There is also an important indirect effect on the entire food-web linking water and land resources (Cederholm et al. 2000). This food-web has likely always included this co-evolutionary relationship between salmon, wildlife and habitat in the Pacific Northwest.

The life stages of salmon (i.e., eggs, fry, smolts, adults, and carcasses) all provide direct or indirect foraging opportunities for terrestrial, freshwater, and marine wildlife (Cederholm et al. 2000). The relationship between pacific salmon and wildlife was examined by Johnson et al. (2001). A total of 605 species terrestrial and marine mammals, birds, reptiles, and amphibians currently or historically common to Washington and Oregon were examined for their relationship to pacific salmon. They found a positive relationship between salmon and 137 species of wildlife. See Appendix C, table C.6.A,h.s. for a full list of the wildlife species in our subbasin identified as having a relationship with salmon.

There are several predators in the Pacific Northwest ecosystem that benefit from the important ecological contribution that pacific salmon make as prey during their anadromous life history. Pacific salmon contribute nutrients during several stages of their life, regardless of whether particular individual salmon complete all life history stages or not (Cederholm et al. 2000). Six wildlife species present in our subbasin are identified as having a strong, consistent relationship with salmon: Common merganser (*Mergus merganser*), harlequin duck (*Histrionicus histrionicus*), osprey (*Pandion haliaethus*), bald eagle (*Haliaeetus leucocephalus*), black bear (*Ursus americanus*) and northern river otter (*Lontra canadensis*).

Fish, and their habitat, also benefit from the presence of particular wildlife species. American beavers (*Castor canadensis*) are extremely important in contributing to large woody debris, which is a critical structural component in Pacific Northwest streams. Large woody debris provides important structural complexity as well as vital nutrients to streams. Large woody debris and beaver dams decreases stream velocity and temperature. It also provides refugia to migrating fish.

There are many human activities that, if conducted improperly, can have significant impact on both terrestrial and aquatic species and habitat. Some examples include timber activities, urbanization, and cattle grazing. Timber activities can fragment and decrease quantity and quality of wildlife habitat. It can also decrease woody debris available to streams and increase sedimentation. High amounts of sediment can increase water temperature, making streams unsuitable for fish, amphibian and aquatic macroinvertebrate species. Urbanizatiion and associated road building can impact terrestrial wildlife by fragmenting habitat and creating barriers to migrating species. Roads can also cause sediment increase and edge degradation. Grazing can degrade both terrestrial and aquatic vegetation, impacting both wildlife and fish.

The White Salmon subbasin chum salmon and chinook salmon are listed within the Lower Columbia Evolutionary Significant Unit (ESU) or distinctive group of Pacific salmon or steelhead established by NOAA Fisheries. Steelhead are listed within the Middle Columbia River ESU. Steelhead in the subbasin were listed as threatened under the ESA in 1998, and fall and spring chinook salmon along with chum salmon , also designated threatened, were added to the list in 1999 (NOAA Fisheries 2004). Steelhead and salmon migrating to upper river tributaries of the Columbia and Snake Rivers typically dip in to the cooler waters of the White Salmon (Yakama nd).

3.2 Subbasin Description

3.2.1 Topographic/Physio-geographic Environment

The White Salmon subbasin is located in south central Washington in Klickitat and Skamania counties. The river begins on the southwest slope of Mount Adams and flows south about 45 miles into Bonneville Pool on the Columbia River (RM 168.3). Drainage area is approximately 386 square miles. Subbasin elevation ranges from 72 feet to 12,300 feet, and topography varies from rugged mountains to rolling hills to river valleys. Consolidated sediments are overlain with basaltic lava flows. Subsequent erosion, mud flows, and glaciation have resulted in precipitous cliffs, deeply incised canyons, and relatively flat valley floors. Several peaks and buttes reach elevations above 4,000 feet, but most prominent is 12,307-foot Mount Adams. Trout Lake Valley is the major subbasin valley and is bordered by hills to the west and rolling plateaus to the east (WDF 1990).

Geology

The geology of the subbasin is dominated by past volcanic activity. Subbasin soils are the result of volcanism and glaciation. Soils in the valley are deep and coarse with moderate fertility. In the hilly areas the deep and well drained soils are derived from weathered volcanic ash and lava underlain with olivine basalt (Haring 2003). The lava flows were often confined within ancient river valleys. For example, Quaternary basalt lavas flowed down the ancient Wind River, Little White Salmon River, and White Salmon River valleys to the Columbia River. In general, these Quarternary volcanics are more permeable than older rocks as the original permeability related to fractures has not been reduced by weathering (Envirovision 2003). In the lower portion of the basin, the soils are generally shallow and less porous (Haring 2003).

Climate

Climatic patterns of the White Salmon subbasin are controlled by marine-influenced air masses from the Pacific Ocean and continental air masses from eastern Washington. Winters are usually wet and mild, while summers are warm and dry. Approximate 75% of the precipitation is delivered in the form of rainfall or snow between October and March. The average precipitation along the eastern most portion of the watershed equals 40 inches a year, increasing to as much as 95 inches in the west and north (Haring 2003).

Temperatures vary considerably because of the large range in elevation, but are tempered by prevailing westerly winds. Typically, temperatures range from 29o F in January to 65oF in July (WDW 1990).

Land Cover and Vegetation

The subbasin vegetation is a mixture of east and west Cascade forests. Of the 247,039 acres that compose the watershed, 233, 698 acres (94.6 %) are forested. The other 5.4% which was composed of grassland and shrub-steppe has been converted to agricultural use (Haring 2003).

3.2.2 Jurisdictions and Land Ownership

The White Salmon subbasin totals 33,437 acres, of which 22,298 acres are located on federal land with the Gifford Pinchot National Forest (GPNF). Planning and management jurisdictions form an overlapping mosaic that includes the U.S. Forest Service (USFS), Confederated Tribes of the Yakama Nation, State of Washington, Klickitat County, Skamania County, Underwood Conservation District (UCD), and Columbia River Gorge Commission.

The upper portion of the basin and its tributaries are located within the legislated boundary of the GPNF. Federal ownership accounts for 50% of the watershed. The Washington Department of Natural Resources (DNR) manages approximately 20% of the basin, corporate timber holdings account for 20%, while the remaining 10% consists of small private timber lands, irrigated cropland, orchards, and residential area. The White Salmon River subbasin is part of the Yakama Nation lands ceded to the United States in the Treaty of June 9, 1855. Within this area the tribe reserves the right to hunt and fish at all usual and accustomed places in common with citizens of the territory.

The 8-mile segment of the White Salmon River upstream of Northwestern Lake to BZ Corner (RM 5.0-12.7) is included within the federal Wild and Scenic River system. The river downstream of Condit Dam (RM 3.3-mouth) is within the boundaries of the Gorge Scenic Area.

3.2.3 Land Use and Demographics

The principal uses of land are timber production, forest range, and agriculture. The area is rural with unincorporated towns and scattered residences along the river. Highway 141 generally parallels the river and provides primary access (WDW 1990).

The White Salmon River drainage has been managed for timber and agricultural production since white settlement. Pasture and hayland rank a distant second to forestland in watershed land use dominance, approximately 9,880 acres are utilized for this purpose, accounting for only 4% of the watershed area. The third largest land use in the watershed is orchard fruit production, accounting for 1,482 acres, or 0.6% of the total watershed area Animal husbandry includes approximately 1,140 range cattle, 500 pasture cattle, 2,050 dairy cattle, 800 sheep, 300 horses, and 60 llamas (Haring 2003). Additionally, all lands within the Gorge Scenic Area fall under land use regulations administered by Skamania County and the Gorge Commission. Land outside the Gorge Scenic Area is regulated under Washington State Forest Practices Act. Also, under the USFS Northwest Forest Plan initiated in 1997, much of the drainage has been designated as riparian reserves, or reserved through other means (Rawding 2000). Most of the land area outside of the GPNF is subject to Klickitat County land use ordinances.

Most of the 3,000 rural residents in the White Salmon subbasin live in the in the vicinity of Trout Lake, BZ Corner, and Husum. Other significant population centers within the watershed include the rural western outskirts of White Salmon, and the east side of Underwood Mountain in and around Underwood Heights. Urban development has been concentrated in White Salmon and the unincorporated towns of Husum, BZ Corner, and Trout Lake. Large scale industrial activities are limited by lack of available land outside the National Forest and Gorge Scenic Area. The river's proximity to the Portland/Vancouver area makes it a popular recreation destination for whitewater boating, winter sports, fishing, golfing, wildflower viewing, camping, hiking, picnicking, sightseeing, hunting, and berry picking (Rawding 2000). River recreational activities such as windsurfing has increased tourism in Klickitat and Skamania counties dramatically, likely leading to continued growth in these rural areas (WDW 1990).

Table 1 Population of major White Salmon subbasin counties, 1990-2000 (U.S. Census Bureau 2000).

County	1990 Population	2000 Population	Area (sq. mi.)	People/sq. mi. in 2000
Klickitat	16,616	19,161	1,904	10.2
Skamania	8,289	9,872	1,684	6.0

Table 2 Population of major White Salmon subbasin towns, 2000-2002 (U.S. Census Bureau 2000).

Town	2000 Population	2001 Population Est.	2002 Population Est.
White Salmon	2,193	2,214	2,229
BZ Corner			
Husum			
Trout Lake			

3.2.4 Anthropogenic Disturbances

Anthropologists date human occupation of the area surrounding the White Salmon river basin in south central Washington around 9,000 years ago (Haring 2003). Archaeological evidence indicates that at least 12 Klickitat villages occupied the valley at that time. They included summer gathering sites on the flanks of Mt. Adams, and permanent settlements adjacent to fishing sites at the Columbia confluence, Husum Falls, and falls at BZ Corner and Trout Lake (Lane and Lane 1981).

The earliest recorded inhabitants of the White Salmon region were those encountered by the Lewis and Clark expedition in 1805. The explorers named these people, who generally inhabited the north bank of the Columbia from the Dalles downstream to the White Salmon mouth, the Chilluckittequaw and estimated the tribe's population at 1,400. Lewis and Clark encountered a second group of people, the Klickitats, who also inhabited the White Salmon region during this time. Fishing was the primary economic pursuit of all aboriginal tribes within the Columbia Gorge region. Fishermen generally speared or netted fish in rapids or falls. Native women collected and stored various plant foods from the uplands. Men also hunted various mammals, including deer and elk in the uplands as well (Haring 2003).

After Lewis and Clark passed by the mouth of the White Salmon in 1805, no subsequent exploration of the area by non-Indian people occurred until 1853, when the McClellan expedition passed through the Trout Lake valley during a railroad survey (USFS 1991).

Early European settlers named the White Salmon after the pale bodies of spawning fish which at times nearly choked the mouth of the stream (GORP 2004). The Trout Lake valley was first settled in 1880; raising livestock was the principal economic activity. Irrigated farming was introduced to the Trout Lake valley in 1887. Timber harvest became a significant economic pursuit in the White Salmon once the first access roads were built in 1882. Near the turn of the century, splash dams became a common means of transporting logs downs the White Salmon River. Since 1882, it is estimated that at least 90% of the forest within the White Salmon basin has been harvested at least once. As land clearing progressed after the turn of the century, a shift in land-use from pasture/hay to orchards took place. Between 1890 and 1900, many small open tracts were planted to cherries, pears, and apples (BOR 1974). Commercial orchard production started in about 1902. Today, a relatively narrow range of human economic activities is being practiced within the White Salmon watershed. Forestland management is overwhelmingly the predominant land use. Secondary land uses include agriculture, recreation, and residential and commercial development (Haring 2003).

Historical information indicates that, until extensive logging opened up the White Salmon watershed, there were few if any deer. Seeing a deer historically was comparable to now seeing a cougar, a novel sight. Also, there were few elk present in the White Salmon River watershed until the last 25 years or so. Historically, most wildlife seen consisted of brown and black bear. Hunter Hill, a successful hunting lodge between Husum and BZ Corners started in the late 1800s, focused only on bear since the animals were abundant (Haring 2003).

Until recent years, timber harvest typically extended to the edge of the stream/river. Extensive grazing has occurred since the late 1800s in the Rattlesnake Creek watershed and in the Trout Lake Valley. Large historical marsh areas in the upper Rattlesnake Creek watershed were actively drained in the early 1900s to improve grazing conditions. The watershed is recovering from some past land use actions; many other impacts of past land use actions remain in the watershed (Haring 2003).

Condit dam was constructed in 1913, precluding all upstream anadromous access. Irrigation diversions date back to the late 1800s, and most diversions/withdrawals have been in place since the early 1900s. There are anecdotal reports of significant LWD accumulations in the vicinity of the dam prior to its construction. There are historical recollections from the period 1907-1910 of a logjam in the river, probably 500 feet upstream of the location of Condit Dam and extending for 0.5 mile, with an estimated 20 million board feet in the jam (Quaempts 1973, as cited in Lane and Lane 1981).

Hennelly et al. (1994) identified numerous private garbage dump locations down the banks of the lower White Salmon River. These dumps have been cleaned up through several volunteer garbage rodeo cleanup efforts. Illegal dumps are no longer considered to be a problem in the lower White Salmon River (Haring 2003).

In order to increase the priority of habitat protection, the USFS implemented the President Forest Plan and the State of Washington has increased habitat protection through the Timber, Fish, and Wildlife process beginning 1989 (Rawding 2000).

3.2.5 Hydrology

Hydrologic regimes

The mainstem White Salmon River has excellent flows and water temperatures year-round. The majority of flow is from glacial melt runoff and/or from springs and seeps from the porous basalts that are present through much of the watershed. Coupled with the location of much of the White Salmon River in a deeply incised canyon, water temperatures in the mainstem remain cold throughout the year (Haring 2003).

Streamflows in the tributaries in the watershed range from summer low flows to peak flows in the winter. Some tributaries only flow during high flow events and are dry the remainder of the year. Peak flows in the mainstem are generated by snowmelt runoff and occur in the spring, increasing from an average daily flow of 644 cubic feet per second (cfs) in the fall to flows of 1,538 cfs during the spring (Haring 2003). However, peak discharges are associated with rain-on-snow events (USFS 1998)

A significant tributary of the White Salmon River subbasin is Trout Lake Creek, which enters the river near RM 26. Below this confluence the White Salmon widens as it passes through the Trout Lake Valley, then enters into an area of box canyons where intermittent streams and many springs join the mainstem. There is a 21-foot falls at RM 16, and the next major tributary is Gilmer Creek, which enters near RM 12. The community of Husum and Husum falls are located near RM 7.6, just upstream of the confluence of the next major tributary, Rattlesnake Creek. Condit dam is located at RM 3.3, the resultant reservoir extends to approximately RM 5.0 (Envirovision 2003).

Subbasin stream gradients are fairly steep. From the headwaters to Trout Lake, the river loses over 5,000 feet in elevation, and from Trout Lake to the Columbia River, the river loses another 1,800 feet. Between RM 35 and RM 30 elevation changes at a rate of 200 feet per mile (4 percent) and from RM 17 to RM 12 the gradient drop averages 100 feet per mile (2 percent). At RM 7.6 there is a 6-foot to 12-foot high falls (Husum Falls), a partial barrier to anadromous salmonids. From RM 12 to RM 16.3, the river travels through a steep gorge that contains several falls. At RM 12.4 there is a 15-foot high fall and at RM 16.3 there are series of falls, the largest being 21 feet high. This probably represented the upstream limit of anadromous salmonid migration prior to Condit Dam. All tributaries between RM 7.5 and 21.4 are inaccessible to fish due to high falls at their mouths (WDW 1990).

The flow pattern on the White Salmon River mainstem is relatively constant due to its glacial origin, large water recharge potential, and storage capacity. Recharged water is released mostly in the middle portion of the mainstem canyon between Trout Lake Valley and Husum. The largest stream flows typically occur in response to Chinooks – rain-on-snow events when heavy rains combine with high air temperatures and high winds to cause widespread snowmelt. Low flows are maintained on the mainstem by late season snowmelt and areas of water retention or recharge (Haring 2003).

Large woody debris (LWD) is a critical habitat element, as it provides cover and instream habitat diversity, reduces peak flow energy, and retains substrate gravels. These key pieces could then form the foundation for collection of smaller LWD pieces and formation of logjams. The potential supply of large key-piece LWD in the watershed is severely impaired by past and ongoing land uses. Much of the limited recruitment of LWD that currently occurs is actively cut up or removed by river rafters (Bair) (Haring 2003).

Water Quality

Water quality in the subbasin is good, although the river suffers from a yearly high sediment discharge due to glacial-melt in the headwaters. Cascade Creek enters the river at RM 36.9 and is heavily laden with glacial flour. Substantial quantities of sediment are delivered downstream, which can reduce the quality of spawning gravel (WDW 1990).

The UCD has been monitoring water quality since 1992. The dry season is the most critical period for temperature and dissolved oxygen in Pacific Northwest rivers. Measured temperatures within the mainstem during this time period are well within all existing and proposed water quality standards. As is normal, the river generally warms as it moves downstream, however the overall increase is only 39˚F to 41˚F, in part because the river flows through a deep box canyon (Envirovision 2003).

Dissolved oxygen concentrations are excellent throughout the mainstem even during the dry season. There appears to be no consistent trend with distance downstream. Fecal coliform bacteria concentrations provide the only troublesome part of the dataset. The White Salmon River was placed on the Washington State's 303d water quality limited list in 1994 (Yakama nd). EPA's TMDL lists White Salmon for fecal coliform with a 1998 cycle date.

While the upper watershed exhibits low concentrations that easily meet both parts of the Class AA standard, the lower watershed exceeds the Class A standard, with the highest concentrations measured at RM 18.2 during the summer period (Envirovision 2003). Agricultural sources are a common contributor to summer period bacteria problems. There is ample evidence that the bacteria is generated from Trout Lake Creek, an important agricultural area (Envirovision 2003).

The White Salmon River has high conductivity, similar to the Warm Springs River, a tributary to the Deschutes River in Oregon, which is typically indicative of moderate fish productivity (Chapman 19). Water quality studies in 1992-1993 documented significant levels of certain water quality parameters in the White Salmon River watershed (including tributaries), including water temperature, fecal coliform, and potentially nutrients (Stampfli 1994). Water temperature in Rattlesnake Creek and Indian Creek exceed temperature criteria are on Washington State's 303(d) water quality limited list.

Impoundments and Diversions

Anadromous salmonid distribution in the White Salmon River watershed has been limited to downstream of Condit Dam (RM 3.3) since 1913. Condit Dam is currently undergoing relicensing through fthe Federal Energy Regulatory Commission (FERC). A certian outcome of the relisencing process is than anadromous fish will have access to habitat above the dam for the first time since 1913, and most likely this will be achieved by removal of the dam.

No information available on Goose Springs Dam.

There are numerous irrigation surface water diversions and pump intakes in the watershed. Few of the surface water diversions are screened to prevent entrainment of juvenile salmonids into the irrigation network. Although several of the culverts in the watershed have been qualitatively evaluated for fish passage status, there has been no comprehensive assessment of culverts and associated fish passage status in the watershed (Haring 2003).

The majority of irrigation in the watershed is flood irrigation (Stampfli 1994), one of few areas in the state that has not converted to more efficient and less environmentally impacting irrigation practices (Haring 2003).

3.2.6 Terrestrial/Wildlife Resources

Riparian Habitat

The majority of terrestrial vertebrate species use riparian habitat for essential life activities and the density of wildlife in riparian areas is comparatively high. Forested riparian habitat has an abundance of snags and downed logs that are critical to many cavity birds, mammals, reptiles, and amphibians. This habitat is often characterized relatively dense understory and overstory vegetation. Cottonwood, alder, and willow are commonly dominant tree species in riparian areas. While riparian habitats are often forested, they may contain important subcomponents such as marshes and ponds that provide critical habitat for a number of species including Virginia rails, sora rails, and marsh wren. Riparian habitats also function as travel corridors between and connectivity to essential habitats for breeding, feeding, and seasonal ranges (see Wildlife Assessment).

Inundation of the lower reaches of the assessment unit by the Bonneville Dam pool has resulted in the loss of riparian habitat and connectivity between the White Salmon River to the Columbia River (Rawding 2000). For most wildlife species, there is a lack of essential historical data to adequately evaluate the impacts of Bonneville pool inundation.

Oak Habitat

The White Salmon River subbasin supports a portion of the white oak habitat remaining in the state of Washington. Oregon white oak is considered a state priority habitat, which is determined to be of significance because it is used by an abundance of mammals, birds, reptiles, and amphibians. Many invertebrates, including various moths, butterflies, gall wasps, and spiders, are found exclusively in association with this oak species.

Oak/conifer associations provide contiguous aerial pathways for animals such as the state threatened western gray squirrel, and they provide important roosting, nesting, and feeding habitat for wild turkeys and other birds and mammals. Dead oaks and dead portions of live oaks harbor insect populations and provide nesting cavities. Acorns, oak leaves, fungi, and insects provide food. Some birds, such as the Nashville warbler, exhibit unusually high breeding densities in oak. Oaks in Washington may play a critical role in the conservation of neotropical migrant birds that migrate through, or nest in, Oregon white oak woodlands (see Wildlife Assessment).

Spotted Owl Habitat

The White Salmon River and one of its tributaries, Trout Lake Creek, have stands of mature timber that have been designated spotted owl habitat areas. Approximately 2,400 acres comprise a habitat area and no timber harvest is allowed. Currently, there are six spotted owl habitat areas in the subbasin (WDW 1990).

3.2.7 Aquatic/Fish

Habitat conditions of the rivers and creeks in the assessment unit range from pristine to heavily impacted. The range of conditions reflects the variety of land use including wilderness, hydropower development, commercial forestry, agriculture, commercial and residential development, and urbanization. Principal impacts have been caused by Condit Dam at RM 3.3, riparian forest removal, splash damming and removal of LWD from the mainstem and tributaries, draining and channelization of tributaries and adjacent floodplain, fish passage barriers, and lack of screening to prevent entrainment of juvenile salmonids into surface water diversions and pumps (Haring 2003).

3.2.8 Fish Resources

Fish assemblages in the White Salmon River are divided into the area above and below the Condit Dam. Species found downstream from the dam include spring and fall chinook, coho salmon, winter and summer steelhead, large-scale and bridgelip suckers, pacific and brook lamprey, threespine stickleback, sculpins, white sturgeon, redside shiners, peamouth, and northern pikeminnow rainbow trout, and bull trout. Historically, sea-run cutthroat trout, pink salmon, and chum salmon likely used this area, but are believed to be extirpated. Species found upstream of the dam include cutthroat trout, rainbow trout, sculpin, and brook trout (non-endemic) (Rawding 2000).

Table 3 Potential production estimates for anadromous salmonids in the White Salmon River upstream of Condit Dam (Dam to RM 16.2) (from Bair et al. 2002)

Species	From Chapman 1981	From WDF et al. 1989	From DCC 1990
Steelhead	763	739	614
Spring Chinook	625	Not estimated	Not estimated
Fall Chinook	--	128-832	42-86
Coho	5480	1600-2300	1136-1880