3.5 Soils

3.5.1 Introduction

The NPNF recently completed the American and Crooked River FEIS. That analysis includes the American River watershed in which the Eastside Project is located. Much of the information and analysis methods in this section are incorporated from that analysis.

3.5.1.1 Scope of the Analysis

The scope of the analysis for soils, including landslide risk, includes the American River watershed. Soil productivity is the inherent capacity of a soil to support the growth of specified plants, plant communities, and soil biota. Soil also performs an important role in hydrologic function: the ability of the soil to absorb, store, and transmit water both vertically and horizontally.

Soil erosion may decline to negligible levels within five years on burned and harvested areas; however soil recovery following hot slash pile burns are not known, but effects are evident 30 years after burning.

Mass wasting is considered to affect soil productivity for 20 years or more, until soil organic matter accumulates and colluvium fills in channels scoured by debris torrents.

Temporal bounds for road-related effects are indefinite, because roads may continue to erode and produce sediment throughout their life, although peak erosion is typically at construction.

3.5.1.2 Soil Physical Properties

Indicators include:

Soil Compaction and Displacement:

- Acres of ground based logging on soils highly susceptible to compaction and displacement (USDA-FS, 1987c; Page-Dumroese, 1993)
- Acres of road construction

Surface and Substratum Erosion:

- Acres of harvest on soils rated as high for surface erosion (USDA-FS, 1987b)
- Acres of road construction on soil substrata (parent materials) rated as high hazard for erosion (USDA-FS, 1987b)
- Acres of road decommissioning

Mass Erosion: Acres of road construction or timber harvest on areas mapped as high landslide hazard.

3.5.1.3 Analysis Methods

Baseline conditions and ecosystem processes are derived from ecological land unit mapping and field reconnaissance. Soil susceptibility to compaction, displacement, and erosion was inferred from soil survey map units (USDA-FS, 1987c).

Past soil compaction and displacement were inferred from areas that have been tractor logged or dozer piled, and through photo interpretation or field reconnaissance. The linkage between tractor operation and machine piling, and their effects on soil compaction, displacement, and reduced soil productivity, is established through scientific research (Cullen et al., 1991; Froelich et al., 1983) and monitoring (USDA-FS, 1988, 1990, 1992, 1999c, 2003b, and 2003c).

The management strategy for landslide prone terrain is to minimize risk of slope failure in response to management activities. For the Eastside Project, field reconnaissance surveys were conducted by BLM on

areas of questionable stability. Roads and past harvest units were inspected for instances of instability; none were evident either on harvest units or roads (Stevenson, field notes, 7/2005). No harvest or road construction will occur in areas identified as having a high landslide hazard.

3.5.2 Existing Condition

Introduction

The South Fork Clearwater River Landscape Assessment (USDA-FS, 1998a) recommended as a high priority, "Restore aquatic processes" as the area theme for the American River watershed. Restoration should include both restoration of aquatic conditions and processes in the watershed and adjustments to the road and trail system to support aquatic restoration and maintain wildlife security while providing for administrative and public uses. The South Fork Clearwater Landscape Assessment (SFCLA) is not a decision document but provides an important synthesis of existing condition and resource potential in the watershed.

Soil resource management affects aquatic processes primarily through erosion, mass wasting, and soil compaction or disturbance that affects subsurface slope hydrology.

Geology, Soil Development, and Landforms
Rocks weather to form soil parent material. Soil texture, chemistry, and resistance to erosion are highly conditioned by geology.

Metamorphic rocks or their derivatives comprise 97 percent of the rock types in the watershed. Belt-age metamorphic rocks: gneiss, schist, and quartzite, weather to sandy loam, loamy sand, or sand parent materials and develop into soil parent materials that are rated moderate to high for substratum erosion hazard (USDA-FS, 1987c). Tertiary sediments and other alluvium are important in the American River Township, and are stratified sediments derived from the same geologic materials. They typically weather into soil parent materials that are rated moderate to high for substratum erosion hazard.

These materials typically have low levels of inherent nutrients, and moderate to poor ability to retain nutrients (Garrison and Moore, 1998). Potassium deficiencies noted in these rock types can affect tree growth and susceptibility to root disease.

Granitics comprise about 3 percent of the project area. They are higher in certain nutrients, including potassium, but weather to sandy soils with low ability to retain nutrients. They typically weather into soil parent materials that are rated high to very high for substratum erosion hazard (USDA-FS, 1987c).

Most soils in the project area have surface layers formed in volcanic ash-influenced loess derived from the eruption of Mt. Mazama about 6,700 years ago. This material is physically highly favorable to root growth, being very permeable and with a high ability to hold moisture and nutrients. This material is very easy to compact or displace at any moisture content (Page-Dumroese, 1993), Soil response to disturbance depends not only on soil type, but topographic setting and slope hydrology. Landforms have characteristic slope shape, steepness, and stream dissection, which affect erosion and sediment delivery to streams.

- Rolling hills of low to moderate relief dominate the watershed at lower and mid elevations (80 percent of the watershed). The volcanic ash influenced soil surface layers buffer against erosion except where soil substrata are exposed, as in roads or mines. Substratum erosion hazard is moderate to high. Slopes are gentle to moderate and sediment is delivered to streams with moderate efficiency. Unstable slopes are uncommon, and typically occur as small areas on lower slopes or near stream headlands. West and south facing slopes at low elevation may have thin or mixed ash surface layers. These soils do not hold moisture as well as ash-influenced soils and are more susceptible to surface erosion.
- Stream breaklands and steep mountain slopes are of limited extent in the watershed (8 percent). In comparison to rolling hills, breaklands have steep slopes, shallower soils, thin or mixed loess

surface layers, higher surface erosion risk, higher risk of mass failure, and more rapid delivery of sediment to streams. Debris torrents can occur in headwater channels after intense rainstorms or rain-on-snow events.

- Convex slopes are found at upper elevations (5 percent of the area). In comparison to rolling hills, convex slopes have broader ridges, lower drainage density, and bedrock is usually deeply fractured. Volcanic ash surface layers are typically present and buffer against surface erosion. Underlying these ash surface layers, the substratum erosion hazard is high, Slopes are gentle to moderate and sediment is delivered to streams with low efficiency. Unstable slopes are uncommon, and typically occur as small areas on lower slopes or near stream headlands.
- Alluvial valleys form along low gradient stream channels (3 percent of the watershed). Soils are often poorly drained and subject to water transport most of the year. Substrata are coarse sands with gravel and cobble. Some have been dredge mined and only coarse mine spoils remain. Sediment delivery efficiency is very high (USDA-FS, 1987c); most of this landform is a riparian area.

The balance of the watershed (4 percent) consists of relatively small percentages of various other landforms.

Soil Compaction and Displacement
Road building, development, mining, tractor logging, machine piling, and grazing have impacted soils in American River. Displacement reduces plant growth where topsoil and organic matter are removed.

Within the American River watershed, mining effects have been localized but severe: soils in dredge and placer-mined areas have been removed, and sterile tailing piles remain. Soil recovery has been very slow and some of these areas still act as sediment sources. About 11,314 acres (19 percent of the watershed) have been tractor logged, machine piled or displaced by mining or development, resulting in soil compaction and displacement over some of that area. This estimate is derived from Forest Service timber stand record systems, photo interpretation, and field reconnaissance. Where the volcanic ash surface layer is compacted, displaced or mixed, soil moisture holding capacity is significantly impaired (USDA-FS, 1999b). Excavator piling has been documented on 250 acres in American River. This is usually less impactive than dozer piling, but can sometimes result in more than 20 percent detrimental disturbance. An estimate of total soil damage from past ground-based logging is 35 percent of the total area tractor logged, or 3,960 acres. About 778 acres of cable yarding have occurred in American River. Soil damage is usually confined to yarding corridors and landings, and accounts for about 4 percent of the activity area, based on monitoring in other areas (USDA-FS, 2003b).

Road construction also displaces soil, with long-term to permanent impairment of soil productivity. About 860 acres of documented system roads occur where topsoil has been displaced, mixed, or lost to erosion. This represents about 1.5 percent of the watershed. Additional undocumented non-system roads occur in the Elk City township.

Motorized and non-motorized trails account for an estimated 65 acres of soil disturbance. Soils are both compacted and displaced. Numerous undocumented user-created ATV trails exist, which add to the amount of detrimental disturbance in the project area.

The larger privately owned meadows near Elk City have been grazed since the mining era, and about 700 acres are likely to have been most compacted. Although no documentation exists, grazing after the fires of 1889, 1910, and 1919 was probably widespread in the burned areas of the watershed.

Surface and Substratum Erosion
Road building is the primary current source of erosion and sediment production in the watershed. Excavated skid trails and temporary roads are prone to erosion because the surface soil is removed. Road

erosion and sediment yield usually decline over time but continue at a chronic (i.e., continual) level indefinitely (Cline et al., 1981). Periodic large pulses of erosion may occur during intense or prolonged rainstorms or rain-on-snow events, or after burning or harvest that increases water yield and overland flow in interaction with road drainage systems (Wemple, 1994).

Past mining has caused locally severe erosion of both surface soil and substrata, often concentrated in valleys where eroded material can reach streams. American River, Little and Big Elk Creeks, and Buffalo Gulch have been most affected (USDA-FS, 1998a). A minimum of 307 acres has been affected by dredge mining. Past fires have resulted in locally severe surface erosion, but post-fire erosion typically declines to negligible levels with vegetation recovery in about 4 years (Megahan, cited in Cline et al., 1981; Elliot, Robichaud, and Brown, 1999, as shown in Elliot and Robichaud, 2001). The most recent large fire occurred in 1919. This fire burned about 24,000 acres or 41 percent of the watershed. This was also the largest documented fire in American River. Other large fires burned in 1878, 1889, and 1910.

Surface erosion from timber harvest has been slight. The volcanic ash-influenced surface soil is rated as low surface erosion hazard (USDA-FS, 1987c) and occurs over more than 75 percent of the project area. Excavated skid trails and temporary roads are prone to erosion because the surface soil is removed. About 507 acres have been harvested in the past on soils with high surface erosion potential. These are on steep slopes, usually on south aspects, or in riparian areas where soil is readily detached and transported by water. Harvest has occurred on 510 acres on soils with moderate surface erosion hazard. They are usually on steep slopes on north aspects. Surface erosion on harvest units typically declines to negligible levels over time, except for some landings and excavated skid trails that remain on the landscape (Cline et al., 1981).

Motorized and non-motorized trails account for 65 acres of soil disturbance which is susceptible to surface and subsurface erosion. Thirty-five acres are on soil substrata rated high for erosion hazard. Numerous undocumented user-created ATV trails exist in addition to the system trails. They add disproportionately to potential surface erosion because they are often gullied or rutted and may go straight up slopes or across creeks and have no erosion controls.

Mass Erosion

Landslide hazard is low in most of the analysis area, and few instances of mass erosion have occurred in harvest units or along roads. Mass erosion is the movement of large bodies of soil under the effect of gravity. Movement may be accelerated by high moisture levels, undercutting of toe slopes, or loss of tree rooting strength, among other factors (Chatwin et al., 1991). Landslides here include slumps, creep, debris avalanches or flows, debris torrents, and bedrock slides. Landslides can result in on-site loss of soil productivity, as surface soils are translocated down slope. Sediment delivered to streams may comprise fine sediments, which could have negative impacts, or larger rock and large organic debris, which could enhance stream habitat complexity.

About 362 acres (less than 0.6 percent of the watershed) are mapped as high hazard for landslides and no project activities will occur on these. These are steep slopes, especially in concave headwalls, and have features that show evidence of past mass wasting. Debris avalanche, debris torrent, and shallow slumps are the most likely kinds of mass failures in the area, but field reconnaissance indicates past mass wasting has been generally restricted to small scale-events with modest impacts. Field reconnaissance for this project found few instances of mass wasting from roads and old harvest units.

Cable logging typically produces relatively little soil damage (research cited in Alexander and Poff, 1985).

About 8,820 acres, or about 15 percent of the American River watershed, has been clearcut harvested with dozer piling or broadcast burning. Most of this harvest was prior to 1990, when the first large woody debris prescriptions might have been implemented. Nitrogen losses have probably been substantial on

these sites. Because slash disposal burns logs on the ground rather than standing trees, soil temperatures can be hotter and nitrogen loss by volatilization may therefore be greater than with a wildfire.

Highly decayed wood provides sites for ectomycorrhizal colonization, which contributes to plant growth and plays a role in the food chains of many small rodents and their predators.

Coarse woody debris in natural systems fluctuates with forest growth, mortality, fire, and decay. Harvest and slash burning can remove large wood to a degree that its soil function is impaired, since both standing boles and down wood may be much reduced.

3.5.3 Soil Compaction and Displacement

3.5.3.1 Direct Effects

Table 3.5.1 Indicators of Soil Compaction and Displacement: Eastside Project

Activity	Alt A	Alt B	Alt C	Alt D
Acres of ground-based timber harvest on soils rated high for compaction or displacement hazard plus new temporary road construction	0	840	819	779
Acres of soil restoration through decommissioning of old roads	0	8	12	6

Alternative A (No Action Alternative)

Under the "no action" alternative**,** no soil compaction or displacement would occur as a consequence of road construction, timber harvest, or fuel reduction activities. Existing soil compaction and displacement would persist with very slight natural recovery of surface layers of compacted soils. No soil restoration or watershed improvement activities would occur, so the long-term upward trend would be slow.

If wildfire occurred, mechanized suppression activities and subsequent salvage logging could create severe soil impacts, depending on fire characteristics and administrative decisions. Although it is not possible to predict an ignition or the size and severity of a wildland fire, it is well documented that the risk is rapidly increasing (see Section 3.1 Fire and Fuels). Given the increasing risk of severe wildland fire the continued accumulation of dead and down fuel loads could contribute to increased potential for locally severe fire effects on soil, including physical alteration of soil structure and development of hydrophobic layers, but compaction and displacement from a potential natural wildfire are not likely.

The scope of such impacts is not foreseeable, given the uncertainties of fire ignition and burning weather. Because the location, intensity, and size of future fire, or agency actions in response to fire, are uncertain, with or without implementing any action alternative, the evaluation of alternatives by fire hazard is most appropriately addressed in Section 3.1 (Fire and Fuels).

Action Alternatives B, C, and D

Alternative B would result in the greatest potential for direct soil compaction and displacement, Alternative D is the least, and alternative C intermediate. There is only an approximately eight percent difference in acres of compaction and displacement between Alternatives B and D. The amount of compaction and displacement are largely driven by the tractor yarded and piled acres by alternative. The area impacted by road construction and recovery through decommissioning, and mine site rehabilitation is miniscule by comparison. Short-term changes to the livestock grazing will result on areas with prescribed burning and reforestation, but the long-term pattern will be unchanged (see Section 3.12 Grazing).

3.5.3.2 Indirect Effects

Action Alternatives B, C, and D
Indirect effects of soil compaction and displacement include effects to vegetation and hydrologic processes. Compaction and displacement can result in reduced moisture holding capacity, greater drought stress, and susceptibility to pathogens or fire. Certain species have a greater competitive advantage in disturbed soils, like weeds or lodgepole pine, so that shifts in plant community composition have been noted in field inventories of harvest units (USDA-FS, 2003c). Altered soil porosity and moisture holding capacity (USDA-FS, 1999b) could contribute to higher drought stress, lower ground cover, and shifts in disturbance regimes like erosion or fire. The relative ranking of likely persistent indirect effects by alternative is (least effect to greatest): D, C, and B.

3.5.3.3 Irreversible or Irretrievable Effects–All Alternatives

Soil compaction effects can last 70 years (Froelich et al., 1983). Effects are irretrievable for that time period, but not irreversible. Decompaction can at least partly restore soil porosity and productivity. Soil displacement that mixes or removes the volcanic ash surface layer reduces soil moisture holding capacity, which may be irreversible and irretrievable. The relative ranking of likely persistent soil compaction and displacement by alternative is (least effect to greatest): A, D, C, and B.

3.5.3.4 Cumulative Effects–All Alternatives

The affected area for cumulative effects analysis is the American River watershed.

Table 3.5.2 Indicators of Cumulative Compaction and Displacement: American River

Activity	Existing Condition Plus Proposed and Foreseeable Actions[1]				
	Alt A	Alt B	Alt C	Alt D	Existing Condition[2]
Acres of ground-based timber harvest on soils rated high for compaction or displacement hazard, plus road construction or mining	12,814	13,386	13,365	13,325	12,546
Acres of soil restoration through road decommissioning.	34	42	46	40	0

[1] The primary foreseeable action includes 251 acres of tractor logging or temporary road construction and 30 miles of road decommissioning in the American and Crooked River Project (in American River) and 17 acres of tractor logging in the Elk City school timber sale.

Project design features and restoration can reduce the likelihood of effects to productivity, diversity, and weed susceptibility. Additional soil restoration associated with decommissioning of old roads would also reduce the extent of cumulative effects within the project area. Cumulative effects are directly related to the scope of timber harvest and mechanical fuel reduction activities, road construction, and soil restoration, including road decommissioning. The relative ranking of likely cumulative effects by alternative is (least to greatest effect) A, D, C, and B.

Activities that cause soil compaction and displacement may have cumulative effects on soil porosity, water holding capacity, aeration, and long-term productivity, with repeated entries. Cumulative effects may also occur at the landscape level, where large areas of compacted and displaced soil affect vegetation dynamics, runoff, and water yield regimes in a subwatershed. About 4,849 acres are currently estimated to have sustained detrimental compaction or displacement in the American River watershed due to logging, mining, or road construction. (see the description of historic activities in American River at the

head of this chapter). About 50 percent of the documented ground-based logging occurred in the years 1972–1981, and about 14 percent from 1993 through 1996. Undocumented logging was extensive for land clearing and construction during the earlier mining eras. Major locations and timing of harvest included the late 1950s in Little Elk Creek subwatershed, 1961 in Middle American River, middle 1960s as part of the Little Elk Creek project, 1970s in Lower American, Upper American and Flint Creek, 1980s in Flint Creek and Kirks Fork, 1990s as part of multiple BLM sales in the Township in Big Elk Creek and Lower American River, 2000 and 2002 in Lower American River throughout the private lands in the Township. Impacts tended to change by time period because different equipment, constraints, and silvicultural prescriptions were used.

Early logging in the mining era was sometimes selective and slash disposal negligible, so that effects were variable and sometimes slight. From the mid 1950s through 1980s impacts were severe due to both uncontrolled skidding and heavy scarification for fuels and site preparation. Broadcast burning occurred in some areas in the 1960s and 1980s and usually resulted in reduced compaction and displacement. During the late 1980s and 1990s some restrictions on timing of operations and skid trail spacing may have been employed. Recent use of forwarders and fuels concerns have prompted extensive grapple piling, both of which result in more widely spread compaction, but often less displacement (USDA-FS, 2003c).

The Eastside Project alternatives will add from 779 to 840 acres of compacted or displaced soils, depending on alternative but will not impact areas already affected by harvest or mining, so cumulative effects considered on an activity area basis would be negligible. Considered across the watershed, cumulative effects of this project and the e American and Crooked River project and foreseeable Elk City school harvest, which could add an estimated 1,560 to 1,621 acres of compacted or displaced soils due to harvest and road construction, would comprise about 3 percent of the American River watershed.

Mining activity has contributed to cumulative effects on soil displacement primarily through ditching in the late 1800s, which interrupted local slope hydrology and displaced surface soils, hydraulic mines which washed away both topsoil and subsoils, hard rock mining which excavated pits and adits, and dredging in the 1930s, which removed valley alluvium and left sterile mine spoils. Dredging has particularly displaced valley soils in the American, Lower American River and Little Elk Creek subwatersheds. No harvest is proposed in areas affected by past mining.

Grazing has probably occurred along the privately owned valley meadows since the discovery of gold in 1861 until the present. Lower forested slopes around the meadows have been converted to pasture and also grazed for many years. Livestock grazing probably compacted the moist soils of these low-lying meadows and slopes. No harvest is proposed in these areas.

3.5.4 Surface and Substratum Erosion

3.5.4.1 Direct Effects

Table 3.5.3 Indicators of Surface and Substratum Erosion

Activity	Alt A	Alt B	Alt C	Alt D
Acres of timber harvest on soils rated high for surface erosion hazard	0	0	0	0
Acres of road construction on soil substrata (parent materials) rated high for erosion hazard	0	5	4	4
Acres of road decommissioning or soil restoration	0	8	12	6

Alternative A (No Action Alternative)

Under the “no action” alternative, surface and substratum erosion processes would continue on roads, skid trails, and landings with slight abatement as slow natural vegetation recovery occurs. Erosion from

harvest units would continue to decline to negligible. No new management sources of surface or substratum erosion would occur, so the net trend would be reduced management-derived erosion. However, no soil or watershed improvement activities would occur, so the long-term upward trend would be slow.

If a wildfire were to occur, consequent surface soil erosion would range from negligible to severe, depending on location, size and severity of burn, soil disturbance associated with suppression, salvage logging, or burn rehabilitation activities, and interaction of watershed response with the existing transportation system. Although the scope of such impacts is not foreseeable, given the uncertainties of fire ignition and burning weather, data displayed in the Section 3.1 (Fire and Fuels) displays an increasing risk of stand replacing fire. The continued accumulation of dead and down fuel loads could contribute to increased potential for locally severe burning behavior, which can increase the likelihood of surface erosion, but this may be similar to risks associated with logging and broadcast burning on areas proposed for treatment.

Action Alternatives B, C, and D

Alternative D would result in little surface erosion and the least substratum erosion, Alternatives B the most, with Alternative C intermediate, considering both harvest, road construction and restoration effects. Road construction is more likely to result in erosion than harvest.

3.5.4.2 Indirect Effects

Alternatives B, C, and D

The relative ranking of likely indirect effects by alternative is (least to greatest effects): D, C, and B. All alternatives would implement design criteria and mitigation measures to minimize rill erosion and sloughing on road cut slopes, and develop burn prescriptions to minimize erosion on harvest units.

Indirect effects of soil surface and substratum erosion include effects to vegetation and hydrologic processes. Surface erosion removes the soil materials with the greatest ability to hold moisture and nutrients, potentially resulting in greater drought stress, poorer growth, and susceptibility to pathogens or fire. Since volcanic ash is not easily replaced, these effects may be very long lasting. Certain species have a greater competitive advantage in eroded soils, like knapweed or lodgepole pine, so that shifts in plant community composition and consequent disturbance regimes like erosion or fire, could occur. Eroded surface and substratum material may be delivered to streams and have consequences to water quality, stream temperature, quality of fish habitat, and channel morphology. See the discussions in Sections 3.4 (Watershed) and 3.6 (Fisheries).

3.5.4.3 Irreversible or Irretrievable Effect

Alternatives B, C, and D

The relative ranking of likely soil erosion by alternative is (least to greatest effects):, D,C,B. Effects of eroded substratum material are not irretrievable or irreversible, although effects as delivered sediment may be long lasting.

Eroded surface soil, where it is derived from volcanic ash influenced loess, is irretrievable and irreversible. Residual soil materials would develop into topsoil over several decades to hundreds of years, but this material may lack the moisture holding properties of volcanic ash.

3.5.4.4 Cumulative Effects–All Alternatives

Table 3.5.4 Indicators of Cumulative Soil Erosion: American River

Activity	Alt A	Alt B	Alt C	Alt D	Existing Condition
Acres of timber harvest or burn on soils rated high for surface erosion hazard	507	507	507	507	507
Acres of road or trail construction on soil substrata rated high for erosion hazard	298	303	302	302	286
Acres of road decommissioning or soil restoration	44	52	56	50	0

The affected area for cumulative effects analysis is the American River watershed.

Cumulative effects are directly related to the scope of timber harvest and road construction on susceptible soils, and the degree of compensation offered by road decommissioning, road to trail conversion, and soil restoration. The relative ranking of likely cumulative effects by alternative is (least to greatest effects): C, B, D.

Activities that result in soil surface and substratum erosion may have cumulative effects on water holding capacity, nutrient pools and retention, and long-term productivity, with repeated entries. Past activities considered in cumulative effects are mining, timber harvest and road construction on soils susceptible to erosion. No repeated entries into previously harvested areas are proposed for this project so cumulative effects at the harvest unit scale should be negligible.

Cumulative effects may also occur at the landscape level, where large areas of soil exposed to erosion may affect vegetation dynamics, invasive species, runoff, and sediment regimes in a subwatershed. Erosion of surface soils on most old harvest units is expected to have declined to zero, but substratum erosion from roads continues on about 843 acres in the watershed. The alternatives would add from 4 to 5 acres of temporary road construction on soil substrata highly susceptible to erosion, and the American Crooked Project about 7 acres of road construction on highly erodible substrata. Although it cannot be quantified, it is anticipated that road construction, development and timber harvest on private lands within the watershed will continue. As private landowners are not required to file for permits prior to activity, the estimated quantity cannot be predicted. These source areas contribute to loss of soil productivity.

Required mitigation and restoration should maintain current or slightly improved soil erosion levels, because of the road decommissioning and soil restoration. Control of erosion is generally easier to attain than restoration of compacted or displaced topsoil.

Existing roads have been constructed on highly erodible substrata throughout the settlement history of the watershed. Some of the most impactive were those constructed along valley bottoms during the mining eras: in 1935 in American River and Lower American River subwatersheds, 1895 and 1930 in Buffalo Gulch, and of undocumented age up Little Elk Creek. These roads generally were located and constructed with little regard for erosion control. Jammer roads built around 1967 for logging on steep slopes are concentrated in Big Elk Creek. These are stacked above one another and may interact to concentrate erosion. Other roads were built in the 1960s and 1970s on highly erodible substrata in the Kirks Fork, Upper American River, Lick Creek, West Fork American, and Little Elk Creek subwatersheds. These had low levels of design controls for erosion control. In the 1980s and early 1990s more roads were built in East Fork American River and Flint Creek, but better road location and design measures for erosion control were implemented during these decades. The temporary roads proposed for the Eastside Project on highly erodible substrata are located in the Lower American River subwatershed. Temporary roads

would contribute most to cumulative erosion in this subwatershed, per acre of ground disturbance, but erosion would decline to negligible levels after decommissioning. The proposed permanent roads for the Eastside Project are located in the Upper and Lower American subwatersheds. These roads are not on lands mapped as having highly erodible substrata.

Past mining impacts on at least 307 acres are likely to have resulted in localized severe erosion. This activity was concentrated in Lower and Main American River, Buffalo Gulch, and Little Elk Creek. Proposed harvest and road construction are most extensive in Main American River, but are not on highly erodible materials, and cumulative erosion due to the Eastside Project would be constrained by design and mitigation applied to harvest units, new roads, and decommissioning of temporary and old roads.

Motorized and non-motorized trails account for an estimated 72 acres. Soils are both compacted and displaced. Numerous undocumented ATV trails exist, which add to the amount of detrimental disturbance in the project area.

3.5.5 Mass Erosion

3.5.5.1 Direct Effects

Table 3.5.5 Indicator of Mass Erosion: American River

Activity	Alt A	Alt B	Alt C	Alt D
Acres of road construction or timber harvest on lands preliminarily mapped as high landslide hazard	0	0	0	0

Alternative A (No Action Alternative)

Under the “no action” alternative, mass erosion processes would remain a slight factor in soil processes in the watershed. Mass erosion from natural causes would continue at small scales and infrequent rates. Mass erosion from past management activities would continue at a much localized scale and declining rate as old roads stabilized and harvest units revegetated. If a wildfire occurred, consequent mass erosion could range from negligible to modest, depending on location, size, and severity of burn, soil disturbance associated with suppression, salvage logging, or burn rehabilitation activities, and interaction of watershed response with the existing transportation system. The scope of such impacts is not foreseeable, given the uncertainties of fire ignition and burning weather.

The continued accumulation of dead and down fuel loads could contribute to increased potential for locally severe burning behavior, which can increase the likelihood of mass erosion in steep draws, drainage headlands, and on steep, wet lower slopes, because rooting strength would be lost, and more moisture available.

Action Alternatives B, C, and D

Mass erosion would change little from natural rates under Alternatives B, C, or D. No harvest or road construction would occur under any alternative on lands mapped as high risk for landslides. No roads proposed for decommissioning under any alternative are on land mapped as high landslide hazard, but local road and slope failures would be identified and treated as roads are decommissioned.

3.5.5.2 Indirect Effects–All Alternatives

Indirect effects of mass erosion include effects to vegetation and hydrologic processes. Mass erosion may affect surface or substratum materials. Indirect effects are likely to be minimal, and differences among alternatives slight, because of the low landslide hazard in American River and because mass erosion potential would change little from natural rates under any of the action alternatives.

3.5.5.3 Irreversible or Irretrievable Effects–All Alternatives

There are no irreversible or irretrievable direct effects from the action alternatives which would impact mass erosion potential, except for potential loss of volcanic ash-influenced topsoil. Anticipated mass erosion processes under action or "no action" alternatives are of slight probability, size, or effects, and are unlikely to exceed natural rates.

3.5.5.4 Cumulative Effects–All Alternatives

The affected area for cumulative effects analysis is the American River watershed.

There are no management activities planned within any of the action alternatives on areas identified as high risk of mass failure (i.e., landslide prone). Consequently, no cumulative effects resulting in increased mass erosion potential are anticipated.

Past road construction in the watershed almost never crossed areas of high landslide hazard (less than 0.04 miles). Small road cut failures, especially associated with areas of Tertiary sediments, occur in this moist climatic zone. They are not documented during routine road maintenance, but can contribute to cumulative erosional losses. Only 34 acres on high hazard areas have been harvested in the past and no mass wasting response has occurred, even during the flood years of 1996–1997. No road decommissioning is proposed for areas of high landslide hazard.

The thinning and pruning that have occurred around administrative structures as part of defensible space projects in the analysis area will not increase mass wasting risk, because these are in areas of low risk and large, deep rooted trees that contribute to slope stability, are retained.

3.5.6 Soil Chemical and Biological Properties

3.5.6.1 Direct Effects

Alternative A (No Action Alternative)

If a wildfire occurred, consequent soil nutrient loss could range from negligible to severe, depending on location, size, and severity of the burn, loss through salvage logging, and loss of nutrients through erosion or leaching. Fire could also make more nutrients readily available for plant uptake and benefit post-fire plant growth. The scope of such impacts is not foreseeable, given the uncertainties of fire ignition and burning weather.

The continued accumulation of dead and down fuel loads could contribute to increased potential for locally severe burning behavior, which can increase the likelihood of nutrient loss to volatilization, erosion, or leaching.

Alternatives B, C, and D

Potential for potassium and nitrogen loss has been constrained by design measures under Alternatives B, C, and D. Design features specify that burn piles would be small and well distributed throughout the unit so that burn intensity would be reduced and redistribution of nutrients would be minimized. Piling would have adequate oversight and monitoring during implementation to ensure that adequate tops and limbs are left well distributed.

3.5.6.2 Indirect Effects–All Alternatives

The design and mitigation measures reduce differences among action alternatives to slight. Indirect effects of loss of soil nutrients include reduced growth and yield, increased susceptibility to pathogens (like root infection), and shifting species composition as species with the ability to sequester nutrients (like grand fir) out compete species less able (like larch) (Garrison and Moore, 1998). The "no action"

alternative would result in less immediate nutrient loss, but wildfire could affect any alternative by resulting in volatilization, leaching or erosion loss of nutrients, but also by making more nutrients readily available for plant uptake.

3.5.6.3 Irreversible or Irretrievable Effects–All Alternatives

Irreversible or irretrievable direct effects of nutrient loss will be reduced, because of the design measures adopted to protect tops and limbs from severe burning in large slash piles.

3.5.6.4 Cumulative Effects–All Alternatives

Activities that cause soil potassium and nitrogen loss may have cumulative effects on soil productivity, plant growth and yield, susceptibility to pathogens, and successional processes, with repeated entries. Past effects to potassium and nitrogen reserves due to management are not thought to be significant for the proposed activities, on a site-specific basis, because no entry into areas with prior timber harvest is proposed.

Some thinning and pruning have occurred around administrative structures as part of defensible space projects in the analysis area. This work is accomplished by hand. Lower branches and small trees were generally removed, and either hand piled or burned. Localized potential for cumulative soil nutrient loss is possible, if treatment is continuously sustained.

Differences among alternatives are only due to the scope of harvesting and the relative ranking is (least to greatest effect): A, D, C, and B. Cumulative effects are in proportion to the scope of past, proposed and foreseeable regeneration timber harvest, particularly whole tree yarding, and likelihood for piling and burning slash that may result in extensive nutrient redistribution and volatilization.

Activities that cause soil potassium and nitrogen loss may have cumulative effects on soil productivity, plant susceptibility to pathogens, and successional processes. Geologic materials potentially susceptible to potassium loss are dominant in American River.

Design measures are required that will ensure that machine piling, where required, results in small well-distributed piles that would less likely to result in loss through volatilization than large piles.

3.6 Fisheries

3.6.1 Introduction

This section will address the aquatic species and habitats found in areas potentially affected by the project and the associated potential direct and indirect affects of the project on aquatic species and their habitats. Refer to previous sections and chapters for a complete list of projects by alternatives which would be considered for this analysis.

3.6.1.1 Scope of the Analysis

The fisheries analysis area includes the American River watershed and the mainstem South Fork of the Clearwater River to the mouth of Crooked River. Within the American River watershed a total of 15 subwatersheds occur (see Figure 3.6.1); the following nine subwatersheds may be potentially affected by the Eastside Project: Middle American River, Lower American River, East Fork American River, Whitaker Creek, Queen Creek, Box Sing Creek, Kirks Fork, Elk Creek, and Little Elk Creek. Appendix A, Map 17 displays subwatersheds within the American River watershed.

The upper and middle South Fork Clearwater River subbasin is primarily under Forest Service management, BLM lands only occur within the Elk City township in the upper portion of the subbasin, which has mixed ownership and a long history of development. The lower portion of the South Fork Clearwater River subbasin consists of mixed ownership, and private lands are dominant. BLM lands within the lower subbasin consist of scattered tracts of lands, which are intermingled with private lands.

Direct, indirect, and cumulative effects have been analyzed for streams and subwatersheds within the analysis area.

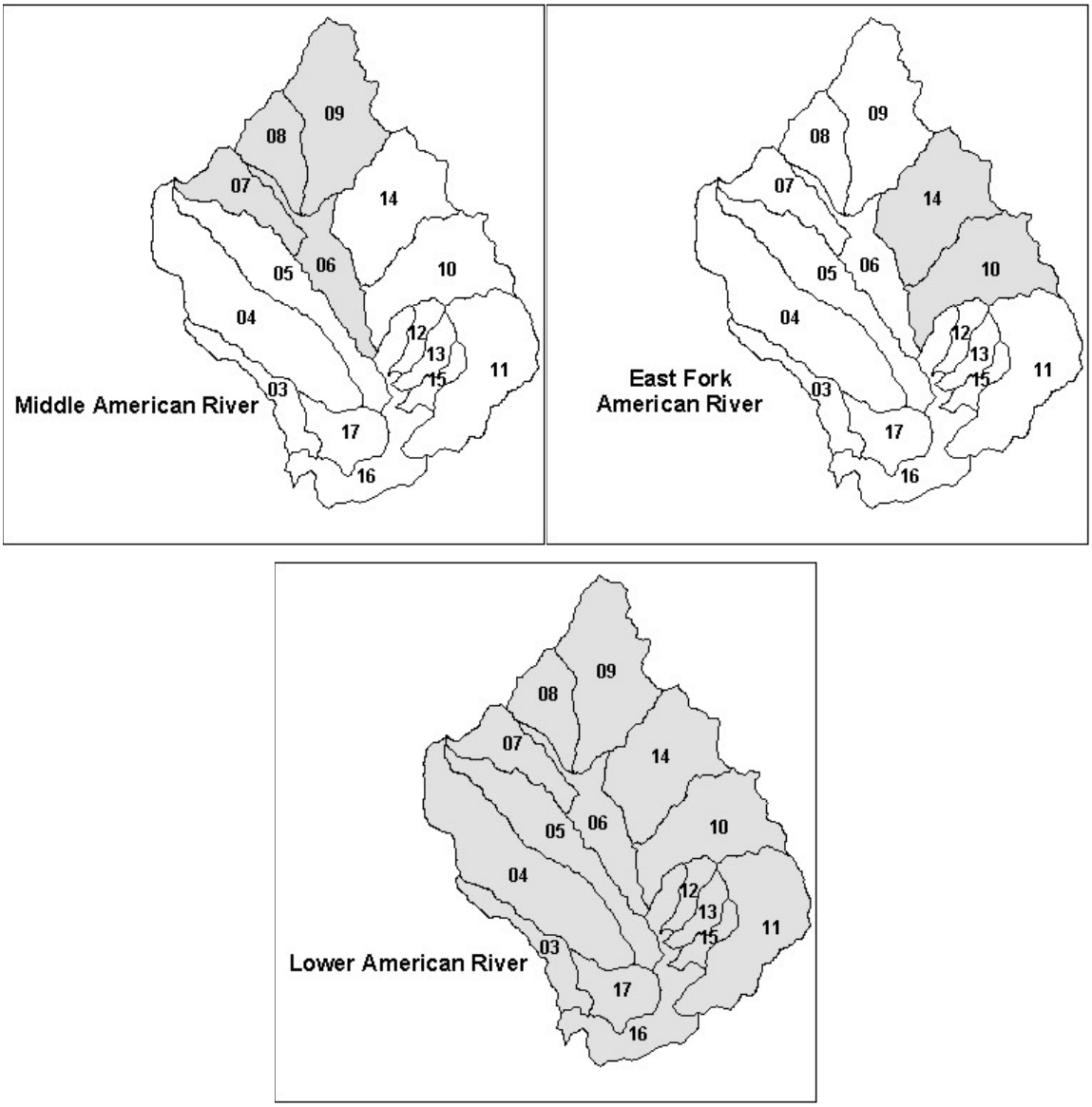

Figure 3.6.1 Composite v. Pure Watersheds–American River

3.6.1.2 Regulatory Framework

Analysis and evaluation of fisheries and aquatic threatened, endangered, and sensitive (TES) species data in this environmental impact statement (EIS) is based on direction contained in Federal Land Policy and Management Act of 1976, National Environmental Policy Act of 1969, and Endangered Species Act of 1973, as amended.

In accordance with national policy (BLM Manual 6840), a Memorandum of Understanding (MOU) has been signed by the State Director and Idaho Department of Fish and Game Director that designates BLM sensitive species. Consistent with national policy, all BLM offices are to use this list to help them "…ensure, to the best of their abilities, that critical habits and populations of sensitive species occurring on lands administered by the BLM will be managed and/or conserved to minimize the need for listing these animals as threatened or endangered by either Federal or State governments in the future."

The Chief Joseph Management Framework Plan (MFP) (USDI-BLM, 1981a) sets direction for management of the Cottonwood Field Office. The MFP includes goals and objectives, and where appropriate, applicable management emphasis areas for fisheries and water quality. The MFP and supplement guidance (USDI-BLM, 1985, 1989a, and 1989b) identifies fisheries/water quality objectives by prescription watersheds for the Cottonwood Field Office management area. Figure 3.6.1 above and Table 3.6.1 below identify eight prescription watersheds that would be affected by the proposed actions. The Elk Creek subwatershed (17060305-05-17) is primarily private lands and does not meet the criteria for a BLM prescription watershed (USDI-BLM, 1989a); however, it does occur in the composite watershed for Lower American River (see Figure 1), which will be assessed for cumulative affects.

Table 3.6.1 Fisheries and Water Quality Objectives

Prescription Watershed	Prescription Watershed Name	Current Fishery Habitat Condition (%)	Fishery/Water Quality Objective (% Habitat Potential)	Sediment Yield Guideline (% Over Baseline)	Entry Frequency Guideline (Per Decade)
17060305-05-06	Middle American R.	65%	80%	30%	1
17060305-05-16	Lower American R.	60%	80%	30%	1
17060305-05-10	E. Fk. American R.	80%	90%	30%	1
17060305-05-12	Whitaker Creek	70%	70%	60%	3
17060305-05-13	Queen Creek	70%	70%	60%	3
17060305-05-15	Box Sing Creek	65%	70%	60%	3
17060305-05-11	Kirks Fork	75%	80%	30%	1
17060305-05-05	Little Elk Creek	60%	80%	30%	1

Desired Future Condition

To estimate natural fish habitat potential and quantify existing stream conditions as required by the MFP, the Cottonwood Field Office is using Desired Future Condition (DFC) tables (USDI-BLM, 1989a) which have been further adapted from a model, developed on the Clearwater National Forest (Espinosa, 1992). The DFC tables identify specific fish habitat parameters by channel types using a habitat quality index. Values for the habitat parameters are quantified in a set of DFC tables. The DFC tables list the specific fish habitat parameter and a value or range that a stream should have in order to be at a given percentage of the streams potential and to meet the objectives for that watershed. The DFC values, habitat parameter data and their relationships are stratified by channel types and fish species. The values for the fish habitat parameters listed in the DFC tables are considered achievable for streams under natural conditions in the absence of major disturbances or are reflective of what good fish habitat should be. Most of the habitat parameters are consistent for each species, but they vary slightly by channel type. Using updated monitoring, surveys, and evaluations will permit adjustment of aquatic habitat parameters to better fit natural conditions and what is achievable.

Upward Trend

Eastside Project activities may potentially affect nine subwatersheds, of which eight are designated BLM prescription watersheds in the American River watershed (see Table 3.6.1).

The MFP Addendums/Refinement (USDI-BLM, 1985, 1989a, and 1989b) provides direction that timber harvest or other land uses can occur in prescription watersheds that do not meet their Fish/Water Quality objectives when such is concurrent with watershed improvement efforts that result in a positive upward trend in habitat condition.

PACFISH
The *Interim Strategies for Managing Anadromous Fish-Producing Watersheds in Eastern Oregon and Washington, Idaho and Portions of California*, commonly referred to as PACFISH (USDI-USDA, 1995) supplemented the MFP in 1995. PACFISH established riparian goals, riparian management objectives (RMOs), and defines riparian habitat conservation areas (RHCAs). It includes specific direction for land management activities within RHCAs for streams, lakes, wetlands, and landslide-prone terrain. The intent of PACFISH is to protect habitat and populations of anadromous fish through the use of RMOs and standards and guidelines for specific land use activities and through monitoring requirements.

RMOs for stream channel condition provide the criteria against which attainment, or progress toward attainment, of the riparian goals is measured. They include habitat attributes such as number of pools, amount of large wood in the channel, stability of the stream banks, and width-to-depth ratio. The RHCAs were established to maintain the integrity of aquatic ecosystems. Healthy riparian areas are essential to maintaining or improving the quality of fish habitat. This analysis will use a combination of DFC, watershed condition indicators, and RMO values to identify conditions in watersheds where activities are proposed.

Riparian Habitat Conservation Areas
As per PACFISH direction, RHCA widths to be used would be:

- 300 feet either side of fish bearing streams;
- 150 feet either side of non-fish bearing perennial streams;
- 100 feet either side of non-fish bearing intermittent stream channels, wetlands, landslides, or landslide-prone area.

No timber harvest would occur in RHCAs. In conjunction with the preparation of a BA,(USDI-BLM 2006a) a site specific watershed analysis would be completed to address any road or landing construction which would be proposed for construction within an RHCA. Currently, a draft BA has been prepared for the Eastside Project. Ongoing review, conferencing, and consultation for the Eastside Project will be taking place with NMFS, USFWS, and BLM staff. Finalization of consultation and submittal of BA to NMFS and USFWS would take place prior to completion of the Final EIS.

Endangered Species Act and Biological Opinions from NMFS and USFWS
The American River watershed is designated as a priority watershed, as directed by the U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS). These regulatory agencies issued Biological Opinions (BO) for Land and Resource Management Plans (NOAA-NMFS et al., 1998) with the following relevant guidelines for priority watersheds:

- Watershed analysis must be conducted prior to harvest, salvage, or thinning activities in RHCAs, and demonstrate that the action would not retard/prevent attainment of RMOs or adversely affect listed fish.
- Watershed analysis must be conducted if a watershed's ECA exceeds 15 percent and harvest activities would increase ECA.
- The 1998 steelhead BO added a sediment RMO incorporated by reference from the 1995 BO for chinook salmon. This RMO includes standards of less than 20 percent surface fines in spawning habitat or less than 30 percent cobble embeddedness in rearing habitat.

The Endangered Species Act also provides direction that federal agencies consult on all activities that may affect listed species and/or their habitat.

It is the policy of Congress that all Federal departments seek to conserve endangered and threatened species and shall utilize their authorities in furtherance of this purpose (ESA 1979 as amended, *1531.2b).

Pursuant to section 305(b) of the Magnuson-Stevens Act and its implementing regulations, 50 CFR Part 600.920, Federal agencies must consult with NOAA-NMFS regarding any of their actions authorized,

funded, or undertaken, or proposed to be authorized, funded, or undertaken that may adversely affect Essential Fish Habitat (EFH). The Magnuson-Steven Act, Section 3, defines EFH as "those waters and substrate necessary for fish for spawning, breeding, feeding, or growth to maturity." Federal agencies may incorporate an EFH assessment into Endangered Species Act Biological Assessments.

EFH for coho salmon (*Oncorhynchus kisutch*) is not in the analysis area, but does occur in the lower Clearwater River subbasin, over 60 miles downstream from the mouth of American River.

Fall chinook salmon (*Oncorhynchus tschawytscha*) do not occur in the American River watershed, but they do occur in the lower reaches of the South Fork Clearwater River and in the mainstem Clearwater River. The mouth of American River is approximately 40 miles upriver from documented fall chinook salmon use in the lower South Fork of the Clearwater River.

Chinook salmon (*Oncorhynchus tschawytscha*) EFH includes all historically accessible reaches of the Clearwater River basin (except the North Fork Clearwater River above Dworshak Dam). EFH is present in American River and the South Fork Clearwater River for spring chinook salmon.

Threatened and Endangered Species

Steelhead Trout

Steelhead trout (*Oncorhynchus mykiss gairdneri*) is under the jurisdiction of NOAA Fisheries which is listed under the Endangered Species Act (ESA) and occurs within the analysis area. The Snake River steelhead Distinct Population Segment (DPS) was listed as threatened in a final rule on January 5, 2006 (71 FR 834, effective date February 6, 2006); the Snake River steelhead was previously listed as threatened August 18, 1997 (62 FR 43937, effective date October 17, 1997). Critical habitat for Snake River Basin *O. mykiss* was designated on September 2, 2005, and became effective January 2, 2006 (Federal Register, Vol. 70, 52630). Steelhead trout are distributed throughout the South Fork Clearwater subbasin and the American River watershed (USDA-FS, 1999a).

Steelhead trout in Idaho are the anadromous form of rainbow trout which have been further classified as redband trout of the Columbia River basin (Behnke, 2002). "Anadromous" refers to a life history whereby fish spawn and rear in freshwater but migrate to the ocean before maturing and returning to fresh water to spawn. Steelhead trout and most species of salmon follow an anadromous life history, and adults of both may attain large size as a result of time spent in the ocean. Populations of redband trout in the Columbia River basin, including those in Idaho, generally follow either an anadromous or resident life history. Some stream systems may support both types of individuals.

Steelhead trout spawning in the upper South Fork Clearwater River and American River watershed generally enter fresh water in late summer and fall, spend the winter in the lower Columbia, Snake, and Clearwater Rivers, and migrate up the South Fork Clearwater River in early spring. Spawning usually occurs in the South Fork Clearwater River and tributaries during April and May. Juveniles may spend one to four years in streams and rivers, generally two, before migrating downstream to the ocean during the spring runoff period in May and June (Behnke, 2002).

Steelhead trout are present in the South Fork Clearwater River and all accessible tributaries, including American River. All accessible American River tributaries have documented occurrences of steelhead trout. The smaller tributaries may only be used by steelhead trout for juvenile rearing.

Bull Trout

On July 10, 1998, the FWS listed the Klamath and the Columbia River population segment of the bull trout (*Salvelinus confluentus*) as threatened (Federal Register, June 10, 1998, Vol. 63, 31647). The FWS designated critical habitat on September 26, 2005; however, this designation did not include any streams or rivers in the South Fork Clearwater River subbasin (70 FR 56212, effective October 26 2005).

Bull trout are actually a char and are included in the genus *Salvelinus*, with brook trout, lake trout, Dolly Varden, and Arctic char. The bull trout and Dolly Varden were long considered the same species, and are

generally similar in appearance, but skeletal and genetic analyses have shown they are separate species (Behnke, 2002). Large bull trout are known as voracious predators of other fish, although small bull trout typically feed on invertebrates. Bull trout spawn in the fall, typically in the coldest reaches of smaller tributaries. Clean substrate (rocks), cold water temperatures, and the presence of cover are important attributes of preferred bull trout habitat.

Bull trout are especially vulnerable to human-induced factors that increase water temperature and sediment loads, change flow regimes, block migration routes, and established non-native trout, particularly brook trout (Behnke, 2002).

A threat to bull trout is hybridization with, or competitive displacement by, brook trout. The effects of hybridization on the genetic integrity of bull trout is a relatively small concern because hybrid offspring are almost always sterile. However, when a brook trout breeds with a bull trout, the fecundity of that bull trout will be zero for that year–there will be no bull trout from that mating. Also, because brook trout can spawn at much younger ages, they can presumably competitively displace bull trout simply by having the capacity for higher population growth rates.

Bull trout are present in the South Fork Clearwater River and many of its tributaries, including American River. Bull trout have been documented in Lower, Middle, and Upper American River, East Fork American River, and Kirks Fork.

Bureau of Land Management Sensitive Species

Spring Chinook Salmon

Spring chinook salmon (*Oncorhynchus tschawytscha*) are not listed as a threatened species under the ESA in the South Fork Clearwater subbasin because indigenous populations were likely eliminated from the Clearwater River by construction of Lewiston Dam in the early 20th century (Schoen et al., 1999; Murphy and Metsker, 1962). Naturalized populations of spring chinook salmon have been re-established in the South Fork Clearwater River subbasin, including American River, as a result of reintroduction efforts by federal and state agencies and the Nez Perce Tribe (Schoen et al., 1999).

The American River watershed has a high inherent capacity to support spring chinook salmon (USDA-FS, 1998a), based on features such as climate, relief, and geology. This river system is comprised of significant lengths of low gradient, meadow reaches that provide optimal spawning and rearing habitat for this species, offering large areas of appropriately-sized spawning gravels as well as preferred low gradient rearing habitat juveniles with a high inherent capability to support spring chinook salmon (USDA FS 1998a). Spring chinook salmon have been documented in Upper, Middle and Lower American River, Elk Creek, Big Elk Creek, Little Elk Creek, East Fork American River, Kirks Fork, and Box Sing Creek.

Historically, significant numbers of spring chinook salmon spawned and reared in these systems as well as other tributaries of the South Fork Clearwater River. Currently, adult returns vary but are generally low. In 2003, the weir at the mouth of Crooked River counted 1360 returning adult spring chinook. The 1990 fish habitat survey conducted by Clearwater BioStudies, Inc. (1990) identified 9,810 square meters of spawning gravel available in the mainstem river from the mouth to Orogrande. If this habitat were fully seeded, even in the existing condition, there is potential to produce over 500,000 spring chinook smolts annually in Crooked River. The American River is a very similar system. Both rivers have been dredge mined using large floating bucket line dredges which resulted in a loss of pool habitat, removal of acting and potential woody debris and wider, shallower streams.

Adult spring chinook salmon destined for the Snake River and tributaries enter the Columbia River in early spring, pass Bonneville Dam and reach the Snake River by late April, arrive at staging areas from late May to early July, and spawn from August to mid-September (IDFG, 1992). Adult ages range from three to six, with ages four and five dominating. Fry emerge from February to April, rear through the summer in the natal stream, and then migrate downstream to a mainstem river or large tributary to

overwinter, depending on habitat conditions in the natal stream. Smolts pass Lower Granite Dam from late April through June on their seaward migration (Chapman et al., 1991).

Redband Trout

Redband trout (*Oncorhynchus mykiss gairdneri*) have been designated a sensitive species by the BLM and includes both anadromous steelhead and native resident rainbow trout that do not migrate to the ocean (Behnke, 2002). They are classified as the same species, except fish included in this category spend their entire lives in a stream or river, often at or near their natal area.

In most anadromous steelhead populations, a portion of the juveniles do not migrate to the ocean and remain as resident redbands throughout their lives (Behnke, 2002). This would be expected to occur in the American River watershed. There are no known populations isolated above barriers within the American River watershed. Isolated populations exist elsewhere in the South Fork Clearwater River sub-basin (USDA-FS, 2005a).

Westslope Cutthroat Trout

Westslope cutthroat trout (*Oncorhynchus clarki lewisi*) have been designated a sensitive species by the BLM, and the Northern Region, U.S. Forest Service and a species of special concern by the State of Idaho. Currently, they are not listed or proposed for listing under ESA. In a letter dated June 10, 1998, the FWS "determined that a petition to list the westslope cutthroat trout…presented substantial information indicating that the requested action may be warranted." Cutthroat trout are widely distributed across the Clearwater basin, although the current abundance is probably less than historic abundance (USDA-FS, 1998a).

Westslope cutthroat trout are widespread in the analysis area, and have been found in virtually every tributary where surveys have been conducted. Populations may also be present in additional areas where surveys have not been conducted or where existing information is insufficient to define species presence or absence.

Historic dredge mining of the American River floodplain has altered the lower reaches of Queen, Whitaker, Telephone, and Maggie Creeks, and resulted in no connecting stream channel to American River, consequently isolating their fish populations. However, during high flow flood events, and when American River flows over its banks and floods the stream bottoms, fish passage and access to these small watersheds may be provided for a limited period. These isolated populations offer unique opportunities to study genetic differences between isolated fish and those subject to hybridization with rainbow trout/steelhead trout or non-native cutthroat trout. It also recognized that human-caused barriers also have the potential to impair life history patterns and population viability.

Although population status of resident westslope cutthroat trout is thought to be strong in some streams, the larger fluvial fish, those moving out of the tributaries and rearing in the mainstem are showing very low densities, making this species at risk (USDA-FS, 1998a).

Primary existing threats to westslope cutthroat trout in the analysis area include habitat degradation, hybridization with rainbow/steelhead trout or non-native cutthroat trout, loss of connectivity among populations, competition with non-native brook trout, and harvest of adults by anglers.

A potential impact to cutthroat trout exists from introduced species and the loss of genetic integrity from hybridization with introduced species such as non-native cutthroat trout and hatchery rainbow trout. In the South Fork Clearwater River subbasin, cutthroat trout evolved in the presence of steelhead. Stream surveys show that there is hybridization between rainbow trout in the lower to mid reaches (USDA-FS, 1999a). Although hybridization is occurring, the two species are often reproductively isolated with cutthroat in the upper reaches and rainbow/steelhead in the lower reaches (USDA-FS, 1999a).

Brook trout have been introduced into many streams in the Upper Columbia River basin and are believed to have replaced many westslope cutthroat trout populations, particularly in headwater streams (Behnke,

1992). Where the two species co-exist, westlsope cutthroat trout predominate in higher gradient reaches with brook trout prevailing in lower gradient reaches (Griffith, 1988). Brook trout outcompete juvenile cutthroat trout for food (Novinger and Rahel, 1999). When brook trout dominate the stream, cutthroat trout cannot compete and regain it.

Pacific Lamprey
Pacific lamprey adults enter freshwater (Columbia River) between July and September and migrate several hundred miles to Idaho. They spawn in sandy gravel immediately upstream from riffles between April and July and die soon after. Eggs hatch in two to three weeks and the ammocoetes (larval lamprey) spend up to six years in soft substrate as filter-feeders before emigrating to the ocean. They remain in the ocean for 12 to 20 months before returning to freshwater to spawn. Diatoms appear to be a primary food supply for ammocoetes.

Cochnauer and Claire (2003) documented habitat utilization for Pacific lamprey ammocoetes and macrothalmia in the South Fork Clearwater River watershed. Individuals were mostly found inhabiting sand and silt substrates in calm water sites adjacent to overhanging riparian canopy cover or in low velocity pockets behind boulders.

Recent sampling in the South Fork Clearwater River and Red River documented the presence of juvenile lamprey in the mainstem South Fork Clearwater River and some of the tributaries (Cochnauer and Claire-2003). Similar sampling conducted in American River in 2001 did not identify any lamprey (Cochnauer and Claire, 2001 and 2002). Much of American River was likely historic habitat for lamprey (Claire, 2004).

Hydropower development, habitat degradation in spawning and rearing streams, and urban development are the major factors contributing to declines. Similar to salmon and steelhead trout outmigrants, the slackwater pools resulting from construction of hydroelectric projects in the lower Snake River impede lamprey downstream migrations by increasing migration time and susceptibility to aquatic predators both native and introduced.

Other Fish Species of Interest

In addition to the above special status species, the American River watershed is also known to support other fish species which are listed as follows: mountain whitefish (*Prosopium williamsoni*), bridgelip sucker (*Catostomus columbianus*), shorthead sculpin (*Cottus confusus*), longnose dace (*Rhinichthys cataractae*), speckled dace (*Rhinichthys osculus*), and brook trout (*Salvelinus fontinalis*).

Brook trout are present throughout the American River watershed and the upper South Fork Clearwater River subbasin, including most streams in the analysis area. Brook trout are not native to streams west of the Continental Divide. Brook trout can occupy a wide range of habitats and have the ability to compete with trout, salmon, and char that are native to streams in Idaho. In degraded habitats, brook trout will often out-compete native bull trout (Clearwater Basin Bull Trout Technical Advisory Team, 1998). Where the species co-exist, brook trout are likely to displace native westslope cutthroat, particularly in low gradient streams.

Brook trout are a fall-spawning species, and interbreeding with bull trout is common in areas where the species coexist. Brook trout are usually much more abundant than bull trout where they occur together, and this distorted ratio of abundance can lead to mass hybridization (Behnke, 1992).

3.6.1.3 Analysis Methods

Introduction

This section will describe in general, how existing conditions for fish and fish habitat were determined. The analysis will focus on seven indicators of fish habitat. This general discussion will be followed by a description of American River, fish bearing tributaries in the project area, and the South Fork Clearwater River and how indicators may potentially change as a result of project implementation. This will be followed with a discussion of cumulative effects. Included in the existing condition narratives for the American River and tributaries is a mix of both old and new data. Field investigations conducted during 2004 and 2005 validated previous survey and monitoring data.

The major improvements to the dredged mine reaches in American River involved the installation of instream structures to create pools and the placement of large woody debris. Most of this work occurred during the 1980s, with extensive efforts taking place by the BLM during 1992. These actions were coupled with riparian planting and seeding in an effort to increase shade and improve stream bank stability. The data used to reflect existing conditions reflects some of these improvements. The mining impacts were so extensive that even with the instream work, habitat elements remain below objective along some stream reaches.

Comparison of past and current surveys and monitoring and field observations have noted overall improving conditions in riparian areas and streams flowing across BLM lands from improved management efforts, past and ongoing restoration efforts, and the federal listing of fish and associated changes to management in the American River watershed (Craig Johnson, 2005). It has also been noted that some legacy dredge mined areas have altered stream channels and riparian habitats and recovery is taking place at much slower rates and active restoration is needed in these areas for achievement of specific aquatic or riparian desired future conditions (Craig Johnson, 2005).

Indicator 1–Sediment/Substrate Condition

Short term increases in turbidity and sediment would result from project implementation for most actions; however, restoration efforts would focus on long term reductions in chronic or “press disturbance” sediment. “Pulse disturbance” like most fires, floods, and some droughts are within the range of natural disturbances to which an ecosystem is adapted, are temporary in time and often patchy in space, and natural recovery is usually possible without assistance. “Press disturbance” alters the long term resilience of an ecosystem, like sediment from permanent roads or channel alteration from mining or grazing. The “press disturbance” described in this assessment are generally chronic, often widespread (i.e., roads, dredge mining), and may exceed the capacity for recovery without assistance. Surface erosion and sediment delivery to streams would be expected to be near pre-project conditions within one to two years after project implementation, with gradual improving reductions occurring in the long term.

Salmonids are typically negatively affected by increasing amounts of sediment (Bjornn and Reiser, 1991). A review of studies related to the effects of fine sediment on salmonids by Chapman and McLeod (1987) concluded that survival to emergence decreases as fine sediment increases in the spawning gravels, the loss of pool volume due to sediment deposition reduces the suitability of a stream for adults, macroinvetebrates decrease in biomass and diversity, and winter carrying capacity decreases. Sedimentation of deep pools and coarse substrate limits the physical space available to juvenile fish for rearing and overwintering. The summer or winter carrying capacity of a stream for fish declines when sediment fills the interstitial spaces of the substrate (Bjornn and Reiser, 1991).

Fine sediment (less than 6.33 mm) deposited in spawning areas can trap or smother eggs and embryos, reducing reproductive success of spawning adults. In spawning areas, egg deposition, development, and survival become limited when sediment fills the spaces between gravel, preventing the flow of oxygen and the flushing of metabolic wastes.

Concern has been identified that laboratory studies have not duplicated the structure and composition of egg pockets in the redds of large salmonids, and have not accurately modeled survival of embryos and alevins in natural egg pockets (Chapman, 1988). Consequently, modeled emergence from data from fines by depth may not portray actual emergence. One criterium suggested by Chapman (1988) was to use the intergravel dissolved oxygen concentration. Fine sediments interfere with the flow of water through spawning gravel and therefore the transport of oxygen to incubating fish eggs. To assess the impact of fine sediments on salmonid spawning in the natural setting a protocol (Burton et al., 1990) was used that evaluated dissolved oxygen, fine sediment, and salmonid embryo survival in artificial redds in American River and Big Elk Creek. In 1992 the BLM conducted an artificial redd monitoring study at river mile 1.1 in American River. In 1993 a similar study was conducted in Big Elk Creek at stream mile 3.55. The study (Johnson, 1993) included the creation of artificial redds, monitoring of dissolved oxygen and fine sediment in the redds, and documenting embryo survival and steelhead fry emergence. Tables 3.6.2 and 3.6.3 provide a summary of the findings.

Table 3.6.2 Assessment of Dissolved Oxygen (DO), Fine Sediment, and Salmonid Embryo Survival in 1992 American River Artificial Redds–C Channel Type (Stream Mile 1.1)

Artificial Redd #	Eyed Steelhead Eggs Total	Steelhead Emergence		% Fines by Depth < 6.3 mm	Redd DO	Comments
		Fry Emergence #	%			
1	100	20	20	29.3	10.7–12.4	
2	100	39	39	19.5	ND	
3	100	Cap Off Basket	ND	31.4	ND	Emergence Data Invalid
4	100	6-Cap Loose, escapement	ND	32.5	10.6–11.7	Emergence Data Invalid
5	100	54	54	30.0	ND	
6	100	17	17	32.4	ND	
7	100	Cap off Basket	ND	29.1	11.1–11.7	Emergence Data Invalid
Average		**32.5**	**32.5%**	**29.2%**	**10.6–12.4**	

Table 3.6.3 Assessment of Dissolved Oxygen (DO), Fine Sediment, and Salmonid Embryo Survival in 1993 Big Elk Creek Artificial Redds–B Channel Type (Stream Mile 3.55)

Artificial Redd #	Eyed Steelhead Eggs Total	Steelhead Emergence		% Fines by Depth < 6.3 mm	Redd DO	Comments
		Fry Emergence #	%			
1	100	34	34	25.7	ND	
2	100	63	63	25.4	ND	
3	100	83	83	25.0	ND	
4	100	8-Cap Loose, escapement	ND	26.1	ND	Emergence Data Invalid
5	100	91	91	23.8	ND	
6	100	65	65	24.5	ND	
7	100	72	72	24.9	ND	
Average		**68**	**68%**	**24.9**	**ND**	

It is acknowledged that the above study was not a controlled research study; however, based on past and recent monitoring efforts in the watershed, it may be concluded that steelhead embryo survival may be approximately 30% in American River (range 17–54%) when percent fines by depth were approximately 30% in a C channel. The Big Elk Creek study found 68% (range 34–91%) emergence when percent fines by depth were approximately 25% in a B channel. It should be noted that even with excellent quality spawning gravels along with suitable redd water temperatures and dissolved oxygen that 100% emergence may not be expected to occur.

Substrate conditions are an important component of fish habitat and fish survival. Cobble embeddedness is a measure of fine-grained sand that has filled in around the cobble substrate. The more embedded the substrate is the more reduction will occur to summer and winter rearing habitat and food production.

Cobble embeddedness and percent surface fines were used as measures of the amount of deposited sediment present in the streambed. Existing measured or estimated cobble embeddedness and percent surface fines have been compared to optimal and desired stream conditions. "Desired future condition" standards are presented in Table 3.6.6, along with the existing condition.

The BLM has collected substrate cobble embeddedness and fines by depth (core data) within the analysis area since the 1980s. Existing measured or estimated cobble embeddedness in analysis area streams was also used to estimate summer and winter rearing capacities for trout and salmon, using the FISHSED model (Stowell et al., 1983). The FISHSED model was then used to compare action alternatives using both existing cobble embeddedness measurements and sediment increase predictions of NEZSED. These elements were used to roughly predict potential changes in summer and winter rearing capacity among action alternatives using mathematical relationships in the FISHSED model. These changes were modeled for each alternative and are an indication of the amount of sediment expected and corresponding changes to cobble embeddedness. The limitations of both the NEZSED and FISHSED models are described in Appendix H, Support Information for the Watershed and Fisheries Analysis. Sediment from sources other than surface sediment erosion, including bank erosion and mass movement (landslides) are not included in model estimates.

The FISHSED model includes predictions for impacts to fish embryo survival, summer rearing capacity and winter rearing capacity. Summer and winter rearing capacity reflect how the degree of fine sediment in the stream bottom affects the stream's ability to support fish during these seasons. This analysis will focus on summer and winter rearing and how these elements are changed as a result of this project. Because of the previous concerns identified above for using modeled results to predict fish embryo survival in spawning gravels (Chapman, 1988), no FISHSED modeled predictions for fish embryo survival will be made. This analysis will utilize BLM pre- and post- monitoring of spawning gravels conducted for other projects in the American River watershed and monitoring data from artificial redd monitoring discussed above.

Model results, as displayed below in Tables 3.6.11 and 3.6.12 (Section 3.6.3.2 Indicator 1–Sediment/Substrate Condition Analysis), are reasonable estimates of potential impacts and not absolute numbers with high statistical precision. The capability of the FISHSED model in analyzing and displaying change at the levels shown in these tables is somewhat limited. In this case, data from FISHSED are most useful in comparing the relative effects among alternatives. The model also reflects short-term changes only and does not show the long-term sediment reductions projected in NEZSED.

Relation of Embeddedness to Management Activities

The ability of embeddedness to detect changes due to land management activities is unclear and results have rarely been published in peer reviewed literature (Sylte and Fischenich, 2003). Burns (1984) sampled embeddedness in 19 tributaries of the South Fork of the Salmon River with varying levels of development. He found that streams with more development had statistically significant higher mean embeddedness than undeveloped or partially developed streams. Partially developed and undeveloped streams were not significantly different from each other. Munther and Frank (1986) quantified conditions

in Montana streams and found significant differences in only four of eight pairings of habitat units between developed and undeveloped streams. Potyondy (1993) in one of the most rigorous of all embeddedness studies summarized the results of cobble embeddedness analyses conducted on 120 streams in the Idaho Batholith on the Boise National Forest (Potyondy, 1988) using the Burns (1984) measurement methodology. Potyondy found no statistical differences among streams in watersheds with various degrees of land-disturbing impacts from timber harvest, road construction, grazing, and mining. Stream embeddedness levels appeared to be more closely related to estimated natural sediment yields related to geology rather than to management activities occurring in the watersheds.

Nelson et al. (1997) documented that some cobble embeddedness in undeveloped watersheds failed to meet specific cobble embeddedness objectives identified in the planning guidance for the Payette National Forest. These results have previously been reported and suggest that sediment conditions, even in the absence of development, are highly variable.

Indicator 2–Large Woody Debris

Large woody debris (LWD) is one of the most important sources of habitat and cover for fish populations in streams (MacDonald et al., 1991:129). LWD increases fish habitat complexity, which helps ensure that cover and suitable habitat can be found over a wide range of flow and climatic conditions (MacDonald et al., 1991:128). Large wood has a major impact on channel forming in smaller streams (Sullivan et al., 1987). The location and orientation of LWD can influence channel meandering and bank stability (Swanson and Lienkaemper, 1978; Cherry and Beschta, 1989). LWD is often the most important structural agent forming pools in small streams (MacDonald et al., 1991). Bilby (1984), and Rainville et al. (1985) found that 80 percent of pools in small streams in Washington and the Idaho Panhandle respectively, were wood associated. LWD also influences sediment transport in streams by forming depositional sites (MacDonald et al., 1991). Wood was responsible for storing half the sediment in several small stream in Idaho (Megahan and Nowlin, 1976). LWD can also provide storage sites for leaves, twigs, and other organic material (MacDonald et al., 1991). In small streams in forested areas, this fine organic material can provide the bulk of the energy and materials entering into aquatic food web (MacDonald et al., 1991).

LWD is a component of habitat quality and complexity and is also an important contributor to stream productivity, cover, and food production for fish and other aquatic organisms. Large wood in the streams also contributes to channel stability in small, low order streams, and is thus an important element even in streams where fish are not present. Under natural conditions, large wood is contributed to streams from the surrounding riparian areas as trees fall over and may be recruited slowly over time or in large numbers over a short period of time. The latter often occurs in response to a significant disturbance event, such as wildfire or an extreme weather event where floods or debris torrents wash large amounts of material into the stream. Stream restoration for LWD deficient streams often includes felling trees into streams, hauling LWD to the stream, and selective placement in the stream.

The amount of LWD in a stream is usually measured in the field during stream surveys by counting the number of large woody pieces present in the stream. Future woody debris recruitment is estimated by counting the number of trees in the riparian area that could fall into the stream.

Field surveys found some stream reaches in the analysis area to be debris-deficient. Most of these reaches occur in the streams that have been dredge mined like mainstem American River and Little Elk Creek (USDI-BLM. 1992. BLM Subbasin Stream Surveys. Bureau of Land Management, Cottonwood Resource Area, Cottonwood, ID., Craig Johnson, 2004/2005 field notes). Most of the tributary streams to American River have altered stream channels at the mouths or lower stream reaches from dredge mining and are also deficient in LWD (Craig Johnson, 2004/2005 field notes).

Increases in water yield and high flood flows have the potential to scour stream channels and streambanks. These increased stream flows also may potentially move and flush embedded or anchored

LWD from a stream reach. LWD may be moved downstream to a larger stream or river reaches where LWD may not have the same important function for instream cover.

Most woody debris recruitment in this landscape comes from the streamside zone. Landslides and debris torrents are uncommon in the American River watershed.

Robison and Beschta (1990) found that when the distance from a tree to a stream was more than one effective tree height, the probability of the tree contributing LWD approached zero. The effectiveness of riparian forests along stream channels to deliver LWD is low at distances greater than one tree height away from the channel (McDade et al., 1990).

Indicator 3–Pool Habitat

Pool:riffle ratio is an indicator of habitat quality and complexity, both of which are important elements for salmonid fishes in streams. In addition, the quality of pools is an important consideration. Pool quality is generally indicated by pool volume and pool depth, with larger, deeper pools offering greater quality. Longitudinal spacing of pools along a stream course is also important.

Stream survey data have provided estimates of the number and quality of pools for streams in the analysis area. Table 3.6.6 displays the summarized data and presents pool information as pool:riffle ratio. A ratio of 40 to 50 percent pools is generally desirable for B and C channel types.

The number of pools in a stream and the quality of those pools can be affected by:

- Long-term increases in sediment yield, a phenomenon that can result in pool-filling and eventual loss of the pool;
- Increased bedload accumulation that also results in pool-filling;
- Lack of large woody debris and other pool-forming structures, which can significantly affect streams that are dependent on large wood as the primary pool-forming mechanism;
- Altered channel structure from dredging or road encroachment; and
- Increased water yield or other high flow scouring events may scour stream channels, resulting in the wash-out or degradation of pool habitats.

Therefore, changes in sediment yield and the amount of large wood available to fall in the stream are indicators for predicting changes in the number and quality of pools over time. In addition, pools may be artificially created during stream channel restoration projects, such as the construction of upstream rock "v" check dams.

Indicator 4–Water Quality

Toxics

A spill hazard exists wherever roads are near streams or road drainage enters streams (Furniss et al., 1991). Fuel spills may negatively affect a fish-bearing stream biologically through direct poisoning of fish and invertebrates, a food source. Fuels and fuel oils are moderately to highly toxic to salmonids, depending on the concentration and exposure time (Gutsell, 1921). Free oil and emulsions may adhere to gills and interfere with respiration and heavy concentration of oil can suffocate fish. The fate of oil in water includes spreading, movement, evaporation, solution, emulsification, photo-chemical oxidation, microbial degradation, sedimentation, and hydrocarbons deposited in sediments which may persist for long periods (Saha and Konar, 1986).

Water quality analysis includes potential risks for introduction of toxic materials. This assessment does not include predictions of the amount of toxic materials entering streams. The project proposal identifies measures that minimize potential risks of toxic materials entering streams.

Historic dredge mining resulted in some accumulation of heavy metals and introduction of mercury, since it was often used as an amalgam in the gold mining process. This assessment includes an evaluation of

project implementation and associated potential to liberate mercury during the implementation of restoration projects that involve disturbance of historic mined areas, stream channels, substrate materials, and streambanks.

Water Temperature

Stream temperatures are the net result of a variety of transfer processes, including radiation inputs, evaporation, convection, conduction, and advection (Brown, 1983). Removal of vegetation along streams may result in instream temperature increases during summer months, and in the loss of insulating vegetation that can contribute to colder winter stream temperatures. Water temperature influences the metabolism, behavior, and mortality of fish and other organisms in their environment (Mihurksy and Kennedy, 1967).

Unsuitable temperatures can lead to disease outbreaks in migrating and spawning fish, altered timing of migration, and accelerated or retarded maturation. Unsuitable temperatures can also force adult and rearing juvenile fish to find thermal refuge in tributaries where there may be increased risk of predation and/or competition for food, potentially affecting a fish's fitness, thus its survival going into winter. Fish can often survive short durations of temperatures above or below their preferred range, growth is reduced at low temperatures because all metabolic processes are slowed, and at high temperatures, because most or all food must be used for maintenance (Bjornn and Reiser, 1991).

Measured buffer strip shading shows that a buffer strip 85 feet wide shades a stream as well as an average undisturbed canopy in late successional old growth forests in the Western Cascades (Steinblums, 1977). In a study of small streams, Brazier and Brown (1973) found the maximum shading ability of the average buffer strip was reached with a width of 80 feet.

Colder water temperatures due to loss of insulating vegetation can lead to the formation of frazil or anchor ice on stream bottoms. Incubating embryos can be killed when frazil or anchor ice forms in streams and reduces water interchange between stream and redd (Bjornn and Reiser, 1991).

Generally spawning temperature is not as high of a concern for steelhead and redband/rainbow trout, which spawn in the spring, or bull trout, which spawn in the in the fall when stream temperatures are typically cooler. High summer temperatures can affect summer rearing habitat for all federally listed or BLM sensitive fish species, and the spawning success for spring/summer chinook that spawn in August to mid-September.

Potential increases in stream temperature are addressed by assessing the degree of activities in riparian areas that may result in increased or decreased solar radiation to streams. No timber harvest is proposed in RHCAs. Within RHCAs, under the action alternatives a limited amount of temporary roads, permanent roads, one new vehicle bridge, and replacement of two existing ATV bridges are proposed. Riparian restoration activities include road decommissioning, relocating roads out of riparian areas, conversion of roads to ATV trails, streambank recontouring and riparian planting designed to increase stream canopy and bank stability. See Section 3.4 (Watershed) for additional discussion of this element.

Indicator 5, Water Yield

The existing condition and a detailed analysis of this indicator are found in Section 3.4 (Watershed). Increased water yield is one indicator used to assess potential effects among the alternatives, and it is a rough predictor of potential changes in channel condition and instream habitat. Increases in water yield may indirectly affect fish habitat through increased bank erosion, channel down cutting, increased accumulation of larger streambed materials, reduction in number of pools, overall reduction of habitat complexity, and changes in number, size, or frequency of LWD. ECA is a term used to describe the total area within a watershed that does or would exist in a clearcut condition. Refer to Appendix H for additional information in regards to ECA protocol and use. The results of the water yield analysis included in Section 3.4 (Watershed) are used for analysis of potential impacts to fish habitat.

The National Marine Fisheries Service (NOAA-NMFS, 1995) suggests that an ECA of 15 percent is cause for concern in priority watersheds. The Matrix of Pathways and Indicators of Watershed Condition (NOAA-NMFS et al., 1998) identifies less than 15 percent ECA as a high quality habitat condition; 15–20 percent ECA as moderate quality habitat condition; and greater than 20 percent as low quality habitat condition. These thresholds were identified to provide a conservative approach to water yield that would avoid the following undesirable effects on stream habitat condition: accumulation of streambed materials (aggradation), channel braiding, channel down cutting, and increased bank erosion. The above may collectively or singularly contribute to increased width/depth ratio, decreased number of pools, decreased pool quality, and overall simplification of instream habitat (Chamberlin et al., 1991).

Increases in water yield are highly variable in time and space because they are dependant on climate, topography, soils, vegetation, and other environmental factors. This high degree of variability makes it difficult to quantifiably determine an outcome as a result of timber harvest activities. Stream channel types and stability rating were used in conjunction with percent increases in ECA to assess the risk that project associated water yield increases may cause channel changes.

Stream channel stability is determined through an inventory procedure developed by Pfankuch (1978:1). He developed a procedure to assess entire channel systems within a watershed, and to use the results in conjunction with other hydrologic analyses. Stream channels are rated based on their ability to withstand increase in stream discharge associated with decreases in the density and areal extent of vegetation, such as the removal of mid-aged to mature trees. A stream with a "poor" rating has a higher risk of sustaining damage from increased peak discharge than a stream rated "good" or "excellent." Scores are the sum total of stability indicator classes for streambanks and stream bottoms (Pfankuch, 1978). Stability ratings are the result of a scoring system where:

Excellent: less than 38
Good: 39–76
Fair: 77–114
Poor: greater than or equal to 115

The fish bearing streams and several representative first order watersheds within the analysis area had channel stability evaluations (Pfankuch, 1978) completed during 2004 and 2005. Stream reach inventory and channel stability evaluations had a high fair to good rating. No severe stream channel or streambank scouring was noted. The potential impact from water yield changes to stream channel conditions, pools and LWD are discussed under those indicators.

Indicator 6–Habitat Connectivity/Fish Passage

The ability for fish to move between habitats as conditions change, and for individuals to move between fish populations, is an important component for short-term survival and long-term population genetic diversity.

Human constructed physical barriers within the stream channel, such as culverts or other stream channel blockage (i.e., dredge tailings), can impair sediment and debris transport, life history patterns, and population viability. Decoupling the stream network (through physical barriers) can result in the disruption and loss of functions and processes necessary for creating and maintaining fish habitat. Physical barriers prevent the movement of fish in their fulfillment of life history functions. Human-caused barriers, for instance, prevent juvenile fish from reaching rearing habitats (Furniss et al., 1991) and have blocked significant amounts of historical anadromous salmonid habitat (Roni et al., 2002). Even more, barriers restrict the expression of various life history forms within a species. Strong populations rely on unimpeded access between watershed reserves, those areas of high quality habitat occupied by viable subpopulations, for dispersion and genetic interchange (Noss et al., 1997).

Overall, the presence of roads is highly correlated with changes in species composition, population sizes, and hydrologic and geomorphic processes that shape aquatic and riparian systems. Research shows the importance of removal or restoration of existing roads to benefit both terrestrial and aquatic biota (Trombulak and Frissell, 2000). Roads can alter the landscape distributions of the starting and stopping points of debris flows and they can alter the balance between the intensity of flood peaks and the stream network's resistance to change (Jones et al., 2000). Road crossings can prevent or interfere with upstream migration of adult and juvenile salmonids, aquatic macro invertebrates, and larval amphibians (Furniss et al., 1991).

Roads, culverts, and sometimes bridges act like dams, constricting stream flow through a single narrow outlet. This can prevent the transportation of habitat-forming gravel and woody material down the channel. These constriction points also cause deposition and channel widening at the culvert inlet. The channels below culvert outlets are typically down cutting and scoured by the high velocity water caused by constriction.

Roads and stream crossings have also been shown to function as barriers to the upstream movement and dispersal for many fish and wildlife species (Furniss et al., 1991). Culvert outlets not in contact with stream bottoms do not allow access for aquatic species. Undersized culverts constrict flows creating high velocity barriers and eliminating substrate from culvert bottoms. These barriers can isolate small aquatic populations, limiting or preventing genetic exchange between populations, and preventing the recolonization of historic or recovering habitats.

Stream crossing structures also limit or prevent seasonal upstream movement by fish and other aquatic biota. Juvenile salmonids living in rivers often seek refuge in tributary streams during high flow events. Additionally, some culverts in fish bearing and non-fish bearing streams within the analysis area are in need of repair or replacement to reduce risk of failure. Historically, most culverts were sized to pass 50-year storm events. In many cases, this sizing is not adequate to handle large flood events or debris torrents. Culverts sized for a 100-year or greater event are more likely to pass the water and debris associated with a large event.

Dredge mining of stream bottom areas has altered the stream channels and in some instances has created blockage for fish passage and no stream channel exists which would connect the tributary stream with the mainstem river in these areas. These blockages typically occur near the mouth areas of small tributary streams to American River.

Indicator 7–Riparian Areas/Stream Channels

The most common biological features establishing or affecting the relationships of channel and valley slope have been native pioneer species of riparian vegetation (Smith and Prichard, 1992). High energy runoff and its associated transported sediment have been moderated by dissipation, through spreading across floodplains, vegetative entrapment, development of sinuous meander patterns, and seasonal recharge of ground-water aquifers and riparian bank storage. Healthy riparian areas are noted for having adequate vegetation, landform, or large woody debris to dissipated energy during high-flow events, limit erosion, and improve water quality. Healthy riparian and wetland areas also filter sediment and capture bedload, which aids floodplain development and enhances flood-water retention and ground-water recharge. In addition, healthy riparian–wetland areas also produce diverse ponding and channel characteristics that provide habitat necessary for fish production, waterbird breeding, wildlife habitat, and other uses (Prichard et al., 1996).

Erman et al. (1977) reported that the composition of benthic invertebrate communities in streams with buffers greater than 100 feet were indistinguishable from those in streams flowing through unlogged watersheds.

Historic dredge mining and road construction have been the most significant land use influences on riparian habitats and stream channels within the analysis area, and is followed by livestock grazing within some subwatersheds. Roads have encroached on riparian areas and stream channels. Road fords, bridges, and culverts exist at stream crossings, and these stream crossings alter stream channels and may be a chronic erosion and sediment source.

3.6.2 Existing Conditions

3.6.2.1 Threatened, Endangered, and Sensitive (TES) Fish Species

TES fish species present in the American River watershed include spring chinook salmon, steelhead trout, bull trout, redband trout, westslope cutthroat trout, and Pacific lamprey. Changes in habitat could affect these species directly, indirectly, and/or cumulatively and are collectively considered indicators of effect. A Biological Assessment (BA) would be completed for threatened, endangered, and sensitive fish species for the selected alternative. Indicators used in the BA are based on accepted indicators developed by the Central Idaho Level 1 Team. Any terms and conditions associated with consultation would be included in the Record of Decision**.**

3.6.2.2 Summary of Fish Species Distribution

Appendix A, Map 17 displays fish distribution within the analysis area. Table 3.6.4 identifies known and suspected occurrences of trout, salmon, and char in the American River watershed and South Fork Clearwater River.

Table 3.6.4 Known and Suspected Occurrence of Trout, Salmon, and Char in American River

Stream Name	Steelhead	Bull Trout	Spring Chinook	Westslope Cutthroat	Brook Trout
Middle American River	Present	Present	Present	Present	Present
Maggie Creek	Absent	Absent	Absent	Present	Absent
Lower American River	Present	Present	Present	Present	Present
Telephone Creek	Absent	Absent	Absent	Present	Absent
Baboon Creek	Absent	Absent	Absent	Present	Present
East Fork American River	Present	Present	Present	Present	Present
Whitaker Creek	Absent	Absent	Absent	Present	Present
Queen Creek	Absent	Absent	Absent	Present	Absent
Box Sing Creek	Present	Absent	Present	Present	Present
Kirks Fork	Present	Present	Present	Present	Present
Elk Creek	Present	Probably Absent	Present	Present	Present
Little Elk Creek	Present	Probably Absent	Present	Present	Present
South Fork Clearwater River	Present	Present	Present	Present	Present

3.6.2.3 Existing Condition of Habitat Characteristics: American River Watershed and South Fork Clearwater River

During the 2004 and 2005 field season, the BLM Fisheries Biologist conducted field investigations of all fish bearing stream reaches within the project area. Stream reach surveys and monitoring included one or more of the following: reconnaissance fish habitat and riparian survey; water quality monitoring; substrate monitoring; and fish population monitoring. These field investigations supplemented existing survey and monitoring data, or verified current conditions in reference to previously collected data.

Within the past twenty years, there's been improved livestock management within riparian areas, some natural recovery of riparian vegetation, increases in LWD, and stream reaches with implemented fish habitat improvement projects that supported achievement of desired aquatic conditions.

American River (Middle and Lower)–Prescription Watersheds #17060305-06 and 16

Overview: American River is a large watershed (58,612 acres) with important aquatic values and a high priority for restoration of aquatic processes. NPNF lands comprise 72% of the watershed, followed by 15% private lands, and 13% (7,825 acres) BLM lands. The American River watershed has 16 prescription watersheds (see Figure 1 and Appendix A, Map 14). The mainstem American River flows through two composite watersheds which may be affected by the Eastside Project and include: (1) Middle American River, which includes NPNF, BLM, and private lands, the watershed originates on NPNF lands and extends into the township and has experienced extensive amounts of historic placer and dredge mining and fish habitat degradation; and (2) Lower American River is within the township and has experienced similar impacts as Middle American River.

Fisheries: Steelhead trout, bull trout, spring chinook salmon, redband trout, westslope cutthroat trout, mountain whitefish, bridgelip sucker, sculpin, dace, and brook trout are present in the American River watershed. Their distribution is widespread, with the exception of bull trout for which distribution is limited and abundance is low. Suitable habitat exists for Pacific lamprey; however, recent surveys have not documented occurrence. Spring chinook salmon and steelhead trout abundance may vary on an annual basis from low to moderate, because of fluctuations of returning adults. Westslope cutthroat trout populations vary; some areas are devoid of cutthroat trout while others have relatively high densities. Although population status of resident westslope cutthroat trout is thought to be strong in some streams, the larger fluvial fish, those moving out of the tributaries and rearing in the mainstem rivers, are showing very low densities.

Migratory bull trout are present in American River, although at low levels. The extent of resident bull trout in American River is not well known. The *Draft Recovery Plan–Clearwater River Recovery Unit* (USFWS 2002) identifies American River as a potential local population. Currently, it appears that the East Fork American River may provide the best potential habitat to be utilized for spawning and early rearing areas by bull trout in the watershed. Surveys conducted by the NPNF in 1998 did not document occurrences of bull trout in upper American River. Recent fish surveys conducted by BLM, NPNF, and IDFG (1996–2003) documented bull trout in mainstem American River, East Fork American River, and lower Kirks Fork.

Fish Habitat: The BLM surveyed Lower American River in 1992 using a modified Hankin and Reeves (1988) survey methodology. The dominant channel types are B and C, average gradient is 1–2%, and unstable stream banks averaged 2%. BLM monitoring (2000) at river mile 1.11 found that cobble embeddedness was 31%, spawning gravel composition by depth had 28% less than 6.3 mm, and surface fines were 8%. A rating of fair was given for rearing and spawning habitat conditions.

The NPNF last did an extensive survey of American River (upstream from BLM boundary) in 1993 using the Nez Perce National Forest basinwide methodology. During the survey approximately 69% of its length was classified as a B type stream channel. The remaining portion was classified as C and A channel types, 24% and 7%, respectively.

Water Quality, Water Yield, and Flow Regimes: Current percent over base sediment yield for the watershed is 16%. From 1995–2004 the BLM has monitored water temperature at stream mile 0.1, and the annual 7-day running average of high water temperature has ranged from 21.4°C to 27.6°C. Historic dredge mining along the stream bottom areas resulted in some accumulation of heavy metals and introduction of mercury, since it was often used as an amalgam in the gold mining process. The potential for adverse amounts of mercury to occur in the stream is considered slight because of the depth of

leaching. Current ECA for the American River watershed is 9%. Mean low summer flows at the mouth average 15–30 cfs and high flow average 500–600 cfs.

Riparian Habitats: Overall, riparian habitats are in an early to mid-seral condition, with some reaches rated as "functional at risk" along the mainstem river. Dredge mining of the stream bottom areas has significantly altered riparian habitat and stream channel morphology. Roads and human development have encroached on riparian habitats and stream channels. The stream channel does not have its natural channel morphology and sinuosity (stream channel meanders).

Land Uses: Timber harvest, livestock grazing, home construction, road construction, and mining have had varying levels of impact in the watershed. Dredge mining has impacted and altered the majority of the stream bottom areas along stream reaches in the lower and middle American River. Private land development is prevalent along some stream reaches, such as the American River subdivision. Refer to Section 3.4 (Watershed) and Table 3.4.2 for additional summaries and discussion concerning land uses and watershed condition evaluations.

Fisheries Water Quality Objectives, Trends, and Limiting Factors: The established fisheries/water quality objective for this watershed is 80% habitat potential. The existing condition is 60% habitat potential for Lower American River, and 65% habitat potential for Middle American River, making these stream segments below objective. Current trends are slightly upward in the watershed. The majority of the stream bottom area along Lower and Middle American River has been dredge mined. Yearlong and seasonal residences occur along some stream reaches. Dredge mining has altered the stream channel and reduced the quantity and quality of pools and active large woody debris is lacking. Dredge mining activity has reduced large woody debris recruitment along some reaches. High summer water temperatures and deposited sediment also reduce fish habitat quality. Because of the lack of LWD and reduced quantity of pools, various stream improvement projects have been constructed by the BLM, which include installation of upstream "v" rock check dams, log check dams, large woody debris, and habitat rock placement.

The primary limiting factors include elevated levels of deposited sediment, high summer water temperatures, lack of LWD, and limited number of good quality pools (BLM 1992 Stream Surveys, BLM 2004 Substrate and Water Quality Monitoring, BLM 2005 Riparian/Greenline Monitoring, Craig Johnson, 2004/2005 field notes).

Maggie Creek

The mouth of Maggie Creek occurs at approximately river mile 12.6 of American River, which is approximately two miles upriver from the mouth of the East Fork American River. The watershed is 263 acres in size. Dredge mining and a road has altered the mouth area of the stream and the stream has no connecting channel to American River. The stream flows into a dredge pond and flows subsurface through dredge tailings at the mouth area. During high flow flood events, American River flows may flow over its banks and floods the river bottom, which may allow periodic limited or unknown fish passage into the lower reach of Maggie Creek.

Westslope cutthroat trout are present in Maggie Creek, but population levels are very low (Craig Johnson 2005 field notes). The dominant channel types are B5 and B5c, dominant substrate was sand and subdominant was small gravel, with a stream gradient of 2 to 3%. Estimated cobble embeddedness was 60% and surface fines were 60%. With the exception of mining at the mouth area, overall, human impacts in the drainage are minimal and elevated deposited sediment exist under natural conditions for this small drainage. Summer high water temperatures ranged from 16°C to 18°C. Mean low summer flows for the lower reach were less than 0.1 cfs, and mean high flows estimated to be 5 cfs. Estimated ECA for the drainage is 5%. Riparian habitats are in mid-seral condition, and are rated as being in "proper functioning condition." With the exception of the mouth area, where dredge mining and a road have encroached on the stream bottom area, the riparian areas are in good ecological condition and bank stability is 99% (Craig Johnson, 2005 field notes). The primary limiting factors for fish production are low flows, lack of

good quality pools, limited spawning gravels, and fish passage barrier at the mouth. Because of the small size of the watershed and low base flows this stream does not have high fish production capability (Craig Johnson, 2005 field notes).

Telephone Creek
Telephone Creek flows into American River at river mile 10.5. The watershed area is 428 acres in size. Because of alteration of the mouth by dredge mining, no stream channel connects with American River. A full passage fish barrier occurs at the mouth area and lowest reach segment of the stream. During high flow flood events, American River may flow over its banks and flood the river bottom, which may allow periodic limited or unknown fish passage into the lower reach of Telephone Creek. The stream flows subsurface during low flow periods into dredge tailings. A primitive road parallels the stream and fords the stream at two locations. During high flow events the stream floods across the American River road and into American River.

Westslope cutthroat trout are present in Telephone Creek and population levels are low (Craig Johnson 2004 field notes). The dominant channel type is B3 in the lower reach and A3 channel type in the middle and upper portions with a stream gradient of 4 to 20%, the dominant substrate was sand and subdominant was small gravel. BLM monitoring (2004) at stream mile 0.1 found that cobble embeddedness was 77%, spawning gravel composition by depth had 68% less than 6.3 mm, and surface fines were 67%. The 2004 seven-day running average maximum temperature was 17.5°C and the maximum temperature recorded was 19.3°C. Mean low summer flows were less than 0.05 cfs, and mean high flows estimated at 6–9 cfs. Estimated ECA for the drainage is approximately 47%. Riparian habitats are in mid-seral condition, and are rated as being "functional at risk." The majority of the private land headwater area has been logged. The private lands in the headwaters are grazed by cattle during the summer. The primitive road is used by recreationists, primarily as an ATV trail. The stream has experienced flood scouring events and the road has encroached on riparian habitats and the stream channel. During spring run-off, the road erodes and rutting is common. The Telephone Creek watershed has an estimated 0.7 mile of fish bearing stream within the watershed. The primary limiting factors for fish production are low flows, lack of good quality pools, and poor quality rearing habitat (Craig Johnson, 2005 field notes).

Baboon Creek
Baboon Creek flows into American River at river mile 8.1. The watershed area is 257 acres in size. Dredge mining has significantly altered the lower reach of the stream where it flows into American River. A private residence occurs at the mouth of the stream and a road crossing/culvert occurs approximately 125 feet from the mouth of the stream. During low flow periods, the lower 50–150 feet of the stream channel may not have not surface flows.

Westslope cutthroat trout and brook trout are present in Baboon Creek, although population levels are low (Craig Johnson 2005 field notes). The dominant channel types are A3 and A4 with a stream gradient of 4 to 7%, the dominant stream substrate is large gravel and subdominant substrate is small cobble. Estimated cobble embeddedness was 35–45% and surface fines were 10–15%. Summer water temperatures ranged from 17°C to 18°C. Mean low summer flows for the lower reach were less than 0.1 cfs, and mean high flows estimated to be 4–6 cfs. Estimated ECA for the drainage is 5%.

Riparian habitats are in mid-seral condition and are rated as being in "proper functioning condition." With the exception of the mouth area, where dredge mining and a road have encroached on the stream bottom area, the riparian areas are in good ecological condition and bank stability is 99%. The primary limiting factors for fish production are low flows and lack of good quality pools. Because of the small size of the watershed and low base flows this stream does not have high fish production capability (Craig Johnson, 2005 field notes).

East Fork American River–Prescription Watershed #17060305-05-10

Overview: East Fork American River flows into American River at river mile 10.6 and totals 11,392 acres. The watershed has two subwatersheds (prescription watersheds), which include East Fork American River and Flint Creek. The lower to mid reaches of the stream flow through a timbered bottom with some stringer meadows. A private residence occurs near the mouth. A non-motorized trail parallels the creek. The lower reaches crossing BLM lands are not leased for grazing; however, NPNF lands are permitted for grazing.

Fisheries: The East Fork American River provides habitat for steelhead trout, bull trout, spring chinook salmon, redband trout westslope cutthroat trout, mountain whitefish, sculpin, dace and brook trout. A culvert located at the mouth was a partial/full fish passage barrier; however, it was replaced with a 20-foot wide bridge during the summer of 2006 by BLM.

Bull trout redd surveys completed in 1999 and 2000 failed to document any confirmed bull trout redds, but brook trout redds were found (Nez Perce National Forest unpublished data). Fish population surveys by BLM, NPNF, and IDFG have documented the presence of bull trout; however, numbers were low and most fish were found in the middle reach. The stream may be used for bull trout spawning and early rearing; further investigations are needed for verification (USDA-FS, 2005a).

Fish Habitat: The East Fork American River was surveyed by the BLM in 1992 from the mouth to NPNF boundary (stream mile 2.33). In 1993 the NPNF surveyed from that point to the headwaters. Both surveys used a modified Hankin and Reeves survey methodology (Hankin and Reeves, 1988). The dominant channel type in the lower reaches was C3 or B3 and average gradient ranged from 1–2 percent, and unstable stream banks were 2%. BLM monitoring at river mile 0.2 found that cobble embeddedness was 44%, spawning gravel composition by depth had 35.6% less than 6.3 mm, and surface fines were 18%.

Water Quality, Water Yield, and Flow Regimes: The current sediment yield over base for the entire East Fork American River watershed is 12%. Current ECA for the East Fork American River watershed is 7%.

The seven-day running average maximum temperature during steelhead and cutthroat spawning periods is 13.4 degrees C, and is rated good (SM 0.1–1995). The seven-day running average maximum temperature for summer rearing is 16.1°C (SM 0.1–1995). No data on rearing temperatures are available for the middle reach, but spot monitoring during fish surveys in 1998 found cool water temperatures, which rated high for steelhead and bull trout rearing. The seven-day running average maximum temperature for bull trout spawning was 14.4°C (SM 0.1–1995), which is not optimal, cooler water temperatures occur upstream in the drainage.

Low summer flows at the mouth average 3–5 cfs and average high flows are estimated at 140 cfs.

Riparian Habitats: Riparian habitats are in mid- to late-seral condition, and are rated as being in "proper functioning condition." With the exception of the mouth area, where dredge mining, a residence and a road occur, the riparian areas along the East Fork American River are in good ecological condition.

Land Uses: Timber harvest and road construction have had low levels of impact in the drainage and have occurred primarily on NPNF lands. A culvert located at the mouth of the stream on private lands is a partial/full fish passage barrier. With the exception of a small tract of private land located at the mouth of the stream, the majority of the watershed ownership is NPNF and BLM lands. A trail parallels the stream. No timber harvest or roading has occurred within the watershed on BLM lands. No BLM lands within the drainage are leased for livestock grazing. Refer to Section 3.4 (Watershed) and Table 3.4.2 for additional summaries and discussion concerning land uses and watershed condition evaluations.

Fisheries/Water Quality Objectives, Trends, and Limiting Factors: The established fisheries/water quality objective for this watershed is 90% habitat potential. The existing condition is 80% habitat potential, making this stream below its objective. Current trends are slightly upward in the watershed.

Reconnaissance field investigation of the watershed during 2004 and 2005 have not identified any BLM land uses adversely impacting fish habitats, riparian habitats or chronic sources of erosion or sediment attributed to BLM management actions which would preclude or not support improving trends.

The primary limiting factor is elevated levels of deposited sediment (BLM 1992 Stream Surveys, BLM 2004 water Quality Monitoring, and Craig Johnson, 2004/2005 field notes). Because of low stream gradients and stream channel morphology, it is expected that this drainage would experience some elevated sediment levels under natural conditions.

Whitaker Creek–Prescription Watershed #17060305-05-12

Overview: The mouth area of Whitaker Creek occurs at approximately river mile 9.7 of American River. The watershed is approximately 1,000 acres in size, and 70% is NPNF lands, followed by 22% BLM lands, and 8% private. Dredge mining has altered the mouth area of the stream and it has no connecting channel to American River. The stream flows subsurface through dredge tailings at the mouth area. Two private residences occur along the lower reach of the stream.

Fisheries: The BLM during 2004 established a permanent monitoring station in the lower reach and electrofished 29 westslope cutthroat trout in a 55 square meter station. Whitaker Creek provides habitat for westslope cutthroat trout, brook trout, dace, and sculpin.

Dredge mining has altered the mouth area and it has no connecting channel to American River. The dredge mined blockage is a barrier for fish passage into the stream from American River. A natural barrier consisting of a small falls and cascade is a full fish passage barrier at stream mile 1.2; westslope cutthroat trout have been documented above this barrier (Craig Johnson, 2004 field notes).

Fish Habitat: Whitaker Creek was surveyed by the BLM in 1991 from the mouth to NPNF boundary (stream mile 1.5), using a modified Hankin and Reeves (1988) survey methodology. The NPNF surveyed their lands upstream in 1989 using the same methodology. The NPNF also conducted surveys in 2003 with the R1 Stream Reach Inventory and Channel Stability an Evaluation and Stream Reach Survey (Pfankuch, 1978), and a Fish Habitat Reconnaissance Survey (USDA-FS, 2000). The channel types starting from the mouth are C3 (short mouth area reach), B4, and A3; and average gradient ranges from 1–12%. Unstable stream banks were less than 3 percent. BLM monitoring (2004) at stream mile 0.4 found that cobble embeddedness was 56%, spawning gravel composition by depth had 47% less than 6.3 mm, and surface fines were 37%.

Water Quality, Water Yield, and Flow Regimes: The current percent over base sediment yield for the watershed is 31%. During 2004 water temperature was monitored and the instantaneous maximum water temperature was 18.1°C and the seven-day running average maximum summer water temperature was 16.8°C. The ECA for the Whitaker Creek watershed is 10%. Estimates of low flows at the mouth average less that one cfs and high flow average is estimated at 14 cfs.

Riparian Habitats: The stream flows through a moderately confined to confined timbered stream bottom. Riparian habitats are in mid- to late-seral condition, and are rated as being in "proper functioning condition." With the exception of the lower reach and mouth area (stream mile 0.0 to 0.4), where dredge mining, roads, timber harvest, and private land development has occurred, the upstream BLM and NPNF riparian areas along Whitaker Creek are in good ecological condition.

Land Uses: Timber harvest, road construction, private land development, and dredge and placer mining have had varying levels of impact in the watershed. Dredge mining has impacted the mouth and lower reach of the stream and no stream channel connects or flows into American River. Private land

development, timber harvest, and roading have occurred in the lower portion of the drainage. Timber harvest and road construction has also occurred on NPNF lands in the upper portion of the watershed. BLM lands within the drainage have had minimal past land uses and no livestock grazing is authorized on BLM lands in the watershed. Refer to Section 3.4 (Watershed) and Table 3.4.2 for additional summaries and discussion concerning land uses and watershed condition evaluations.

Fisheries/Water Quality Objectives, Trends, and Limiting Factors: The established fisheries/water quality objective for this watershed is 70% habitat potential. The existing condition is 70% habitat potential, making this stream at its objective.

Reconnaissance field investigation of the watershed during 2004 and 2005 have not identified any BLM land uses adversely impacting fish habitats, riparian habitats or chronic sources of erosion or sediment attributed to BLM management actions which would preclude or not support improving trends.

The primary limiting factors include lack of connectivity at mouth, elevated levels of deposited sediment, and low flows. (BLM 1991 Stream Surveys, BLM 2004 Substrate and Water Quality Monitoring, Craig Johnson, 2004 field notes).

Queen Creek–Prescription Watershed #17060305-05-13

Overview: The mouth area of Queen Creek occurs at approximately river mile 9.4 of American River. The watershed is approximately 1,088 acres in size, and 70% is NPNF lands, followed by 25% BLM lands, and 5% private. Dredge mining has altered the mouth area of the stream and the stream has no connecting channel to American River. The stream flows into dredge ponds and then subsurface through mine tailings at the mouth area.

Fisheries: Queen Creek provides habitat for westslope cutthroat trout and dace. A segment of the lower reach was electrofished in 2003 by the Forest Service, and high densities of resident fish were identified (22 westslope cutthroat and 6 dace in a 23 square meter reach) (USDA-FS, 2005a). The BLM during 2004 also established a permanent monitoring station in the lower reach and electrofished 29 westslope cutthroat trout in a 55 square meter station. The cutthroat population is isolated from the mainstem American River by dredge mining caused blockage and channel alteration of the mouth area and the stream has no connecting channel with American River. The stream flows into dredge ponds at the mouth. The BLM during 2004 conducted electrofishing in the dredge ponds the stream flows into at the mouth of the stream and documented the presence of dace and bridgelip sucker. These ponds have very high summer temperatures and during 2004 water temperatures of 20–26°C were documented. During high flow flood events, American River flows over its banks and floods the river bottom, which may allow unknown limited fish passage into the lower reach of Queen Creek.

Fish Habitat: Queen Creek was surveyed by the BLM in 1991 from the mouth to NPNF boundary (stream mile 1.5) using a modified Hankin and Reeves (1988) survey methodology. The NPNF surveyed their lands in 1989 using the same methodology and completed a Stream Reach Inventory and Stream Channel Stability Evaluation (Pfankuch, 1978). In 2003 the NPNF conducted a Stream Reach Reconnaissance Survey, R1 Stream Reach Inventory and Channel Stability Evaluation (Pfankuch, 1978), Rosgen Stream Channel Classification (Rosgen, 1996) with Wolman pebble count and channel profiles, and cobble embeddedness measurements.

The stream flows through a wide valley bottom at the mouth, while upstream reaches flow through a confined timbered stream bottom. The channel types starting from the mouth are C2 (mouth area), B3, and A3; and average gradient ranges from 2–7 percent. Unstable stream banks were less than one percent. BLM monitoring (2004) at stream mile 0.2 found that cobble embeddedness was 42%, spawning gravels had 44.7% less than 6.3 mm, and surface fines were 22%. Deposited sediment levels are elevated; however, fish densities are moderate to high for this small stream.

Water Quality, Water Yield, and Flow Regimes: The current percent over base sediment yield for the watershed is 37%. During 2004 water temperature was monitored and the instantaneous maximum water temperature was 15.8°C and the seven-day running average maximum summer water temperature was 15.3°C. ECA for the Queen Creek watershed is 13%. Estimates of summer flows at the mouth average less that one cfs and high flow average is estimated at 16 cfs.

Riparian Habitats: Riparian habitats are in mid- to late-seral condition, and are rated as being in "proper functioning condition." With the exception of the lower reach that has been disturbed by historic mining, the riparian areas are in good ecological condition with a stable to slight upward trend. Grand-fir is a common overstory riparian tree, followed by Engelmann spruce, Douglas-fir, and lodgepole pine. Understory vegetation includes alder, bracken-fern, arrowleaf groundsel, water sedge, small-fruited bulrush, bluejoint, mountain brome, and other forbs.

Land Uses: Timber harvest, road construction, and dredge and placer mining have had varying levels of impact in the watershed. Dredge mining has impacted the mouth and lower reach of the stream and no stream channel connects or flows into American River. Timber harvest and road construction has occurred on NPNF lands in the upper portion of the watershed. With the exception of some historic mining, BLM lands within the drainage have had minimal past land uses and no livestock grazing is authorized on BLM lands in the watershed. Refer to Section 3.4 (Watershed) and Table 3.4.2 for additional summaries and discussion concerning land uses and watershed condition evaluations.

Fisheries/Water Quality Objectives, Trends, and Limiting Factors: The established fisheries/water quality objective for this watershed is 70% habitat potential. The existing condition is 70% habitat potential, and stream survey data and field investigations indicate this stream is meeting objective.

Reconnaissance field investigation of the watershed during 2004 and 2005 have not identified any BLM land uses adversely impacting fish habitats, riparian habitats or chronic sources of erosion or sediment attributed to BLM management actions which would preclude or not support improving trends.

The primary limiting factors include elevated levels of deposited sediment, limited winter rearing habitat, lack of good quality pools, and low flows (BLM 1991 Stream Surveys; BLM 2004 Substrate and Water Quality Monitoring; Craig Johnson, 2004 field notes).

Box Sing Creek–Prescription Watershed #17060305-05-12

Overview: Box Sing Creek flows into American River at river mile 8.5 and the lower segment flows across the dredge mined flood plain of American River. Roads, logging, and mining have impacted the stream to varying levels. Box Sing is approximately 5.7 miles long with a watershed area of 1,140 acres. The watershed is 84% is NPNF lands, followed by 13% BLM lands, and 3% private. Dredge mining has altered the mouth area of the stream.

Fisheries: Box Sing Creek provides habitat for westslope cutthroat trout, brook trout, rainbow/steelhead trout, and chinook salmon. The FS documented the presence of chinook salmon juveniles in the lower segment of the stream during 2003. During 2005 the BLM monitored two permanent stations in the lower reach. Monitoring at stream mile 0.1 documented 10 cutthroat and 3 brook trout from a 57.5 square meter station and monitoring at stream mile 0.8 documented 30 cutthroat trout from a 32.5 square meter station.

During the summer of 1992 the BLM constructed approximately 250 feet of new stream channel to connect Box Sing Creek with American River. Historic dredge mining of the mouth area altered the American River floodplain and no stream channel connected the stream with American River. At the mouth area, Box Sing Creek flowed subsurface through the old tailings during low flows or during high flow events flowed into low depressions or over the floodplain area in no distinct channel.

Fish Habitat: Box Sing Creek was surveyed by the BLM in 1991 from the mouth to NPNF boundary (stream mile 0.67), using a modified Hankin and Reeves (1988) survey methodology. The NPNF surveyed the upstream reaches using the same methodology in 1989. NPNF recon surveys were

conducted in 2003 in support to this project. Surveys included Stream Reach Reconnaissance Survey, Rosgen Stream Channel Classification (Rosgen, 1996) with channel profiles and Wolman pebble count and R1 Stream Reach Inventory and Channel Stability Evaluation (Pfankuch, 1978).

The stream flows through a confined timbered stream bottom. The dominant channel type in lower reaches was B4 and average gradient was 2 percent. Unstable stream banks were less than 3 percent. Box Sing is approximately 5.7 miles long. BLM monitoring (2004) at stream mile 0.1 found that cobble embeddedness was 44%, spawning gravel composition by depth had 31.4% less than 6.3 mm, and surface fines were 19%.

Water Quality, Water Yield, and Flow Regimes: The current percent over base sediment yield for the watershed is 21%. During 2004 water temperature was monitored and the instantaneous maximum water temperature was 17.7°C and the seven-day running average maximum summer water temperature was 16.5°C. ECA for the Box Sing Creek watershed is 6%. Estimates of low flows at the mouth average less than one cfs and high flow average is estimated at 14 cfs.

Riparian Habitats: Riparian habitats are in mid-seral condition, and are rated as being in "proper functioning condition." With the exception of the mouth area, where dredge mining altered the channel, the riparian areas along Box Sing Creek are in good ecological condition with a slight upward trend. Common overstory riparian trees include grand fir, lodgepole pine, and Engelmann spruce. Understory vegetation includes alder, arrowleaf groundsel, water sedge, small-fruited bulrush, bluejoint, mountain brome, and other forbs/shrubs.

Land Uses: Low-moderate levels (16% of watershed) of historic timber harvest have occurred in the watershed and road density is 3.3 miles per square mile. The lower 2.0 miles of Box Sing Creek is moderately disturbed from past dredge mining and placer mining activities. Refer to Section 3.4 (Watershed) and Table 3.4.2 for additional summaries and discussion concerning land uses and watershed condition evaluations.

Fisheries/Water Quality Objectives, Trends, and Limiting Factors: The established fisheries objective for this watershed is 70% habitat potential. The existing condition is approximating 65% habitat potential indicating this stream is near objective. With successional advancement in riparian habitats (mid-age to mature timber) and increased contribution of active large woody debris to stream channels from lodgepole pine that is dead or dying, it is expected that pool/riffle ratios and active instream woody debris will improve in the watershed. BLM restoration work in the watershed includes barricading the lower reach of the stream from ATV use, closing a road across a wet meadow, and re-connecting the channel to American River in 1992. Further activities that support upward trend include the installation of an open arch culvert at a ford that was a chronic sediment source and graveling the road (2002).

Reconnaissance field investigation of the watershed during 2004 and 2005 have not identified any BLM land uses adversely impacting fish habitats, riparian habitats or chronic sources of erosion or sediment attributed to BLM management actions which would preclude or not support improving trends.

The primary limiting factors include elevated levels of deposited sediment, limited winter rearing habitat, lack of good quality pools, and low flows (BLM 1991 Stream Surveys; BLM 2004 Substrate and Water Quality Monitoring; Craig Johnson, 2004 field notes).

Kirks Fork–Prescription Watershed #17060305-05-12

Overview: Kirks Fork flows into American River at river mile 6.9. The watershed is approximately 6,530 acres in size, and approximately 98% is NPNF lands and approximately 2% BLM lands. Dredge mining has altered the mouth area and lower reach segment of the stream. A primitive road parallels American River on the east side and this road fords Kirks Fork near the mouth.

Fisheries: Kirks Fork provides habitat for steelhead, bull trout, spring chinook salmon, westslope cutthroat trout, brook trout, mountain whitefish, sculpin, and dace. Bull trout use the stream for adult and

subadult rearing. Fish population surveys of the stream in recent years by BLM, NPNF, and IDFG (1996–2003) have documented the presence of bull trout; however, numbers were low.

Fish Habitat: Kirks Fork was surveyed by the BLM in 1992 from the mouth to Forest Service boundary (stream mile 0.55) (USDI-BLM, 1992; USDA-FS 1999a). The Forest Service surveyed from the BLM boundary upstream in 1991. Both surveys used a modified Hankin and Reeves (1988) survey methodology. The NPNF conducted a recon fish habitat stream survey in 2003.

The stream flows through a confined timbered stream bottom. The dominant channel type in lower reaches was B3 and average gradient ranged from 2–3 percent. Unstable stream banks varied from 3–5 percent. BLM monitoring at stream mile 0.15 found that cobble embeddedness was 45%, spawning gravel composition by depth had 28.9% less than 6.3 mm, and surface fines were 15%.

Water Quality, Water Yield, and Flow Regimes: Current percent over base sediment yield for the watershed is 5%. ECA for the Kirks Fork watershed is 2%. During 2004 water temperature was monitored and the instantaneous maximum water temperature was 20.3°C and the seven-day running average maximum summer water temperature was 17.8°C. The seven-day running average maximum temperature was 16.7°C in 1995. ECA for the Kirks Fork watershed is 2%. Estimates of low flows at the mouth average 1–2 cfs, and high flow average is estimated at 80–85 cfs.

Riparian Habitats: Riparian habitats are in mid-seral condition, and are rated as being in "proper functioning condition." BLM and NPNF riparian areas along Kirks Fork documented a good ecological condition. Common overstory riparian trees include Engelmann spruce, lodgepole pine, grand fir, and subapline fir. Understory vegetation includes alder, red-osier dogwood, arrowleaf groundsel, water sedge, small-fruited bulrush, bluejoint, mountain brome, and other forbs/shrubs.

Land Uses: Timber harvest has occurred on 4% of the watershed and the road density is 0.6 miles per square mile. This watershed has relatively low levels of roading, timber harvest, and development. A primitive road and ford crossing occurs on Kirks Fork near the mouth of the stream. An ATV trail parallels Kirks Fork. Dredge mining has altered the mouth area and lower reach of the stream. With the exception of some historic mining and a ford at the mouth, BLM lands within the drainage have had minimal past land uses on BLM lands in the watershed. Refer to Section 3.4 (Watershed) and Table 3.4.2, for additional summaries and discussion concerning land uses and watershed condition evaluations.

Fisheries/Water Quality Objectives, Trends, and Limiting Factors: The established fisheries objective for this watershed is 80% habitat potential. The existing condition is approximating 75% habitat potential. With successional advancement in riparian habitats (mid-age to mature timber) and increased contribution of active large woody debris to stream channels from lodgepole pine that is dead or dying, it is expected that pool quality and active instream woody debris will improve in the watershed.

The primitive road and ford at the mouth of the stream is a source of erosion/sediment. With the exception of the ford, reconnaissance field investigation of the watershed during 2004 and 2005 did not identify any land uses adversely impacting riparian or aquatic habitats or chronic sources of erosion or sediment attributed to BLM management actions which would preclude or not support improving trends.

The primary limiting factors include elevated levels of deposited sediment, poor winter rearing habitat conditions, and lack of good quality pools (BLM 1992 Stream Surveys; BLM 2004 Substrate and Water Quality Monitoring; Craig Johnson, 2004 field notes). This subwatershed has relatively low levels of human disturbance; however, existing deposited sediment levels are elevated.

Elk Creek

Overview: Elk Creek flows into American River at river mile 1.5. Elk Creek includes the reaches from the mouth to the confluence of Big Elk Creek and Little Elk Creek at stream mile 2.7. The watershed is approximately 15,650 acres in size, and approximately 45% is NPNF lands, 39% private lands, and 16% BLM lands. The Elk Creek watershed is a composite watershed, with three subwatersheds. The lower

portion of the watershed is primarily in private ownership, and the creek meanders through a large meadow, which is grazed by cattle and horses. Portions of the meadow are also used for hay production. The stream flows through the community of Elk City and the watershed is the municipal water source. The lower watershed consists of a broad meadow, with moderate slopes that are timbered. The mid and upper portions of the watershed are timbered, with meadows occurring along some of the stream bottoms.

Fisheries: Elk Creek provides habitat for steelhead, spring chinook salmon, westslope cutthroat trout, brook trout, mountain whitefish, sculpin, and dace. Bull trout may use the stream for adult and subadult rearing; however, an IDFG fish population survey of the creek in 1998 did not document the presence of bull trout in the watershed. IDFG sampled ten transects in Elk Creek during 1998, which occurred from the mouth to the confluence of Big and Little Elk Creeks (IDFG, 1998). Survey efforts during 1998 documented that chinook salmon made up the greatest density (subyearlings) (71.4%), followed by mountain whitefish (20.48%), brook trout, rainbow/steelhead trout, and westslope cutthroat trout were the least populated species in Elk Creek (IDFG, 1998). Chinook salmon and steelhead trout densities can vary greatly from year to year, which is dependent on previous year adult salmon that returned to the watershed. Sculpin and dace were also observed during the 1998 surveys.

Fish Habitat: Elk Creek was surveyed by the BLM in 1991 using a modified Hankin and Reeves (1988) survey methodology. The dominant channel type was C4 and average gradient was less than 1%. Unstable streambanks varied from 5–45%. The stable streambanks occur within livestock exclosure areas constructed by the BLM. BLM monitoring at stream mile 0.8 found that cobble embeddedness was 64%, surface fines were 34%, and spawning gravels had 54% less than 6.3 mm. BLM monitoring at stream mile 2.2 found that cobble embeddedness was 62%, surface fines were 45%, and spawning gravels had 36% less than 6.3 mm.

Water Quality, Water Yield, and Flow Regimes: Elk Creek has some of the highest recorded summer water temperatures in the upper South Fork of the Clearwater River watershed. A seven-day running average maximum temperature of 23.0°C has been recorded for Elk Creek. The current percent over base sediment yield for the watershed is 18%. ECA for the watershed is 13%. Estimates of low flows at the mouth average 2–3 cfs and high flows average is estimated at 190 cfs.

Riparian Habitats: Riparian habitats are generally in poor to fair ecological condition. Unstable streambanks and lack of shrubs are common along some stream segments. Livestock grazing is common along most stream segments. The only segment (0.4 mile) of Elk Creek flowing across BLM lands has been fenced from livestock use. Common riparian vegetation includes Kentucky bluegrass, redtop, reed canary grass, water sedge, small-fruited bulrush, bluejoint, mountain brome, Drummond's willow, and other forbs/shrubs.

Land Uses: Timber harvest, livestock grazing, home construction, urban development, road construction, and mining have had varying levels of impact in the watershed. The Elk Creek watershed is the municipal watershed for the community of Elk City. Specific stream reaches flowing across private lands have had historic and present summer grazing which have had adverse effects on riparian vegetation and streambank stability. Refer to Section 3.4 (Watershed) and Table 3.4.2 for additional summaries and discussion concerning land uses and watershed condition evaluations.

Fisheries/Water Quality Objectives, Trends, and Limiting Factors: Because of the small amount of BLM ownership in the Elk Creek 6th code HUC, no specific fisheries or water quality objectives have been established. Livestock grazing is one of the primary land uses impacting this stream reach, and the BLM has excluded livestock grazing along the segment flowing across BLM lands. BLM Elk Creek exclosures were constructed in 1983 and 2000 and riparian condition and bank stability have improved from poor to good along the stream reach flowing across BLM lands. Livestock grazing on private lands has resulted in streambank and riparian degradation. The BLM is currently cooperating and coordinating with Framing Our Community on several American River restoration projects. One project involves

private land riparian restoration (e.g., riparian fencing, streambank plantings, and streambank stabilization) for Elk Creek.

The primary limiting factors for Elk Creek are high summer water temperatures, elevated deposited sediment levels, poor winter rearing habitat conditions, and lack of good quality pools (1991 BLM stream surveys; 2005 BLM Riparian/Greenline Monitoring; Craig Johnson, 2005 field notes).

Little Elk Creek

Overview: Little Elk Creek flows into Elk Creek at stream mile 2.7. The watershed is approximately 5,100 acres in size, and approximately 63% is NPNF lands, 23% private lands, and 14% BLM lands. The majority of the watershed is timbered with the exception of the lower meadow portion. The lower portion of the watershed is primarily in private and BLM ownership, while the mid and upper portion is primarily NPNF lands. The creek meanders through a large meadow in the lower reaches. In the mid and upper sections, the creek flows through stringer meadows or timbered/shrub stream bottoms.

Fisheries: Little Elk Creek provides habitat for steelhead trout, spring chinook salmon, cutthroat trout, brook trout, mountain whitefish, sculpin, and dace. Bull trout may use the stream for adult and subadult rearing; however, an IDFG fish population survey of the creek in 1998 did not document the presence of bull trout in the watershed. IDFG sampled 25 transects in Little Elk Creek during 1998 (IDFG, 1998). Survey efforts during 1998 documented that brook trout were the most abundant species in the watershed (60.09%), followed by cutthroat trout (40.98%), chinook salmon (subyearlings) (12.36%), mountain white fish (2.13%), and rainbow/steelhead trout (1.64%) (IDFG, 1998).

Fish Habitat: Little Elk Creek was surveyed by the BLM in 1991 from the mouth to the NPNF boundary using a modified Hankin and Reeves (1988) survey methodology (mouth to NPNF boundary). The dominant channel type was C4 and C3 in the lower and mid reaches and B3 in the upper reaches. The average gradient ranges from less than 1% to 2%. Unstable streambanks for various stream reaches ranged from 10–25%. BLM monitoring at stream mile 3.2 found that cobble embeddedness was 56%, surface fines were 39%, and spawning gravels had 37% less than 6.3 mm.

The primary limiting factors include high summer water temperatures, elevated levels of deposited sediment, poor winter rearing habitat, and lack of good quality pools.

Water Quality, Water Yield, and Flow Regimes: The current percent over base sediment yield for the watershed is 24%. A seven-day running average maximum temperature of 23.0°C has been recorded for Little Elk Creek. ECA for the watershed is 11%. Estimates of low flows at the mouth average less than 0.5–1 cfs and high flow average is estimated at 60–70 cfs.

Riparian Habitats: Riparian habitats are generally in fair ecological condition. Livestock grazing is common along most stream segments. Common riparian vegetation includes Kentucky bluegrass, redtop, reed canary grass, water sedge, small-fruited bulrush, bluejoint, mountain brome, Drummond's willow, and other forbs/shrubs in meadow reaches. Timbered stringer meadows will have redtop, water sedge, small-fruited bulrush, bluejoint, mountain brome, and other forbs/shrubs in meadow reaches. Common riparian trees and shrubs in the mid and upper reaches include lodgepole pine, Engelmann spruce, grand fir, alder, red-osier dogwood, and Drummond's willow.

Land Uses: Timber harvest, livestock grazing, home construction, road construction, and mining have had varying levels of impact in the watershed. Little Elk Creek occurs within the Elk Creek watershed, which is the municipal watershed for the community of Elk City. Stream reaches of Little Elk Creek have been dredge mined, and sinuosity has been significantly increased in these reaches. Refer to Section 3.4 (Watershed) and Table 3.4.2 for additional summaries and discussion concerning land uses.

Fisheries/Water Quality Objectives, Trends, and Limiting Factors: The established fisheries objective for this watershed is 80% habitat potential. The existing condition is approximating 60% habitat potential. With successional advancement in riparian habitats (mid-age to mature timber) and increased contribution

of active large woody debris to stream channels from lodgepole pine that is dead or dying, it is expected that pool quality and active instream woody debris will improve in the watershed.

The primary limiting factors for Little Elk Creek are high summer water temperatures, elevated deposited sediment levels, lack of large woody debris, poor winter rearing habitat conditions, and lack of good quality pools (1991 BLM stream surveys; Craig Johnson, 2004 field notes).

South Fork Clearwater River

Overview: The South Fork Clearwater River subbasin is approximately 746,000 acres in size and BLM lands within the subbasin total 2% (15,203 acres). The majority of BLM lands occurring within the subbasin are in the Elk City township (12,859 acres). The elevations range from 1,240 feet at the mouth (Kooskia) to 10,000 feet. American River and Red River flow together at river mile 62.5 to form the South Fork Clearwater River. The South Fork Clearwater River flows into the Clearwater River at river mile 74.4.

Fisheries: Special status fish found in the South Fork Clearwater River include: steelhead trout, bull trout, fall chinook salmon, spring chinook salmon, Pacific lamprey, rainbow/redband trout, redband trout, and westslope cutthroat trout. Other native fish known to occur in the South Fork Clearwater River include: mountain whitefish, northern pikeminnow, chiselmouth, brdigelip sucker, sculpin, redside shiner, speckled dace, and longnose dace. Non-native species occurring in the South Fork Clearwater River include: brook trout Yellowstone cutthroat trout, black bullhead, and smallmouth bass.

The following Table 3.6.5 lists the lifestages for select special status species in the upper South Fork Clearwater River and American River/tributaries.

Table 3.6.5 Lifestages for Federally Listed and BLM Sensitive Species–Upper S. Fk. Clearwater R.

Lifestage	Steelhead Trout	Bull Trout	Sp/Summer Chinook Salmon	Westslope Cutthroat Trout	Pacific Lamprey
Adult Migration	AUG–APR S.Fk.Clearwater	JUN–AUG S.Fk.Clearwater	APR–JUL S.Fk.Clearwater	MAR–JUN S.Fk.Clearwater	JUL–OCT S.Fk.Clearwater
Adult Spawning	MAR–JUN S.Fk.Clearwater & Trib. Streams	Late AUG–SEP Trib. Streams	AUG–SEP Trib. Streams	MAR–JUN Trib. Streams	APR–JUL S.Fk.Clearwater Trib. Streams
Adult Overwintering	NOV–MAR S.Fk.Clearwater	NOV–MAR S.Fk.Clearwater.	N/A	NOV–MAR S.Fk.Clearwater	NOV–MAR S.Fk.Clearwater
Adult / Subadult Rearing	N/A	YEARLONG S.Fk.Clearwater & Trib. Streams	N/A	YEARLONG S.Fk.Clearwater & Trib. Streams	N/A
Incubation & Emergence	MAR–JUN S.Fk.Clearwater & Trib. Streams	SEP–MAY Trib. Streams	SEP–MAY S.Fk.Clearwater Trib. Streams	MAR–JUN Trib. Streams	APR–JUL S.Fk.Clearwater & Trib. Streams
Juvenile Rearing	1–3 Years S.Fk.Clearwater & Trib. Streams	2–3 Years Trib. Streams	1 Year S.Fk.Clearwater & Trib. Streams	1–3 Years Trib. Streams	4–6 Years S.F.Clearwater Trib. Streams
Smolt Emigration	APR–JUN	Sub Adults SEP–OCT	APR–JUL	N/A	APR–JUL

Fish Habitat: The mainstem South Fork Clearwater River begins at the confluence of American and Red River (River Mile 62.5). From this point to about Tenmile Creek (River Mile 47.1), the river is a relatively low gradient riffle/pool stream dominated by gravel and cobble substrate (USDA-FS, 1998a). In this reach, it is typically a C channel. It has been highly altered by dredge mining and placement of State Highway 14. From Tenmile Creek to Mill Creek (River Mile 32.8), the river is steeper, more confined, and the substrate is dominated by boulders and cobbles. The channel type is typically A, B, or C. This is a high energy reach through which sediment is readily transported. From Mill Creek to just above Threemile Creek (River Mile 7.6) to its confluence with the Middle Fork Clearwater River at Kooskia (Clearwater River–river mile 74.7), the South Fork is a relatively flat, unconfined riffle/pool channel with gravel and cobble substrate. The channel type is predominately C. This reach tends to be aggradational, with fine sediment depositing in the relatively few pools, and gravel and cobble depositing from upstream sources and the mouths of tributaries. The lowest reach of the river has also been partially confined by dikes, most notable in the vicinity of Stites and Kooskia. BLM monitoring (2000) at river mile 58.6 found that cobble embeddedness was 30%, spawning gravels had 40% less than 6.3 mm, and surface fines were 5.3%.

Water Quality, Water Yield, and Flow Regimes: The current estimated annual sediment yield over base delivered to the main stem South Fork Clearwater River at the NPNF boundary is approximately 5.6% (USDA-FS, 2005a). The South Fork Clearwater River has elevated summer water temperatures, which are summarized in Section 3.4 (Watershed). Refer to Figure H.2, Appendix H, which depicts flow regimes for the upper South Fork Clearwater River, immediately upstream from the mouth of Crooked River.

Riparian Habitats: The upper South Fork Clearwater River riparian vegetation includes the following tree species: Engelmann spruce, subalpine fir, grand fir, and Douglas-fir. Understory shrubs, forbs, and grasses include: alder, willow, red-osier dogwood, serviceberry, reed canarygrass, mountain brome, redtop, and hairgrass. Spotted knapweed infestations are common along roads and disturbed river bottoms. Historic dredge mining and Highway 14 have encroached on riparian habitats and the river channel.

Fish/Water Quality Objectives, Trends, and Limiting Factors: The primary limiting factors for fish production include high summer water temperatures, sediment, and poor instream cover conditions (USDA-FS, 1999a).

3.6.2.4 Summary of Habitat Factors

The following table 3.6.6 provides a summary of conditions observed and/or documented by the BLM and NPNF for streams potentially affected by this action.

Table 3.6.6 American River and Tributaries Existing Conditions of Fish Habitat Indicators Compared to Objectives

Prescription Watershed	Cobble Embeddedness (BO Standard)		Percent Fines By Depth Spawning Gravels (DFC Standard)		Percent Surface Fines (Steelhead/Bull Trout Matrix Standard)		Pool:Riffle Ratio (DFC Standard)		Acting Large Woody Debris Pieces per 100 meters (DFC Standard)	
	Objective	Existing	Objective	Existing	Objective	Existing	Objective	Existing	Objective	Existing
Middle American River 17060305-05-06	<30	40	23	25.2	≤20	10	40:60	29:71	40	22
Maggie Creek	N/A	60	N/A	No Data	N/A	60	N/A	10:90	N/A	15
Lower American River 17060305-05-16	<30	31	23	27.6	≤20	8	40:60 40:60	20:80 42:58[1]	40 40	3 22[1]
Telephone Creek	N/A	77	N/A	68.5	N/A	67	N/A	10:90	N/A	20
Baboon Creek	N/A	40	N/A	No Data	N/A	10–15	N/A	10:90	N/A	35
East Fork American River 17060305-05-10	<30	40	21	35.6	≤20	18	45:55	20:80	45	28
Whitaker Creek 17060305-05-12	<40	56	25	47.2	N/A	37	30:70	15:85	35	30
Queen Creek 17060305-05-13	<40	42	25	44.7	N/A	20	30:70	11:89	35	20
Box Sing Creek 17060305-05-15	<40	44	25	31.4	≤20	19	30:70	15:85	35	28
Kirks Fork 17060305-05-11	<30	45	23	28.9	≤20	22	40:60	33:67	40	22
Elk Creek 17060305-05-11	<30	64	N/A	34	≤20	54	N/A	13:87	N/A	3
Little Elk Creek 17060305-05-11	<30	56	23	39	≤20	37	40:60	21:79	40	9
South Fork Clearwater River	<30	30	N/A	39.5	N/A	5	N/A	N/A	N/A	N/A

[1] BLM stream reaches in Lower American River with instream fish habitat projects constructed, which included rock upstream "v" check dams and installation of large woody debris.

Deposited Sediment (Cobble Embeddedness and Percent Fines)
Using the above cobble embeddeness measurements, the FISHSED model was used to estimate the existing conditions of summer and winter rearing habitat in American River and its tributaries potentially affected by this action. As displayed in Table 3.6.7 below, summer rearing is at or near objective for most streams. Winter rearing however is well below objective and has been identified as a limiting factor. Sediment can also settle in low gradient pool habitats and affects important holding areas for fish in the winter.

Table 3.6.7 Existing Conditions of Select FISHSED Variables, Which Are Relevant to the Deposited Sediment Indicator

Watershed Name/ Channel Type	Existing Cobble Embeddedness (%)[1]	Existing Summer Rearing Capacity (Percent of Optimal)[2]	Existing Winter Rearing Capacity (Percent of Optimal)[2]
Middle American River/C	40	89	35
Lower American River/C	31	94	45
East Fork American River/C	40	89	35
Kirks Fork/B	45	87	31
Whitaker Creek/B	56	79	23
Queen Creek/B	42	88	34
Box Sing Creek/B	44	87	32
Elk Creek/C	64	72	19
Little Elk Creek/C	56	79	23
South Fork Clearwater River/C	30	94	46

[1]Existing cobble embeddedness was measured in the stream.
[2]Values derived from FISHSED Model.

Habitat Connectivity/Fish Passage
Habitat connectivity involves perennial and intermittent stream channels that have human-caused impairments which may affect habitat connectivity and fish passage. These impairments include culverts or dredge mining that altered stream channels, causing fish passage blockage. Vehicle use of fords generally can result in localized disturbance and displacement of fish, or may disturb spawning fish or destroy redds. These fords are a chronic sediment source, and vehicle use would result in minor short-term increases in turbidity. Properly designed bridges or culverts that do not adversely encroach or alter natural stream channels do not impair fish passage. Table 3.6.8 displays a summary of stream channel crossings within the project area which have been impacted by culverts, dredge mining, bridges, or fords.

Table 3.6.8 Existing Fish Bearing Stream Crossings in Eastside Project Area[1]

Watershed Name	Culvert Crossings	Vehicle Bridge Crossings[2]	ATV Bridge[2]	Vehicle Fords[3]	Dredge Mining Blockage	Total Crossings (Partial or Full Barriers)
Middle American River	0	3	0	1	0	4 (0)
Maggie Creek	0	0	0	0	1	1 (1)
Lower American River	0	3	1	1	0	5 (0)
Baboon Creek	1	0	0	0	1	2 (2)
Telephone Creek	0	0	0	2	1	3 (1)
East Fork American River	0	1	0	0	0	1 (0)
Kirks Fork	0	0	1	1	0	1 (0)
Whitaker Creek	0	0	0	0	1	1 (1)
Queen Creek	0	0	0	0	1	1 (1)
Box Sing Creek	1	0	1	0	0	2 (0)
Total	3	6	3	5	5	17 (7)

[1] Includes stream reaches (BLM and private) within or adjacent to East Side project area only.
[2] Existing vehicle bridges and ATV bridges are not partial/full barriers to fish passage. However, dependent on bridge design, such may encroach on stream channel or cause localized channel scouring or bank erosion.
[3] Fords are not full passage barriers to fish. However, dependent of ford characteristics would have varying effects on stream channel, streambanks, and riparian habitats. Vehicle use of ford causes turbidity and disturbance or displacement to fish utilizing stream crossing habitat. Potential vehicle caused mortality or injury may occur to incubating eggs in redds or juvenile fish rearing in the interstitial spaces in the streambottom substrate.

Water Quality/Temperature
Monitoring of water temperature within the American River watershed has documented that streams are not in compliance with the Idaho State Water Quality Standards. Cold-water biota, salmonid spawning, and bull trout criteria were exceeded at selected stream monitoring sites within the past four years. See Watershed section 3.4 (Indicator 5 – Water Quality), Tables 3.4.9 and 3.4.10, for additional information in regards to water quality and temperature.

3.6.3 Environmental Effects

3.6.3.1 Introduction

This section will assess the effects of various alternatives on fish and aquatic habitats and the methods used to analyze the changes as a result of the Eastside Project. Assessment will focus on action alternative effects to “key” indictors, along with corresponding analysis of cumulative effects.

Direct and Indirect Environmental Effects

Riparian Habitat Conservation Areas
RHCA widths identified in PACFISH (USDI-USDA, 1995) were developed to protect sensitive areas that are important to maintenance of aquatic ecosystem integrity. RHCAs do this by: (1) influencing the delivery of coarse sediment, organic matter, and woody debris to streams: (2) providing root strength for channel stability; (3) shading the stream; and (4) protecting water quality (Naiman et al., 1992). Eastside Project RHCA widths should be sufficient to provide and protect riparian functions, including delivery of organic matter and woody debris, stream shading, and bank stability (Gregory et al., 1987; Beschta et al., 1987; McDade et al., 1990; Belt et al., 1992).

Watershed and Stream Restoration
For a complete description of the activities covered in this section, please refer to Appendix I. Most of the restoration actions are associated with streamside riparian areas and rehabilitation of past dredge mining and roads. Listed (ESA) fish and BLM sensitive fish are present in the area. The in-channel and streambank disturbance from this work would cause some previously deposited sediment at the work sites to be mobilized within the stream. This short-term impact must be weighed against the long-term benefit, particularly when the activities provide long-term reduction in sediment and improve riparian, aquatic, and water quality conditions. The NEZSED model is not designed for use with instream projects, soil restoration, watershed improvements or culvert removal/replacement.

In-channel and streambank activities may result in disturbance to individual fish, both within the immediate work area and downstream. Increased turbidity during work may locally affect individual fish but would not be at a magnitude where serious harm or mortality would be expected to occur. Timing restrictions for in-channel work would result in avoidance of spawning fish or occupied redds.

3.6.3.2 Indicator 1–Sediment/Substrate Condition Analysis

Direct and Indirect Effects Sediment/Substrate Condition Analysis

A review by Belt et al. (1992) of studies in Idaho and elsewhere concluded that non-channelized sediment flow rarely travels more than 300 feet and that 200–300 foot riparian "filter strips" are generally effective at protecting streams from non-channelized sediment flow. In a review of past studies, Broderson (1973) noted that a stream buffer width of 200 feet had been found to control overland flows of sediment under the most extreme conditions.

Channelized flow can travel in excess of 1,000 feet (Belt et al., 1992). RHCAs would help, but not eliminate the risk of channelized sediment reaching streams. Field verification has taken place during 2004 and 2005 to delineate perennial, intermittent, and ephemeral streams, seeps, springs, and bogs to ensure all appropriate areas are included and protected in designated and mapped RHCAs. Field verification also documented and verified the occurrence of two additional American River tributary streams as being fish bearing: Baboon Creek and Maggie Creek (Craig Johnson, 2005 reconnaissance stream survey and field notes).

Disturbed Water Erosion Prediction Project (WEPP)
The disturbed WEPP soil model (Elliot et al., 2000) is a tool to allow users to describe numerous forest and rangeland erosion conditions. The model disclosures for the WEPP model can be reviewed in Appendix H. Disturbed WEPP allows summary outputs, and presents the probability of a given level of erosion occurring the year following a given disturbance. Disturbed WEPP is designed to predict runoff and sediment yield from:

- Young and old disturbed forests
- Skid trails and harvested forests
- Prescribed and wildfires

Values for disturbed WEPP modeling of the proposed projects, such as slope, and percent cover for different activities, were either collected in the field during 2004 and 2005, or are estimates based on knowledge of the area. The accuracy of WEPP-predicted runoff or erosion rate may be plus or minus 50 percent. The primary purpose of using the WEPP model was to provide additional analysis information for the evaluation of the effectiveness of RHCA buffers in reducing sediment delivery to stream channels.

Using a minimum 100 foot RHCA, WEPP modeling predicts no probability of sediment delivery to a channel based on a 2-year climatic period for timber harvest, skid trails, and low severity prescribed burning (see Table 3.6.9 below). Based on a 30 year climatic period, the probability of sediment delivery from timber harvest and skid trails is 10% and 23% for prescribed burning. WEPP modeling indicates the minimum 100-foot RHCA would be able to filter sediment and yield a low risk of harvest-associated

sediment affecting RMOs for the project area subwatersheds. Most RHCA buffers in the project would exceed the 100 foot minimum.

Table 3.6.9 WEPP Modeled Sediment Delivery for Action Alternatives (Based on Minimum 100 Foot Buffer to Intermittent Stream Channel)

Activity	Based on 30 Year Climate Period		Based on 2 Year Climate Period	
	Sediment Leaving Profile (Tons/Acre)	Probability of Sediment Delivery First Year	Sediment Leaving Profile (Tons/Acre)	Probability of Sediment Delivery First Year
Skid Trails	0.102	10%	0%	0%
Timber Harvest	0.067	10%	0%	0%
Prescribed Burn (Low Severity)	0.169	23%	0%	0%

Deposited Sediment Analysis and FISHED

Model results are reasonable estimates and not absolute numbers with high statistical precision. The capability of the FISHSED model in analyzing and displaying change at the levels shown in these tables is somewhat limited. In this case, data from FISHSED are most useful in comparing the relative effects among alternatives. The model also reflects short-term changes only and does not reflect long-term benefits in sediment reduction as predicted by NEZSED. The results must be used in combination with sound professional judgment. Disclosures for FISHED and NEZSED models can be found in Appendix H.

All modeling was conducted for age 0+ steelhead trout. The data shown for Alternative A is the existing condition. The analysis of effects on fish habitat from increased sediment is based on the Watershed analysis of sediment in Section 3.4 (Watershed) above. Table 3.6.10 displays the existing and predicted changes in cobble embeddedness for each action alternative. Tables 3.6.11 and 3.6.12 display the FISHSED-predicted impacts to summer and winter rearing habitat. Modeled activities include road construction, road reconstruction, timber harvest, fuel treatments, and road decommissioning. It does not include site treatments for watershed, stream, and riparian restoration. This is a reflection of the model's limitations, not the amount of actual on the ground improvements.

The FISHSED model uses predicted peak sediment yields from NEZSED to calculate potential changes in cobble embeddedness, embryo survival, summer rearing capacity, and winter rearing capacity (Stowell et al. 1983). The specific fish response curves have drawn heavily upon the work of Bjornn (1969), Klamt (1976), McCuddin (1977), and Bjornn et al. (1977). These studies were conducted primarily in the laboratory and may constitute only a partial simulation of natural conditions. The model calculates short-term changes only and does not have the capability to provide estimates in substrate response to long-term declines in sediment yield.

Tables 3.6.10, 3.6.11, and 3.6.12 below display the existing condition of Eastside Project area streams and South Fork Clearwater River, and changes predicted by FISHSED.

Table 3.6.10 Comparison of Predicted Cobble Embeddedness (CE) by Alternative

Stream/Channel Type	Predicted Percent (%) CE			
	Alt A (Legacy[2])	Alt B	Alt C	Alt D
Middle American River/C[1]	40 (42)	43	42	42
Lower American River/C[1]	31 (33)	35 (2006)	34 (2006)	34 (2006)
		34 (2007)	34 (2007)	34 (2007)
East Fork American River/C[1]	44 (46)	46	46	46
Whitaker Creek/B	56 (59)	61	59	61
Queen Creek/B	42 (45)	47	45	46
Box Sing Creek/B	44 (46)	48	48	48
Kirks Fork/B	45 (45)	46	46	46
Elk Creek/C	64 (67)	67	67	67
Little Elk Creek/C	56 (60)	60	60	60
South Fork Clearwater River/C[1]	30 (33)	33	33	33

[1] Data compiled for composite watersheds, not pure watersheds. Includes upstream sediment contributing subwatersheds and routed downstream sediment.
[2] Identifies modeled FISHSED effects from legacy/existing sediment (percent over base). Displayed for alternative comparison purposes so that legacy and existing NEZSED modeled sediment (percent over base) effects and Eastside Project action alternative effects can be identified. These are the FISHSED predicted changes attributed to existing levels of sediment over base (Alternative A), with no increases attributed to Eastside Project action.

Table 3.6.11 Comparison of Summer Rearing Capacity (SRC) by Alternative

Stream/Channel Type	Predicted Percent (%) SRC			
	Alt A (Legacy[2])	Alt B	Alt C	Alt D
Middle American River/C[1]	89 (88)	88	88	88
Lower American River/C[1]	94 (93)	92 (2006)	92 (2006)	93 (2006)
		93 (2007)	93 (2007)	93 (2007)
East Fork American River/C[1]	87 (86)	86	86	86
Whitaker Creek/B	79 (77)	75 (2007)	77 (2007)	75 (2007)
Queen Creek/B	88 (86)	85 (2007)	86 (2007)	86 (2007)
Box Sing Creek/B	87 (86)	84	84	84
Kirks Fork/B	87 (86)	86	86	86
Elk Creek/C[1]	72 (70)	70	70	70
Little Elk Creek/C	79 (76))	76	76	76
South Fork Clearwater River/C[1]	94 (93)	93	93	93

[1] Data compiled for composite watersheds, not pure watersheds. Includes upstream sediment contributing subwatersheds and routed downstream sediment.
[2] Identifies modeled FISHSED effects from legacy/existing sediment (percent over base). Displayed for alternative comparison purposes so that legacy and existing NEZSED modeled sediment (percent over base) effects and Eastside Project action alternative effects can be identified. These are the FISHSED predicted changes attributed to existing levels of sediment over base (Alternative A), with no increases attributed to Eastside Project action.

Table 3.6.12 Comparison of Winter Rearing Capacity (WRC) by Alternative

Stream/Channel Type	Predicted Percent (%) WRC			
	Alt A (Legacy[2])	Alt B	Alt C	Alt D
Middle American River/C[1]	35 (34)	33	33	33
Lower American River/C[1]	45 (42)	41 (2006)	41 (2006)	41 (2006)
		42 (2007)	42 (2007)	42 (2007)
East Fork American River/C[1]	32(30)	30	30	30
Whitaker Creek/B	23 (22)	20 (2007)	22 (2007)	20 (2007)
Queen Creek/B	34 (31)	29 (2007)	31 (2007)	31 (2007)
Box Sing Creek/B	32 (30)	29	29	29
Kirks Fork/B	31 (31)	31	31	31
Elk Creek/C[1]	19 (18)	18	18	18
Little Elk Creek/C	23 (21)	21	21	21
South Fork Clearwater River/C[1]	46 (43)	42	42	42

[1] Data compiled for composite watersheds, not pure watersheds. Includes upstream sediment contributing subwatersheds and routed downstream sediment.
[2] Identifies modeled FISHSED effects from legacy/existing sediment (percent over base). Displayed for alternative comparison purposes so that legacy and existing NEZSED modeled sediment (percent over base) effects and Eastside Project action alternative effects can be identified. These are the FISHSED predicted changes attributed to existing levels of sediment over base (Alternative A), with no increases attributed to Eastside Project action.

The results of FISHSED show predicted increases in cobble embeddedness and correspondingly, no change or slight decreases in summer and winter rearing capacity for most fish-bearing streams under all action alternatives. As stated by Stowell et al. (1983), FISHSED is most appropriately used to assess the effects of "substantial" changes in habitat quality greater than 10 to 20 percent and to document the relative differences among alternatives. Stowell et al. (1983) also stated that sound biological judgment should be used when comparing the relative differences among alternatives.

Of the above results, predicted changes in cobble embeddedness in Lower American and Queen Creek (Alternative B) exceed this 10 percent threshold; for all the others, the predicted changes in cobble embeddedness are less than 10 percent.

Predicted changes in winter rearing capacity exceed 10 percent in Whitaker Creek (Alternatives B and D) and Queen Creek (Alternative B). Percent change in cobble embeddedness, summer rearing capacity, and winter rearing capacity are presented below in Table 3.6.13.

Table 3.6.13 Percent Change in Cobble Embeddedness, Summer Rearing Capacity, and Winter Rearing Capacity, Based on FISHSED Results

Subwatershed	Percent Change Cobble Embeddedness[2] (Legacy[3])			Percent Change Summer Rearing Capacity[2] (Legacy[3])			Percent Change Winter Rearing Capacity[2] (Legacy[3])		
	Alt B	Alt C	Alt D	Alt B	Alt C	Alt D	Alt B	Alt C	Alt D
Middle American River	+7.50 (+5.00)	+5.00 (+5.00)	+5.00 (+5.00)	-1.12 (-1.12)	-1.12 (-1.12)	-1.12 (-1.12)	-5.71 (-2.81)	-5.71 (-2.81)	-5.71 (-2.81)
Lower American River	+12.90 (+6.45)	+9.67 (+6.45)	+9.67 (+6.45)	-2.13 (-1.07)	-2.13 (-1.07)	-1.07 (-1.07)	-8.89 (-6.67)	-8.89 (-6.67)	-8.89 (-6.67)
East Fork American R.	+4.54 (+4.54)	+4.54 (+4.54)	+4.54 (+4.54)	-1.15 (-1.12)	-1.15 (-1.15)	-1.15 (-1.15)	-6.25 (-6.25)	-6.25 (-6.25)	-6.25 (-6.25)

Subwatershed	Percent Change Cobble Embeddedness[2] (Legacy[3])			Percent Change Summer Rearing Capacity[2] (Legacy[3])			Percent Change Winter Rearing Capacity[2] (Legacy[3])		
	Alt B	Alt C	Alt D	Alt B	Alt C	Alt D	Alt B	Alt C	Alt D
Whitaker Creek	+8.92 (+5.36)	+5.36 (+5.36)	+8.92 (+5.36)	-5.06 (-2.53)	-3.80 (-2.53)	-5.06 (-2.53)	-13.04 (-4.35)	-4.35 (-4.35)	-13.04 (-4.35)
Queen Creek	+11.90 (+7.14)	+9.52 (+7.14)	+9.52 (+7.14)	-3.41 (-2.27)	-2.27 (-2.27)	-2.27 (-2.27)	-14.70 (-8.82)	-8.82 (-8.82)	-8.82 (-8.82)
Box Sing Creek	+9.09 (+4.54)	+9.09 (+4.54)	+9.09 (+4.54)	-3.44 (-1.15)	-3.44 (-1.15)	-3.44 (-1.15)	-9.37 (-6.25)	-9.37 (-6.25)	-9.37 (-6.25)
Kirks Fork	+2.17 (+2.17)	+2.17 (+2.17)	+2.17 (+2.17)	-1.15 (-1.15)	-1.15 (-1.15)	-1.15 (-1.15)	-0.00 (-0.00)	-0.00 (-0.00)	-0.00 (-0.00)
Elk Creek	+4.69 (+4.69)	+4.69 (+4.69)	+4.69 (+4.69)	-2.78 (-2.78)	-2.78 (-2.78)	-2.78 (-2.78)	-5.86 (-5.86)	-5.86 (-5.86)	-5.86 (-5.86)
Little Elk Creek	+7.14 (+7.14)	+7.14 (+7.14)	+7.14 (+7.14)	-3.80 (-3.80)	-3.80 (-3.80)	-3.80 (-3.80)	-8.89 (-8.89)	-8.89 (-8.89)	-8.89 (-8.89)
South Fork Clearwater R.	+10.00 (+10.00)	+10.00 (+10.00)	+10.00 (+10.00)	-1.06 (-1.06)	-1.06 (-1.06)	-1.06 (-1.06)	-6.52 (-6.52)	6.52) (-6.52)	-6.52 (-6.52)

[1] Data compiled for composite watersheds, not pure watersheds. Includes upstream sediment contributing subwatersheds and routed downstream sediment.
[2] Percent changes based on FISHSED results from legacy/existing sediment yield over base and Eastside Project.
[3] Identifies modeled FISHSED effects from legacy/existing sediment (percent over base) only. Displayed for alternative comparison purposes so that legacy and existing NEZSED modeled sediment (percent over base) effects and Eastside Project action alternative effects can be identified. These are the FISHSED predicted changes attributed to existing levels of sediment over base (Alternative A), with no increases attributed to Eastside Project action.

With the exception of three subwatersheds, predicted increases in deposited sediment is not at a magnitude where measurable changes would be expected to occur, and differences between the action alternatives, as modeled, are all within the margin of error for the model. Erosion control measures, project design features, and effectiveness of buffers are expected to minimize or prevent erosion and sediment from reaching stream channels. As stated above, the proper use of NEZSED and FISHSED is to assess the effects of "substantial" changes in habitat quality greater than 10 percent and to document the differences among alternatives. Most subwatersheds have FISHSED modeled increases in cobble embeddedness, and subsequent decreases to summer and winter rearing capacity primarily attributed to legacy sediment effects and not from the Eastside Project. There is a difference between Alternative A and the action alternatives, reflecting the short-term spike from the actions.

Specific only to restoration actions identified for improvement of watershed, water quality, and fish habitat conditions, Alternative C would have the highest long-term beneficial effects. Although most of the restoration actions were not specifically modeled for sediment production, short-term pulses would occur, followed by long-term reductions. See Appendix I, for a summary by alternatives of overall short term and long term effects from vegetation treatments and restoration projects.

Winter rearing is a limiting factor for fish production within the analysis area. Sediment analysis conducted specifically in regards to winter rearing habitat and comparison of alternatives, has identified the largest potential changes from sediment by action alternatives occurring in Lower American River, Middle American, Whitaker Creek, Queen Creek, and Box Sing Creeks. Alternative C would have the least sediment effects in these watersheds and Alternative B the most.

The basic model assumption behind FISHSED is that an inverse relationship exists between the amount of fine sediments in spawning and rearing habitats and fish survival and abundance. In general, when sediment yields are increased over natural rates in Idaho batholith watersheds, especially on a sustained basis, fish biomass decreases. Fine sediment is known to degrade salmonid spawning and rearing habitat (Chapman and McCleod, 1987; Bjornn and Reiser, 1991), as suggested by the FISHSED model. Specifically, high sediment levels can impair habitat for spawning and rearing by:

1. Trapping fry in redds when they are attempting to emerge;
2. Depleting intergravel oxygen levels in redds, smothering eggs contained within;
3. Limiting aquatic invertebrate populations used a food source;
4. Filling and thereby reducing the number of large pools which serve as primary feeding and resting areas for juvenile salmonids; and
5. Filling spaces between rocks that serve as over wintering refuge for juvenile salmonids (NOAA-NMFS, USFWS, USDA-FS, and USDI-BLM. 1998).

It is expected that changes in substrate condition from (modeled) increased sediment yield are of an amount that only discountable or negligible effects on fish would occur. However, recent findings suggest that there is no threshold below which increased fine-sediment delivery will be harmless (Suttle et al., 2004). That study also found that sediment reduction could produce immediate benefits for salmonid restoration. When combining the modeled activities with the improvements, increased short-term spikes in sediment is likely; however, long-term reduction from chronic sources, such as roads and fords are expected.

An important concept in assessing effects on fish habitat from increases in surface sediment erosion for this project is that both the FISHSED and NEZSED models represent peak sediment yields, which in this case are temporary. The final result of the project would be reduced road density and improvement in various existing baseline conditions, including a long term reduction in sediment yield and delivery to salmonid habitat. The consequence of long-term improvement in watershed condition is a short-term increase, or spike, in surface sediment yield, which must occur in order for the long-term goal of improvement to occur.

Short-term risks of increased sediment yields have been considered in the context of long-term improvement in watershed and stream habitat condition.

Sediment Effects Analysis and Modeling of Aquatic Habitat Effects

As displayed in Tables 3.6.10–3.6.12 above, all action alternatives have identified varying levels of modeled sediment yield, corresponding effects to cobble embeddedness, and related effects to fish summer rearing and winter rearing habitat. Short-term modeled increases in sediment yield may be of a magnitude where changes in cobble embeddedness may result in a modeled slight decrease in summer or winter rearing capacity. When interpreting these results, it is important to note that peak sediment yields modeled by FISHSED include sediment yield from both existing (legacy) sources and sources proposed under the action alternatives. With the exception of three subwatersheds, sediment yield from legacy sources comprises the majority of the peak, and contributions from alternatives when considered alone would probably not affect the above streams or have measured instream increases.

As discussed above, increases in sediment yield could occur from road construction, vegetation treatments, road reconditioning, and road decommissioning, all of which have been included in the sediment model NEZSED. In addition, increases in sediment could occur from stream crossing upgrades and riparian restoration projects. Temporary increases in suspended sediment (i.e., turbidity) are likely from stream crossing restoration, riparian restoration projects, culvert installations, and construction of the Queen Creek re-connect channel.

Since mainstem American River and some of the tributaries already exhibit high levels of deposited sediment, the question becomes not so much how much sediment is yielded to the stream but what happens to it once it gets there. Sediment transport within a stream is affected by gradient and flushing flows. Fish bearing streams within the analysis area are comprised of both low gradients and/or small watersheds with relatively low peak average flows. Lower gradient stream reaches are particularly susceptible to sediment deposition and long-term storage.

Of the streams within the analysis area which may be affected by the project, Middle American River, Lower American River, East Fork American River, Little Elk Creek, and Elk Creek all have a substantial portion of their length with a gradient less than 2 percent. Conversely, Whitaker Creek, Queen Creek, Box Sing Creek, and Kirks Fork have substantial portions of their lengths that are greater than 4 percent. With regard to sediment deposition and transport, the Rosgen stream classification system suggests that A channels are relatively high in sediment transport capacity, followed by B channels, and C, E, and F channels (Rosgen, 1996). A and B channels in the American River watershed are generally found in lower order headwater reaches. The mainstem South Fork Clearwater River is a low gradient C channel in the river reach immediately below the confluence of American and Red Rivers.

Overall, all action alternatives are very similar, and the differences of peak year high sediment yield predictions is generally between 0 (no difference for all alternatives) to 4 percent. The subwatersheds with the greatest differences between one or more alternatives include Lower American, Whitaker, Box Sing and Queen Creek. For all action alternatives, subwatershed peak year increases above existing conditions range from 0.1 to 27 percent. Subwatersheds with the highest range of alternative increases include Whitaker Creek (31 to 58 percent), Box Sing Creek (21 to 47 percent), Queen Creek (37 to 59 percent) and Lower American (15 to 22 percent).

Subwatersheds with low to moderate peak year high increases include: Middle American River (12 to 17 percent), Lower Elk Creek (16 to 18 percent), Kirks Fork (5 to 7 percent), East Fork American River (11.8 to 12.2 percent), and Little Elk Creek (23.8 to 23.9 percent).

Maximum modeled sediment yields for Whitaker Creek, Queen Creek, and Box Sing Creek range from 34 to 59 percent. Compared to other American River subwatersheds, these subwatersheds are very small, and sensitivity to sediment modeling is compounded. The general threshold at which FISHSED model assumes measurable deposition in B channels is peak sediment yields that exceed 30 percent over natural. No-treatment buffers and project design features to minimize or prevent erosion and sediment delivery are expected to result in negligible amounts of sediment reaching stream channels in these watersheds.

Maximum modeled sediment yields for Little Elk Creek and Lower American River range from 22 to 24 percent. The general threshold at which FISHSED model assumes measurable deposition in C channels is at peak sediment yields that exceed 20 percent over natural. The majority of sediment in these watersheds is from legacy sediment and not from the Eastside Project.

The maximum predicted increase over existing from project implementation for Little Elk Creek is 0.1 percent for all alternatives. All peak sediment yields modeled for Little Elk Creek are attributed to legacy sediment and increases from action alternative implementation would be discountable.

The maximum predicted increase over existing for Lower American River ranges between 1 and 7 percent for all action alternatives. The majority of predicted peak sediment yield for Lower American River is attributed to legacy effects and lower amounts are attributable to the action alternatives. However, the FISHSED model assumption is that measurable effects would occur to fish habitat in the Lower American River subwatershed. Restoration measures to reduce chronic sources of sediment (e.g., roads, fords, dredge mined areas) along with no-treatment buffers (timber harvest, prescribed burning), and project design features to minimize or prevent erosion and sediment delivery are expected to result in negligible sediment reaching American River.

Maximum modeled sediment yields for Middle American River, East Fork American River, and Lower Elk Creek range from 12 to 18 percent. Based on the FISHSED model assumptions for C channels, measurable deposition would probably not be detectable because modeled sediment yields do not exceed 20 percent over natural.

Kirks Fork modeled maximum sediment yield would not exceed 10 percent and based on FISHSED model assumptions for B channels, measurable deposition would probably not be detectable because modeled sediment yields do not exceed 30 percent over natural. This subwatershed does not approach threshold levels and effects to fish habitat would be negligible.

In summary, there are predicted short-term spike sediment yield increases and long-term chronic sediment yield decreases associated with the project. These changes in sediment yield should be reflected in substrate conditions, but over longer periods of time. Accurate predictions for recovery rates for deposited sediment (i.e., surface fines, cobble embeddedness, fines by depth) is very difficult, and in addition to land uses is also dependent on variables such as channel morphology, geologic parent material, stream channel characteristics, climate, and natural disturbance events. The BLM has been monitoring deposited sediment in the American River watershed since the 1980s. Monitoring is conducted at the same site because of high instream variability. Additional substrate measurements and observations at sites are made to assist with data interpretation.

Alternative A (No Action Alternative)

Under the "no action" alternative, the existing substrate condition would probably improve very slowly over time. Because of historic dredge mining and associated legacy effects to riparian habitats and stream channels, natural recovery would be negligible in some stream reaches without active restoration taking place. Restoration improvements in the watershed may occur as funding became available and substrate conditions in streams would likely be stable to slightly improving. The risk of more severe wildfire would increase over time in the absence of vegetation treatments. With severe wildfire, there are risks associated with pulses of sediment delivered rapidly to streams, which could adversely affect habitat already impaired by past human activities.

Benefits of Alternative A include no further ground-disturbing activities, which would result in no additional human-caused spikes of sediment. This alternative would not address the need for active stream, watershed and soils restoration. However, the BLM has an ongoing watershed and fisheries restoration program which would continue to address restoration various actions as funding becomes available.

Common to all Action Alternatives–Alternatives B, C, and D

Timber Harvest and Associated Roads–Effects on Sediment Delivery

Established RHCAs widths are expected to be very effective at protecting streams from non-channelized sediment. RHCAs may not totally protect streams from sediment production that is carried in channelized flow. However, this would be unexpected for the Eastside Project because only one small segment of temporary road (Alternative D) crossing an intermittent stream channel, no other temporary roads or skid trails associated with timber harvest cross any stream channels. Negligible or discountable amounts of sediment would be expected to reach channels.

Refer to previous Tables 3.6.10, 3.6.11, 3.6.12, and 3.6.13 for a summary of action alternatives modeled erosion/sediment effects to cobble embeddedness and summer and winter rearing habitats.

One helicopter landing would be located within the American River RHCA; the landing would be located 200–300 feet from American River and occurs in an area that does not have drainage slope that would deliver erosion or sediment to American River. Access to the landing would include the use of 0.07 mile of existing road and the landing area would be less than one acre in size. The landing occurs in a meadow area and no tree harvest would occur. After timber harvest is completed, landing restoration actions would

be implemented to reduce adverse effects to soils and vegetation, which include ripping (reduce soil compaction), seeding, and weed control measures. No short or long-term adverse water temperature or sediment effects to American River are expected to occur from use of this landing.

No timber harvest is proposed within streamside and wetland RHCAs or in landslide prone RHCAs. No short-term or long-term increase in risk of mass wasting and landslide type disturbance is expected to occur from Eastside Project actions. Eastside Project action alternative actions which affect erosion and sediment processes have the ability to directly or indirectly affect water quality and fish habitat in the short-term and long-term. For additional project related short-term and long-term effects to these processes refer to Appendix H, Tables H.3 and H.4, American River Aquatic Trend Analysis and Summary.

Alternative B

A short-term spike from restoration and timber harvest/fuel treatments would occur. A long-term reduction of baseline sediment yield from chronic sediment sources would result from restoration activities and aid in recovery of watershed and aquatic conditions.

Primary restoration benefits and reduction in sediment would occur in the mainstem American River (i.e., Middle American River and Lower American River). Restoration actions include decommissioning roads, re-location of roads out of the riparian area, stream ford crossing obliterations, reduction of road related sediment by converting roads to ATV trails, and riparian restoration.

Winter rearing is a limiting factor for fish production within the analysis area. Sediment analysis conducted specifically in regards to winter rearing habitat and comparison of alternatives has predicted Alternative B as having the largest modeled negative changes to winter rearing habitat from increased sediment. These predicted changes would occur in Whitaker Creek and Queen Creek. Predicted habitat changes in all other watersheds would be less than 10% and, according to the FISHSED model protocols, would be undetectable. The reconnection channel of Queen Creek to American River would allow access to additional habitat and the channel would be designed to provide additional winter rearing habitat.

This alternative has the highest amount of new temporary roads (15.1 miles) identified for timber harvest, the majority of the roads are located on ridge tops or upper slopes. This alternative has the highest amount of timber harvest and fuel treatments proposed and totals 1,293 acres. No temporary road construction would occur in any RHCAs.

For additional project related short-term and long-term effects from erosion and sediment processes specific to Alternative B actions refer to Appendix H, Tables H.3 and H.4, American River Aquatic Trend Analysis and Summary.

Alternative C

This alternative has the highest amount of watershed restoration actions identified. Under Alternative C, the percent over base sediment would have the least short-term peak associated with the implementation of timber harvest activities and sediment risks to winter rearing habitat.

Winter rearing is a limiting factor for fish production within the analysis area. Sediment analysis conducted specifically in regards to winter rearing habitat and comparison of alternatives, has predicted Alternative C as having the smallest modeled negative changes to winter rearing habitat from increased sediment. Predicted habitat changes in all watersheds would be less than 10% and, according to the FISHSED model protocols, would be undetectable.

Various soil restoration treatments, fish passage improvements, and native vegetation restoration would result in improvement to watershed conditions. An additional restoration action that is included in this alternative is the decommissioning and restoration of 0.89 mile of road paralleling American River and a stream ford located at stream mile 12.8. The reduced baseline sediment yield resulting from road

decommissioning and other improvement activities would aid in recovery of the watersheds, and it is expected that fish habitat conditions would improve over time.

This alternative has the least amount of temporary roads (10.5 miles) identified for timber harvest, the majority of the roads are located on ridge tops or upper slopes. This alternative has the second highest amount of timber harvest proposed and totals 1,284, which is only 10 acres less than alternative B.

A new access road for the American River subdivision includes the construction of 0.56 mile of permanent road and the construction of a new vehicle bridge. Approximately 0.12 mile of the new road would be constructed within the RHCA. Erosion and sediment measures would be implemented to reduce adverse water quality effects to American River. Several trees would be cut within the riparian area; however, no adverse water temperature effects are anticipated to occur from this action and short-term and long-term sediment effects are expected to be negligible.

For additional project related short-term and long-term effects from erosion and sediment processes specific to Alternative C actions refer to Appendix H, Tables H.3 and H.4, American River Aquatic Trend Analysis and Summary.

Alternative D

Winter rearing is a limiting factor for fish production within the analysis area. Under Alternative D, the percent over base sediment would be similar to Alternative B in regards to short-term peak associated with the implementation of timber harvest activities and sediment risks to winter rearing habitat in the Whitaker Creek watershed. Predicted habitat changes in all other watersheds would be less than 10% and, according to the FISHSED model protocols, would be undetectable. Various soil restoration treatments, fish passage improvements, and native vegetation restoration, would support improvement of watershed condition. The reduced baseline sediment yield resulting from road decommissioning and other improvement activities would aid in recovery of the watersheds, and it is expected that fish habitat conditions would improve over time.

This alternative has the second highest amount of temporary roads (10.7 miles) identified for timber harvest, the majority of the roads are located on ridge tops or upper slopes. This alternative has the lowest amount of timber harvest proposed and totals 1,171 acres.

A new access road for the American River subdivision includes the construction of 0.56 mile of permanent road and the construction of a new vehicle bridge. Approximately 0.12 mile of the new road would be constructed within the RHCA. Erosion and sediment measures would be implemented to reduce adverse water quality effects to American River. Several trees would be cut within the riparian area. Short-term and long-term sediment effects are expected to be negligible.

For project related short-term and long-term effects from erosion and sediment processes specific to Alternative D actions refer to Appendix H, Tables H.3 and H.4, American River Aquatic Trend Analysis and Summary.

Irreversible and Irretrievable Effects–Sediment/Substrate Condition

There are no known irreversible or irretrievable effects associated with the sediment/substrate condition indicator.

Cumulative Effects–Sediment/Substrate Condition

The cumulative effects analysis area for sediment and substrate is the American River watershed and the upper South Fork Clearwater River to just downstream of the mouth of Crooked River.

As previously described, the current condition of the American River watershed reflects past events that have elevated base sediment yields above natural levels. In its pre-development condition, deposited

sediment in American River, tributaries, and the South Fork Clearwater River was probably substantially less than the current condition.

Activities contributing to the change from historic to existing condition of the deposited sediment indicator are generally associated with road construction, continued existences of roads and high road density on the landscape, roads in riparian areas, in-channel dredge mining and placer mining in and adjacent to stream channels, timber harvest that emphasized tractor yarding, grazing of domestic livestock, and rural and urban development.

There are a number of on-going and proposed activities in the American River watershed involving BLM, NPNF, and private lands. A list of these projects is provided in Table 3.0.1. Past events and activities occurring within the analysis area, and affecting American River, tributaries, and the South Fork Clearwater River have been discussed throughout this document. The existing condition of the watershed and aquatic habitats reflect the past disturbance history.

Cumulative sediment effects in the American River watershed analysis area and the South Fork Clearwater River have been quantified through the NEZSED model, which included sediment from timber harvest, road construction, road reconstruction, road decommissioning, and prescribed fire. Refer to Section 3.4 (Watershed) for specific and additional cumulative sediment analysis information. Road to trail conversions, riparian restoration, fish passage projects, and instream fish habitat improvements were not included in the model. Specific projects that were modeled for the Eastside Project include NPNF American and Crooked River Project, timber harvest and road construction on private lands, and road decommissioning. The results of cumulative effects sediment modeling follow through to FISHSED, which was used to address cumulative sediment effects to cobble embeddedness, summer rearing capacity, and winter rearing capacity.

Table 3.6.14 Comparison of Predicted Cobble Embeddedness (CE) by Alternative, Including Effects of NPNF American and Crooked Project & Recent Timber Harvest on Private Lands

Stream/Composite/Channel Type	Predicted Percent (%) CE			
	Alt A (Legacy[2])	Alt B	Alt C	Alt D
Middle American River/C[1]	40 (42)	43	43	43
Lower American River/C[1]	31 (33)	35 (2006)	35 (2006)	35 (2006)
		35(2007)	34(2007)	34(2007)
East Fork American River/C[1]	44 (46)	47	47	47
Whitaker Creek/B	56 (59)	61 (2006)	61 (2006)	61 (2006)
		61 (2007)	59 (2007)	61 (2007)
Queen Creek/B	42 (45)	47 (2006)	47 (2006)	47 (2006)
		47 (2007)	46 (2007)	46 (2007)
Box Sing Creek/B	44 (46)	48	48	48
Kirks Fork/B	45 (45)	46	46	46
Elk Creek/C[1]	64 (67)	67	67	67
Little Elk Creek/C	56 (60)	60	60	60
South Fork Clearwater River/C[1]	30 (33)	33	33	33

[1] Data compiled for composite watersheds, not pure watersheds. Includes upstream sediment contributing subwatersheds and routed downstream sediment.

[2] Identifies modeled FISHSED effects from legacy/existing sediment (percent over base). Displayed for alternative comparison purposes so that legacy and existing NEZSED modeled sediment (percent over base) effects and Eastside Project action alternative effects can be identified. These are the FISHSED predicted changes attributed to existing levels of sediment over base (Alternative A), with no increases attributed to Eastside Project action.

Table 3.6.15 Comparison of Summer Rearing Capacity (SRC) by Alternative, Including Effects of NPNF American and Crooked River Project and Recent Timber Harvest on Private Lands

Stream/Composite/Channel Type	Predicted Percent (%) SRC			
	Alt A (Legacy[2])	Alt B	Alt C	Alt D
Middle American River/C[1]	89 (88)	88	88	88
Lower American River/C[1]	94 (93)	92 (2006)	92 (2006)	92 (2006)
		93(2007)	93(2007)	93(2007)
East Fork American River/C[1]	87 (88)	85	85	85
Whitaker Creek/B	79 (77)	75 (2006)	75 (2006)	75 (2006)
		75 (2007)	76 (2007)	75 (2007)
Queen Creek/B	88 (86)	85 (2006)	85 (2006)	85 (2006)
		85 (2007)	86 (2007)	86 (2007)
Box Sing Creek/B	87 (86)	70	70	70
Kirks Fork/B	87 (86)	86	86	86
Elk Creek/C[1]	72 (70)	70	70	70
Little Elk Creek/C	79 (76)	76	76	76
South Fork Clearwater River/C[1]	94 (93)	93	93	93

[1] Data compiled for composite watersheds, not pure watersheds. Includes upstream sediment contributing subwatersheds and routed downstream sediment.
[2] Identifies modeled FISHSED effects from legacy/existing sediment (percent over base). Displayed for alternative comparison purposes so that legacy and existing NEZSED modeled sediment (percent over base) effects and Eastside Project action alternative effects can be identified. These are the FISHSED predicted changes attributed to existing levels of sediment over base (Alternative A), with no increases attributed to Eastside Project action.

Table 3.6.16 Comparison of Winter Rearing Capacity (WRC) by Alt., Including Effects of NPNF American and Crooked River Project and Recent Timber Harvest on Private Lands

Stream/Composite/Channel Type	Predicted Percent (%) WRC			
	Alt A (Legacy[2])	Alt B	Alt C	Alt D
Middle American River/C[1]	35 (34)	33	33	33
Lower American River/C[1]	45 (42)	40 (2006)	41 (2006)	41 (2006)
		42(2007)	42(2007)	42(2007)
East Fork American River/C[1]	32 (34)	30	30	30
Whitaker Creek/B	23 (22)	20 (2006)	20 (2006)	20 (2006)
		20 (2007)	21 (2007)	20 (2007)
Queen Creek/B	34 (31)	29 (2006)	29 (2006)	29 (2006)
		29 (2007)	31 (2007)	30 (2007)
Box Sing Creek/B	32 (30)	18	18	18
Kirks Fork/B	31 (31)	31	31	31
Elk Creek/C[1]	19 (18)	18	18	18
Little Elk Creek/C	23 (21)	21	21	21
South Fork Clearwater River/C[1]	46 (43)	42	42	42

[1] Data compiled for composite watersheds, not pure watersheds. Includes upstream sediment contributing subwatersheds and routed downstream sediment.

[2] Identifies modeled FISHSED effects from legacy/existing sediment (percent over base). Displayed for alternative comparison purposes so that legacy and existing NEZSED modeled sediment (percent over base) effects and Eastside Project action alternative effects can be identified. These are the FISHSED predicted changes attributed to existing levels of sediment over base (Alternative A), with no increases attributed to Eastside Project action.

As indicated in the tables above, addition of cumulative effects from FISHSED modeling is similar to cobble embeddedness levels predicted for the Eastside Project only. The reason for this is staggered NPNF and BLM entries for road construction and timber harvest within specific subwatersheds that potentially may yield elevated modeled sediment yields (i.e., Whitaker Creek and Queen Creek). The staggered entry would reduce potential sediment spikes that may occur if all FS and BLM soil disturbing actions occurred in the same year. In addition, a considerable number of sediment sources cannot be modeled in NEZSED and are therefore not reflected in the above results of FISHSED. Sediment sources such as past and active mining activity, grazing, trails, instream fish habitat restoration, and sediment sources from mass wasting are not included in NEZSED calculations. However, by using actual data for the cobble embeddedness measures, the legacy impact of these activities is included in the summer and winter rearing habitat analysis. Of these, past mining activity and private land grazing (in some subwatersheds), and urban/rural development have contributed to sediment loading in the watershed. The BLM is currently cooperating with Framing Our Community on several projects that would occur in the foreseeable future and would reduce sediment production on BLM and private lands. These actions include additional fencing of the stream corridor along Elk Creek to prevent livestock grazing and decommissioning of road segments on private and BLM lands.

One specific BLM planned (2007–2008) restoration action (USDI-BLM, 2006) that would directly affect this indicator includes the Telephone Creek road to ATV trail conversion and channel re-connect project. The Telephone Creek road (0.9 mile) which occurs in the stream bottom has been identified as a chronic source of sediment to Telephone Creek and American River (USDI-BLM, 2006).

In summary, American River and tributaries are subject to cumulative sediment effects due to past impacts in the watershed and the existing degraded condition. Additional sediment, regardless of the source, could further impact deposited sediment and other associated habitat elements. This could adversely affect listed and BLM sensitive fish in the project area. Sediment impacts are expected to decline, and fish habitat condition is expected to improve in the long-term, resulting in higher habitat condition than currently exists. Of the alternatives, Alternative B presents the greatest risk in terms of cumulative sediment risks and Alternative C presents the least risk. Alternative A, while presenting no short-term risks, would also not result in long-term improvement in watershed condition or the deposited sediment indicator. The action alternatives (Alternative C and D) only include one long-term new chronic sediment source (negligible effects) for the American River stream channel/riparian area, which is the new vehicle bridge and new permanent road. It is acknowledged that ongoing BLM and NPNF restoration actions would continue, which would result in long-term benefits to watershed and aquatic habitats.

3.6.3.3 Indicator 2–Large Woody Debris Analysis

Direct and Indirect Effects–Large Woody Debris Analysis

Alternative A (No Action Alternative)
No instream improvement work is planned under this Alternative to improve LWD. BLM has an ongoing restoration program which would continue, and dependent on funding, future restoration actions could continue to take place, and actions that install LWD would result in beneficial effects to treated stream reaches. With increased dead and dying lodgepole pine or other trees having potential to fall into streams, it is expected that LWD conditions would continue to improve with time within the analysis area.

The risk of a severe wildfire would increase over time in the absence of vegetation treatments. With severe wildfire, there are risks associated with impacts to riparian trees, which would affect LWD in the

short and long-term. Generally, with stand replacing fires, fire-killed trees would provide an abundance of LWD as trees fall into the stream.

Alternatives B, C, and D
Research indicates that with the established RHCA buffers, harvest activities would be expected to have negligible effects on large woody debris recruitment. Because no timber harvest would take place within any RHCAs under all action alternatives, harvest activities would be expected to present a negligible risk of retarding attainment of temperature or LWD RMOs or causing adverse impacts to this management indicator.

No instream improvement work to install LWD is proposed with this project. PACFISH guidance would be applied to streamside, landslide prone and wetland RHCAs. No actions that would adversely impact this indicator are proposed. Decommissioning roads in riparian habitats and riparian restoration actions would result in long-term improvements for large woody debris recruitment. Alternative C has the highest level of riparian restoration actions, followed by Alternatives B and D.

Eastside Project action alternative actions which affect riparian condition and LWD processes have the ability to directly or indirectly to affect instream cover conditions and pool quality and quantity. For additional project related short-term and long-term effects to these processes refer to Appendix H, Tables H.3 and H.4, American River Aquatic Trend Analysis and Summary.

Irreversible and Irretrievable Effects–Large Woody Debris

There are no known irreversible or irretrievable effects associated with the large woody debris indicator.

Cumulative Effects–Large Woody Debris

The cumulative effects analysis area for large woody debris is the American River watershed and the upper South Fork Clearwater River to just downstream of the mouth of Crooked River.

Similar to deposited sediment, the existing condition of this indicator reflects a long history of human development in this watershed. Riparian encroachment by roads has affected streamside conditions in the American River watershed, including large woody debris. The presence of streamside roads generally results in the permanent removal of large woody debris, sometimes all the debris, that otherwise could be recruited into streams. Riparian areas throughout the watershed have been affected by past road streamside road construction, dredge mining activities, domestic livestock grazing, and timber harvest. Rural home construction and development has encroached on riparian habitats, particularly within the Elk City township (e.g., American River subdivision). The RHCA road density for the entire American River watershed is 1.9 miles per square mile, it expected that this density would be higher within the Elk City township for roads occurring streamside or within riparian areas, because many roads parallel streams and provide private land access. The continued existence of streamside roads generally translates into reduced ability of stream to recruit wood.

Significant lengths and areas of American River, Buffalo Gulch, and Little Elk Creek, and other streams were subjected to flood plain and in-channel placer and dredge mining that generally eliminated most or all of the large woody debris. Dredge mining additionally resulted in dredge piles that are primarily composed of cobble/gravel material. Soils in dredge and placer-mined areas have been removed, and sterile tailing piles remain in localized areas. Soil and riparian vegetation (e.g., trees) recovery has been very slow and some of these areas still are relatively devoid of vegetation (e.g., riparian vegetation, trees, shrubs). The conditions created by historic mining activities continue to affect riparian and floodplain processes, including growth and recruitment of large woody debris.

Effects from implementation of Alternatives B, C, and D are unlikely to contribute to reduction of LWD, when considered cumulatively with past contributors to the degraded condition. With the exception of a new public access road and vehicle bridge (American River) (Alternatives C and D); and a temporary

road constructed for timber harvest (intermittent non-fish bearing stream) (Alternative D); no additional streamside roads would be constructed adjacent to or cross any streams. No tree harvest would occur within any RHCAs and no LWD would be removed from channels. Implementation of restoration actions, specifically streamside road decommissioning and riparian restoration is expected to contribute to improvement of LWD over time. In addition, increased natural LWD recruitment is expected to continue, even in the absence of restoration. Dead and dying lodgepole pines that occur within riparian areas are expected to be a primary LWD source along some stream channels.

There are a number of past, recent, on-going, and proposed activities in the American River watershed and upper South Fork Clearwater River involving BLM, NPNF, State of Idaho, Nez Perce Tribe, and private lands. Some of the proposed restoration projects occur within the immediate project area. A list of these projects is provided in Table 3.0.1. Projects and other activities displayed at the beginning of Chapter 3 could affect the large woody debris indicator include NPNF American and Crooked River Project, proposed BLM restoration actions, private land restoration actions, private land timber harvest and road construction, and firewood cutting. Specific BLM planned restoration actions (USDI-BLM, 2006) that would directly affect this indicator includes the installation of LWD, in addition to construction of pool habitats and installation of habitat rocks in 3.4 miles of American River (foreseeable future 2007–2009). The BLM implemented a similar project in 2.5 miles of American River during 1992. Pre- and post-project monitoring of this restoration project documented that sub-optimal LWD levels of 1–2 pieces occurred in dredge mined reaches and was improved to over 15 to 20 pieces per 100 meters and supported meeting LWD objectives for American River.

3.6.3.4 Indicator 3–Pool Habitat Analysis

Direct and Indirect Effects–Pool Habitat Analysis

Alternative A (No Action Alternative)
This alternative would not implement specific watershed improvement projects or construction of pool habitats. Chronic sources of erosion/sediment such as stream fords, roads, and historic dredge mined areas would continue to contribute sediment to stream channels and subsequent pool filling. BLM has an ongoing restoration program which would continue and, dependent on funding, future restoration actions would continue to take place, and actions that construct pools, install LWD, or reduce erosion would result in beneficial effects to pool quality and quantity within treated reaches and watersheds.

In addition, increased natural LWD recruitment is expected to continue, even in the absence of restoration. Along some stream reaches, dead and dying lodgepole pine occurring in riparian areas and streamside are expected to be a primary LWD source. LWD recruitment would support creation of additional pools and improve instream cover. Existing non-point sediment sources would slowly recover over time and pool habitat would slowly improve.

Alternatives B, C, and D
No instream improvement work for pool construction is planned in American River or tributaries, except the Queen Creek reconnect. The small reconnection channel would be designed to provide some pool structure, as well as improved riparian vegetation and LWD. Short-term increases in sediment would occur but no measurable effects to pool habitats are expected to occur in American River. A limited amount of new permanent roads and a new vehicle bridge (Alternatives C and D) is planned to occur within RHCAs under the action alternatives, consequently negligible sediment effects or impacts to riparian habitats is expected from these actions. However, watershed, watershed improvement projects and road decommissioning would reduce sediment sources and would likely improve pool habitat over time with the reduction of chronic sediment sources attributed to roads, fords, and historic dredge mined areas. Actual pool quality and quantity would improve in the long-term with restoration actions that improve riparian habitats and large woody debris recruitment to stream channels.

Alternative C restoration actions have greatest potential to improve riparian habitats, LWD recruitment, and reduce sediment to streams, which would improve pool quality and quantity in the long-term and is followed by Alternatives B and D.

Eastside Project action alternative actions which could affect riparian condition, erosion, sediment, and LWD processes have the ability to directly or indirectly to affect pool quality and quantity. For additional project related short-term and long-term effects to these processes refer to Appendix H, Tables H.3 and H.4, American River Aquatic Trend Analysis and Summary.

Irreversible and Irretrievable Effects–Pool Habitat

There are no known irreversible or irretrievable effects associated with the large pool habitat indicator.

Cumulative Effects–Pool Habitat

The cumulative effects analysis area for pool habitat debris is the American River watershed.

The quantity and quality of pools and the effects from historic events have been previously discussed. Accelerated sediment yield has resulted in reduction of pool volume. Streamside land uses such as road construction, in-channel/riparian mining, and riparian development that removed existing LWD, reduced LWD recruitment potential. LWD is a primary factor for pool creation in many streams.

Effects from implementation of Alternatives B, C, and D are unlikely to contribute to reductions in pools and pool volume, as discussed previously, even when considered cumulatively with past contributors to the degraded condition. With the exception of a new public access road and vehicle bridge (American River) (Alternatives C and D); and a temporary road constructed for timber harvest (intermittent non-fish bearing stream) (Alternative D); no additional streamside roads would be constructed adjacent to or cross any streams. No tree harvest would occur within any RHCAs. Implementation of restoration actions, specifically streamside road decommissioning and riparian restoration is expected to contribute to improvement of pool habitat over time. In addition, increased natural LWD recruitment is expected to continue, even in the absence of restoration.

There are a number of past, recent, on-going, and proposed activities in the American River watershed and upper South Fork Clearwater River involving BLM, NPNF, State of Idaho, Nez Perce Tribe, and private lands. Some of the proposed restoration projects occur within the immediate project area. A list of these projects is provided in Table 3.0.1. Projects and other activities displayed at the beginning of Chapter 3 that could affect the pool habitat indicator (quality and quantify) include NPNF American and Crooked River Project, proposed BLM restoration actions, private land restoration actions, private land timber harvest and road construction, and firewood cutting. Specific BLM planned restoration actions (USDI-BLM, 2006) that would have direct affect on this indicator includes the construction of pool habitat (construction of upstream rock “v” check dams) and installation of LWD and habitat rocks in 3.4 miles of American River (foreseeable future 2007–2008). The BLM implemented a similar project in 2.5 miles of American River during 1992. Pre- and post-project monitoring of this restoration project documented that sub-optimal pool:riffle ratio of 20:80 was improved to desired objectives of 35:65–50:50 ratios. In addition, the installation of LWD in pool habitats created high quality instream cover for the recently constructed pools. Consequently, this foreseeable future action is predicted to improve quality and quantity of pools within treated reaches in Lower and Middle American River.

3.6.3.5 Indicator 4–Water Quality Analysis (Toxics and Temperature)

Direct and Indirect–Water Quality Analysis (Toxics and Temperature)

Toxics–Alternative A (No Action Alternative)
Historic dredge mining resulted in some accumulation of heavy metals and introduction of mercury, since it was often used as an amalgam in the gold mining process. The risks of historic mining related hazardous material impacting water quality or aquatic resources would not change from existing conditions because no disturbance to historic mined areas is proposed.

Under this alternative, no use of herbicides, fuels, or any fire suppression chemicals is proposed above current levels. The risk of these materials entering streams would remain unchanged from the existing condition. All herbicide application would be in accord with BLM's multi-year program submittal and completion of Section 7 consultation. Application of herbicides within riparian areas and RHCAs would be ground based and risks would be at low levels to aquatic organisms and non-target vegetation.

Toxics–Alternatives B, C, and D
Toxic materials used under the action alternatives include fossil fuel derivatives, including diesel fuel, hydraulic fuel, various petroleum-based lubricants, and gasoline.

The two factors determining the degree of risk from toxic materials are the toxicity of the chemical and the likelihood that non-target organisms would be exposed to toxic doses (Norris et al., 1991). Toxicity alone does not make a chemical hazardous; exposure to a toxic dose must also occur. Chemicals may enter water by one or more of the following routes: direct application, drift, and mobilization in ephemeral stream channels, overland flow, and leaching (Norris et al., 1991).

In addition, fueling and storage of fuels is addressed with specific Eastside Project design measures. Transport of fuels is regulated through project design measures that minimize the risk of accidents or accidental introduction of these materials to streams. Therefore, the risk of fuel delivery to streams is considered extremely unlikely to occur.

Historic dredge mining of the American River stream bottom resulted in some accumulation of heavy metals and introduction of mercury, since it was often used as an amalgam in the gold mining process. There is some potential to liberate mercury during the implementation of restoration projects that involve disturbance of historic mined areas, stream channels, substrate materials, and streambanks. The potential to release mercury in harmful amounts is considered to be slight because of historic leaching beyond the depths of disturbance and/or mobilization during the dredge mining process. It is expected that depth of restoration disturbance and remaining buffer material would reduce or eliminate the potential of intercepting adverse amounts of heavy metals during excavation which may reside at the bedrock level.

The Eastside Project design measures identified for equipment fueling and maintenance would minimize the risks associated with accidents, spills, or introduction of fuels to fish bearing waters.

Stream Temperatures–Alternative A (No Action Alternative)
Stream temperatures within the analysis area would remain unchanged over the short-term. Some improvement may occur over time as vegetation recovers in areas where shade has been reduced from past activities or where dredge mining has resulted in over-widened, shallow streams. Road encroachment in riparian areas has also reduced shrub and trees shading potential along some stream reaches. Historic dredge mining along some stream reaches has severely altered and disturbed the streambottoms, floodplains, riparian areas, and stream channels. Some of these mined areas contain dredged materials that are still relatively devoid of shrubs and trees. These dredge materials may contain gravel and cobble materials that are lacking in soils which promote vegetation growth.

Lack of vegetation treatments may contribute to continued accumulation of fuels, potentially resulting in more severe wildfires, which, depending on size, severity, and location, could affect water temperature.

Effects would be dependent on amount of stand replacing fire that occurred within riparian habitats and changes resulting to shading.

Stream Temperatures–Alternative B, C, and D
Since harvest of timber within streamside RHCAs is not proposed under any of these alternatives, the risk of adverse effect on stream temperature is discountable, or extremely unlikely to occur. Riparian restoration actions and decommissioning of roads within RHCAs and riparian areas result in improved shading and riparian conditions in the long-term.

A new access road for the American River subdivision includes the construction of 0.56 mile of permanent road and the construction of a new vehicle bridge for Alternatives C and D. Approximately 0.12 mile of the new road would be constructed within the RHCA. Several trees would be cut within the riparian area; however, short-term and long-term riparian condition, stream shading, and water temperature effects are expected to be discountable.

Alternatives B and C include the relocating and decommissioning of an existing road (0.53 mile) which parallels American River within the riparian area, to a toeslope area. This action would include the construction of 0.57 mile of new road in the toeslope area, a portion of this new road would utilize an old existing road prism (0.22 mile). Moving the road out of the stream bottom area and implementation of riparian restoration actions would improve riparian habitat conditions and shading along this stream reach in the long-term. A small portion of the new road construction would occur in the American River RHCA. Tree cutting for the new road would be more than one tree distance in length from American River, consequently no tree shading or water temperature effects are expected to occur to American River from this action.

Alternative D includes the construction of approximately 300 feet of new temporary road within the American River RHCA. This road would also cross a small intermittent stream that drains into dredge ponds. Tree cutting for the temporary road would be more than one tree distance in length from American River, consequently no tree shading or water temperature effects are expected to occur to American River from this action.

Alternative C restoration actions have greatest potential to improve riparian habitats, shading, and water temperatures in the long-term, and is followed by Alternative B and D.

The restoration activities should moderate current stream temperature levels, and possibly decrease stream temperature in the long-term with growth of streamside trees and shrubs, and subsequent increased shading. For additional project related short-term and long-term effects to riparian shading, riparian condition, and water temperature processes specific to the action alternatives, refer to Appendix H, Tables H.3 and H.4, American River Aquatic Trend Analysis and Summary.

Irreversible and Irretrievable Effects–Water Quality

There are no known irreversible or irretrievable effects associated with the water quality indicator.

Cumulative Effects–Water Quality

The cumulative effects analysis area for toxics is the American River watershed. The American River watershed and the upper South Fork Clearwater River to just downstream of the mouth of Crooked River are the cumulative effects analysis area for water temperature.

The two factors determining the degree of risk from toxic materials are the toxicity of the chemical and the likelihood that non-target organisms would be exposed to toxic doses (Norris et al., 1991). Toxicity alone does not make a chemical hazardous; exposure to a toxic dose must also occur. Chemicals may enter water by one or more of the following routes: direct application, drift, and mobilization in ephemeral stream channels, overland flow, and leaching (Norris et al., 1991).

Toxics
There are a number of past, recent, on-going, and proposed activities in the American River watershed and upper South Fork Clearwater River involving BLM, NPNF, State of Idaho, Nez Perce Tribe, and private lands. Some of the proposed restoration projects occur within the immediate project area. A list of these projects is provided in Table 3.0.1. Projects and other activities displayed at the beginning of Chapter 3 that could affect water quality and toxics include NPNF American and Crooked River Project, herbicide application on private and public lands, proposed BLM restoration actions, private land restoration actions, private land timber harvest and road construction, and hauling or storage of fuels. Risks do occur for an accidental hazardous material spill or toxic materials reaching live waters, consequently streamside uses of toxic material in close proximity to riparian areas and streams have higher risks. Safe guard measures generally are used when using large quantities of hazardous or toxic materials. Various restoration, road construction, and mining operations that take place on historic mined areas have the potential to liberate mercury. Overall, risks from such actions are considered low because of probable leaching of such toxic material below expected disturbance depth.

The potential for the introduction of toxic materials reaching aquatic habitats has been previously discussed. In summary they include: mining operations, herbicide application, use and storage of fuels and petroleum products, and fire suppression chemicals. Historic dredge mining of the American River stream bottom and other streams within the analysis area has resulted in some accumulation of heavy metals and introduction of mercury, since it was often used as an amalgam in the gold mining process.

Effects from implementation of Alternatives B, C, and D are unlikely to contribute to increased risks to water quality from toxic materials, even when considered cumulatively with past, ongoing, and foreseeable actions. There is some potential to liberate mercury during the implementation of restoration projects that involve disturbance of historic mined areas, stream channels, substrate materials, and streambanks. The potential to release mercury in harmful amounts is considered to be slight because of historic leaching beyond the depths of disturbance and/or mobilization during the dredge mining process.

In addition, fueling and storage of fuels is addressed with specific Eastside Project design measures. Transport of fuels is regulated through project design measures that minimize the risk of accidents or accidental introduction of these materials to streams. Therefore, the risk of fuel delivery to streams is considered extremely unlikely to occur.

Water Temperature
There are a number of past, recent, on-going, and proposed activities in the American River watershed and upper South Fork Clearwater River involving BLM, NPNF, State of Idaho, Nez Perce Tribe, and private lands. Some of the proposed restoration projects occur within the immediate project area. A list of these projects is provided in Table 3.0.1. Projects and other activities displayed at the beginning of Chapter 3 could affect riparian conditions and improved shading of streams within the analysis area include NPNF American and Crooked River Project, proposed BLM restoration actions, private land restoration actions, private land timber harvest and road construction, and firewood cutting.

The existing condition of this indicator reflects a long history of human development in this watershed. Encroachment by roads has affected streamside/riparian conditions in the American River watershed, including shading and water temperatures. The presence of streamside roads generally results in the permanent removal of riparian vegetation and associated stream shading. Riparian areas throughout the watershed have been affect by past streamside road construction, dredge mining activities, domestic livestock grazing, and timber harvest. Rural home construction and development has encroached on riparian habitats, particularly within the Elk City township (e.g., American River subdivision).

Significant lengths and areas of American River, Buffalo Gulch, and Little Elk Creek, and other streams were subjected to in-channel placer and dredge mining that degraded riparian areas and stream channels. Soils in dredge and placer-mined areas have been removed, and sterile tailing piles remain in some areas. Soil and riparian vegetation (e.g., trees) recovery has been very slow and some of these areas still are

relatively devoid of vegetation (e.g., riparian vegetation, trees, shrubs). The conditions continue to affect riparian and floodplain processes, including riparian vegetation establishment, growth, and shading to streams.

Domestic livestock grazing continues to occur within the watershed on private, NPNF, and BLM lands. Private land grazing is prevalent in the large meadows associated with Elk Creek, Big Elk Creek, and Little Elk Creek. Grazing on BLM and NPNF lands within the watershed has been conducted at levels to minimize or reduce effects to riparian vegetation and listed fish. Some private land grazing still occurs at levels that result in localized adverse impacts to riparian vegetation and streambanks, which have direct and indirect effects on water temperature (e.g., Elk Creek).

Effects from implementation of Alternatives B, C, and D are not expected to adversely affect water temperature within the analysis area, when considered cumulatively. With the exception of a new public access road and vehicle bridge (American River) (Alternatives C and D); and a temporary road constructed for timber harvest (intermittent non-fish bearing stream) (Alternative D); no additional streamside roads would be constructed adjacent to or cross any streams. No tree harvest would occur within any RHCAs. Implementation of restoration actions, specifically streamside road decommissioning and riparian restoration is expected to contribute to improved riparian conditions, stream shading, and improvements to water temperature. In addition, natural recovery to riparian areas and improved shading would also occur.

3.6.3.6 Indicator 5–Water Yield Analysis

Direct and Indirect Effects–Water Yield

Section 3.4 (Watershed) discusses changes in ECA for affected watersheds in the project area. Alternative A displays the existing condition for each watershed. None of the alternatives propose increases in water yield that are expected to result in channel degradation or long-term impacts to fish habitat.

Alternative A (No Action Alternative)
Under this alternative, ECA and any changes in water yield from past activities would continue to recover, except for areas affected by land uses that result in soil compaction, such as past tractor logging, dozer piling, and log landings. These areas are affected by low soil infiltration rates and may not recover in the absence of soil and other watershed restoration efforts. In addition, existing roads would continue to contribute towards ECA, and recovery, if any, would occur extremely slowly in the absence of road decommissioning and soil restoration. Lack of vegetation treatments may contribute to continued accumulation of fuels, potentially resulting in more severe wildfires, which, depending on size, severity, and location, could result in significant water yield changes. Significant water yield changes could result in adverse effects on habitat not fully recovered from past impacts.

The benefits of this alternative, with respect to ECA and water yield, include no short-term changes in ECA and thus, no potential short-term changes in water yield and habitat condition.

Alternatives B, C, and D
A complete ECA analysis is included in Section 3.4 (Watershed). ECA would increase as a result of implementation of these alternatives. Road decommissioning and soil restoration contribute to a reduction in compaction, thus improving infiltration and reducing surface runoff. This effect would be most pronounced in Alternative C and least in Alternative D. The BO for Land and Resource Management Plans set 15 percent ECA as a threshold which triggers a watershed assessment in priority watersheds such as American River. Within the American River watershed, ECA would increase from 9 to 10 percent under all action alternatives. Whitaker Creek and Queen Creek, which support an isolated population of westslope cutthroat trout and no listed steelhead or bull trout, exceed 15 percent under all action alternatives, all other subwatersheds would be below this threshold. Implementation of action alternatives would increase ECA for Whitaker Creek from 10 percent to 16 or 17 percent; and for Queen Creek, ECA

would increase from 13 to 18 percent. Stream channel evaluation conducted during 2004 found that Whitaker and Queen Creek channels are stable and resilient, and capable of withstanding predicted increases in water yield. Unstable streambanks in Whitaker Creek and Queen Creek are one to three percent. Field investigations of all fish bearing stream segments within the project area during 2004 and 2005 documented a channel stability rating of high-fair to good for the stream channels. The exception was lower Elk Creek. However, within this drainage a very small amount of vegetation treatments are proposed and discountable effects to ECA and no adverse effects to channel stability are expected from the Eastside Project.

Irreversible and Irretrievable Effects–Water Yield

There are no know irreversible or irretrievable effects associated with the water yield indicator.

Cumulative Effects–Water Yield

The cumulative effects analysis area for water yield is the American River watershed and the upper South Fork Clearwater River to just downstream of the mouth of Crooked River.

Timber harvest, road construction, fires, mining, and development activities have the ability to affect ECA conditions in the American River watershed. Water yield refers to stream flow quantity and timing and is a function of water/soil/vegetation interactions. Changes in amount or distribution of vegetation can affect water yield by changing rates of interception and infiltration, evapotranspiration, and alter shading. These factors affect the accumulation and melt rates of snow packs and how rainfall is processed, which have an effect on the timing and total amount of water yield that flows off the landscape. Determining the ECA, which represents the extent of forest canopy opening from fire, harvest, and roads, can assess changes in amount and distribution of vegetation. Compacted soils and road systems (watershed networks) can also have an effect on the timing and amount of runoff. Increased runoff and peak flow may be associated with stream downcutting, bank instability, and deposition of sediment in low-gradient stream reaches and can cause alteration of riparian function and lower the quality of fish habitat.

Effects from implementation of Alternatives B, C, and D would increase ECA, when considered cumulatively with past activities. ECA cumulative analysis and discussion including existing conditions and expected ECA effects from the Eastside Project and American and Crooked River Project are also found in Section 3.4 (Watershed). Implementation of the action alternatives B, C, and D, when combined with the past, present, and reasonably foreseeable projects, would increase ECA by an additional 0to 10% in watersheds that could be affected by the Eastside Project. With the exception of three watersheds, ECA would still be below 15%. The three watersheds that would be above or at 15% include: Whitaker Creek (10 to 20%), Queen Creek (13 to 23%), and Box Sing Creek (6 to 15%). ECA increases are more apparent in these watersheds because of the small size of the watersheds. A stream reach inventory and channel stability evaluation was conducted in Whitaker, Queen, Box Sing Creeks, and several representative small first order streams within these watersheds during the 2004 and 2005 field season, using protocols detailed by Pkankuch (1975). These procedures were developed to systemize measurements and evaluations of the resistive capacity of mountain stream channels to the detachment of bed and bank materials. The evaluation provides information about the capacity of streams to adjust and recover from potential changes in flow and/or increases in sediment production. These surveys documented overall channel stability ratings of high fair to good and predicted increases in water yield are not expected to result in adverse impacts to the channels.

There are a number of past, recent, on-going, and proposed activities in the American River watershed and upper South Fork Clearwater River involving BLM, NPNF, State of Idaho, Nez Perce Tribe, and private lands. Some of the proposed restoration projects occur within the immediate project area. A list of these projects is provided in Table 3.0.1. Projects and other activities displayed at the beginning of

Chapter 3 could affect ECA include NPNF American and Crooked River Project, private land timber harvest and road construction, restoration projects, and road decommissioning projects on NPNF, BLM, and private lands.

3.6.3.7 Indicator 6–Habitat Connectivity, Fish Passage, and Ford Use Fish Disturbance Analysis

Direct and Indirect Effects–Habitat Connectivity, Fish Passage, and Ford Use Fish Disturbance Analysis

The Eastside Project offers opportunities for increasing connectivity of fish populations. Drainages with fish blockages within the immediate project area include Queen, Whitaker, Telephone, Baboon and Maggie Creeks in American River. Dredge mining and alteration of the stream channels at the mouths of these watersheds has blocked fish access between these streams and the mainstem American River. The East Fork American River barrier culvert was replaced with a 20 foot wide bridge in 2006. Improvement of Queen Creek fish passage has been identified and is included with the restoration activities associated with the Eastside Project. Increasing connectivity allows individual fish to migrate in and out of tributaries to seek cool water. Increased connectivity also promotes genetic exchange between populations thus potentially increasing diversity. All stream crossings proposed would be designed to prevent channel encroachment and to handle the capacity of a 100 year flood event.

Other projects include decommissioning and restoration of several existing ford crossings in streams providing habitat for federally listed fish. Decommissioning or armoring the fords would reduce instream fish disturbance (particularly for spawning and incubation), reduce chronic sources of sediment, and reduce increased turbidity when vehicles cross the stream.

Table 3.6.17 Miles of Stream with Improved Fish Access, Decommissioning of Stream Fords, and Stream Ford Restoration

Alternative	Type of Stream With Improved Fish Passage and Available Habitat (Miles)			Decommissioning Stream Ford Crossing and Restoration	Stabilization and Armoring of Stream Ford Crossing
	Fish Bearing Streams	Perennial Non-Fish Bearing	Intermittent Non-Fish Bearing		
A	0	0	0	0	0
B	1.4	0	0	2	1
C	1.4	0	0	3	0
D	1.4	0	0	3	0

Alternative A (No Action Alternative)
The "no action" alternative would not include any fish passage improvement projects. The BLM has implemented a variety of restoration projects in the analysis area, and this would be expected to continue. Future stream restoration actions would be dependent on acquisition of funding for projects.

The existing human-caused physical barrier for Queen Creek fish passage would continue to restrict fish use of 1.4 miles of historical stream habitat for spawning and rearing. Keeping Queen Creek isolated from American River would insure that no risks associated with hybridization with non-native cutthroat trout or rainbow trout or competition with nonnative fish, such as brook trout would occur.

The BLM has an ongoing restoration program which has been replacing culverts which impede fish passage. The East Fork American River barrier culvert was replaced with a 20 foot wide bridge in 2006. The Telephone Creek watershed is proposed to be have a re-connect channel to American River

constructed (2007–2008). Additional stream passage work would continue to occur over an extended period and would be dependent on future funding.

Alternative B, C, and D

Queen Creek Channel Re-Connect
Alternatives B, C, and D would provide fish passage to 1.4 miles of stream in Queen Creek by constructing approximately 100 feet of new channel to connect the stream to American River. The newly constructed stream channel would cross the American River road and it is proposed to install a seven-foot wide culvert that is embedded approximately 35–50%. Culvert capacity would allow for 100 year flow events. As needed, suitable sized substrate (e.g., 3–6 inch) material would be placed throughout the length of the culvert. The new stream channel would simulate a natural channel, and streambank restoration would include riparian seedings and plantings with native species.

Within the upper South Fork of the Clearwater River subbasin, westslope cutthroat trout have co-evolved with steelhead trout and resident rainbow/redband populations of *O. mykiss*. Westslope cutthroat trout occur in the Queen Creek watershed. Westslope cutthroat trout do hybridize with rainbow trout and other non-native cutthroat trout subspecies. Many remnant genetically pure cutthroat trout populations are located above barriers that protect them from non-native species.

Re-connecting Queen Creek with American River would result in potential increased use of the watershed by steelhead trout, and potentially westslope cutthroat trout hybridization. The potential for natural introgression with either native redband or steelhead trout was not considered a risk where these species co-evolved with westslope cutthroat trout (Shepard et al., 2003). Box Sing Creek is located 0.9 mile downstream from Queen Creek and had a dredge mined caused blockage similar to Queen Creek. In 1992 the BLM constructed a new channel to connect the stream to American River, monitoring of this watershed during 2005 at stream miles 0.1 and 0.8 did not visually document any cutthroat trout/rainbow trout hybridization. Monitoring conducted during 2004 and 2005 in the Buffalo Gulch watershed, which is also an American River tributary, supported the conclusion identified by the NPNF above for the South Fork of the Clearwater River subbasin, rainbow trout and cutthroat trout occurred in the lower reaches; however, the upper reaches were completely dominated by cutthroat trout.

Brook trout, a nonnative species can compete with cutthroat trout for food and space. If brook trout became dominate in the stream they could replace westslope cutthroat.

The dredge mined caused blockage at the mouth of Queen Creek does not function as a full barrier every year. There may be periodic fish access during flood events. However, during most years fish access would be restricted.

Although potential for hybridization would occur between rainbow/steelhead and cutthroat trout, this should result in low risks to westslope cutthroat trout genetics. Competition between brook trout and westslope cutthroat is also expected also have low risks, and should not reduce the viability of cutthroat trout in the watershed. Increasing connectivity to Queen Creek would allow individual fish to migrate in and out of tributaries to seek cool water. Increased connectivity also promotes genetic exchange between populations, potentially increasing diversity.

Decommissioning of Stream Fords and Stream Ford Stabilization
American River Ford (River Mile 6.3) and Kirks Fork Ford (Stream Mouth) Rehabilitation
Alternatives B, C and D identify the decommissioning and restoration of fords located at river mile 6.3 of American River, and at the mouth of Kirks Fork. These components are interrelated with a road to ATV trail conversion project for a primitive road that parallels American River for approximately 1.6 miles. Decommissioning the fords would reduce two chronic sources of sediment and turbidity from the native surface stream crossings and associated vehicle use. Closing the fords would also eliminate risks associated with vehicle use and fish using the stream at the ford crossing for rearing, spawning, incubation, or passage.

Upper American River Ford (River Mile 12.8) Restoration Actions
Alternative B would improve and stabilize a severely rutting road segment (400 feet) crossing a meadow and a stream ford located at river mile 12.8 of American for vehicle passage. Restoration would include streambank stabilization and "armoring" the ford. This would reduce turbidity and streambank erosion. The "armoring" would also restrict fish from using the ford for rearing or spawning. These actions would reduce a chronic sediment source attributed to a native surface stream ford and road crossing a meadow adjacent to American River. The conflict of vehicle use and fish using the ford for spawning or rearing would be eliminated.

Alternative C identifies that the American River ford crossing at river mile 12.8 would be decommissioned and rehabilitated. Associated with this action would be the decommissioning of 0.89 mile of primitive road which parallels American River. This action would reduce sediment from the ford crossing and eliminate risks associated with vehicle disturbance or harm to fish utilizing the ford for spawning, rearing, or passage.

Alternative D identifies that the American River ford crossing at river mile 12.8 would be decommissioned and rehabilitated. Associated with this action would be the conversion of 0.89 mile of primitive road which parallels American River to an ATV trail, decommissioning of approximately 500 feet of road through a meadow area, and constructing approximately 0.5 mile of new ATV trail along the east side of American River, which would connect with Forest Service road 443. This action would reduce sediment from the ford crossing and eliminate risks associated with vehicle disturbance or harm to fish utilizing the ford for spawning, rearing, or passage.

Irreversible and Irretrievable Effects–Habitat Connectivity, Fish Passage, and Ford Use Fish Disturbance

There are no know irreversible or irretrievable effects associated with habitat connectivity, fish passage, and ford use fish disturbance indicator.

Cumulative Effects–Habitat Connectivity, Fish Passage, and Ford Use Fish Disturbance

The cumulative effects analysis area for sediment and substrate is the American River watershed and the upper South Fork Clearwater River to just downstream of the mouth of Crooked River.

There are a number of past, recent, on-going, and proposed activities in the American River watershed and upper South Fork Clearwater River involving BLM, NPNF, State of Idaho, Nez Perce Tribe, and private lands that may affect aquatic habitat connectivity and reduce impacts to native fish at ford crossing areas. Some of these projects occur within the American River watershed and/or immediate project area. A list of these projects is provided in Table 3.0.1. Projects and other activities displayed at the beginning of Chapter 3 would affect aquatic habitat connectivity and fish disturbance at fords include NPNF American and Crooked River Project, private land timber harvest and road construction, road decommissioning projects on NPNF, BLM, and private lands, and culvert replacement projects for improved fish passage. With increased emphasis on maintaining or improving fish passage, it can be expected that no future actions on BLM or NPNF would result in adverse impacts to aquatic habitat connectivity and most would result in improvement in the long-term. Road crossings and aquatic habitat connectivity involving the Idaho Transportation Department (Highway 14), county roads, and private roads would be expected to provide for improved fish passage when an existing or new road crossing in a fish bearing stream was being constructed, maintained, or upgraded in the long-term, particularly when authorization for such projects would require appropriate Federal (Section 404 of the Clean Water Act, through application of either Nationwide or site-specific permits) or State Permits (Idaho Stream Channel Protection Act).

As discussed previously, some stream crossing structures (roads and culverts) limit or prevent seasonal upstream movement by fish and other aquatic biota. Juvenile salmonids living in rivers may seek refuge

in tributary streams during high flow events. Dredge mining of stream bottom areas has altered tributary stream channels and in some instances has created blockage for fish passage as no stream channel exists. These blockages typically occur near the mouth areas of small tributary streams to American River within the analysis area. Dredge mining has also altered floodplains and riparian habitats and had degraded or eliminated side channels or high flow channels along some low gradient stream channels. Stream fords, have altered the stream channel in areas at the crossing. Vehicle use may disturb and displace fish using the crossing area, or cause mortality or injury to fish using the area.

Table 3.6.18 summarizes BLM past and foreseeable future fish passage enhancement projects in the upper South Fork Clearwater River subbasin.

Table 3.6.18 BLM Past and Foreseeable Future Fish Passage Projects in the Upper South Fork Clearwater River

Stream	Fish Passage Projects	Year
Box Sing Creek (American River Tributary–RM 8.5)	Constructed re-connect channel (mouth) through dredge tailings (mouth). Facilitate access to 2.4 miles of stream.	1992
Box Sing Creek (American River Tributary–RM 8.5)	Replaced barrier culvert (SM 0.1) with 6 ft. open arch culvert. Facilitate access to 2.4 miles of stream.	2002
Little Campbell Creek (Big Campbell Creek Trib.–SM 0.15) (Red River Tributary 0.7)	Replaced barrier culvert (SM 0.6) with partially embedded 6 ft. culvert. Facilitate access to one mile of stream.	2004
Little Campbell Creek (Big Campbell Creek Trib.–SM 0.15) (Red River Tributary–RM 0.7)	Removed barrier culvert (SM 0.35), rocked ford crossing, and closed road to public vehicle use. Facilitate access to one mile of stream.	2004
Buffalo Gulch (American River Tributary–RM 1.3)	Replaced barrier culvert (SM 0.8) with 8 ft. partially embedded culvert. Facilitate access to 5 miles of stream.	2005
Buffalo Gulch (American River Tributary–RM 1.3)	Replaced barrier culvert (SM 2.1) with 7 ft. partially embedded culvert. Facilitate access to 5 miles of stream.	2005
Buffalo Gulch (American River Tributary–RM 1.3)	Replaced barrier culvert (SM 4.5) with 6 ft. partially embedded culvert. Facilitate access to 5 miles of stream.	2005
East Fork American River (American River Tributary–RM 10.6)	Replaced barrier culvert (mouth) with 20 foot bridge. Facilitate access to 13 miles of stream	2006
Telephone Creek (American River Tributary–RM10.5)	Proposed to construct feet of re-connect channel and install 6 ft. partially embedded culvert at American River road crossing (mouth). Proposed to armor and stabilize two ford crossings for road to ATV trail conversion project. Facilitate access to 0.7 mile of stream.	2007

Effects from implementation of Alternatives B, C, and D would improve aquatic habitat connectivity and reduce potential disturbance and mortality to fish utilizing stream fords, when considered cumulatively with past activities. Implementation of the action alternatives B, C, and D would increase accessible native fish habitat by 1.4 miles and eliminate or reduce fish disturbance at three ford crossings. No activities proposed by the action alternatives would impair or adversely impact aquatic habitat connectivity or result in long term instream disturbances at stream crossings (i.e., stream fords).

3.6.3.8 Indicator 7–Riparian Areas/Stream Channels Analysis

Direct and Indirect Effects–Riparian Areas/Stream Channel Analysis

Alternative A (No Action Alternative)
Riparian habitats within the analysis area would remain unchanged over the short-term. Some improvement may occur over time as riparian habitats and vegetation succession continues. Riparian habitat has been impacted by past land uses, particularly where dredge mining has impacted stream bottom areas. Road encroachment in riparian areas has also impacted riparian habitats along some stream reaches. Historic dredge mining along some stream reaches has severely altered and disturbed the stream bottoms, floodplains, riparian areas, and stream channels. Some of these mined areas contain dredged materials that are still relatively devoid of shrubs and trees. These dredge materials may contain gravel and cobble materials that are lacking in soils which promote vegetation growth. Other ongoing land uses would continue to have varying levels of impacts to riparian habitats and includes livestock grazing, recreation, roads, and home construction.

Lack of vegetation treatments may contribute to continued accumulation of fuels, potentially resulting in more severe wildfires, which, depending on size, severity, and location, could affect riparian condition streambank stability, and water temperature. Effects would be dependent on amount of stand replacing fire that occurred.

Alternative B, C, and D
Since harvest of timber within streamside RHCAs is not proposed under any of these alternatives, the risk of adverse effect on riparian habitat is discountable, or extremely unlikely to occur. Riparian restoration actions and decommissioning of roads within riparian areas would improve conditions in the long-term. Re-contouring of stream banks altered by historic dredge mining would improve floodplains and enhance vegetation growth along 1.2 miles of American River, and is expected to improve these areas from a riparian rating of “functional at risk” to “proper functioning condition” in the long-term. Decommissioning and restoration of roads within RHCAs/riparian areas would total 2.55 miles for Alternative B, 3.70 miles for Alternative C, and 3.57 miles for Alternative D. Implementation of these actions would improve infiltration, riparian conditions, filter sediment, and provide for improved streamside vegetation and shading. Increased additional riparian habitat attributed to road decommissioning and restoration for Alternative B, C, and D would be expected to increase by 3.7 acres, 5.4 acres, and 5.2 acres.

A new access road for the American River subdivision includes the construction of 0.56 mile of permanent road and the construction of a new vehicle bridge for Alternatives C and D. Approximately 0.12 mile of the new road would be constructed within the RHCA. Several trees would be cut within the riparian area; however, short-term and long-term riparian condition, stream shading, and water temperature effects are expected to be negligible.

Alternatives B and C include the relocating of an existing 0.46 mile of road which parallels American River to a toeslope area. This action would include the major reconstruction of 0.22 mile of existing road and construction of 0.35 mile of new road. Moving the road out of the stream bottom area and implementation of riparian restoration actions would improve riparian habitat conditions and shading along this stream reach in the long-term. A small portion of the new road construction would occur in the American River RHCA. Tree cutting for the new road would be more than one tree distance in length from American River, consequently no tree shading or water temperature effects are expected to occur to American River from this action.

Alternative D includes the construction of approximately 300 feet of new temporary road within the American River RHCA. This road would also cross a small intermittent stream that drains into dredge ponds. Tree cutting along the route road would be more than one tree distance in length from American

River, consequently no tree shading or water temperature effects are expected to occur to American River from this action.

Alternative C restoration actions have the greatest potential to improve riparian conditions in the long-term, and these are followed by Alternative B and D.

The restoration activities should moderate current stream temperature levels, and possibly decrease stream temperature in the long-term with growth of streamside trees and shrubs, and subsequent increased shading. For additional project related short-term and long-term effects to riparian shading, riparian condition, and water temperature processes specific to the action alternatives, refer to Appendix H, Tables H.3 and H.4, American River Aquatic Trend Analysis and Summary.

Irreversible and Irretrievable Effects–Riparian Areas/Stream Channel

There are no know irreversible or irretrievable effects associated with the riparian areas/stream channel indicator.

Cumulative Effects–Riparian Areas/Stream Channel

The cumulative effects analysis area for riparian habitats and stream channels is the American River watershed.

There are a number of past, recent, on-going, and proposed activities in the American River watershed and upper South Fork Clearwater River involving BLM, NPNF, State of Idaho, Nez Perce Tribe, and private lands. Some of the proposed restoration projects occur within the immediate project area. A list of these projects is provided in Table 3.0.1. Some of the projects and other activities displayed at the beginning of Chapter 3 would affect the riparian habitat and stream channel indicator, and include the NPNF American and Crooked River Project, proposed BLM restoration actions, private land restoration actions, private land timber harvest and road construction, firewood cutting, and urban and rural development. Private land road construction, timber harvest, and urban/rural development activities which may happen in the future is unquantifiable, but it is expected that additional riparian development would occur.

The existing condition of this indicator reflects a long history of human development in this watershed. Dredge mining activities within stream bottom areas and road encroachment into riparian habitats have been the primary land use which has affected riparian habitats. In addition, riparian areas throughout the watershed have been affected to varying levels by domestic livestock grazing, timber harvest, and urban and rural development. Rural home construction and development has encroached on riparian habitats, particularly within the Elk City township (e.g., American River subdivision).

Some stream reaches of American River, Buffalo Gulch, and Little Elk Creek, and other streams were subjected to in-channel and flood plain placer and dredge mining. Dredge mining resulted in sterile dredge piles that are primarily composed of cobble/gravel material. Soil and riparian vegetation (e.g., trees) recovery has been very slow and some of these areas still are relatively devoid of vegetation (e.g., riparian vegetation, trees, shrubs). Riparian vegetation may be lacking in these areas and the riparian plant communities are in an early to mid seral stage. The conditions caused by these historic mining activities continue to affect stream channel morphology and riparian and floodplain processes, including riparian vegetation growth, composition, and seral stage.

Domestic livestock grazing occurs within the watershed on private, NPNF, and BLM lands. Private land grazing is prevalent in the large meadows associated with Elk Creek, Big Elk Creek, and Little Elk Creek. Grazing on BLM and NPNF lands within the watershed has been conducted at levels to minimize or reduce effects to riparian vegetation or listed fish. Some private land grazing occurs at levels that impact riparian vegetation and stream banks (e.g., Elk Creek).

Effects from implementation of Alternatives B, C, and D would not contribute to long-term adverse impacts to riparian habitats, when considered cumulatively with past contributors to the degraded condition. With the exception of a new public access road and vehicle bridge (Alternatives C and D), and a temporary road constructed for timber harvest (intermittent non-fish bearing stream) (Alternative D), no additional streamside roads would be constructed. No tree harvest would occur within any RHCAs. Implementation of restoration actions, specifically streamside road decommissioning and riparian restoration would improve riparian habitats over time. In addition, some natural improvements in riparian habitats are expected to continue, even in the absence of restoration.

Specific BLM planned restoration actions (USDI-BLM, 2006) that would directly affect this indicator includes the Telephone Creek road to trail conversion project (0.9) mile and channel re-connect project (250 feet). This project would implement restoration of road encroachment within riparian areas, construct approximately 250 feet of new stream channel through dredge tailing areas, and improve riparian vegetation (seedings and plantings) along the new channel.

The Elk Creek stream reach which flows across BLM lands has been fenced off from livestock grazing (0.4 miles); this riparian restoration effort has improved bank stability and riparian conditions from poor to good within this reach. The BLM is coordinating with Framing Our Community regarding the construction of riparian fences and restoration efforts along an additional one mile of Elk Creek flowing across private lands.

3.6.3.9 South Fork Clearwater River Analysis of Effects

Direct and Indirect Effects

Of the indicators discussed in this section, sediment and temperature are the most relevant in terms of direct and indirect effects to the South Fork Clearwater River.

Alternative A (No Action Alternative)
Under the "no action" alternative, the existing substrate condition in the South Fork Clearwater River would probably improve very slowly over time. Because of historic dredge mining and associated legacy effects to riparian habitats and stream channels, natural recovery would be negligible in some stream reaches without active restoration. Restoration improvements in the watershed may occur as funding becomes available.

Benefits of Alternative A include no further ground-disturbing activities, which would result in no additional human-caused spikes of sediment. This alternative would not address the need for active stream, watershed and soils restoration. However, the BLM has an ongoing watershed and fisheries restoration program which would continue to address restoration various actions as funding becomes available.

Stream temperatures would remain unchanged over the short-term. Some improvement may occur over time as vegetation recovers in areas where shade has been reduced from past activities or where dredge mining has resulted in over-widened, shallow streams. Highway 14 and other road encroachment in riparian areas has reduced shrub and trees shading potential along some river reaches. Historic dredge mining along some stream reaches has severely altered and disturbed the streambottoms, floodplains, riparian areas, and stream channels. Some of these mined areas contain dredged materials that are still relatively devoid of shrubs and trees. These dredge materials may contain gravel and cobble materials that are lacking in soils which promote vegetation growth.

Lack of vegetation treatments may contribute to continued accumulation of fuels, potentially resulting in severe wildfires, which, depending on size, severity, and location, could affect sediment yield and water temperature. With severe wildfire, there are risks associated with pulses of sediment delivered rapidly to streams, which could adversely affect habitat already impaired by past human activities. Effects would be

dependent on amount of stand replacing fire that occurred within riparian habitats and changes resulting to sediment yield and shading.

Alternative B, C, and D
For specific direct or indirect effects expected from the Eastside Project, refer to indicator analysis conducted for the indicators and the American River watershed above.

No timber harvest is proposed within streamside and wetland RHCAs or in landslide prone RHCAs. No short-term or long-term increase in risk of mass wasting and landslide type disturbance is expected to occur from Eastside Project actions. Eastside Project action alternative actions which affect erosion and sediment processes have the ability to directly or indirectly affect water quality and fish habitat in the short-term and long-term. Predicted increases in deposited sediment would not be at a magnitude where measurable changes would be expected to occur in the South Fork Clearwater River (see Tables 3.6.10–3.6.13 above), and differences between the action alternatives, as modeled, are all within the margin of error for the model.

A short-term spike of sediment from restoration and timber harvest/fuel treatments would occur. A long-term reduction of baseline sediment yield from chronic sediment sources would result from restoration activities and aid in recovery of watershed and aquatic conditions.

Since harvest of timber within streamside RHCAs is not proposed under any of these alternatives, the risk of adverse effect on stream temperature is discountable, or extremely unlikely to occur. Riparian restoration actions and decommissioning of roads within RHCAs and riparian areas would result in improved shading and riparian conditions in the long-term.

Alternative C restoration actions have greatest potential to improve riparian habitats, shading, and water temperatures in the long-term, and is followed by Alternatives B and D.

The restoration activities should moderate current stream temperature levels, and possibly decrease stream temperature in the long-term with growth of streamside trees and shrubs, and subsequent increased shading. For additional project related short-term and long-term effects to these processes refer to Appendix H, Tables H.3 and H.4, American River Aquatic Trend Analysis and Summary.

Irreversible and Irretrievable Effects

There are no known irreversible or irretrievable effects associated with fisheries or aquatic indicators for any of the alternatives.

Cumulative Effects

Cumulative effects include past, present, reasonably foreseeable actions within the analysis area (see Table 3.0.1). The cumulative effects area for fisheries resources includes subwatersheds within American River watershed and the upper South Fork Clearwater River, downstream to below Crooked River (RM 58.4). Findings for aquatic resources in American River and the South Fork Clearwater River include substantial physical changes since the initiation of human disturbances in the 19th century.

Both American River and the South Fork Clearwater River are subject to cumulative effects, with sediment and temperature impacts being prevalent. Aquatic restoration projects have been implemented overtime in the American River and the upper South Fork Clearwater River.

Specific activities include but are not limited to mainstem river dams, in-channel mining in the mainstem rivers and tributaries, timber harvest throughout the subbasin, road construction and encroachment on streams, domestic livestock grazing, home construction and private land development, agriculture and cultivation, fire suppression, and many others. It is generally accepted that water quality and habitat in the South Fork Clearwater River is in a degraded condition, both from sediment and temperature impacts (USDA-FS, 1998a; USDA-FS, 1999a).

Table 3.0.1 lists the aforementioned activities and the possible effects of these actions are described below. Section 3.4 (Watershed) highlights the natural (fire) and management activities that have affected the project area. The detailed discussions of sediment yield and water temperature highlights these elements and how they have changed overtime. Both elements have adversely affected fish populations and aquatic habitats in the South Fork Clearwater River

As described in this section, dredge mining and hydraulic mining caused significant erosion in the tributaries, and accelerated sediment deposition in the mainstem river. Fish passage in the South Fork Clearwater River has been impacted by mainstem dams since the early days of settlement. The first dam reported in the South Fork Clearwater River was the Dewey Mine Dam in place by about 1895. This dam was reported to be 6 to 8 feet high and located about 3.3 miles above the Harpster Bridge. The dam was in place for a few years with no documentation of fish passage conditions. Lower in the South Fork, near the town of Kooskia was the site of the Kooskia Flower Mill Dam. This dam was in place from 1910 into the 1930s. The dam was estimated to be about 6 feet high. The Washington Water Power Dam was reportedly built in 1911 (Siddall, 1992). This dam was a total barrier to fish migration although a fish ladder was constructed in 1935 but was washed out in 1949. This dam was reported to be 33 or 56 feet high depending on the source. It was removed on August 3, 1963. The existing salmon and steelhead populations are a result of fish stocking, and likely supplemented by straying adults from the Clearwater River.

Current land uses occurring on private lands include livestock grazing, timber harvest, agriculture, residence construction, road construction, sewage treatment, and water withdrawals for domestic use and irrigation. It is estimated that increases in general land uses would occur in the next decade. Additional information on private land activities is found in the South Fork Clearwater River Biological Assessment (USDA-FS, 1999a).

Given all the above information, the South Fork Clearwater River is at high risk for cumulative impacts, especially from additional sediment and increased water temperature. The Eastside Project is designed to improve overall fish habitat by reducing non-point sediment sources and improving instream fish habitat. Sediment increases from road and harvest activities will however, increase sediment in the short-term. In general, the level of activity on federal lands is currently substantially less than in recent decades, and many federal actions contain watershed improvements as part of the project. Proposed mining activities may contribute to the conditions in the subbasin, but mitigation for these projects is expected to reduce some of these impacts. Proposed timber sales on BLM and National Forest lands are subject to similar mitigation and upward trend requirements as the Eastside Project, and although spikes of sediment may occur, in general, stream habitat is expected to improve at least locally.

Actions associated with the Eastside Project area may contribute cumulatively to sediment in the South Fork Clearwater River downstream from the mouth of American River. As discussed in the Watershed Cumulative Effects section, these effects would be short-term only, and improvements in watershed condition over time would contribute to improved conditions in the river.

Cumulative sediment effects to the South Fork Clearwater River from the Eastside Project, American and Crooked River Project, and other projects in the upper subbasin would occur. Sediment produced in American River would be routed downstream into the South Fork Clearwater River. The difference between alternatives (including Alternative A) is relatively inconsequential (less than one percent), when considered in relation to the total sediment yield to the upper South Fork Clearwater River. Currently, routed sediment delivery to upper South Fork cumulative assessment reach is approximately 6% over base. Therefore, measurable cumulative increases in deposited sediment in the upper South Fork Clearwater River are not expected from implementation of any of the action alternatives when coupled to past, present and reasonably foreseeable actions. Short-term sediment yield attributed to the Eastside Project and American and Crooked River project action alternatives is primarily short term increases in sediment yields, while the focus of restoration projects is the reduction of chronic sediment sources (i.e.,

decommissioning of roads, riparian restoration of mined areas) and long-term reduction of erosion sources.

Specific BLM planned restoration actions identified for the South Fork Clearwater River include the *South Fork Clearwater River Restoration Project* (USDI-BLM, 2005Bb). This project includes reduction of sediment, reconnecting a small perennial (non-fish bearing stream), riparian restoration, decommissioning small segments of road and a primitive campsite adjacent to the river, and maintenance of side channel habitats for juvenile rearing habitat. This project is anticipated to take place in the foreseeable future (2007–2008).

Over the long-term, sediment yield is expected to decrease, especially with the implementation of watershed improvement projects, and in the absence of additional disturbance, sediment yields in tributary streams to the upper South Fork Clearwater River would also decrease. Consequently, decreases would occur in the South Fork Clearwater River.

Past, present and future riparian restoration actions will provide long-term improvement to shade conditions for the South Fork and some of its tributaries. These actions should provide a long-term trend to improved temperature conditions.

The South Fork Clearwater River TMDL (see Section 3.4 Watershed) for sediment and water temperature will govern activities on State and private lands as well as Federal lands. Under this guidance, aquatic conditions should continue to improve in the South Fork Clearwater River.

3.6.3.10 Consistency with the Management Framework Plan and Environmental Law

The MFP direction and regulatory framework relevant to fisheries is presented in Section 3.6.1.2 and Table 3.6.1. It includes a description of general guidelines for activities in BLM fisheries/water quality prescription watersheds, a summary of relevant direction from PACFISH (1995), and direction associated with the ESA for listed fish species potentially affected by actions in the American River area. All alternatives are in conformance with the BLM MFP and compliance with environmental law. The project design incorporates measures to minimize effects to ESA listed and BLM sensitive fish.

Upward Trend Of Below Objective Watersheds–All Action Alternatives

In addition to Eastside Project restoration actions, upward trend can also be supported by other ongoing and planned BLM management actions.

The MFP supplement (USDI-BLM, 1985; USDI-BLM, 1989) for fisheries/water quality objectives for prescription watersheds provides direction that timber harvest in subwatersheds that do not meet their fisheries/water quality objectives would occur only where concurrent watershed improvement efforts result in a positive upward trend in habitat condition. Most prescription watersheds in the analysis area were included in this category (see Table 3.6.1).

Direct watershed improvement actions, which range from road obliteration, road decommissioning, riparian restoration, conversion of roads to ATV trails, and non-point sediment stabilization, are included with all action alternatives (Appendix I). Large-scale vegetation treatments, which include timber harvest, are designed in part to reduce fuel accumulations and improve stand condition within the analysis area. The combined vegetation treatments and watershed restoration activities will result in a short-term increase in sediment but a long-term improvement in watershed condition.

Long-term declines in surface sediment yield are displayed in figures and tables included in Section 3.4 (Watershed). These figures and tables display a long-term improvement in baseline sediment yield conditions expected as a result of the action alternatives. The action alternative restoration actions are very similar, with Alternative C offering slightly more improvement versus the least short-term risk, and are followed by Alternatives B and D.

Irreversible or Irretrievable Effects

There are no known irreversible or irretrievable effects associated with fisheries or aquatic resources for any of the alternatives.

3.6.3.11 Conclusions

Existing Condition

Fish habitat in the analysis area is generally in poor to fair condition, with a few streams rated as high-fair to good. Past bucket line dredging of the mainstem American River, Little Elk Creek, and upper South Fork Clearwater River, have left these systems with a reduced carrying capacity for fish. Dredging activity has also impacted the mouth areas and lower reaches of tributary streams to American River. Water temperatures are elevated due to the vegetative canopy that was removed by roads and dredging. Many of the streams in the analysis area are below objectives (see Table 3.6.1). Habitat elements of most concern include high levels of deposited sediment, lack of LWD, low number of high quality pools, high summer stream temperatures, and an overall simplification of habitat leading to reduced carrying capacity.

Road/stream crossings in the project area have culverts that block or impede upstream fish migration. Dredge mining has altered the mouth area and lower reach of several tributary streams, causing fish passage blockages. Dredge mining of some stream bottom areas has altered stream channel morphology and reduced amount of side channels and high flow channels within floodplains.

Migratory steelhead trout, bull trout, spring chinook salmon, and westslope, while located in the project and analysis area streams, are at very low densities and the American River is a designated priority watershed (USDA-FS, 1998a). Resident rainbow/redband trout occur within the American River watershed. Pacific lamprey have been documented in the South Fork Clearwater River, and American River provides potential habitat for the species. Current habitat conditions may be limiting growth, reproduction, and survival of these species in the tributaries as well as in the mainstem rivers.

Non-native brook trout exist in many streams in the analysis area, and may compete with or displace native species as well as hybridize with bull trout.

Environmental Consequences

If Alternative A is implemented, watersheds and some stream reaches would remain in a poor to fair condition and recover slowly over time.

Under the action alternatives, a limited short-term increase in sediment production is expected from vegetation treatments, road construction/reconstruction, temporary road construction, road decommissioning, new road and bridge construction, riparian restoration projects, Queen Creek re-connect channel construction, ford obliteration and restoration, and road to ATV trail conversion projects.

This short-term increase in sediment yield is not at a level where changes in stream substrate (cobble embeddedness) are expected to occur.

Under the action alternatives, vegetation treatments, including timber harvest, may result in lower risk of large, stand-replacing fires. Such fires could adversely affect watershed condition and fish habitat. Short-term increases in sediment yield under the action alternatives are partly due to watershed improvement activities, which are expected to result in long-term improvement in habitat condition.

Equivalent Clearcut Area (ECA), a predictor of changes in water yield, would increase slightly under all action alternatives. This increase is not likely to result in adverse changes in fish habitat.

Of the action alternatives, Alternative C offers the most rapid improvement in watershed condition, with the least short-term risks. Alternative B offers a lesser rate of improvement, and is followed by Alternative D.

Fish in the project area, including steelhead trout, bull trout, spring chinook salmon, Pacific lamprey, redband trout and westslope cutthroat trout, may be adversely affected by potential short-term changes in habitat condition and spike sediment yields. However, these species are also expected to benefit from long-term improvement in habitat condition with reductions of chronic sediment yields, improved riparian habitats and improvements to water temperature, improved active and potential LWD, more accessible habitat, reduced disturbance from vehicle use of fords, and improved channel conditions with recontouring of streambanks.