Appendix N

Fisheries Specialist Report

Resource: Fisheries

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Activity in the Little Canyon Mountain project area historically occurred prior to the Taylor Grazing Act of 1934. Gold was discovered in Canyon Creek to the west on June 8, 1862. This discovery led to placer and hard rock mining in the project area. The mining activity resulted in construction of roads to individual claims and other ground disturbing activities associated with claim development. Some timber was cut to provide lumber and support material.

Little Pine Creek is a fish-bearing stream on the east side of the project area. Species present in this stream are mid-Columbia Ecological Significant Unit (ESU) summer steelhead, listed as threatened under the Endangered Species Act (ESA) and Westslope Cutthroat trout.

The majority of summer steelhead spawning and rearing in Little Pine Creek occurs on private lands to the north of Bureau of Land Management (BLM) managed lands in the northeast portion of the project area. Approximately ¼ mile of occupied summer steelhead spawning and rearing has been identified by Oregon Department of Fish and Wildlife on BLM administered lands. Field surveys in this area indicate the area has been impacted by historic and current placer mining. No current mining activity is impacting the present stream channel, however, there are active mining claims along this stream segment.

Historic mining heavily impacted the channel and adjacent riparian area. Currently willows, alder, black cottonwood and red-osier dogwood are the dominant riparian hardwood species present. Ponderosa pine, Douglas fir and western juniper are also present on the uplands and drier sites within the riparian area. Based on field surveys, large wood did not play an important role in channel and floodplain development in this lower stream segment. Few large stumps were found and the current trees are less than 150 years old. The stream to the north of the project area is hardwood dominated with grass/shrub upland. Ponderosa pine and Douglas fir increase and are dominate south to the headwaters.

ODFW identified approximately 2 ½ miles of Westslope cutthroat trout spawning and rearing habitat in Little Pine Creek. The lower limit is ½ mile below BLM administered land with distribution upstream ¼ mile into the Strawberry Mountain Wilderness area of the Malheur National Forest. Approximately 1 ½ mile of spawning and rearing cutthroat habitat is on BLM administered lands. Mining impacts to the channel and riparian are reduced as one goes upstream. Although there is more large wood potential in this segment, the narrow valley shape limits the interaction of large wood for channel and floodplain development.

Historic and current mining activity and later agriculture development created diversions of Little Pine Creek water. Water rights currently exist from Little Pine Creek for both mining and irrigation.

Canyon Creek is a perennial fish-bearing stream on the west side of the project area. U.S. Highway 395 parallels the creek on the east side. Historic and current mining evidence are present along the creek for approximately 2 ½ miles upstream of the town of Canyon City. Bureau of Land Management administers One and one-half miles of this segment. The project boundary is along the east side of the highway right of way.

Fisheries
Existing Condition

Little Pine Creek is a small north flowing tributary that enters the mainstem John Day River at river mile 249.8. Fish species of concern are Mid-Columbia summer steelhead, *Oncorhynchus mykiss gairdneri* (Behnke 1992), a listed threatened species under the Endangered Species Act (ESA) and Westslope Cutthroat trout, *Oncorhynchus clarki lewisi* (Behnke 1992. Currently willows *Salix sp.*, alder *Alnus incana*, black cottonwood *Populus trichocarpa* and red-osier dogwood *Cornus stolonifera* are the dominant riparian hardwood species present. Ponderosa pine *Pinus ponderosa*, Douglas fir *Pseudotsuga menziesii* and western juniper *Juniperus occidentalis* are also present on the uplands and drier sites within the riparian area.

European influenced disturbances in the Little Canyon Mountain area began with the discovery of gold in Canyon Creek on June 6, 1862. This find basically started a gold rush into the John Day basin. Initially, placer or hydraulic mining was the preferred method of extracting gold from alluvial deposits but was closely followed by hard rock mining resulting in tunnels and tailing dumps. Although both methods had varying impacts to the fisheries resource, placer mining had significantly greater adverse effects due to direct stream channel and riparian floodplain involvement.

Placer mining consisted of totally excavating alluvial materials from the channel and floodplain and both panning and sluicing these materials to separate the gold from rock and dirt in the alluvium. Not only did this activity destroy much of the inchannel habitat, it also required removal of much of the riparian vegetation. Although the stream was likely dewatered periodically and diverted to new manmade channels to excavate the alluvium, water remained in the stream at various changing locations. Typically the water carried heavy sediment from the mining operation. Initially, gold nuggets pinhead size and larger were panned or sluiced but later, as more ground was excavated and smaller particle sized gold was lost, in some instances mercury was used to aid in separation of gold dust from the alluvium. Some of the claims were reworked to recover the fine gold dust.

As placer claims occupied most of the riparian area, including perennial, intermittent and ephemeral drainages, hard rock claims also were filed. Hard rock mining required the blasting and excavation of tunnels on gold bearing ore veins in solid rock formations. Many of the ore formations were rather small but in order for the tunnel to accommodate workers and equipment, large amounts of material had to be removed with the ore. This excess material was discarded in a dump area outside the tunnel. If this dump occurred within a drainage, material would be subject to rain and snowmelt flows and be washed down to perennial fish-bearing streams segments.

As with most man-made activities, access to the activity was required. This resulted in numerous roads and trails constructed to the various mining operations. Typically, these roads were poorly constructed with native material and erosion was common during inclement weather. Concern for aquatic resources was non-existent. Roads and trails were built in riparian areas because of ease of construction and numerous stream fords were required to take advantage of flat terrain in floodplains. Some of these roads and fords are still being used today. Although the roads have been reconstructed with the advent of heavy equipment and more modern mining operations, sediment from these native surfaced roads continues to be a concern. Continued sediment input from roads and/or mining influence channel stability. Channel adjustments increase with increased sediment as the stream compensates for more bed load and fine sediment (Rosgen 1996). Fine sediment tends to degrade pool quality by reducing pool volume and decreasing structure complexity within pool habitats. In addition, fine sediments can influence macro invertebrate production by limiting food availability, water quality and aquatic habitat.

Oregon Department of Fish and Wildlife has only surveyed for presence or absence but not population viability or potential (Unterwegner 2002). Since no data exists from the early mining period concerning the aquatic resources of the area, only speculation of how the native fish managed to survive the intense mining era is available. Professionally, I assume fish sought small refugia pockets in spring areas adjacent to the stream and headwaters above the mining activity. These areas likely maintained fairly good water quality that allowed some fish to spawn and rear. As the mines “played out” this remnant population continued to survive and as time went on, vegetation returned and hydrological function restored some habitat. It is unlikely habitat will reach the pre 1862 condition because of continued man-made activities. There is good recruitment potential for large wood and with no planned thinning or harvest occurring within 300 feet of fish-bearing streams, the populations are likely to be self sustaining.

Several factors limit the potential for increasing populations of steelhead and cutthroat. These include small stream size, narrow valley form, gradients of 4 to 8 %, mining claims, private land uses, existing water rights and historic disturbance. Water quality is likely to remain good in the upper stream since the headwaters are in the Strawberry

Mountain Wilderness area. Activities on BLM will meet land and resource management plans. Mining activities require a Plan of Operation and will restrict activities that could impact fish and aquatic habitats. Private land activities are regulated by Forest Practices Act and land use planning laws.

Canyon Creek is a fish-bearing stream on the west side of the project area. Mid-Columbia summer steelhead, Westslope Cutthroat, and redband trout *Oncorhynchus mykiss* (Behnke 1992), use the stream adjacent to the project area as spawning, rearing or migratory habitat. Spring Chinook salmon *Oncorhynchus tshawytscha* occasionally spawn in the upper reaches of Canyon Creek. Canyon Creek within the project area would be migratory habitat for upstream adults and downstream smolts. U.S. Highway 395 runs parallel to the creek on the east side. The channel is severely constrained by the highway and floodplains are essentially non-existent on BLM lands. Black cottonwood, willow and red osier dogwood are the dominant hardwood species. The majority of land within 300 feet of the stream is a non-forested Mountain Mahogany *Cerocarpus ledifolius* /Idaho fescue *Festuca idahoensis* plant association (Johnson and Hall 1990) with numerous rock outcrops.

An east to west oriented ephemeral tributary, Whiskey Gulch enters Canyon Creek at the southern edge of the town of Canyon City. Private land is from the confluence of Whiskey Gulch with Canyon Creek up the gulch approximately ¼ mile. Adjacent to the private land is primarily Western juniper /Ponderosa pine plant association transcending into a ponderosa pine/Douglas fir further uphill. Douglas fir is dominant on the north facing slope with Ponderosa pine /mountain mahogany dominant on the drier south facing slope. There is no evidence of a defined channel in most of the gulch that would indicate an annual flow. One of the old mining ditches from Little Pine Creek terminates at Whiskey Gulch however has not been used in many years.

Alternative A

No Action

Effects on fisheries will **not** be discussed species by species. The similarity of aquatic habitat requirements for the four documented species is such that management actions will provide essential elements for either steelhead or cutthroat trout even though they have different life history forms. Redband and steelhead are resident and anadromous life forms of the same species and have the widest distribution in the basin. Westslope cutthroat are also a resident species with summer distribution limited to numerous headwater tributaries to the mainstem John Day River with winter migrations into the mainstem being documented. Migratory habitat for Chinook salmon in Canyon Creek would not be affected because the west project boundary is Highway 395 which serves to buffer potential project disturbances.

Effects

Direct Effects

The existing condition and improving channel function would continue. Stand structure would continue to be complex with a high risk of stand replacement fires caused by overstocked stands that are susceptible to insect and disease. Stream shading, large wood recruitment, pool frequency and other aquatic habitat or channel structure would change with natural processes. Changes to channel function and morphology would change by increasing pool volume and numbers in the long term as large wood is recruited to the stream and vegetation trends to a climax stage.

This alternative would have no impact on individual steelhead or cutthroat trout and presently occupied habitat. However, because long-term benefits from road stabilization would not be realized, sediment from this source (see hydrologist report) would continue to enter the streams. As a result, aquatic habitat potential would remain static or degrade slightly and continue to affect fish populations.

Indirect Effects

Allowing the trend of increasing ladder and surface fuel to continue would place fish habitat at risk because of the potential for high intensity stand replacement wildfires. Short-term water temperature increases would be expected from loss of shade in riparian areas. As a wildfire moves through RHCAs, lethal temperatures could be reached causing immediate fish mortality. This impact is expected to be local in nature, confined to the high intensity fire area and for a short distance immediately downstream. Adjacent areas of refugia would serve to harbor individuals that could repopulate the area over time.

Riparian roads provide access for unauthorized woodcutting that will reduce recruitment of large wood to the channel and damage to riparian vegetation. These roads and/or crossings are causing channelized flows that carry sediment, which increases turbidity, cobble embeddedness and reduces pool quality will not be closed.

Alternative B
BMBP

Double “Pacfish” (USDA/USDI 1995) buffers will be implemented for all Riparian Habitat Conservation Areas (RHCAs). These buffers would be as follows: 600 feet on either side of fish bearing stream, 300 feet on either side of perennial non-fish bearing streams, ponds, reservoirs and wetlands >1 acre and 200 feet on either side of seasonally flowing or intermittent streams, wetlands < 1 acre, landslides and landslide prone areas. These buffers are in excess of what is adequate to protect fish bearing stream from non-channelized sediment inputs and to be sufficient to provide other riparian functions such as: litterfall and nutrient input/retention, shading, woody debris recruitment, and stream bank stability. (Stowell, Pers. comm.)

Effects to fish and habitat would be similar between action alternatives because of "Pacfish buffers. Although proposed treatments may differ, the anticipated ground disturbance is not expected to increase sediment that would reach the stream.

Direct Effects

The direct effect to the fisheries resource from "Pacfish" buffers is the assurance no activities would occur that would directly harm fish or riparian habitat, water quality, and/or channel stability. Since no stand management will be allowed inside the buffer, important components such as large wood, shade and channel stability would virtually continue to be maintained at the present level in the short term. Long term, channel adjustments would continue to progress with the natural recruitment of large wood and flow regime. Riparian vegetation would change from a seral stage to a climax stage where conifers would shade out hardwood species and herbaceous vegetation. Overall, implementation of these buffers would be indistinguishable from the no action alternative.

The doubling of "Pacfish" buffers would not noticeably change fish habitat or riparian vegetation characteristics. No unstable landforms have been identified in the project area. Trees that may contribute to large wood recruitment typically do not exceed 150 feet in height therefore would not reach the stream. Although steeper slopes have potential to increase flow, velocity, and sediment transport, non-channelized sediment rarely travels more than 300 feet. (Stowell. pers. comm.)

Indirect Effects

The indirect effects of implementing "Pacfish" buffers is that over time, natural recruitment of large wood and riparian vegetation would influence meeting riparian management objectives within site potential capability. These objectives are >100 pools per mile, water temperature <64 degrees F., >20 pieces of large wood per mile, >80% bank stability, >75% of banks with <90 degree angle (i.e., undercut), and width/depth ratio <10 (mean width divided by mean depth). (USDA/USDI 1995). Existing disturbed conditions at varying locations along the stream such as: channel entrenchment, bank rock content, floodplain width and channel substrate influence the capability of the site to achieve natural potential. The site potential is likely limited from pre-European conditions by post 1862 activity as well as existing and future disturbances caused by mining and associated access requirements. These activities are governed by the General Mining Act of 1872 and are independent of any proposed action for this project.

Riparian roads provide access for unauthorized woodcutting that will reduce recruitment of large wood to the channel and damage to riparian vegetation. These roads and/or crossings are causing channelized flows that carry sediment, which increases turbidity, cobble embeddedness and reduces pool quality will not be closed.

Alternative C

Historic Perspective – circa 1900

Since this alternative addresses timber stand conditions in the late 1800s it does not attempt to imply the fish habitat and riparian areas were not in a degraded condition. As mentioned in the existing condition, mining activity post June 8, 1862 had severely degraded the streams. No pre 1862 data is present to indicate the riparian/stream condition, fish populations or distribution.

"Pacfish" buffers will be implemented for all Riparian Habitat Conservation Areas (RHCAs). These buffers are as follows: 300 feet on either side of fish bearing stream, 150 feet on either side of perennial non-fish bearing streams, ponds, reservoirs and wetlands >1 acre and 100 feet on either side of seasonally flowing or intermittent streams, wetlands < 1 acre, landslides and landslide prone areas. (USDA/USDI 1995). These buffers are considered to be adequate to protect fish bearing stream from non-channelized sediment inputs and to be sufficient to provide other riparian functions such as: litterfall and nutrient input/retention, shading, woody debris recruitment, and stream bank stability. (Stowell, Pers. comm.)

No improvements to road surface or drainage would occur with this alternative. Maintenance would be limited to shaping the road surface to better facilitate vehicle traffic and reduce channelized flows on the road surface. Cutoff roads would continue to contribute sediment and flow to the drainage ditches on the main road. No closure of arterial mining roads would occur so sediment from these sources would continue.

Direct Effects

The direct effect to the fisheries resource from "Pacfish" buffers is the assurance no activities would occur that would directly harm fish or riparian habitat, water quality, and/or channel stability. Since no stand management will be allowed inside the buffer, important components such as large wood, shade and channel stability would virtually continue to be maintained at the present level in the short term. Long term, channel adjustments would continue to progress with the natural recruitment of large wood, riparian vegetation changes and flow regime. Overall, implementation of these buffers would be indistinguishable from the no action alternative.

Indirect Effects

The indirect effects of implementing "Pacfish" buffers is that over time, natural recruitment of large wood and riparian vegetation would lead to channel stability, eventually reaching the natural site potential and riparian management objectives. This site potential likely is limited by historic activity as well as existing and future disturbances caused by mining and associated access requirements. These activities are governed by the General Mining Act of 1872 and are independent of any proposed action for this project.

Likewise, no improvements to roads that are currently contributing sediment to the stream would result. The existing road crossings that may be producing adverse effects would not be closed or improved.

Alternative D
Uniform Basal Area

This alternative would treat the area somewhat uniform across the landscape to address the potential fire hazard within the wildland-urban interface zone. Basal area would be 40 – 60 sq. ft. per acre.

Road management will consist of reconstructing a segment of the main road to relocate it outside the 300 feet “Pacfish” buffer, surfacing the road with pit-run aggregate, and closing the existing segment along Little Pine Creek. The relocated segment is approximately 2,748 feet in length. Although approximately 600 feet of this realignment will still be within the “Pacfish” buffer because of topographic design limits, it will be greater than 250 feet from the stream. The surfacing would be designed to preclude access from/to the main road by cutoff roads.

Direction in “Pacfish” for Road Management is: (RF-2b) to minimize roads and (RF-3b) landings in RHCAs, (RF-3a) reconstruct road and drainage features that do not meet design criteria or operating and maintenance standards, or that have been shown to be less effective than designed for controlling sediment delivery, or that retard attainment of Riparian Management Objectives (RMOs), and (RF-3b) to prioritize reconstruction based on the current and potential damage to listed fish or their designated critical habitat, the ecological value of the riparian resources affected, and the feasibility of options such as helicopter logging and road relocation out of the RHCA (USDA/USDI 1995).

With these guidelines in mind, the best way to minimize sediment to Little Pine Creek is to relocate the segment of road, surfacing with aggregate, install adequate drainage structures, close the main road segment within the RHCA, and design reconstruction that will reduce potential for cutoff roads.

Four small (< 2 acre) areas will have some conifers felled within the riparian area. The down trees will provide large wood to the channel and open the riparian canopy to allow hardwood vegetation expression that has been suppressed from over shading. Trees will not be removed and may be bucked to ensure contact with bank full flows. Each area will have scattered conifer overstory to ensure future recruitment of large wood. The number of trees felled at any location will not cause a jackpot of fuels that could be detrimental to fish or habitat if a fire would occur.

A culvert on a private road easement is currently restricting upstream movement of juvenile salmonids because of outlet height. Two options to correct this situation are available. One is to lower the existing culvert and meet passage criteria for all life stages.

The second option is to design a meander cascade to bring the channel up to the culvert outlet. In order to accomplish this, 8 inch minus pit run aggregate would be hauled to the site and placed in the existing floodplain in such a manner as to create a meander channel similar to that found above the culvert. The rough cobble channel would allow juvenile upstream migrations to reach the culvert outlet at a near level approach. Currently, there is no summer connectivity approximately 100 feet above the culvert for about 300 feet where low flows go subsurface.

One mile of fence would be constructed on the east side of Little Pine Creek toreplace an existing allotment boundary fence. The fence would exclude livestock in the Pointer Allotment from the stream on BLM lands. This comes from "Pacfish" direction under grazing management (GM-1) "Modify grazing practices (e.g. accessibility of riparian areas to livestock,…) that retard or prevent attainment of Riparian Management Objectives" (USDA/USDI 1995)

Direct Effects

The direct effect to the fisheries resource from "Pacfish" buffers is the assurance no activities would occur that would directly harm fish or riparian habitat, water quality, and/or channel stability. Since no stand management will be allowed inside the buffer, important components such as large wood, shade and channel stability would virtually continue to be maintained at the present level in the short term. Long term, channel adjustments would continue to progress with the natural recruitment of large wood, riparian vegetation changes and flow regime. Overall, implementation of these buffers would be indistinguishable from the no action alternative.

The direct effect of road surfacing and installation of drainage structures would greatly reduce fine sediments to Little Pine Creek. Designing the reconstruction to reduce potential for cutoff roads will minimize flow and sediment delivery to the main road drainage system. All of these will improve the likelihood of attainment of RMOs and adverse affects to listed fish and habitat.

Alleviating the passage barrier at the culvert would allow all fish life stages access to upstream habitat during periods when seasonal volumes are sufficient to provide above ground flows to the segment that is subsurface during the summer. This may allow sub-adult fish that winter rear in the mainstem John Day River to return to the spawning/rearing areas of Little Pine Creek in early spring.

Construction of the fence will require removal of vegetation 6 feet on either side of the fence to allow livestock passage and sufficient space for fence maintenance. Any dead trees that could fall and damage the fence will be felled prior to construction. Livestock would not be excluded from the stream on private lands.

Indirect Effects

The indirect effects of implementing “Pacfish” buffers is that over time, natural recruitment of large wood and riparian vegetation would lead to channel stability, eventually reaching the natural site potential and riparian management objectives. This site potential likely is limited by historic activity as well as existing and future disturbances caused by mining and associated access requirements. These activities are governed by the General Mining Act of 1872 and are independent of any proposed action for this project.

By reducing sediment sources, cobble embeddedness will be reduced and channels remain stabile. This will, in the short and long term, improve aquatic habitat and allow existing fish populations to reach the carrying capacity of the stream.

The construction of a fence on the east side of Little Pine creek will assure livestock would not have access to the stream on BLM administered lands. This exclusion will protect fish habitat by ensuring no bank damage from livestock will occur, redd trampling will not occur, increased sediment from bank sloughing, and riparian vegetation will not be impacted from grazing. Livestock on private lands would not be excluded from the stream by this fence construction.

Alternative E
Graded Basal Area

“Pacfish” (USDA/USDI 1995) buffers will be implemented for all Riparian Habitat Conservation Areas (RHCAs).

Fuels reduction will consist of variations of basal area in graded bands from bottom to top. The lower band would be in the 40-50 basal area to provide greater fuels reduction near residential property. The upper most area would be increased to a 90-100 basal area with gradation in between.

The main road will be surfaced and drainage structures installed to disperse surface flows at adequate filter areas with this alternative. The surfacing would be designed to preclude access from/to the main road by cutoff roads. No closure of arterial mining roads would occur so sediment from these sources would continue.

Direct Effects

The direct effect to the fisheries resource from “Pacfish” buffers is the assurance no activities would occur that would directly harm fish or riparian habitat, water quality, and/or channel stability. Since no stand management will be allowed inside the buffer, important components such as large wood, shade and channel stability would virtually continue to be maintained at the present level in the short term. Long term, channel adjustments would continue to progress with the natural recruitment of large wood, riparian vegetation changes and flow regime. Overall, implementation of these buffers would be indistinguishable from the no action alternative.

Indirect Effects

The indirect effects of implementing “Pacfish” buffers is that over time, natural recruitment of large wood and riparian vegetation would lead to channel complexity, eventually reaching the natural site potential and riparian management objectives. This site potential likely is limited by historic activity as well as existing and future disturbances caused by mining and associated access requirements. These activities are governed by the General Mining Act of 1872 and are independent of any proposed action for this project.

Likewise, no improvements to roads that are currently contributing sediment to the stream would result. The existing road crossings that may be producing adverse effects would not be closed or improved.

Alternative F
Stratified Basal Area

This alternative would treat stands based on tree species composition. Stands would be identified as to preponderance of dominate species composition. Those units predominately ponderosa pine would target a basal area of 40 – 50 sq. ft. per acre, mixed conifer ponderosa pine/Douglas fir would target 50 – 60 sq. ft. per acre and Douglas fir would have 60 – 70 sq. ft. per acre. Treating the various stands in this manner will increase diversity for terrestrial species.

“Pacfish” (USDA/USDI 1995) buffers will be implemented for all Riparian Habitat Conservation Areas (RHCAs).

No improvements to road surface or drainage would occur with this alternative. Maintenance would be limited to shaping the road surface to better facilitate vehicle traffic and reduce channelized flows on the road surface. Cutoff roads would continue to contribute sediment and flow to the drainage ditches on the main road. No closure of arterial mining roads would occur so sediment from these sources would continue.
Direct Effects

The direct effect to the fisheries resource from “Pacfish” buffers is the assurance no activities would occur that would directly harm fish or riparian habitat, water quality, and/or channel stability. Since no stand management will be allowed inside the buffer, important components such as large wood, shade and channel stability would virtually continue to be maintained at the present level in the short term. Long term, channel adjustments would continue to progress with the natural recruitment of large wood, riparian vegetation changes and flow regime. Overall, implementation of these buffers would be indistinguishable from the no action alternative.

Maintenance of the main road will reduce channelized flow and subsequent sediment delivery to the streams and tributaries for a short period. However, the native surface will deteriorate rapidly during precipitation periods and rutting will result. Channelized flows and sediment will continue to retard recovery of Little Pine Creek because of channel adjustments and degraded pool habitat.

Indirect Effects

The indirect effects of implementing "Pacfish" buffers is that over time, natural recruitment of large wood and riparian vegetation would lead to channel stability, eventually reaching the natural site potential and riparian management objectives. This site potential likely is limited by historic activity as well as existing and future disturbances caused by mining and associated access requirements. These activities are governed by the General Mining Act of 1872 and are independent of any proposed action for this project.

Likewise, only maintenance improvements to roads that are currently contributing sediment to the stream will be a short-term improvement. The existing road crossings that are producing sediment would not be closed or improved.

Behnke, R. J. 1992. Native trout of western North America. American Fisheries Society Monograph 6. pp 80 & 177

Robert Behnke has extensively researched the taxonomy of native trout and the distribution of each species.

Johnson, Charles G. and Fredric C. Hall. 1990. Plant Associations of the Blue Mountains. U.S. Dept. of Agriculture, Pacific Northwest Region. p 30

Charles Johnson and Fred Hall have spent several years identifying plant associations in the Blue Mountains.

Rosgen, D.L. 1996. Applied River Morphology. Wildland Hydrology p. 5-45, & 6-19

Dave Rosgen has studied river morphology all over the world and developed a classification of streams/rivers using numerous characteristics such as meander pattern, gradient, substrate, valley form, width/depth ratio and others.

Stowell, Rick. 8/25/95. Pers. Comm. “Where Did The 300 Feet Come From”.

Rick Stowell contacted the authors of the “Pacfish” EA to clarify where distances and reasons for the default buffers.

Unterwegner, T. 11/7/02. Pers. Comm. Oregon Dept. Fish And Wildife.

Tim Unterwegner is the local Fish Biologist in the John Day basin for Oregon Department of Fish and Wildife.

U.S. Department of Agriculture (USDA) and U.S. Department of Interior (USDI). February 1995. Environmental Assessment for the Implementation of Interim Strategies for Managing Anadromous Fish-producing Watersheds in Eastern Oregon and Washington, Idaho, and Portions of California (PACFISH). pp C-6, C-8, C-10/11, C-12

This document amends the existing John Day Resource Management Plan to ensure protection of riparian areas and listed fish species.