Aquatic Resources Existing Conditions and Environmental Consequences

Introduction: This section discusses the affected environment and environmental consequences to the aquatic ecosystems. The discussion begins with the regulatory framework and analysis methodology of the hydrology and fisheries resources. This is followed by a description of the alternative components and effects common to all alternatives, and a description of each major watershed and associated environmental effects.

There are eight major watersheds located in the project area including: Fish Creek, Pete King Creek, Canyon Creek, Deadman Creek, Bimerick Creek, Apgar Creek, Glade Creek, and Rye Patch Creek. In addition, there are several undelineated ("face") watersheds that flow directly into the Lochsa River. The existing condition for each watershed is described, including what Forest Plan standards apply. The effects analysis evaluates direct and indirect effects at the subwatershed and cumulative effects for each major watershed. The cumulative effect watershed is the logical culmination point of water flow where the effects of distributed project activities could possibly integrate or synchronize over time and space and be cumulatively addressed in a larger watershed. The cumulative effects analysis includes an analysis of past, present, and reasonably foreseeable activities. Table 3-67 describes the organization of the aquatic analysis.

Table 3-67: Organization of Aquatic Resource Analysis

Subsection	Content
Regulatory Framework	Description of Laws and Regulations regarding Aquatics
Forest Plan Requirements	Description of Forest Plan criteria
Analysis Process	Overview of the Analysis Process
Analysis Tools	Description of the models/assumptions used
Evaluation Criteria	Description of the evaluation criteria
General Characterization of Watersheds	Describes general characterizations of watersheds affected
Alternative Components	Description of components of the alternatives and how they are incorporated into the models/effects analysis
Effects Common to All Action Alternatives	Describes the effects of road obliteration/long-term storage, sediment trap removal, riparian planting, road construction/reconstruction and noxious weed treatments on aquatic ecosystems
Affected Environment and Effects om Major Watershed/Subwatershed	Description of the local effects by subwatershed and cumulative effects by major watershed
Effects to the Lochsa Subbasin	Description of the cumulative effects to the Lochsa River
Consistency with the Forest Plan and Regulations	Description of the consistency with the Forest Plan, Clean Water Act, Endangered Species Act

Regulatory Framework

The Clean Water Act (CWA) establishes Federal water quality policies. Both the Environmental Protection Agency (EPA) and individual states have responsibility for implementing the CWA. States are required to designate the beneficial uses of each stream and determine the criteria sufficient to protect these uses. Beneficial uses can be consumptive or non-consumptive.

Beneficial uses for the Lochsa River are domestic and agricultural water supply, cold water biota; salmonids spawning, primary and secondary contact recreation and special resource water recognized as needed intensive protection to preserve outstanding or unique characteristics, or to maintain current beneficial uses (IDAPA 16.01.2120.01).

Water Quality Limited Segments (WQLS) are streams where the State of Idaho has identified water quality concerns. The Final EIS noted that the State of Idaho had listed several streams as being water quality limited (WQLS) due to sediment (see Table 3-68). The State completed a Beneficial Use Reconnaissance report (1998), and recommended removing these streams from the WQLS list because they **determined that water quality in these streams provided full support for its beneficial uses** (emphasis added).

The State also noted that the streams supported their designated uses, despite elevated temperatures. The State determined that the streams that exceeded State temperature standards are natural occurrences (Beneficial Use Reconnaissance Report, 1998, p. 29). In May 2000, Department of Environmental Quality (DEQ) requested that the Environmental Protection Agency (EPA) approve removing the streams due to sediment, and proposed to add several streams (see table below) with temperature as the pollutant of concern. Based on DEQ's proposal, these streams will be considered as water quality limited segments. The Lochsa River is also listed a WQLS, with temperature as the pollutant of concern.

Table 3-68: Water Quality Listed Streams within the North Lochsa Face Analysis Area

Stream	1996 List	Reason	1998/2000 List	Reason
Lochsa River	X	Temperature	X	Temperature
Canyon Creek (upper)	X	Sediment and Temperature	X	Temperature
Canyon Creek (lower)	X	Sediment	X	Temperature
South Fork Canyon	X	Sediment	X	Temperature
Deadman	X	Sediment		
WF Deadman	X	Sediment	X	Temperature
Glade Creek	X	Sediment	X	Temperature
Nut Creek	X	Sediment	X	Temperature
Pete King	X	Sediment		
WF Pete King	X	Sediment	X	Temperature
Walde	X	Sediment	X	Temperature
Fish			X	Temperature

Endangered Species Act: Several streams include threatened or sensitive fish species.

Fish Creek has an excellent steelhead trout population and a few spring chinook salmon may be present. Pete King, Canyon, and Deadman all have moderate steelhead populations. Spring chinook salmon have been documented in Pete King and have occasionally been observed in Deadman, which may provide some refugia. Cutthroat trout are present in all the drainages. Some brook trout and rainbow are present in Bimerick. Current conditions of threatened, endangered, and sensitive fish species and their occurrence with the North Lochsa Face area are displayed in the following table:

Table 3-69: Occurrence of Threatened, Endangered, and Sensitive Fish Species

Species	Occurrence	Comments
Bull Trout (T)[1]	Known	Historically, bull trout routinely used the lower Lochsa River in the winter and early spring and ascended the river as temperatures rose. Current data indicates that bull trout populations are present and considered depressed in most of the tributaries of the upper Lochsa River.
Fall Chinook Salmon (T)	Not Likely	The majority of the fall chinook salmon spawning documented over the last five years has occurred within the designated critical habitat reaches of the Clearwater River, mostly downstream of the North Fork Clearwater River. Current data suggests that fall chinook salmon may have a historic distribution only up to the mouth of the Lochsa River.
Steelhead Trout (T)	Known	Wild steelhead runs have declined over the last several decades to very low numbers. Steelhead migrate up the Lochsa River each spring to spawn in many of its tributaries, including Pete King, Canyon, Deadman, and Fish Creeks. It is the Forest Plan indicator species for these streams, with Fish Creek containing some of the highest densities in the State.
Spring Chinook Salmon (S)	Known	Within the Lochsa River drainage, a majority of spring chinook production (natural and hatchery stock) occurs upstream of the analysis area. Surveys within the upper Lochsa River show a decline in natural spring chinook production over the last 20 years. In recent years, some natural spring chinook production may have occurred in Fish Creek and Pete King Creek.
Westslope Cutthroat Trout (S)	Known	Cutthroat trout can be found in almost all fish-bearing streams in the North Lochsa Face area. It is the Forest Plan indicator species for Bimerick, Apgar, Glade, and Rye Patch Creeks.

Forest Plan Requirements

The Clearwater Forest Plan includes Forest-wide standards for water (Clearwater Forest Plan, pp II-27-II-29, and Appendix K). The Forest Plan requires projects to

[1] (T) = Threatened; (S) = Sensitive

- Manage water quality and stream conditions to assure that National Forest management activities do not cause permanent or long-term damage to existing or specified beneficial uses.
- Apply best management practices (BMP) to project activities to ensure water quality standards are met or are exceeded.
- Manage all waters in the Forest under a basic standard. Streams that do not support fish populations, and do not have a specific standard listed in the Forest Plan must meet the "Basic" standard, which means that the stream "…must continue to maintain the stability, equilibrium, and function (physical and biologic) of a tributary stream as it relates to the beneficial uses of local, downstream, and parent stream…" Typically, the Geomorphic Threshold (defined below) of a watershed is used to determine if a stream meets the "Basic" Standard.
- Manage **Fish Creek** as a "no effect" stream at a minimum of 100 percent of biological potential. The no effect standard allows for 45 percent sediment production over natural. No effect means "no sustained, measurable adverse changes over time due to management-caused effects on turbidity, temperature, substrate composition, and chemical quality; or physical loss or degradation of existing fish habitat potential.
- Manage **Pete King, Canyon, Deadman, Bimerick, Apgar, Glade, and Rye Patch Creeks** as "high fishable" streams, at a minimum of 80 percent biological potential. High fishable means "Maximum short-term reduction of water quality that is still likely to maintain a fish habitat potential that can support an excellent fishery relative to the stream system's natural potential, and that will provide the capability for essentially full habitat recovery over time.

Forest Plan Stipulation Agreement*:* Litigation on the Clearwater Forest Plan resulted in a Stipulation Agreement (Project File, Doc 732) that discusses what type of activities the Forest could proceed with and under what conditions. The Agreement states "The Forest Service agrees to proceed only with those projects that would result in no measurable increase in sediment production in drainages currently not meeting Forest Plan standards." (Only those watersheds that do not meet sediment and/or cobble embeddedness, which is a measurement of sediment, would trigger this portion of the Stipulation Agreement).

Each watershed is evaluated to determine if it meets Forest Plan standards for sediment and/or cobble embeddedness. The determination of Forest Plan consistency is based on the sediment or cobble embeddedness measured at the mouth of the stream, or where the stream leaves the forest boundary (Project File, Doc 733). If the standards are not met, then each project is evaluated to determine if it results in "no measurable increase". No measurable increase means the activity cannot produce measurable quantities (using techniques such as cobble embeddedness, Riffle Armor Stability Index, and pool riffle ratios) of sediment, or that an equivalent or greater amount of sediment would be mitigated through restoration activities in the watershed, such as proposed road obliteration or other sediment-source mitigation/restoration activities.

In this project, however, the intent is for the vegetative treatments to meet the appropriate standards/criteria on their own merit, without using the road obliteration/long-term maintenance as mitigation.

Desired Conditions: In 1992 the Forest prepared a report (Espinosa, 1992) to identify desired future conditions (DFC) (or desired conditions) for the above standards. This report identifies desirable attributes for different stream types and fish species (no effect, high fishable, moderate fishable, etc.). Where these conditions currently are not met, then projects should not further impair beneficial uses. Of all the DFC's, cobble embeddedness is the only one that stands alone, i.e., if it exceeds the DFC then the stream is considered to be out of compliance with the Forest Plan sediment standards, and is held to the "no measurable increase" language of the 1993 Settlement. The water temperature DFC is equally important, and any activities near streams not meeting temperature standards can cause no further increases in that parameter.

> **No measurable increase** means the activity cannot produce measurable quantities (using techniques such as cobble embeddedness, Riffle Armor Stability Index, and pool riffle ratios) of sediment, or that an equivalent or greater amount of sediment would be mitigated through restoration activities in the watershed, such as proposed road obliteration or other sediment-source mitigation/restoration activities.

PACFISH: On February 25, 1995, the Forest Service and Bureau of Land Management issued a decision for managing anadromous fish-producing watersheds on federal lands (USDA Forest Service, 1995). This decision amended the Clearwater Forest Plan. The direction provided in PACFISH:

- Identifies and defines habitat conservation areas (RHCAs)
- Establishes riparian management goals and objectives (RMOs)
- Establishes standards and guidelines to meet the RMOs.

The default standards in PACFISH, including streamside buffers have been applied to this project.

Analysis Process

To assess potential effects from all proposed activities, the following tools were utilized:

- Channel Type Data
- Sediment Reduction Effects of PACFISH Buffers
- Landslide Risk Screen

- WATBAL Sediment Model
- WEPP Erosion Model
- Interpretation of the models based on past experience, research, knowledge of models

These tools were used to evaluate (evaluation criteria):

- Percent increase in sediment yield
- Percent increase in equivalent clearcut acres
- Peak flow increases
- Duration of peak flow
- Geomorphic threshold

Information from these tools was used to determine consistency with the Clearwater Forest Plan and the Stipulation Agreement. In addition, the effects on channel morphology (structure and function), and the effects on fish habitat were also evaluated.

There are eight major watersheds within North Lochsa Face, plus the "Face" drainages that are not defined drainages but drain directly into the Lochsa River. The effects analysis evaluates the effects of the alternatives at three levels:

- Subwatersheds within the major watersheds
- The 8 major watersheds and Face drainages
- The Lochsa Subbasin

The analysis is designed to provide an understanding of the effects at the local level (subwatershed) as well as the cumulative effects at the watershed and Subbasin scale.

Analysis Tools

Channel type data: Methods used to assess channel conditions included the Rosgen channel type classification (Rosgen, 1996). Reconnaissance surveys collected information on stream gradient, channel type, cobble embeddedness, evidence of mass wasting, riparian vegetative condition, acting woody debris, depth and length of bank cutting, recent depositional areas, substrate size and mobility, and effects of culverts and adjacent roads on the stream channel. This information was used to determine existing fish habitat conditions, as well as, overall stream conditions. Surveys on cobble embeddedness were used to evaluate whether or not streams met the Clearwater desired conditions for cobble embeddedness (addition stream survey information is available in the North Lochsa Face SEIS Project File).

Sediment Reduction of PACFISH buffers: Many studies have documented the effectiveness of buffers in arresting sediment resulting from logging. A review of studies

in Idaho (Haupt 1959a, 1959b; Ketcheson and Megehan 1990; Burroughs and King 1985, 1989) and elsewhere (Packer 1967; Swift 1986) conducted by Belt et al. (1990) concluded that movement of sediment overland (non-channelized) rarely traveled more than 300 feet, the buffer width identified in PACFISH for Class I fish bearing streams. In addition, PACFISH RHCAs minimize any change in water temperatures by preserving overhead riparian canopies. These studies were reviewed and were their findings were determined to be applicable to this project area. Monitoring of Best Management Practices (BMPs), which includes a review of the effectiveness of PACFISH buffers, has found that the PACFISH buffers have been effective in eliminating overland sediment from reaching the stream (USDA Forest Service, 1997, 1998, 1999a, 2000a, 2000b). Most of the landforms in this project area are the same as landforms where BMPs have been monitored in the past; therefore the findings from BMP monitoring are applicable to this site.

Landslide Risk Screen: The report *Assessment of the 1995 & 1996 Floods and Landslides on the Clearwater National Forest* (McClelland, et al 1997) identified the several geomorphic parameters that could be used to assess the inherent risk of failure of new road construction (permanent and temporary). Road locations were evaluated against each of these parameters to determine the risk of causing landslides from road construction (see discussion on road construction later in this section for more detail).

WATBAL: The WATBAL model is an analysis tool that estimates typical watershed response relationships as a result of forest practices. The estimated responses are combined with other sources of information and analysis to determine the findings of probable effects. (see North Lochsa Face Project File, WATAL Technical Users Manual, for additional information on WATBAL).

Most of the proposed road construction/reconstruction and vegetative treatments were modeled in WATBAL. However, WATBAL **is not capable of evaluating** the overall benefits reaped from:

1) The obliteration of old roads;

2) The obliteration of temporary roads constructed specifically for this project; and

3) The removal of sediment traps from Walde and Pete King Creeks.

The WATBAL results are based on the vegetative treatments and road construction associated with each alternative.

It does not include beneficial effects from the obliteration of old roads, obliteration of temporary roads constructed or the removal of sediment traps.

WATBAL results in conservative estimates because:

- It evaluates gross acres treated, and does not include untreated acres within PACFISH buffers.
- It assumes temporary road construction remains on the landscape.

In addition, the WATBAL analysis for this project assumed that all temporary road construction would remain on the landscape,

even though temporary roads are constructed and obliterated within the same year. This analysis also assumed that every acre would be harvested, although 20 to 30 percent would not be harvested because they are within PACFISH buffers. Therefore, the information generated by WATBAL is very conservative.

WATBAL also does not consider the spatial context of any proposed activity. It does not really "know" where an activity is occurring in relation to the actual delivery distances required for sediment to reach live water. Although WATBAL may predict delivery of "x" units of sediment to a stream, that particular activity may be 1,000 or more feet from water; therefore, that unit of sediment may be produced, but not necessarily delivered. These circumstances are discussed site specifically below. All of the activities were modeled in accordance with the proposed years of implementation, with the first activity scheduled for 2002.

Because the WATBAL model figures largely in the determination of whether the alternatives are consistent with the Forest Plan, the following criteria were adhered to:

- Watersheds within the optimum size range for the model (4-40 mi^2) consider a **4 percent** increase in sediment output to be **essentially immeasurable.**
- Watersheds less than the above stated size range consider a **6 percent increase** in sediment to be **essentially zero and not measurable** using standard methodologies (Simon 2000, Patten 2000).

> It is important to understand the difference between "baseline" and "existing" conditions. The **baseline** or natural sediment production for a watershed is that sediment resulting only from **natural processes** in the watershed. The WATBAL-derived predictions represent a percentage increase above baseline (natural) condition. The Forest Plan Standards that refer to an allowable increase in sediment refer to a rise above that baseline condition. The "**existing condition**" represents the current state of the watershed expressed as the **percent sediment <u>above</u> the baseline condition**. The Stipulation Agreement refers to "**no measurable increase" in sediment above this existing condition**—which may currently be greater than the baseline sediment production.

This margin of error is compatible with the plus or minus five percent error described in the DFC Fisheries Model developed by Espinosa, 1992. The DFC model is used in concert with WATBAL to help make determinations of compliance, and that process is facilitated by the use of two models that are comparable in their margin of error.

Water Erosion Prediction Project (WEPP) model: Was used to evaluate the effects on the Face drainages because these drainages have not been delineated as separate watersheds. This model is designed to predict runoff and sediment yield resulting from various forest management activities. It predicts the probability of sediment delivery, the probability of erosion, and the probability of runoff. The model also predicts delivered sediment in tons per acre based on a 30-year (or greater) return period. User-input variables include: climate, soil, texture, local topography, plant community, and surface residue cover

WEPP also permits the user to input buffer strip parameters such as slope, and width, and can model riparian vegetation loss and its effect on sediment filtration (as may occur during prescribed burns). Please see the project file for technical documentation of the model.

> The units analyzed with WATBAL and WEPP represent ***gross*** acres, i.e., PACFISH buffers were not subtracted. This means that the modeled acres are at least 20 to 30 percent greater than the actual unit size. Consequently, although all the alternatives for all watersheds meet their respective criteria, actual sediment production would be lower than the model results displayed in the effects discussion.

Interpretation of models: Models, such as WATBAL and WEPP, are designed to address and integrate a vast and complex number of conditions and organize the evaluation according to established rule sets. In the case of WATBAL, the rule sets were based on research, data and analysis collected locally. The models, however, also include simplifying assumptions, and do not include all possible controlling factors. Therefore, the use of models is to provide one set of information to the technical user, who, along with knowledge of the model and its limitations, other models, data, analyses, experience, and judgment integrates all those sources to make appropriate findings and conclusions.

Evaluation Criteria

Percent Increase in Sediment: Is the estimated annual sediment loading for the watershed and is reported as the percent change above the estimated natural sediment yield (baseline) for the watershed. The percent can be compared to the existing condition, which is the existing percent above baseline. Sediment yield percent is calculated for each alternative using the WATBAL model. The estimated annual sediment for a watershed or watershed area was derived from methods documented in the R1/R4 Sediment Guides and the WATBAL Technical Users Guide. The annual sediment load values are reported as tons per year per square mile of drainage area. The current (existing condition) sediment load is a three-year mean expressed as percent over baseline or "natural" sediment conditions. It is based on the natural sediment rates for the landtypes and

> In this project, timber harvest and prescribed burning were evaluated separately to ensure that by themselves they meet the specific criteria. Road obliteration and sediment trap removal **are not** used to "off-set" the effects of timber harvest and prescribed burning.

precipitation/streamflow characteristics in the watershed, as well as the disturbed or altered sediment rates as influenced by wildfire, prescribed fire, road building, and harvest. The proposed timber harvest, prescribed burning, construction and reconstruction of roads, and site preparation treatments are included in the analysis. The model was run for the period 2001 to 2006. **The percent increase in sediment does not estimate the reduction in sediment from watershed restoration projects.**

Equivalent clearcut acres (ECA): Is an attempt to quantify the effective size of a harvest or burn unit. Initially the ECA for a unit is related to the established crown cover before the practice, and the magnitude of the practice itself. For example, a 100-acre unit that had an initial cover of 50 percent, and 50 percent of the crowns were removed, would have an initial ECA of 25 acres. The ECAs for a given unit decrease through time as hydrologic recovery progresses. Increases in ECAs should not be viewed as static, but need to be interpreted in the context of changes in water yield and sediment delivery increases.

Peak flow: is also used to indicate possible adverse changes in sediment dynamics in a basin. As ECAs increase, there can be a concomitant increase in peak flows and in-channel erosion. Peak flows increase due to the removal of water-using vegetation (trees), increases in snowpack in new openings, and an earlier runoff due to increased solar energy.

> Peak flow increases in the range of **15-20 percent** are considered a "*red flag*" that indicate there may be decreased channel stability due to sustained increased energy in the stream.

Duration of Peak Flow (T_{peak}): is used in the narrative to characterize changes in flow regime related to management proposals. T_{peak} is the percentage of days that discharge is expected to exceed 75 percent of the peak flow. This is referred to as the "channel impact period", or the time during which streamflow may accelerate channel erosion.

> Typically, T_{peak} should not exceed **20 percent**.

Geomorphic Threshold: Represents the point at which a stream is no longer able to process excess sediment and/or flow without major adjustments in its form. Stable stream systems are considered to be in dynamic equilibrium, and capable of accommodating constant changes over time. Unstable streams are out of dynamic equilibrium because they can no longer accommodate those changes.

> The threshold is expressed as a **percent increase in sediment above baseline conditions**. Usually, the higher the geomorphic threshold, the more stable the stream system.

Changes from Final EIS

The WATBAL-derived sediment values are not the same as those displayed previously in the Final EIS. This is due to:

Change in mitigation values: Since completion of the Final EIS, the Forest Ecologist/Soil Scientist, the Forest Hydrologist and Biological Technicians, with expert knowledge of the WATBAL model have reviewed these values and have developed a standardized method for assigning these values (Schoen 2000). The values are LTA-specific and are keyed to specific harvest systems and percent canopy removal. The values applied to activities modeled for the Supplemental EIS is generally lower than that used previously. WATBAL was rerun for the entire project (all alternatives) using these new values.

Change in unit acres: Many of the unit acres changed since the Final EIS (see Chapter 2 discussion). This change in acres changed the results in the WATBAL model.

Addition of Underburn Units: The watershed analysis in the Final EIS did not include up to 7,000 acres of underburn in Alternatives 2, 3, 3a, 5 and 6, and 700 acres in Alternative Four. Those acres have been included in this analysis.

Change in Existing Condition: In the Final EIS, the sediment values representing the existing condition were based on the state of the watersheds in 1999, with the first activities proposed for year 2000 (FEIS pages 100, 103,105, 107, 109, 110). In the Supplemental EIS the sediment values representing the existing condition are based on the state of the watersheds in 2001, with the first activities planned to occur in 2002. Because there has been two years of recovery, the existing conditions show commensurately lower sediment production. The change in existing condition varies by watershed, but ranges from 0-8 percent.

Change in Display of Sediment Values: In the Final EIS, sediment values derived from WATBAL were displayed as the "Maximum Change From Existing Condition 1999 (FEIS pages 100, 103, 105 107, 109, 110). The values in the tables were shown as an increase (+) or decrease (-) from the existing condition. In the Supplemental EIS sediment predictions are displayed as the percent increase in sediment above baseline condition. The existing condition for year 2001 is also displayed.

Watershed General Characterization

Table 3-70 displays general information for each major watershed within North Lochsa Face. This table is followed by specific discussion for each watershed. Appendix A includes a map showing locations of the watersheds used in this analysis.

Table 3-70: General Characteristics of Watersheds in the North Lochsa Face Analysis Area

Variables	Fish	Pete King	Canyon	Deadman	Bimerick	Apgar	Glade	Rye Patch
Subwatersheds*	Alder Frenhman Willow Horn Hungery Bowl Doubt Gass Greensaddle Obia	Walde Placer Polar Nut	Mystery					
Watershed Acres	55,680	17,500	12,275	12,642	9,549	1,037	3,119	1,449
Channel Types**	A 9% B 55% C 36%	A 65% B 35%	A 64% B 31% C 5%	A 87% B 13%	A 100%	A 100%	A 57% B 8% C 35%	A 100%
Acres of Disturbance	900 (2%)	7,400 (42%)	7,600 (62%)	2,400 (19%)	0	150 (14%)	1,100 (35%)	300 (19%)
Current Road *** Density (mi/mi^2)	.5	5	5	2	.5	1	5	1
WQLS	Temp	None	Temp	None	Temp	Temp	Temp	Temp
Forest Plan Direction	No effect	High Fishable	High Fishable	High Fishable	High Fishable	High Fishable	High Fishable	High Fishable

* Subwatersheds include the smaller watersheds that flow into the major drainage. For analysis purposes, some watersheds such as Canyon and Deadman were further split up to evaluate more local effects (see discussion for each watershed).

** The type A channel is defined as a relatively straight and steep reach (typically 4 percent or greater gradient) that is structurally controlled with frequent low falls or cascades. This is a "high energy" segment. The type B channel is defined as having a moderate gradient that may be incised into depositional material to some degree. This type of reach is moderately confined by the adjacent slopes, but some degree of meandering may have developed. The type C channel is defined as having a low gradient that is rarely confined by the adjacent slopes with a high degree of meandering.

Current road density numbers are approximates and have been rounded.

Acres of disturbance are approximate and have been rounded to the nearest 1000.

Alternative Components

Timber Harvest: To minimize the risk of surface erosion and mass movement within harvest units, the following canopy retention and buffering guidelines apply to all proposed stands in the analysis area.

- At least 50 percent canopy retention on breakland landtypes
- At least 35 percent canopy retention on colluvial midslopes.
- At least 25 percent canopy retention on old surfaces. The exception is the Bimerick off-site pine conversion. Some of these units may have less than 25 percent canopy retention.
- Implementation of default (no cut) PACFISH riparian buffers in all harvest units.

In addition, because these are priority watersheds, active or recent landslide areas would receive a 100' buffer, as would small wetlands and seeps. The guidelines discussed above should prevent overland flow of non-channelized sediment, and the risk of debris

torrent would be minimized through substantial overstory retention (see SEIS, Erosional Processes Section).

Best Management Practices (BMPs): Would be implemented for all action alternatives, as required by the Idaho Forest Practices Act. Site specific BMPs are described in Appendix B. Idaho water quality standards regulate nonpoint source pollution from timber management and road construction activities through the application of BMPs. The BMPs were developed under the authority of the Clean Water Act to ensure that Idaho waters do not contain pollutants in concentrations that adversely affect water quality or impair a designated use.

The BMPs utilized for the North Lochsa Face project are designed to protect beneficial uses by avoidance and minimizing effects. BMPs utilized on past projects were reviewed to determine if they were successful in meeting resource objectives and if they were applicable to the site and conditions with the project area. Most of the landforms in this project area are similar to other areas on the Clearwater and Nez Perce National Forests, therefore a review of BMP implementation and effectiveness utilized on these forests provides a relative understanding of the likelihood of success or effectiveness on this project.

Most of the landforms in this project area are similar to other areas on the Clearwater and Nez Perce National Forests, therefore a review of BMP implementation and effectiveness utilized on these forests provides a relative understanding of the likelihood of success or effectiveness on this project.

The Clearwater National Forest has an excellent record of successful implementation of BMPs. In 2000, the Forest had a 99.1 percent rate of BMP implementation and a 99.1 percent rate of effectiveness (Jones 2000). Similar results have been obtained on the Nez Perce National Forest where audits of the Idaho Forest Practices Act go back to 1988. Their implementation rates have averaged between 95 and 100 percent for these years (Gerhardt 2000).

Idaho Department of Environmental Quality (DEQ) has also conducted audits of the Forest Practices Act (FPA) statewide. In their 1996 FPA Audit, DEQ concluded that "the rates of forest practices rule implementation increased across all land ownership categories when the 1996 rate was compared to the 1988 and 1992 rates… When averaged statewide, the rate of rule implementation increased from 93 percent to 97 percent." Similar results were obtained for BMP effectiveness. "We found that, when properly applied and maintained, the management practices described in the Idaho forest practices rules are effective 99 percent of the time." (Idaho Division of Environmental Quality 1997). DEQ completed its 2000 audit of the Forest Practices Act this summer. Five of the timber sales audited were located on the Clearwater National Forest. Preliminary findings indicated similar implementation results, however, data has not been sufficiently analyzed to determine effectiveness rates (Hoeschler 2000, Jones & Mital 2001 *Erosional Processes and Management Practices on the Clearwater National Forest*).

The Forest is currently in the process of analyzing management practices as they relate to erosion processes on the Forest, and would soon be stratifying BMP audit data by landtype, management activity, and buffer width.

PACFISH: Riparian Habitat Conservation Areas (RHCAs) would be implemented in the project area. Road construction guidelines stipulated in PACFISH would keep sediment production from road surfaces to a minimum and reduce the risk of road failure. Riparian vegetation and woody debris would be left intact to catch and retain overland sediment before it can reach streams. Many studies have documented the effectiveness of buffers in arresting sediment resulting from logging. A review of studies in Idaho (Haupt 1959a, 1959b; Ketcheson and Megehan 1990; Burroughs and King 1985, 1989) and elsewhere (Packer 1967; Swift 1986) conducted by Belt et al. (1990) concluded that movement of sediment overland (non-channelized) rarely traveled more than 300 feet, the buffer width identified in PACFISH for Class I fish bearing streams. In addition, PACFISH RHCAs would minimize any change in water temperatures by preserving overhead riparian canopies.

Contamination from Petroleum Products: Transportation of small to moderate volumes of petroleum products to support road construction or other land management activities would occur under all of the action alternatives. To minimize the risk of an accidental spill, as well as to protect watercourses and aquatic biota from adverse effects in the event of a spill, site specific BMPs and the Fuel, Transport, and Containment Plan developed under Section 7 consultation with the NMFS would be applied throughout project implementation. In addition, service landings for helicopter fueling and maintenance would require an approved spill plan. Absorbent materials, spill kits, and diking around fuel storage areas would be required at the landing site to contain spilled fuel. The Forest Service would inspect all landings for compliance prior to helicopter activities proceeding (see Design Criteria, Chapter 2).

Temporary Roads: All of the proposed temporary roads were modeled using WATBAL. They were considered ridge roads, which means that they do not cross water, and are on the upper third of the slope. Although these roads would be obliterated after use, there is no way to model obliteration in WATBAL. Therefore, the output continues to show sediment production as if the roads still existed on the ground. The temporary roads were included in the modeling, because it was important to show sediment produced (if any) by their construction, even though it would cause the model to show more sediment than actually may be generated in subsequent years.

> It is very remote that sediment would reach the creeks from temporary roads because of the distance from the road to the streams, and no stream crossings. However, they were included in the WATBAL model. The model also assumes that they remain on the landscape, although they would be obliterated.

Staggered Implementation: To keep sediment delivery within allowable limits, and to allow hydrologic recovery between entries, staggered implementation has been

incorporated into the project design (Chapter 2, Design Criteria). Table 3-71 also summarizes that information.

Table 3-71: Staggered Implementation Schedule by Watershed

Watershed	Unit Numbers	Alternatives	Implementation
Hungery:			
Gass	MSB 2,8	2,3,5,6	Burn #2 wait at least 3 yrs. Burn #8
Obia	MSB #1	2,3,5,6	Split in half and burn w/at least 2 yrs between entries
Greensaddle	MSB #t 3	2,3,5,6	Split in half and burn w/ at least 3 yrs. between entries
Bowl	MSB #4	2,3,5,6	Split in 1/4s and burn w/ at least 2 yrs between entries.
Doubt	MSB 5 &6 UB 126,127,128	2,3,5,6	Burn 5,6. Burn UB 126-128 at least 2 yrs. later
Fish			
Fish "C" Reaches	MSB 18,19 UB 152,153,155,157	2,3,5,6	Burn UB and MSB at least 4 yrs apart. Monitor 1st burn and if no sediment can drop delay
Alder	UB 15, 91,158,160,161,177,178 UB 15, 91,160,161,178	2,3,5,6 3a	Split in half w/ at least 3 yrs between entries Burn #15 wait at least 3 yrs and burn others
Pete King			
Nut	UB 241,242,248 Harvest 44,75,76,80,180,232,260	2,3,3a,4,5,6	Separate harvest and UB by at least 3 yrs.
	UB 241,242,248 Harvest 44,75,76,80,232	3	Separate harvest and UB by at least 3 yrs.
Placer	UB 235,236,239,240 Harvest 93,110,111,112,251,296	2,3,3a,4,5	Separate harvest and UB by at least 2 yrs.
	UB 235,236,239,240 Harvest 110,111,112,93	6	Separate harvest and UB by at least 2 yrs.
Canyon			
SF Canyon	Harvest 41,42,70-72,74,75,243,253,254	2,3,3a	100 acres-- harvest 2002 Balance--harvest at least 2 yrs later.
	Harvest 41,70-72,74,75,243,253,254	4,5	100 acres-- harvest 2002 Balance--harvest at least 2 yrs later.
Upper Canyon	Harvest 25,26,28,29,30,49,59,60,119	2,3,3a,4,5	Implement all units after 3 yrs. Beyond 2002

Units/Alts/Watersheds Not Listed Have No Restrictions

Effects Common to All Action Alternatives

Effects from Road Obliteration: Except for Fish/Hungery creeks, the major drainages are all above desired conditions for sediment. As noted in the existing condition a significant number of landslides occurred in 1995-1996. Many of these landslides were road related. Obliteration would occur on roads that are at high risk of landslide or debris torrent, close to fish bearing streams and are chronic sediment sources. Appendix D lists the criteria used for each road. Based on this screening, all alternatives would obliterate approximately 66 miles of road, and place into long-term maintenance an additional 54 miles of road. Long-term maintenance are roads that are closed to motorized traffic and are placed in a condition to assure they are self-maintaining, with stable drainage.

Table 3-72: Miles of Road Obliteration and Long-Term Maintenance Roads

Major Watershed	Miles of Road Obliteration	Miles of Long-Term Maintenance
Pete King	40	25
Canyon/Deadman	17	16
Fish	3	5
“Face” Areas	6	8
Total	**66**	**54**

Road obliteration and long-term maintenance may produce some short-term sediment delivery to headwater streams when stream crossings are removed, and during spring runoff. Minor amounts of sediment delivery to headwater streams, mostly in the form of suspended sediment is expected based on past monitoring of obliteration on the West Fork of Squaw Creek and from road obliteration monitoring on the Nez Perce National Forest. Monitoring of the West Fork of Squaw Creek (Jones 1998) showed a delivery of 0.2 cubic yards of sediment over a 13-day period when an adjacent road was being removed. A road obliterated on the Nez Perce National Forest, at Relief Creek on the Elk City Ranger District, resulted in no sediment delivered to the stream (Gerhardt 1993).

The timing of sediment delivery greatly favors the controlled removal of an old road vs. the uncontrolled failure of that same section of road. When roads are obliterated, the work is typically done during low flow periods, with specific cut-off dates based on salmonids use of the stream. When a road fails, it does so almost exclusively during high flow periods when stream energy and erosive force is at its height, and when potential damage to aquatic systems would be greatest.

Road obliteration would improve aquatic habitats by removing potential sediment sources in and around riparian areas, particularly at stream crossings. It also aids in the reestablishment of trees and soil stability where the road use to exist. The impacts to fish and their habitat would be far less than the sediment delivered by road-related landslides (if the roads were not obliterated). In addition, the Idaho Division of Environmental Quality recommended that management agencies continue to apply resources to reduce legacy (road related) impacts (Lochsa River Subbasin Assessment, 1999).

> Road obliteration would result in a short-term increase in suspended sediment and long-term decrease in sediment. The sediment resulting from road obliteration would be less than leaving the roads on the landscape. It would hasten recovery of aquatic conditions by removing chronic sediment sources and roads at high risk of landslides.

Effects from Sediment Trap Removal: Two sediment traps in Walde Creek and two traps in Pete King Creek, which were installed in the 1980s would be removed. The purpose of these traps was to trap bedload sediment (primarily sand) coursing through the streams. The removal would occur between July 15 and August 15 to avoid critical times for fish. BMPs would be applied to minimize sedimentation (see Chapter 2, Design Criteria).

Implementation during the one-month mid-summer work window would minimize turbidity and siltation below the sites (due to low flows) and avoid the effects on spawning steelhead or incubating steelhead eggs. Short-term instream sediment increases would occur during sediment trap removal and channel reconstruction. Observed increases would be a result of existing sediment disturbance and removal. Increases would not be expected to last more than a few days after project completion. Additional short-term increases may be observed the following spring during high flows as instream sediments readjust to the new channel configuration. Sediment removed from the traps would be placed in stable riparian locations away from the stream and revegetated to prevent surface erosion. In the long-term the sites would stabilize and provide improved aquatic conditions.

Effects of Riparian Area Planting: Approximately 450 acres in a six-mile strip along Fish Creek would be interplanted with cottonwoods. A similar 150-acre strip along 2 miles of Pete King would be planted with conifers and deciduous trees. Hand planting would not result in any sediment into the streams as a very limited area is disturbed for tree placement. Planting quick growing hardwoods would provide shade and nutrients to the streams over the short term. Planting conifers would provide large instream wood and shade over the long term. Water temperatures would be reduced as a result of shading. Both aquatic and riparian species and habitats would benefit.

Effects from road construction (Alternatives 2, 3a, 4, 5 and 6): Each proposed road was evaluated to determine the risk of road failure caused by landslides. The report *Assessment of the 1995 & 1996 Floods and Landslides on the Clearwater National Forest* (McClelland, et al 1997) identified the following geomorphic parameters that

could be used to assess the inherent risk of failure of new road construction (permanent and temporary):

1) **Geologic Parent Material -** The report tabulated landslide frequency by geologic parent material. In decreasing order of occurrence per thousand acres they were: Border, Batholith, Belt, Alluvium, and Basalt. All of the proposed road construction is in either Border or Batholith geology

2) **Landform -** The greatest landslide rate by landform occurred on mass wasted slopes (1.72/1,000 acres), followed by breaklands, at a rate of 1.12/1,000 acres. There are two segments of road; 0.6 miles of new construction, and 0.1 miles of temporary construction proposed on dissected breaklands. The balance is on low to moderate relief rolling uplands and mountain slopelands.

3) **Aspect -** The report stratified failures by prevailing aspect. They found that landslides/1,000 acres were greatest on south aspects, followed by southwest, and westerly. The roads proposed in this project are found on all aspects except north. A 0.3-mile segment of Temporary Road #9, and a 0.4-mile segment of new specified road construction are on south aspects.

4) **Elevation -** It was found that the highest rate of landslides (1.66/1000 acres) occurred between 3,001-3,500 feet of elevation. The proposed road construction in North Lochsa Face falls into three elevation zones:

   - 3,500-4,000 feet range ranked fourth in the Landslide Report with a frequency of 1.10 slides/thousand acres.
   - 4,001-4,500 feet range ranked sixth with a frequency of 0.85 slides/thousand acres.
   - 4,501-5,000 feet range ranked seventh with a frequency of 0.50 slides/thousand feet.

5) **Sideslope -** The flood assessment found the highest rate of landslides occurred on slopes in excess of 56 percent. All road construction in North Lochsa Face is on slopes ranging from 15-40 percent.

Table 3-73 describes the road segments by watershed and landslide indicator.

Table 3-73: Landslide Indicators - Temporary Roads

Watershed	Segment Length (miles)	Geology	Landform	Aspect	Elevation	Slope %
Risk Factors		Border Baltholith	Mass wasted, breaklands	S, SW, W	3,000-5000	>56%
Face						
Permanent #1	0.4	Batholith	Low Relief Rolling Hills	S	4150	25
Permanent #1	0.1	Batholith	Mod. Relief Rolling Uplands	E	4100	30
Permanent #1	0.6	Batholith	Dissected Breaklands	SE	3900	40
Pete King						
Temp #3	0.6	Border	Mod. Relief Rolling Uplands	E	4100	30
Temp #5	0.3	Border	Upland	SE	3700	30
Temp #5	0.4	Batholith	Upland	E	3600	30
Temp #5	0.1	Border	Upland	SE	3640	35
Temp #7	0.4	Batholith	Low Relief Hills	-	4420	15
Temp #7	0.1	Border	Upland	NE	4400	30
Walde						
Temp #4	0.5	Border	Mountain Slopeland	-	4200	35
Canyon						
Temp #1	0.3	Batholith	Low Relief Hills	NE	4400	30
Temp #2	0.1	Batholith	Dissected Breakland	W	3840	40
Temp #2	0.3	Border	Mountain Slopelands	NW	4000	30
Temp #6	0.7	Batholith	Low Relief Rolling Hills	E	4800	20
Deadman						
Temp #8	0.1	Batholith	Low Relief Rolling Hills	NE	4720	25
Temp #8	0.3	Batholith	Mod. Relief Rolling Uplands	SW	4600	30
Temp #9	0.1	Batholith	Mountain Slopelands	-	4280	35
Temp #9	0.3	Batholith	Mod. Relief Rolling Uplands	S	4200	30
Unnamed						
Temp #10	0.1	Batholith	Low Relief Rolling Hills	E	4250	25
Temp #10	0.1	Batholith	Mod. Relief Rolling Uplands	SE	4200	35

Considering each landslide risk factor, the proposed roads were rated as shown in the following table.

High Risk = 1; Low Risk = 0

Geology: Border and Batholith = 1

Landform: Breakland or Mass Wasted = 1

Elevation: 3,000-5,000 feet = 1

Aspect: S, SW, or W = 1

Slope: >56% = 1

Table 3-74: Risk Factor Rating - Temporary Roads

Road	Geology	Landform	Aspect	Elevation	Slope %	Overall Risk[2]
Permanent #1	1	1	0	1	0	3
Temp #1	1	0	0	1	0	2
Temp #2	1	1	1	1	0	4
Temp #3	1	0	0	1	0	2
Temp #4	1	0	0	1	0	2
Temp #5	1	0	0	1	0	2
Temp #6	1	0	0	1	0	2
Temp #7	1	0	0	1	0	2
Temp #8	1	0	1	1	0	3
Temp #9	1	0	1	1	0	3
Temp #10	1	0	0	1	0	2

Landslide Indicator Summary: Based on the parameters discussed above, there is a low to moderate risk of road related problems. However, it is important to note that although all were weighted equally, they do not contribute equally to the risk associated with any given road location. The five landslide indicators also do not consider the position on the slope, or distance to water for any proposed locations. Slope and geology are arguably the most important considerations. These temporary roads are all located on ridgetops. For this project, geology ratings indicate high risk, but the slopes rank as a low risk. Additionally, none of the proposed roads cross live water. This is important, because nearly all of the debris torrents that occurred in the 1995-96 events were the result of plugged culverts or associated fill failures, resulting in channelized flow in the form of debris torrents. Other potential problems related to roads include:

- **Non-channelized, overland flow:** The primary factors influencing overland flow are a) distance to water, and b) type of material through which it would flow. For virtually all the proposed road, delivery distance to water is a minimum of 600'. The exception is the existing 5545 Road, which would require a culvert replacement in addition to its proximity to a wet area. For all the other roads, any non-channelized flow is likely to infiltrate or be absorbed by forest litter well before it reaches an active channel. Additionally, any new construction (permanent and temporary) would have a slash filter windrow at the toe of the fill. This technique, of placing slash at the bottom of the fill slope, is highly efficient at trapping and retaining sediment (Burrough and King, 1989).

- **The risk of the road prism intercepting groundwater:** In areas of high groundwater, it is quite common for a road to intercept the groundwater zone. This is usually seen as cutslopes that chronically slough, and cutslopes that regularly "weep" water. All the road locations were analyzed by landform and soil type and rated for that risk. Again, except for Road 5545, the probability of this occurrence is very low to moderate.

[2] This represents a summation of the risk factors where: 1-2 = low risk; 3-4= moderate risk; and 5 = high risk of road related problems.

As discussed previously, temporary roads would be built, used, and obliterated all in the same year. The permanent road locations would be reviewed on the ground by soil, water and engineering specialists to ensure appropriate mitigation and design criteria are implemented (Chapter 2, Design Criteria).

Based on the following factors there is a low risk that new road construction would fail due to landslides.

1. Temporary roads would be built, used and obliterated all in the same year, decreases the likelihood that the roads will become saturated with water.
2. None of the proposed roads cross water.
3. Roads are located on gentler slopes, generally less than 40 percent.
4. Roads are located on ridgetops.

Effects from Noxious Weed Spraying: Risks to aquatic organism health have been documented in the Risk Assessment for Herbicide use in Forest Service Regions 1, 2, 3, 4 and 10 and on Bonneville Power Administration Sites (1992). Those results are represented by the concentration point at which fifty percent of the test organism die (LC50). The LC50 is typically expressed with an hourly exposure time, which represents the exposure of an organism to the amount of chemical for the expressed number of hours (i.e. A 48 hour LC50 relates to exposure for 48 hours to a given chemical concentration). The lower the LC50, the more toxic the compound. The No Observable Effect Level (NOEL) for these compounds are not available however, it is assumed that the NOEL is reasonably approximated by ten percent of the LC50. The US Environmental Protection Agency has recommended that the 96-hour LC50 for fishes be divided by a safety factor of 10 because of the lack of information on long-term NOEL.

Table 3-75: Toxic Herbicide Levels for Fish

Herbicide/Test Species	96 Hour LC50 (milligram/liter)	LC50 divided by 10 (milligram/liter)	Assumed NOEL (milligram/liter)
Clopyralid / Trout	103.5	10.3	10.3
Dicamba / Trout	>50	>5.0	>5.0
Picloram/Trout	3.5	.35	.35
2,4-D/Trout	420	42	42
Glyphosate/Trout	140	14.0	14.0
Metsulfuron/Trout	150	15.0	15.0
Triclopyr/Trout	117	11.7	11.7

Herbicides can indirectly affect fish populations by affecting populations of organisms that fish are dependent. Generally, these compounds are less toxic to lower orders of organisms than to fish. Table 3-76 lists organisms that are used as indicators for a wide range of aquatic organisms by the Environmental Protection Agency and US Fish & Wildlife Service.

Table 3-76: Toxic Herbicide Levels for Aquatic Organisms

Herbicide	Test Species	Results
Clopyralid	Daphnids (Daphnia sp.)	48 hour LC50 = 225 mg/l
Clopyralid	Ram's horn snail (Helisoma trivolvis)	Zero mortality after 48 hours in 1 mg/l solution
Clopyralid	Green algae (Selenastrum capicornutum)	96 hour LC50 = 61 mg/l
Dicamba	Daphnids Daphnia sp.)	96 hour LC50 = 11 mg/l
Dicamba	Scuds (Grammarus fasciatus)	96 hour LC50 > 100 mg/l
Dicamba	Scuds (Grammarus lacstris)	96 hour LC50 = 3.9 mg/l
Picoloram	Daphnia magna	48 hr LC50 is 76 mg/l
Picloram	Scuds	96 hr LC50 is 27 mg/l
2,4-D amine	Daphnia magna	48 hr LC50 is greater than 100 mg/l
2,4-D amine	Seed Shrimp	48 hr LC50 is 8 mg/l
Glyphosate	Scuds	96 hr LC50 is greater than 43 mg/l
Glyphosate	Water Flea	48 hr LC50 is 3 mg/l
Triclopyr	Daphnia magna	48 hr LC50 is 1,170 mg/l
Metsulfuron Methyl	Dapnia magna	48 hr LC50 is > 150 mg/l

In order to analyze the risk to aquatic species, maximum herbicide concentration in stream systems were determined. Instream compound concentrations are a function of factors including distances between treatment areas and surface water, amounts of runoff from treated sites and precipitation levels following treatment. There are two types of sites: infiltration sites and runoff sites. Precipitation percolates through the soil on infiltration sites and flows overland on runoff sites. Contamination of stream systems is more likely to occur on runoff sites than infiltration sites.

The project area, in general, can be characterized as an infiltration site. However, there are isolated pockets of runoff sites that have been created by the invasion of spotted knapweed and orange hawkweed. These weeds have drastically displaced desirable vegetation. Example of microsites are roads and trails.

In order to address a worst-case scenario, herbicide application for all sites was calculated for each watershed as if applied the same day, which is logistically unfeasible. It was assumed that a severe rainfall event could wash ten percent of the active ingredient into the streams on run-off sites and that an additional one percent of the active ingredient would reach the stream in a six-hour period. The average cubic feet per second water yield for the month of July was used to calculate the litters of water produced during an average six-hour period. The proposed herbicide applications would be made from mid May to early July; stream flows would be higher than those modeled so, average July flows show a worst-case scenario. Table 3-77 shows the maximum amounts of herbicide that could be applied for each drainage and still remain under the No Observable Effect Level for aquatic species.

Table 3-77: Maximum Acres Treatable by Chemical within NOEL limits

Drainage	Square Miles	Precip.	Picloram (1.5lbs/ac) Max acres	2,4-D Dicamba Glyphosate (1.5 lbs/ac) Max acres	Clopyralid (.5 lbs/ac) Max acres	Triclopyr (1.0lb/ac) Max acres	Metsulfuron (0.4 lbs/ac) Max acres	Total Acres Existing Treatment (No Action)	Total Acres Proposed for Treatment (Alts 2-6)
Lochsa at Lowell	1180	42	4773	39504	508613	288872	925873	29	1
Fish	87.73	52	296	2448	31516	17900	57372	1	9
Deadman	19.75	46	60	496	6391	3630	11633	1	248
Canyon	19.18	43	58	481	6193	3518	11274	2	9
Pete King	27.37	38	85	704	9062	5147	16497	0	164
Bimerick	9.61	42	28	230	2957	1679	5382	0	21.5
Glade	4.87	44	4	34	443	252	807	1	2.5
Apgar	1.63	44	4	34	443	252	807	3	0
Rye Patch	2.11	45	5	45	584	332	1063	0	0

If the acres proposed for treatment with a certain chemical remain under the amount listed in the "max acres" column for that chemical then the treatment remains under the No Observable Effect Level. The total acres of existing and proposed treatment are less than the maximum acres for all chemicals except Picloram (Tordon?). Because of Piclorams toxicity, fewer acres can be treated and still remain under the NOEL. The majority of the chemicals proposed are clopyralid, and triclopyr (Stinger? and Transline?). This is outlined in **Appendix DXX**. None of the alternatives exceed the NOEL levels listed here. In addition the chemicals currently in use, which were analyzed as part of the cumulative effects analysis, are described in detail in the project file.

Because of its relatively long persistence and relatively high soil mobility, picloram represents the worst-case scenario of a highly mobile herbicide. A report by Scott, et al (1978) of the US Fish and Wildlife Service, concluded that a concentration of 0.6 parts per million (ppm) picloram decreased cutthroat fry growth by 25 percent. No adverse effects were observed when concentrations were below 0.3 ppm. The results of this analysis show that approximately 540 acres within the analysis areas, not counting the face drainages, could be sprayed with picloram and remain under the No Observable Effect Limit (NOEL). This is well above the amount proposed (less than 10 acres). As a further example, the previous table shows that approximately 9060 acres could be sprayed in Pete King Creek with Clopyralid and still remain under the NOEL. This shows that the risks associated with Clopyralid are relatively low. Conversely if you read the figures for Picloram and Rye Patch Creek, it shows that you can only spray up to 5 acres to remain under the NOEL level. All activities proposed, including the cumulative actions, remain under the NOEL levels; therefore there would be no cumulative effect from herbicides on the aquatic ecosystems.

All activities proposed, including the cumulative actions, remain under the NOEL levels; therefore there would be no cumulative effect from herbicides on the aquatic ecosystems.

Fish Creek Existing Conditions

The Fish Creek watershed, including Hungery and Willow Creeks, drains 55,680 acres of forested lands. Its aspect is generally east, and its elevation ranges from 2,000 feet at the mouth, to 5,450 feet near the headwaters. Fish Creek is a sixth order stream. The average annual precipitation in the watershed is 52 inches. Runoff is typical of snow-dominated watersheds of the west, with peak flow occurring in May or June and low flow in August through November. Cedar is the dominant tree in the channel bottoms with subdominant mixed shrubs.

The majority of the watershed is breaklands, old surfaces, frost churned uplands, and colluvial midslopes, with a lesser amount of stream terraces. Parent material is Idaho Batholith gruss and granites. Erosional processes range from very low to high, with erosion coming from exposed soils on roads and skid trails. During the 1995-96 flood events, Fish Creek experienced one slide from natural causes. Fish Creek has 9 percent type A channel, 55 percent type B channel, and 36 percent type C channel.

The **type A** channel is defined as a relatively straight and steep reach (typically 4 percent or greater gradient) that is structurally controlled with frequent low falls or cascades. This is a "high energy" segment. The **type B** channel is defined as having a moderate gradient that may be incised into depositional material to some degree. This type of reach is moderately confined by the adjacent slopes, but some degree of meandering may have developed. The **type C** channel is defined as having a low gradient that is rarely confined by the adjacent slopes with a high degree of meandering.

Management activities began in the Fish Creek watershed in the late 1960's, but roading and timber harvest were confined to the 1970's. Approximately 1,000 acres of the watershed (2 percent) has been harvested. Current road density equals 0.5 mi/mi^2, with most of the roads constructed in the upper portion of the watershed. The water quality and watershed condition of Fish Creek is considered excellent.

The Clearwater National Forest Plan requires that Fish Creek be managed as a "no effect" stream, at a minimum of 100 percent biological potential. This means that the biological threshold cannot be exceeded at anytime. The "no effect" standard allows for 45 percent sediment production over natural. The standard for sediment is being met, since WATBAL model runs show no increases in sediment. Although some sediment is stored in Fish Creek meadows, which may be natural or management induced, the stream is being managed below its geomorphic threshold[3] as stream integrity and equilibrium are maintained. Both the A and B type channels are meeting the desired future condition (DFC) of <25 percent cobble embeddedness. The cobble embeddedness in the C type channel is at 51 percent, which is above the desired condition of 30-35 percent.

Table 3-78 displays each of the subwatershed and the percent peak flow over natural, percent of sediment over baseline and whether or not the percent of sediment meets Forest Plan standards based on the type of stream it is. In addition, the table displays cobble embeddedness for each subwatershed and the watershed as a whole. Consistency with the Forest Plan is based on averages of the stream, not necessarily particular stream reaches. However, particular stream reaches were taken into account. For example, the C type channel in Fish Creek does not meet cobble embeddedness; therefore to ensure no adverse effects to this channel activities within this area are held to the "no measurable increase" criteria. In many cases, subwatersheds may not meet a Forest Plan standard, therefore the "no measurable increase' criteria is applied, even though the entire watershed may meet the standard. The purpose is to be conservative in the design of

[3] The level of disturbance believed where the cumulative impacts of all activities can cause irreversible, or long-term and adverse channel changes.

activities to ensure that water quality is maintained or improved, and that habitat for aquatic species continues to be provided.

Table 3-78: Fish Creek Sediment/Forest Plan Summary

Watershed	Peak Flow % Over Natural	Sediment % Over Baseline	Sediment within Forest Plan Standard	% Cobble Embeddedness	Within CE Desired Condition?	Sediment Standard Percent
Fish						
Alder	NA	0	NA	34	No	NMI*
Frenchman	1.0	0	Yes	35	Yes	No effect 45%
Willow	NA	0	NA	17	Yes	No effect 45%
Horn	NA	0	NA	18	Yes	No effect 100%
Fish below Hungery	NA	No data	NA	14	Yes	No effect 45%
Fish above Hungery	NA	0	NA	28	Yes	High Fish 35%
Fish "C"	NA	0	NA	51	No	NMI 6%
Hungery						
Bowl	NA	0	NA	45	No	NMI 6%
Doubt	NA	0	NA	41	No	NMI 4%
Gass	NA	0	NA	29	No	NMI 4%
Greensaddle	NA	0	NA	36	No	NMI 4%
Obia	NA	0	NA	28	No	NMI 4%
Hungery above Obia	NA	0	NA	34	No	NMI 4%
Hungery at Fish	NA	0	NA	14	Yes	No effect 45

*NMI = No measured increase

Fisheries: Although bull trout have access to the Fish Creek and Hungery Creek drainages, very few individuals have been observed during 25 years of fish population surveys. No bull trout spawning or early rearing areas have been located. High summer water temperatures probably limit bull trout populations. Steelhead use occurs throughout the entire system from the mouth to the headwaters. The Fish Creek drainage, including Hungery Creek, has shown very high densities of wild steelhead trout over the past 20 years. This drainage contains the strongest wild steelhead populations within the Lochsa River.

Summer Rearing Habitat: The overall conditions of summer rearing habitat are below the desired level in all channels (see Table 3-79). The primary reason is the higher than desired maximum temperature which may be attributed to lack of shading from past fire events. Pool quality is also limiting which can be attributed to the lack of acting and

potential woody debris from past fire events. Pool to riffle ratio is limiting in the C channel, due mostly to its low gradient.

Winter Rearing Habitat: The overall winter habitat conditions are below the desired level in all channels. Again, the lack of pool quality is the major factor for the low rating. Substrate conditions as reflected by the amount of sedimentation in the stream channel (measured as cobble embeddedness) are mostly rated good as are the pool to riffle ratios. The higher levels of cobble embeddedness and pool to riffle ratios in the C channels are due to its low gradient.

Spawning Habitat: The overall conditions of the spawning habitat are below the desired level in all channels. Temperature is limiting in the A channel, and pool quality is limiting in all channels. In the C channel, the percent of fines is high; due to the sediment that tends to accumulate in these low gradient reaches.

Riparian Habitat: The baseline desired condition for the riparian function is well below desired from all perspectives. The low potential and acting debris parameters are due to Fish Creek flowing through an extensive sedge meadow complex interspersed with alternating reaches of coniferous forest. Also, the extensive wildland fires in the 1930s reduced the potential of existing stands to produce large wood. Therefore, the level of large woody debris in the stream is low and is expected to remain so as long as the meadow ecosystem prevails. This is a natural condition that does not fit the riparian description listed in the desired condition tables.

Management Considerations: Ensure no measurable increase in sediment for watersheds not meeting standards. Future projects should not reduce potential woody debris levels. In addition, stream temperatures need to be maintained or improved (lower temperatures) in Fish Creek and its tributaries to maintain spawning temperatures below 13°C by retaining riparian vegetation.

Table 3-79: Habitat Function Summary for Fish Creek

	Desired Condition	A Channel Reach Existing Condition	B Channel Reach Existing Condition	
Summer Rearing	**100%**	**70%**	**77%**	
Max Temperature	10-15ºC	24ºC	18ºC	
Pool Quality	5	3.1	2.0	
In-Stream Cover	5	4.6	3.5	
Pool-Riffle Ratio	50:50	57:43	67:33	
Winter Rearing	**100%**	**94%**	**83%**	
Cobble Embeddeness	<25%	13%	20%	
Pool-Riffle Ratio	50:50	57:43	67:33	
Pool Quality	5	3.1	2.0	
Spawning	**100%**	**73%**	**84%**	
% Fines Sediment	<19%	7%	16%	

	Desired Condition	A Channel Reach Existing Condition	B Channel Reach Existing Condition	
In Stream Cover	5	4.6	3.5	
Pool Quality	5	3.1	2.0	
Max. Temperatures	13ºC	19.5ºC	13ºC	
Riparian	**100%**	**46%**	**48%**	
Potential Debris	120 pieces/100 meters	9 pieces	13 pieces	
Acting Debris	50-60 pieces/100 meters	4 pieces	7 pieces	
Bank Cover	5	1.6	1.5	
Bank Stability	5	5	5	
	Desired Condition			**C Channel Reach Existing Condition**
Summer Rearing	**80%**			**71%**
Max Temperature	16-17ºC			17ºC
Pool Quality	3			2.8
In-Stream Cover	3			2.8
Pool-Riffle Ratio	40:60			88:12
Winter Rearing	**80%**			**65%**
Cobble Embeddeness	30-35%			51%
Pool-Riffle Ratio	40:60			88:12
Pool Quality	3			2.8
Spawning	**80%**			**71%**
% Fines Sediment	**22-24%**			30%
In Stream Cover	**3**			2.6
Pool Quality	**3**			2.8
Max. Temperatures	13ºC			13ºC
Riparian	**80%**			**57%**
Potential Debris	80 pieces/100 meters			16 pieces
Acting Debris	40 pieces/100 meters			21 pieces
Bank Cover	3			2.4
Bank Stability	3			4.7

Fish Creek Environmental Consequences

The following tables display sediment data (generated from WATBAL) as the percent change from the baseline condition. The existing condition, or "no action" alternative, is depicted in year 2001, with implementation to begin in 2002. The existing condition includes all past and present actions. Because the changes in peak flow and ECA are typically well below threshold levels, that data is not displayed; however, it is included where needed in the narrative for each watershed.

Note: Alternative 4a drops 35 acres of underburn from Alt 4. The effects to aquatic ecosystems from Alternative 4a are the same as the effects to Alternative 4. Therefore 4a is not discussed

Fish Creek: Standard--"No Effect". Sediment not to exceed 45% above baseline.

Table 3-80: Fish Creek Maximum Percent Increase in Sediment from Baseline Condition (WATBAL)

Watershed	Sediment Standard (Percent)	Alt	2001 Existing Condition	2002	2003	2004	2005	2006
Upper Fish	No effect (35%)	2,3,5,6 3a 4	0 0 0	2 2 2	4 4 4	4 4 4	2 2 2	0 0 0
Middle Fish*	No effect (45%)	2,3,5,6 3a,4	0 0	3 0	6 0	6 0	3 0	0 0
Frenchman Creek	No effect (45%)	2,3,5,6 3a, 4	0 0	4 2	8 4	10 6	8 6	4 4
Fish Creek "C" Reaches	No measured increase (6%)	2,3,5,6 3a, 4	0 0	0 0	0 0	0 0	0 0	0 0
Alder	No measured increase (6%)	2,3,5,6 3a, 4	0 0	1 1	2 2	2 2	4 4	6 6
Willow/Horn	No effect 45-Willow 100-Horn	2,3,5,6 3a	0 0	2 1	2 2	2 2	1 1	0 0
Fish above Hungery	No effect (35%)	All alts	0	0	0	0	0	0

*Middle Fish includes Frenchman Creek and Upper Fish Creek.
Watersheds within the optimum size range for the model (4-40mi^2) consider a 4 percent increase in sediment output to be essentially immeasurable.
Watersheds less than the above stated size range consider a 6 percent increase in sediment to be essentially zero and not measurable using standard methodologies (Simon 2000, Patten 2000).

The following describes the effects by subwatershed. This is followed by a discussion of the cumulative effects to Fish Creek.

Upper Fish Creek: Alternatives 2, 3, 5, and 6 include mixed severity burn unit #19, tractor harvest unit #25, and approximately 320 acres of underburning. There is a maximum 4 percent sediment increase predicted, which would cause no adverse impacts to channel stability, and is within Forest Plan standards for this drainage. Increases in ECA values are also slight (5 percent), and no changes in flow parameters are predicted.

Upper Fish (All Alternatives)

?? Maximum 4 percent increase above baseline
?? Maximum 5 percent increase in ECAs
?? No increase in peak flow
?? No change in channel structure or function
?? Consistent with Forest Plan

Alternative 3a has only the tractor harvest of unit #25, and Alternative 4 is the same with the addition of underburn unit #156. The small sediment increases for all alternatives is the same, and is attributable to unit #25. The Forest Plan sediment standard is being met for all alternatives.

Middle Fish Creek: This area includes the Fish Creek watershed above Alder Creek, and Frenchman Creek. Alternatives 2, 3, 5, and 6 includes mixed severity burn units 16, 17, 18, and 19; underburning of 312 acres, harvest units 25 and 26; and road reconditioning. WATBAL predicts a maximum sediment increase of 6 percent above baseline conditions, and a maximum increase in ECAs of 3 percent, and no increase in peak flow. This magnitude of change in sediment and ECA is within Forest Plan standards for this watershed, and are not sufficient to precipitate adverse changes in channel structure or function.

Middle Fish (Alternatives 2, 3, 5 and 6)

?? Maximum 6 percent increase above baseline
?? Maximum 3 percent increase in ECAs
?? No increase in peak flow
?? No change in channel structure or function
?? Consistent Forest Plan

Alternative 3a and 4

?? No increase above baseline
?? Maximum 3 percent increase in ECA
?? No increase in peak flow
?? No change in channel structure or function
?? Consistent with Forest Plan

Alternative 3a contains only harvest of units 25 and 26. Alternative 4 also has both harvest units in addition to underburning in unit 156. Neither alternative is predicted to increase sediment delivery greater than 6 percent above baseline. Slight changes in ECAs (3%) and Peak Flow (0%) would have no adverse impacts. The proposed activities are within Forest Plan Standards for this watershed.

Frenchman Creek: A tributary of Fish Creek, Frenchman Creek meets the DFC objective for cobble embeddedness.

Under alternatives 2, 3, 5, and 6, activities in the drainage include burning of unit #17, skyline harvest of unit #26, with some associated road reconditioning (Road #483), plus underburning of Unit #157. The maximum sediment increase under this scenario is 10 percent, which is within standard for this watershed, and would cause no adverse impacts to stream form or function. There is also an increase in ECA values of 9 percent above baseline condition, which is also considered to be well within the natural range of variability. Increases in peak flows do not exceed 1 percent over current condition, and are considerably below the threshold (15-20%) where adverse channel changes may occur.

Frenchman (Alternatives 2, 3, 5 and 6

?? Maximum 10 percent increase above baseline
?? Maximum 9 percent increase in ECAs
?? 1 percent increase in peak flow
?? No change in channel structure or function
?? Consistent with Forest Plan

Alternative 3a and 4

?? Maximum 3 percent above baseline
?? Maximum 6 percent increase in ECA
?? No increase in peak flow
?? No change in channel structure or function
?? Consistent with Forest Plan

Under alternatives 3a, and 4, the only proposed activity in Frenchman Creek is the harvest of Unit #26 and road reconditioning, and one acre of harvest in unit 25. Increases in sediment, ECA from 2.8 percent to 8.4 percent, and flow parameters are less than those discussed above, and would cause no degradation of water quality in the watershed. All the alternatives comply with the “no effect” standard for the drainage.

Fish Creek: "C" Channel Reaches: This portion of Fish Creek has cobble embeddedness that exceeds the Desired Future Condition objective for this channel type and indicator species. The reaches are located in T35N R7E, Sections 26 & 27. They are numbered FI-1 through FI-5, and were surveyed by Clearwater Biostudies in 1992.

Planned activity is scheduled to occur only under alternatives 2, 3, 5, and 6. Mixed-severity burn units 18 and 19, as well as underburn units 152, 153, 155, and 157 are tributary to the "C" type reaches, so WATBAL was run to isolate what effects, if any, they may have on water quality. Because the modeling showed some sediment delivery resulting from the underburn, the activities (mixed severity burning and underburning) are scheduled to occur at least four years apart. Under that scenario, there are no predicted sediment increases (as shown in the table), therefore none would be measurable downstream of reach FI-5. There is a very slight increase in ECA (2.4 percent), and no changes in peak flow; therefore, these activities are in compliance with the 1993 Stipulation Agreement.

Fish "C" Channels (Alternatives 2, 3, 5 and 6)

?? Maximum 0 percent increase above baseline
?? Maximum 2.4 percent increase in ECAs
?? 0 percent increase in peak flow
?? No change in channel structure or function
?? No measurable increase in sediment
?? Consistent with Stipulation Agreement and Forest Plan

Alternative 3a and 4

?? No change
?? No measurable increase in sediment
?? Consistent with Stipulation Agreement and Forest Plan

Although the model did predict sediment delivery without delayed implementation, the LTA in which the units occur are generally rated low for surface erosion risk. They are predominantly Old Surfaces (81A/81B), and Colluvial Midslopes (61). However, some of the stream reaches (C4, C5) tributary to the proposed activities are rated as very high in their sensitivity to disturbance. Because the modeled output, LTA erosion risk, and channel type data may be in conflict, sediment monitoring of the burn units would be conducted (see Monitoring Requirements, Chapter 2). If the monitoring results show no measurable sediment being delivered, then it would not be necessary to delay implementation of the balance of the burning.

Alder Creek: There are 759 acres of underburning, and 3 acres of harvest proposed in this drainage under alternatives 2, 3, 5,and 6. WATBAL modeling predicts a maximum sediment increase of 6 percent above baseline conditions to occur in years 2006-2007. Peak flows do not increase under this proposal, and ECA values increase to a maximum of 0.8 percent above current conditions.

Alternative 3a differs by the omission of unit 158 (2 acres of underburning); consequently, predicted values are identical for all alternatives. Because this is a relatively small watershed (3.23 mi^2) the sediment values are slightly exaggerated, and actual suspended sediment produced would not be measurable at the mouth of the stream. The predicted changes in ECA and peak flow are also quite small, and would not be detectable as adverse channel changes at the confluence of Alder Creek and Fish Creeks. The full length of Alder Creek has been typed as an A3 channel, which has a very high sensitivity to disturbance and a poor recovery potential. The units are located on colluvial midslopes, old surfaces, breaklands, and frost-churned uplands, all of which are rated low to moderate in erosion risk. All of the proposed alternatives meet the "no measurable increase" criteria, and would have no adverse impacts on channel structure or function.

Willow & Horn Creeks: The proposed burning in the Willow/Horn drainage for Alternatives 2, 3, 5, 6 consists of three mixed severity burn units (5, 6, and 87), in addition to planned underburning of Units 129-133.

Alder Creek (Alternatives 2, 3, 5 and 6)

?? Maximum 6 percent increase above baseline
?? Maximum 0.8 percent increase in ECAs
?? No increase in peak flow
?? No change in channel structure or function
?? No measurable increase in sediment
?? Consistent with Stipulation Agreement and Forest Plan

Altemative 3a

?? Maximum 6 percent above baseline
?? Maximum 0.8 percent increase in ECA
?? No increase in peak flow
?? No change in channel structure or function
?? No measurable increase in sediment
?? Consistent with Stipulation Agreement and Forest Plan

Alternative 4

?? No activities in Alder Creek

For Alternative 3a the only proposed activity is underburns in units 131 and 140. Alternative 4 does not propose activities in this area. Under all alternatives there is a 2% predicted increase in sediment. ECA increases less than one percent with Alternatives 2, 3, 5, and 6. Though the channel types (A3) tributary to the proposed actions are predominantly very high in their sensitivity to disturbance, it is unlikely any sediment would be delivered as a result of this proposal because there is no predicted increase in sediment, or increase in peak flows. The alternatives are in full compliance with the Clearwater Forest Plan, and would cause no adverse effects to water quality in this watershed.

Willow/Horn (Alternatives 2, 3, 5 and 6)

?? 2% increase above baseline
?? <1 percent increase in ECAs
?? No increase in peak flow
?? No change in channel structure or function
?? Consistent with Forest Plan

Alternative 3a

?? Maximum 2 percent increase above baseline
?? No increase in ECA
?? No increase in peak flow
?? No change in channel structure or function
?? Consistent with Forest Plan

Alternative 4

?? No change
?? Consistent with Forest Plan

Cumulative Effects for Fish Creek (above Hungery): Fish Creek above its confluence with Hungery Creek is the reach used to evaluate cumulative effects. It includes all harvest, road reconstruction, and burning in Frenchman Creek; mixed severity burning in Alder Creek, as well as burn units in undesignated face drainages of Fish Creek. The Willow/Horn drainages described above flow into Fish below Hungery, and are *not* part of this cumulative effects analysis. There are no private lands within this area, nor are there other proposals on Federal lands that would cumulatively affect this watershed.

Sediment: For all the alternatives WATBAL modeling predicts no increase in sediment as a result of the vegetative treatments or road reconstruction. There is no increase in peak flows, and ECA values are raised a maximum of 1.6 percent above baseline conditions throughout the life of the proposal. The cumulative effects of the proposed activities would not exceed the "no effect" standard applicable to this watershed. All of these values indicate a watershed and stream system that is dynamically stable, and functioning within its ability to handle changes in flow or sediment regime.

Fish Creek (All Action Alternatives)

?? No increase in sediment above baseline
?? 1.6 percent increase in ECAs
?? No increase in peak flow
?? No change in channel structure or function
?? Consistent with Forest Plan

The Fish Creek watershed upstream from Hungery Creek, although large (36 mi^2), is within the optimum 4-40 square mile size for WATBAL's maximum effectiveness. Furthermore, the model output is within the plus or minus four percent range discussed

previously. Of greater importance than sediment predictions at the confluence of Fish and Hungery are the sediment values predicted at the mouths of the lower order tributaries. Because the smaller tributaries (where most of the activities occur) show either very slight or no increases in measurable sediment, the probability of detecting increases further downstream are remote.

Hungery Creek

Hungery Creek: Standard—"No Effect". Sediment not to exceed 45% above baseline.

Table 3-81: Hungery Cr Maximum Percent Increase in Sediment from Baseline Condition WATBAL)

Watershed	Sediment Standard Percent	Alt	2001 Existing Condition	2002	2003	2004	2005	2006
Bowl	No measured increase (6%)	2,3,5,6 3a	0 0	1 0	3 0	6 0	6 0	6 0
Doubt	No measured increase (4%)	2,3,5,6	0	1	2	4	4	2
Gass	No measured increase (4%)	2,3,5,6	0	2	4	4	4	4
Greensaddle	No measured increase (6%)	2,3,5,6	0	3	6	6	5	3
Obia abv. Gass	No measured increase (4%)	2,3,5,6 3a	0 0	1 1	2 2	4 2	2 1	1 0
Obia/Gass at Hungery	No measured increase (4%)	2,3,5,6 3a	0 0	2 1	4 2	4 2	4 1	2 0
Hungery abv. Fish	No effect (45%)	2,3,5,6 3a	0 0	2 0	4 0	4 0	2 0	0 0

Watersheds within the optimum size range for the model (4-40 mi^2) consider a **4 percent** increase in sediment output to be **essentially immeasurable.**
Watersheds less than the above stated size range consider a **6 percent increase** in sediment to be **essentially zero and not measurable** using standard methodologies (Simon 2000, Patten 2000).

Bowl Creek: A tributary of Hungery Creek, it exceeds the DFC objective for cobble embeddedness (Table 1.1). In Alternatives 2, 3, 5, 6 Unit 4 in Bowl Creek is proposed for mixed severity burning, and Unit #125 would be underburned. To maintain sediment at the "no measurable" level, the prescribed burning would occur at a minimum of two year intervals, with only 25 percent of the acreage being burned at any one time. Using this technique, the maximum sediment increase is 6 percent above natural levels. Sediment production returns to baseline (natural) levels in 2012. There are no changes in peak flows, and ECA values reach a maximum increase of 1.6 percent of the watershed.

Under Alternative 3a only underburning of unit #125 would occur, and there would be no increases in sediment or peak flow. ECAs would rise less than one percent. The LTAs in Bowl Creek, although rated low to moderate in erosion risk, do contain channel types (A3, A3a, B4a) that range from moderate to very high in their sensitivity to disturbance. However, given the staggering of prescribed burns there would be no measurable increase in sediment or adverse changes to channel form or function resulting from this proposal.

Bowl Creek – Alternatives 2, 3, 5, and 6

Staggered Burning (only 25 percent burned per year)

?? Maximum 6 percent increase in sediment
?? No increase in peak flow
?? Maximum 1.6 increase in ECA
?? No change in channel structure or function
?? No measurable increase in sediment
?? Consistent with Stipulation Agreement and Forest Plan

Alternative 3a

?? No increase in sediment
?? No increase in peak flow
?? <1 percent increase in ECA
?? No change in channel structure or function
?? No measurable increase in sediment
?? Consistent with Stipulation Agreement and Forest Plan

Alternative 4

?? No direct effects
?? No measurable increase in sediment
?? Consistent with Stipulation Agreement and Forest Plan

Doubt Creek: Under Alternatives 2, 3, 5, and 6 there are two mixed severity burn units (#5, 6) in the watershed totaling 356 acres. Underburn units #126-128 equal 91 acres. They are a minimum of 600 feet from Doubt Creek, which is comprised primarily of B4a, A3, and A3a type channels, which are considered to range from moderate to very high in their sensitivity to disturbance. To maintain sediment levels at or below the "no measurable" threshold, burning is staggered by at least two years. Regardless of whether the mixed severity burns or underburns occur first, two years should elapse before completing the balance. Given those criteria, distance to the main channel, and the implementation of PACFISH default buffers on intermittent channels within the units, there is almost no probability of sediment reaching live water. The WATBAL model shows a maximum sediment increase of 4 percent over the existing condition. There is no change in average annual flows or peak flows, and equivalent clearcut acres increase to only 1.7 percent of the watershed. These levels of change would not be measurable at the mouth of Doubt Creek, and would cause no adverse impacts to stream channel equilibrium.

Doubt Creek – Alternatives 2, 3, 5, and 6

Staggered Burning between mixed severity burn and underburns

?? Maximum 4 percent increase in sediment

?? No increase in peak flow

?? Maximum 1.7 percent increase in ECA

?? No change in channel structure or function

?? No measurable increase in sediment

?? Consistent with Stipulation Agreement and Forest Plan

Alternatives 3a, 4

?? No impacts

?? No measurable increase in sediment

?? Consistent with Stipulation Agreement and Forest Plan

Gass Creek: The burning proposal for Gass Creek include mixed severity burn units 2 and 8, with implementation of one unit in 2002, and the second at least three years later. Channels bordering the units (> 300') are A3 types that have a very high sensitivity to changes in flow or sediment regime. Under this scenario sediment levels are at most a 4 percent increase, and as such would not be measurable at the mouth of the stream. Flow values do not increase at all in the watershed. Activity is scheduled only in Alternatives 2, 3, 5, and 6.

Gass Creek – Alternatives 2, 3, 5, and 6

2 units – burn one 2002, the other 3 years later

?? Maximum 4 percent increase in sediment
?? No increase in peak flow
?? Maximum 1.7 percent increase in ECA
?? No change in channel structure or function
?? No measurable increase in sediment
?? Consistent with Stipulation Agreement and Forest Plan

Alternatives 3a, 4

?? No impacts

Greensaddle Creek: There are 338 acres of mixed severity burning proposed in the Greensaddle watershed under Alternatives 2, 3, 5, and 6. To keep sediment at the "no measurable" level, the unit would be split in half, and burned with at least three years between entries. WATBAL modeling predicts a maximum 6 percent increase in delivered sediment, although there are no increases in peak flows, and ECA values rise less than 2 percent.

Alternative 3a contains only a five-acre unit scheduled for underburning and would not raise sediment levels above current values. Because the watershed is less than the optimum size range for the WATBAL model, it is likely that sediment predictions are slightly exaggerated, and actual sediment delivered would not be measurable at the mouth of Greensaddle Creek. Of the 2,700 meters of stream tributary to the burn units, 58 percent is an A2a channel, and 42 percent is a B4a channel type. These are rated as having a very low, and moderate sensitivity to disturbance, respectively, with an excellent recovery potential. The activities, if implemented as discussed above would not cause a measurable increase in sediment at the mouth of Greensaddle Creek, and cause no degradation to channel form or function.

Greensaddle Creek – Alternatives 2, 3, 5, and 6

1 units – burn ½ the acres, 3 years apart

?? Maximum 6 percent increase in sediment
?? No increase in peak flow
?? Maximum 2 increase in ECA
?? No change in channel structure or function
?? No measurable increase in sediment
?? Consistent with Stipulation Agreement and Forest Plan

Alternatives 3a, 4

?? No impacts

Obia Creek (above Gass): For alternatives 2, 3, 5,and 6, mixed severity burn unit #1 (427 acres), and underburn units #120-123 (145 acres) are scheduled for burning in this watershed. To maintain sediment production at the "no measurable" threshold Unit #1 would be split in half and separate the burning of each half by at least two years. The underburn units can be burned at any time with no ill effects to the channel. All of the channel types in Obia Creek (A2, A1a, B3) have a very low sensitivity to disturbance, and are in no danger of degradation from the proposed burns. The maximum sediment increase in Obia is 4 percent, and would not be measurable using standard hydrologic methods. There are no increases in peak flows predicted, and ECAs increase to only 1.6 percent of the watershed.

Under Alternative 3a only underburn units 120 and 122 would be implemented, with a maximum sediment increase of 2 percent above baseline conditions and negligible changes in peak flow (0%) and ECA (0.3%).

Obia/Gass at Hungery: This is a combination of the activities described separately under "Obia" and "Gass" Creeks and for the different alternatives as discussed. The maximum sediment increase is 4 percent, and does not exceed that level. There are no increases in peak or mean annual flows predicted; therefore, there would be no adverse channel changes as a result of this proposal. All of the proposed activities are in compliance with the Stipulation Agreement in this watershed.

Obia Creek (above Gass)–

Alternatives 2, 3, 5, and 6

Mixed severity burn– burn ½ the acres, 2 years apart

- ?? Maximum 4 percent increase in sediment
- ?? No increase in peak flow
- ?? Maximum 1.6 increase in ECA
- ?? No change in channel structure or function
- ?? No measurable increase in sediment
- ?? Consistent with Stipulation Agreement and Forest Plan

Alternatives 3a

- ?? Maximum 2 percent increase in sediment
- ?? No increase in peak flow
- ?? Maximum 0.3 percent increase in ECA
- ?? No measurable increase in sediment
- ?? Consistent with Stipulation Agreement and Forest Plan

Alternative 4

- ?? No impacts

Cumulative Effects Hungery Creek (at Fish Creek): The evaluation of cumulative effects includes all of the units and watersheds discussed above, and also considers units 7, 9, 10, and 11, which are in undesignated face drainages of Hungery Creek. Because these units are in the Hungery Creek mainstem, it is difficult to isolate potential sediment effects from their implementation. However, all four of these units are tributary to stable (B2, B4), channel reaches with a very low to moderate sensitivity to disturbance, and an excellent recovery potential. Should sediment reach these channels it is unlikely it would negatively impact water quality because the streams can move small quantities of sediment without having an effect to stream conditions.

The activities proposed under Alternatives 2, 3, 5, and 6 have an ECA value of 1.1 percent of the entire Hungery Creek watershed (35.31 sq. miles). Modeled sediment increase for those actions reach a maximum of 4 percent in 2004, and return to natural conditions by 2006. There are no predicted changes in peak flow values.

Hungery Creek (at Fish Creek)

Alternatives 2, 3, 5, and 6

?? Maximum 4 percent increase in sediment
?? No increase in peak flow
?? Maximum 1.1increase in ECA
?? No change in channel structure or function
?? Consistent with Forest Plan

Alternatives 3a

?? No increase in sediment
?? No increase in peak flow
?? No increase in ECA
?? Consistent with Forest Plan

Alternative 4

?? No impacts

Alternative 3a causes no increase in sediment, flow or ECA. All these levels of increase are within Forest Plan "no effect" standards for the watershed, and would cause no adverse impacts to channel structure or function. Planned burning activities would continue in the watershed through 2008, when the final phase of burning in Bowl Creek would occur. There is very little likelihood that cumulative sediment effects would be evident at the mouth of Hungery Creek. Because almost all the tributary streams would produce no measurable sediment, the high-energy, supply-limited mainstem would tend to move what small quantities of sediment may be produced through the system with no adverse effects.

Alternative 4 would not implement any activities within Hungery Creek therefore natural processes would continue.

Cumulative Effects – All of Fish Creek (includes Hungery)

Alternative 1: No activities would occur and natural processes would continue. Sediment sources would still exist and continue to direct sediment into the streams. Stream temperatures would remain above desired conditions. The streams would continue to recover slowly from the effects of the fires in the 1930s. In the short term it is unlikely that a fire would burn all of Fish Creek, due to vegetation breaks caused by past fires. However, even a smaller, localized fire could remove riparian vegetation and continue the problem of lack of stream shade and woody debris in Fish Creek.

In the long term stream temperatures would decrease as vegetation slowly grows back along the stream channels burned earlier in the century. Natural succession would continue. Vegetation would continue to change species composition to late seral species, which are not adapted to fire. Stand densities would continue to increase. The likelihood of a large stand replacing fire would increase as densities and late seral species increase. Another large fire could retard the recovery of the watershed. The resiliency of the watershed would decrease.

Cumulative Effects Action Alternatives

The cumulative effects analysis evaluates all activities within the Fish Creek watershed. It includes all harvest, prescribed burning, road construction, and reconstruction, road obliteration/long-term maintenance, and noxious weed treatment. There is no private land within the drainage. There are no foreseeable Federal activities within the drainage that would cumulatively increase.

Summary of activities considered in the cumulative effects analysis:

Alternatives 2-6

- 3 miles of road obliteration throughout Fish Creek
- 5 miles of long-term road maintenance throughout Fish Creek
- 0 miles of temporary road construction
- 9 acres of noxious weed treatment
- Planting 450 acres along Fish Creek

Alternatives 2, 3, 5 and 6

This analysis evaluates the cumulative effects for all of Fish Creek, including all the subwatersheds discussed above. It includes all harvest, road reconstruction, prescribed burning, riparian area planting, road obliteration/long term road maintenance and noxious weed treatment. There are no private lands within this area, nor are there other proposals on Federal lands that would cumulatively affect this watershed. Future salvage sales may occur, but are not planned at this time. If they were to occur they would likely remove only a small (less than 20 percent) of the live basal area over a small area, and would not have increase ECAs, peak flows or sediment. These projects would undergo separate environmental analysis to evaluate cumulative effects.

Sediment: Because the smaller tributaries and analysis for Fish Creek above Hungery and Hungery Creek show either very slight or no increases in measurable sediment, the probability of detecting increases further downstream are remote.

Road obliteration and long-term storage may result in short-term increases in sediment but would result in a long-term improvement in aquatic conditions by removing chronic sediment sources. There would be less sediment resulting by taking action, versus leaving the sediment sources there. Retention of existing vegetation adjacent to the streams would filter any potential surface erosion.

Temperature/Woody Debris: Ignition for mixed severity burns would occur outside of riparian areas, however, some small localized burning within the riparian area is likely to occur. This burning would not be of the magnitude to result in changes in stream temperatures. Planting 450 acres along a six-mile portion of Fish Creek would provide shading and future woody debris recruitment that is currently lacking along portions of the stream. Streamside shade and woody debris is lacking because of the effects of the fires early in the century. Overall long-term temperatures would decrease quicker than taking no action.

Landscape Resiliency: Prescribed burning and harvest activities would improve the resiliency of the landscape by reducing the potential for large, lethal, stand-replacing fires. Fires would still occur, however the intensity of the fires would be reduced. This would also reduce the likelihood of catastrophic fires that occurred early in the century. These fires burned the riparian areas, and triggered debris torrents. Vegetative activities would break up the continuity of the fuels, reduce stand densities, and shift species composition toward early seral species that are adapted to fire.

Cumulative Effects No Action

?? Sediment sources still exist
?? Long-term recovery in stream temperatures
?? No improvement in vegetative resiliency
?? Does not take care of the whole aquatic ecosystem

Cumulative Effects Alternatives 2, 3, 5, and 6

?? Decreases sediment
?? Decreases stream temperatures
?? Improves vegetative resiliency
?? Improves aquatic resiliency by taking care of the whole

Cumulative Effects Alternative 3a

?? Decreases sediment
?? Decreases stream temperatures
?? Begins improvement of vegetative resiliency but doesn't restore mixed fire regimes

Cumulative Effects Alternative 4

?? Decreases sediment
?? Decreases stream temperatures
?? Does not improve vegetative resiliency
?? Does not take care of the "whole" aquatic ecosystem

Aquatic Habitat: Cumulatively sediment would decrease, through removal of sediment sources; temperatures would decrease through retention of stream side shade and riparian

planting; cobble embeddedness would decrease through reduction of sediment; resiliency would increase through introduction of historic fire systems (non-lethal and mixed severity fire); with an overall improvement in the aquatic habitat conditions.

Cumulative Effects of Alternatives 3a and 4: The cumulative effects of Alternatives 3a and 4 are similar as those described above, with one exception. Alternative 3a proposes substantially less vegetative treatments within the Fish Creek watershed. Alternative 4 only includes regeneration harvest in one area of Fish Creek.

Without prescribed burning and harvest landscape resiliency would continue to be at risk. Fuels and stand density would continue to build and the likelihood of a large stand-replacing fire would increase over time. Although large stand replacing fires have been part of the ecosystem process in the past, these fires have had their own environmental consequences. The effects from the fires from the turn of the century are still occurring. Idaho DEQ stated, "Hot, intense fires strip the area soils of protective vegetation and expose them to erosion. Many burned and eroded areas have not yet been reforested largely because of these fire damaged soils" (Lochsa River Subbasin Assessment, 1999).

Implementing mixed severity burns and underburns, and regeneration harvest would remove excess biomass, change species composition to species more resilient to fire, and introduce patches where fire intensity would decrease. This would decrease the likelihood of extreme fires and their effects.

Forest Plan and Regulatory Consistency: Each alternative was evaluated at the subwatershed level to ensure they were consistent with the Clearwater Forest Plan, and if applicable the "no measurable increase" as agreed to in the Stipulation Agreement. All alternatives are consistent with the applicable criteria.

All alternatives are consistent with Clean Water Act by protecting beneficial uses. Fisheries habitat would be maintained in the short term through the design of the vegetative activities to meet the Forest Plan standards and/or "no measurable increase" in sediment requirement. In the long term habitat would improve as vegetative resiliency increases, streamside shade is reestablished, and chronic sediment sources are removed.

All action alternatives would decrease stream temperature, which is listed as a pollutant of concern for Fish Creek. Harvest activities would retain streamside vegetation therefore those activities would not affect stream temperatures. It is possible that some prescribe burns may "back" into riparian areas, however it is not anticipated that removal of vegetation would be to the degree or magnitude that stream temperatures would change. Prescribed burns would be conducted under specific criteria for fuel and duff moisture to ensure that resource objectives are met. In addition, mixed severity burns would be completed over several years so that areas burned each year can be monitored to be sure that prescriptions meet resource objectives, including not affecting stream temperatures. This information would be provided to the National Marine Fisheries Service and if prescriptions need modified they would be modified with the approval of the Fisheries Service.

All alternatives are consistent with the Endangered Species Act by maintaining and/or improving aquatic conditions.

Pete King Creek Existing Conditions

The **Pete King Creek** watershed, including Polar, Nut, Placer, and Walde Creeks, drains 17,500 acres of forested lands. Its aspect is generally east, and its elevation ranges from 1,500 feet at the mouth, to 5,200 feet. The average annual precipitation is 38 inches. Runoff peaks in April and is low in August through November. Alder is the dominant tree in the channel bottoms with a subdominant composition of mixed shrubs.

The majority of the watershed is composed of old surfaces and breaklands, with lesser amounts of colluvial midslopes and stream terraces. The parent material is border zone schist. Pete King Creek, a fourth order stream, has 65 percent type A channel and 35 percent type B channel.

The natural sediment production rate for the Pete King Creek watershed is 23 tons/mi^2/yr. The estimated geomorphic threshold is 174 percent over natural, or 63 tons/mi^2/yr. Sediment delivery is generally high on the steep slopes, especially the breaklands, and low elsewhere. The tendency, in Pete King Creek, is for sediment to increase and deposit at a faster rate than the increased runoff can remove it. The stream, therefore, has a tendency to be sediment surplus and energy limited.

In 1934, approximately 6,000 acres of the Pete King drainage burned. Management activities began in 1953 with the construction of Forest Road 101. Roads in this period were constructed prior to the implementation of modern best management practices and therefore delivered sediment to the stream. Current road density is approximately 5 mi/mi^2. Timber harvest began in 1954 and continued through the 1980's on National Forest lands. To date, approximately 7,400 acres have been harvested, including land cleared for roads.

During the 1995-96 flood events, Pete King experienced a total of 43 slides; Polar Creek experienced 5 slides, and Walde Creek experienced 16 slides; and Nut Creek experienced one slide. Most were road related, ranging from less than 25 cubic yards to more than 1,000 cubic yards, with much of this sediment reaching the streams. Sediment traps, installed in the early 1980s, trapped some of this sediment. Surveys taken after the flood events indicate that the high flows scoured out much of the sediment in Pete King Creek, and that sediment in this stream is on the decline.

Recent monitoring data indicates a fluctuation in cobble embeddedness values in Pete King Creek. Cobble embeddedness and other stream parameters were measured over several years. The following table displays those changes as measured in Pete King Creek from 1991 -1998

Table 3-82: Lower Pete King Creek Monitoring Data

Year	Reach Number	Reach Length (meters)	Channel Type	Cobble Embeddedness	Bank Stability	Channel Stability
1991	**PK12**	**1560**	**B3**	**43**	**5.0**	**--**
	PK13	980	B3	33	5.0	--
	PK14	1970	B3	38	5.0	--
	PK15	860	B3	34	5.0	--
1997	**PK12**	**1320**	**B3**	**30**	**5.0**	**64 (good)**
	PK13	960	B3	29	4.9	63 (good)
	PK14	1230	B3	32	5.0	59 (good)
	PK15	510	B3	29	4.5	69 (good)
1998	**PK12**	**1440**	**C3b**	**47**	**5.0**	**79 (fair)**
	PK13	960	C3b	42	4.9	73 (good)
	PK14	1020	C3b	43	5.0	73 (good)
	PK15	775	B3	36	4.6	77 (fair)

These data show a decrease in cobble embeddedness in the lower reaches of the stream in 1997. This is probably due to the scouring effect of high flows in late 1995 and 1996. 1998 shows not only an increase in cobble embeddedness, and a slight decrease in channel stability. This may indicate that flood-related sediments upstream are being entrained, and the cross sectional and longitudinal changes occurring at the mouth are a result of the channel trying to process excess sediment.

The Forest Plan requires that Pete King Creek be managed as a "high fishable" stream, at a minimum of 80 percent biological potential. The "high fish" standard allows for 45-55 percent sediment production over natural for 10 out of 30 years, starting with year 1984. Current sediment levels are 19 percent over natural at the mouth of Pete King Creek (within standard for sediment). Of its critical reaches, Walde Creek (currently at 48 percent) exceeds the Forest Plan standard, because it has been above the "no effect" standard of 45 percent more than 10 years out of 30. This determination does not take into account the removal of 657 tons of sediment from sediment traps located in these streams and the recent completion of 14.5 miles road obliteration within the drainage. Although logging and roading activities have produced additional sediment and runoff, the stream is being managed below its geomorphic threshold as stream integrity and equilibrium are maintained. Cobble embeddedness in Walde Creek averages 45 percent in the B channel types, which is 10 percent outside the fisheries desired condition.

Table 3-83 displays each of the subwatersheds and the percent peak flow over natural, percent of sediment over baseline and whether or not the percent of sediment meets Forest Plan standards based on the type of stream it is. In addition, the table shows whether the desired conditions for cobble embeddedness are met. The table shows that Pete King Creek meets the Forest Plan standards and cobble embeddedness, therefore the Stipulation Agreement of “no measurable increase” does not apply for the whole watershed. However, each of subwatersheds do not met the desired cobble embeddedness levels, therefore the Stipulation Agreement of “no measurable increase” would be applied to these watersheds.

Table 3-83: Pete King Creek Sediment/Forest Plan Summary

Watershed	Peak Flow % Over Natural	Sediment % Over Baseline	Sediment within Forest Plan Standard	% Cobble Embeddedness **	Within CE Desired Condition?	Sediment Standard Percent
Pete King	4	19	Yes	32	Yes	No effect 55%
WF Pete King	6	33	Yes	55	No	NMI* (4%)
Polar	6	42	No Forest Plan std	45	No	NMI (4%)
Placer	3	2	Yes	38	No	NMI (4%)
Nut	2	0	Yes	38	No	NMI (6%)
Walde	7	48	No	45	No	NMI (4%)

*No measured increase
To determine consistency with the Forest Plan, cobble embeddedness is averaged over the entire stream. There may be stream reaches that are higher or lower.

Fisheries: Bull trout have not been observed in the Pete King drainage. Steelhead use occurs through the entire system from the mouth to the headwaters.

Summer Rearing Habitat: As noted above, Pete King has two primary channel types, A and B. The overall conditions of the summer rearing habitat are below the desired level for both channels. The primary reason is the higher than desired maximum temperature which may be attributed to lack of shading from the past management activities and fires. Pool quality is also limiting which can be attributed to the lack of acting woody debris and potential woody debris.

Winter Rearing Habitat: The overall winter habitat conditions are below the desired level for both channels. In the A channel, the main reason for the low rating is the high level of cobble embeddedness. Both channels display a lack of pool quality, but pool to riffle ratios is good.

Spawning Habitat: The overall conditions of the spawning habitat are below the desired level for both channels. The amount of fine material in the stream was limiting in the A channel, and temperatures are limiting in both channels.

Riparian Habitat: The riparian habitat conditions are below the desired level for both channels. The limited amounts of acting and potential woody debris, due to past management activities and fires, are the primary factors for the poor riparian rating. Pete King Creek has especially low levels of potential woody debris indicating some riparian management may need to occur in order to promote recruitment.

Management Considerations: Ensure no measurable increase in sediment for watersheds not meeting standards. Future projects should not reduce potential woody debris levels. In addition, stream temperatures need to be maintained or improved in Pete King Creek and its tributaries to maintain spawning temperatures below 13°C.

Table 3-84: Habitat Function Summary for Pete King Creek

Habitat	Desired Condition	A Channel Reach Existing Condition	B Channel Reach Existing Condition
Summer Rearing	**80%**	**71%**	**65%**
Max. Temperature	16-17°C	21.1^{o}C	22.9^{o}C
Pool Quality	3	1.7	1.5
In-Stream Cover	3	2.2	1.8
Pool-Riffle Ratio	40:60	49:51	55:45
Winter Rearing	**80%**	**59%**	**78%**
Cobble Embeddedness	25-35%	62%	37%
Pool-Riffle Ratio	40:60	49:51	55:45
Pool Quality	3	1.7	1.5
Spawning	**80%**	**52%**	**59%**
% Fines Sediment	22-24%	36.8%	24.8%
In-Stream Cover	3	2.2	1.8
Pool Quality	3	1.7	1.5
Max. Temperature	13°C	16.5^{o}C	18°C
Riparian	**80%**	**60%**	**45%**
Potential Debris	80 pieces/100 meters	21 pieces	5 pieces
Acting Debris	40 pieces/100 meters	17 pieces	5 pieces
Bank Cover	3	3.3	2.2
Bank Stability	3	5	5

Pete King Creek Environmental Consequences

Table 3-85: Pete King Maximum Percent Increase in Sediment from Baseline Condition (WATBAL)

Watershed	Sediment Standard Percent	Alt.	2001 Existing Condition	2002	2003	2004	2005	2006
WF Pete King	No measured increase (4%)	All Alts	33	33	33	33	33	33
Walde	No measured increase (4%)	2,3,3a,4,5 6	48 48	49 49	50 49	50 49	48 47	44 44
Placer	No measured increase (4%)	All Alts	2	3	4	5	6	5
Polar	No measured increase (4%)	2-6 3	42 42	42 40	41 37	39 34	35 31	32 29
Nut	No measured increase (6%)	All Alts	0	1	2	4	6	6
Pete King at mouth	High Fish (55%)	All Alts	19	19	19	21	21	19

Watersheds within the optimum size range for the model (4-40 mi^2) consider a **4 percent** increase in sediment output to be **essentially immeasurable.**
Watersheds less than the above stated size range consider a **6 percent increase** in sediment to be **essentially zero and not measurable** using standard methodologies (Simon 2000, Patten 2000).

Pete King Creek is to be managed as a "high fish" stream, with the high fish standard allowing up to 55 percent sediment production over natural for 10 out of 30 years. Currently only Walde Creek has been above 55 percent for more than 10 years, and is still above the 45 percent threshold for sediment. Walde Creek also does not meet the

desired condition objective for cobble embeddedness. In addition, Placer, Polar and Nut have higher cobble embeddedness numbers than desired, therefore the Stipulation Agreement of "no measurable increase" will be applied. The WATBAL model did not account for approximately 1,872 cubic yards (1,870 tons) of sediment that was removed from the mainstem Pete King sediment trap between 1989 and 1998.

West Fork Pete King Creek: Timber harvest activities**,** which are limited to 232 acres of skyline logging in alternatives 2, 3, 3a, 4, and 5, are not anticipated to have any adverse impact on the watershed. Current sediment levels in West Fork are at 33 percent above baseline. Peak flows do not increase with this action, and ECAs, which are currently at 11.4 percent increase for one year to 12.6 percent and return to existing levels by 2005. There are no increases in sediment levels resulting from the proposed activities; consequently, there would be no measurable increases at the mouth of West Fork. Alternative 6 is identical except there are 15 fewer acres harvested in unit 97. Potential effects are the same, so no measurable increase in sediment is expected at the mouth of West Fork Pete King. There would be no change in stream temperatures since streamside shade is retained through retention of PACFISH buffers. No mixed severity burns are proposed in West Fork of Pete King, therefore there would be no potential change in stream temperatures caused by that activity. From 1988 to 1998, approximately 1,019 cubic yards (1,020 tons) of sediment were removed from the sediment trap on the West Fork of Pete King Creek. The WATBAL model did not account for this.

West Fork Pete King Creek –All Action Alternatives

- ?? No increase in sediment levels
- ?? No increase in peak flows
- ?? 1.2 percent increase in ECAs
- ?? No measurable increase in sediment
- ?? No change in channel structure or function
- ?? Consistent with Forest Plan
- ?? No change in stream temperatures

Walde Creek: Alternatives 2, 3, 3a, 4, and 5 would disturb 1,248 acres through a combination of harvest, underburning, and a small amount of temporary road construction. Alternative 6 would disturb 1,101 acres with the same types of activities. The maximum sediment increase is 2 percent above existing condition (50 percent above baseline), and as such would not be measurable using standard hydrologic methods. ECAs also increase to 17.5 percent, which is a 4.3 percent rise above existing conditions. Peak flow values increase by only 1 percent to a maximum of 8 percent above baseline. This value is well below threshold (15-20%), and indicates no adverse channel changes.

The Duration of Peak Flows (Tpeak) predicts an increase of 3 percent to 23 percent, with 20 percent considered threshold. Duration of Peak Flows at this level suggest the potential for adverse channel changes, particularly when most of the channel types tributary to the proposed activities are A3 types that have a very high sensitivity to disturbance and a very poor recovery potential. However, stream survey data (Clearwater Biostudies 1997), indicates a channel that is relatively stable: 1) bank stability was rated as "very good" (4.9); 2) there is adequate woody debris; 3) alder and cedar, both of which have good root strength comprises 60-70 percent of the riparian vegetation; and 4) the

substrate is primarily (75%) rubble and boulder. The survey data indicates a channel that is more stable and resilient than would be assumed through the model output alone. In addition, 1,950 cubic yards (1,950 tons) of sediment from sediment traps were removed between 1986 and 1998, and 14.5 miles of road were recently obliterated which were not accounted for in the model.

There is no measurable increase in sediment based on the vegetative management and temporary road construction alone. Although there is an increase in ECAs and the duration of peak flows, this increase would not result in adverse changes to channel conditions, because the channels are stable, with primarily a rubble/boulder substrate. Also, as noted above the model did not account for roads recently obliterated and sediment trap removal.

Two additional sediment traps are proposed for removal under all action alternatives, as well as additional road obliteration. This would result in long-term improvement in sediment conditions and were not accounted for in the model.

There would be no change in stream temperatures since streamside shade is retained through retention of PACFISH buffers. No mixed severity burns are proposed in Walde Creek, therefore there would be no potential change in stream temperatures caused by that activity.

Walde Creek–All Action Alternatives

- ?? Maximum 2 percent increase in sediment
- ?? Maximum 1 percent increase in peak flows (from 7 to 8 percent)
- ?? ECAs increase from 13.2 to 17.5 percent
- ?? Duration of Peak Flow increases from 20 percent to 23 percent
- ?? No changes to channel conditions because streams are stable, with rubble/boulder substrate, and good riparian vegetation
- ?? No measurable increase in sediment
- ?? Model did not account for past sediment reductions
- ?? No change in stream temperatures
- ?? Consistent with Forest Plan

Placer Creek: Proposed activities in this watershed include tractor logging, temporary road construction (0.5 miles) and underburning (Alts 2, 3, 3a, 4,and 5), and underburning and tractor logging in Alternative 6. To maintain sediment levels below the level discussed for drainages less than 4 square miles the underburning would be delayed in all alternatives for at least 2 years after the harvest. Under those conditions sediment levels rise 4 percent above existing levels and as such would not be measurable at the mouth of the stream. There is a maximum increase in peak flow of 1 percent and a maximum increase in ECA of less than one percent. The proposed activities would have no adverse effect on stream conditions in Placer Creek.

Placer Creek–All Action Alternatives

Delay underburning until 2 years after harvest

- ?? Maximum 4 percent increase in sediment
- ?? Maximum 1 percent increase in peak flows
- ?? ECAs increase <1 percent
- ?? No change in channel structure or function
- ?? No measurable increase in sediment
- ?? Consistent with Forest Plan

Polar Creek: Under Alternatives 2, 3a, 4, 5, and 6 there is harvest activity planned on 214 acres and the construction of 0.8 miles of temporary ridge road. Alternative 3 proposes 135 acres of harvest and no temporary road construction. Under all alternatives there is no increase in predicted sediment or peak flows. ECAs increase less than one percent. The small amount of activity in the watershed would cause no adverse effects to channel structure or function, nor would an increase in sediment be measurable at the mouth of the stream.

Polar Creek–All Action Alternatives

- ?? No increase in sediment
- ?? No increase in peak flows
- ?? ECAs increase <1 percent
- ?? No change to channel structure or function
- ?? No measurable increase in sediment
- ?? Consistent with Forest Plan

Nut Creek: Proposed activities in Nut Creek (Alt 2, 3a, 4, 5, 6) include underburning and timber harvest. Activities in Alternative 3 are the same except for 85 acres less planned underburn. All alternatives include at a least three-year delay between the underburning and the harvest to ensure no measurable increases in sediment. The delay would allow a measure of hydrologic recovery in the watershed.

Sediment is predicted to increase to a high of 6 percent above natural for two years, and would then begin to taper off. Peak flows increase by only one percent and would not precipitate adverse channel changes. ECAs reach a high of 7.7 percent of the watershed and as such are not a concern.

Nut Creek is a small watershed with channels (A3a) that are sensitive to disturbance. Given its small size (2.32 mi^2), it is likely that WATBAL is overestimating effects. In any case, the predicted increases would not be measurable at the mouth of Nut Creek, particularly given its high ratings for bank and channel stability (Clearwater Biostudies 1997).

There would be no change in stream temperatures since streamside shade is retained through retention of PACFISH buffers. No mixed severity burns are proposed in Nut Creek, therefore there would be no potential change in stream temperatures caused by that activity.

Nut Creek–All Action Alternatives

Delay 3 years between underburning and harvest

- ?? Maximum 6 percent increase in sediment
- ?? Maximum 1 percent increase in peak flows
- ?? ECAs increases to 7.7 percent
- ?? No change to channel structure or function
- ?? No measurable increase in sediment
- ?? Consistent with Forest Plan
- ?? No change in stream temperatures
- ?? WATBAL overestimating effects

Cumulative Effects - Pete King Creek

Cumulative Effects Alternative 1: No activities would occur and natural processes would continue. Sediment sources would still exist and continue to direct sediment into the streams. Pete King road would not be reconstructed, therefore sediment created by this road would continue. Stream temperatures would remain above desired conditions. The streams would continue to recover slowly from the effects of the fires in the 1930s. Noxious weeds would not be treated and would continue to expand, increasing the potential for sediment.

In the long term stream temperatures would decrease as vegetation slowly grows back along the stream channels burned earlier in the century. Natural succession would continue. Vegetation would continue to change species composition to late seral species, which are not adapted to fire. Stand densities would continue to increase. The likelihood of a large stand replacing fire would increase as densities and late seral species increase. Another large fire could retard the recovery of the watershed. The resiliency of the watershed would decrease.

Cumulative Effects Alternatives 2-6

The cumulative effects analysis evaluates all activities within the Pete King watershed, including the existing conditions on private land. It includes all harvest, prescribed burning, road construction, and reconstruction, riparian area planting, road obliteration/long-term maintenance, sediment trap removal and noxious weed treatment.

Summary of activities considered in the cumulative effects analysis:

Alternatives 2-6:

- Removal of 2 sediment traps in Pete King Creek and 2 sediment traps in Walde Creek
- Riparian planting of 150 acres along a 2-mile stretch of Pete King Creek
- 40 miles of road obliteration throughout Pete King Creek
- 25 miles of long-term road maintenance throughout Pete King Creek
- Reconstruction of road 453
- 1.9 miles of temporary road construction
- 164 acres of noxious weed treatment

Alternatives 2, 3a, 4 and 5: 2,743 acres of vegetative management

Alternative 3: 2,413 acres of vegetative management (predominately commercial thins and underburns)

Alternative 6: 2,567 acres of vegetative management

Reasonably Foreseeable Actions: Future salvage sales may occur, but are not planned at this time. If they were to occur they would likely remove only a small (less than 20 percent) of the live basal area over a small area, and would not have increase ECAs, peak flows or sediment. These projects would undergo separate environmental analysis to evaluate cumulative effects. There are no other reasonably foreseeable actions, on private or federal land that would affect water yield, sediment or aquatic conditions.

Sediment: All of the action alternatives would result in a 2 percent increase in sediment as measured at the mouth of Pete King Creek because the amount of acres affected are similar. There is a one percent increase in peak flow for all alternatives, although at 5 percent it is well below threshold. ECAs increase the most under Alternatives 2, 3a, 4, 5, but it is only a 2.9 percent rise to a maximum of 11.2 percent. The Duration of Peak Flows (Tpeak), although moderately elevated at 13 percent prior to implementation rises for two years to 15 percent, but then begins to decrease one to two percent a year as hydrologic recovery of the watershed continues. All of the modeled values are within Forest Plan Standards for this watershed. The small increase in peak flows and no measurable increase in sediment would result in no adverse channel changes.

The reconstruction of the Pete King road (#453), may cause some short-term sediment production into Pete King Creek, but should result in an overall decrease in sediment due to stabilization of problem areas and control of surface runoff.

Road obliteration and long-term storage may also result in short-term increases in sediment but would result in long-term improvement in aquatic conditions by removing chronic sediment sources. There would be less sediment by taking action, versus leaving

the sediment sources there. Applications of BMPs (see Design Criteria, Appendix B) are also effective in minimizing sediment from road obliteration/long-term storage (USDA Forest Service, 1999, 2000 Monitoring Reports).

Removal of two sediment traps in Pete King Creek and two sediment traps in Walde Creek (a subwatershed of Pete King) would also improve sediment transport processes within the watershed. This would result in restoration of habitat elements needed for fisheries.

Temperature/Woody Debris: All alternatives retain existing streamside shade through retention of PACFISH buffers. Timber harvest would have no effect on stream temperatures. Mixed severity burning is not prescribed in Pete King Creek. Underburning, which is usually done under more moist conditions, may result in very small localized burning within the riparian area. It is unlikely that the small areas affected would result in temperature changes in the creeks.

Planting 150 acres along Pete King Creek would provide shading and future woody debris recruitment that is currently lacking. Streamside shade and woody debris is lacking because of the overall effects of the fires early in the century. Overall long-term temperatures would decrease and result in improved fisheries habitat.

Landscape Resiliency: Underburning and harvest activities (primarily commercial thinning) would improve the resiliency of the landscape by reducing stand biomass, increasing early seral species adapted to fire. Fires could still occur, however the intensity would be reduced because the biomass is reduced. These activities would improve aquatic conditions by themselves by improving the structure and function on the landscape. The additional removal of roads, sediment sources and planting of riparian areas would accelerate recovery of Pete King quicker than taking no action.

Aquatic Habitat: Cumulatively sediment would decrease, through removal of sediment sources; temperatures would decrease through retention of stream side shade and riparian planting; cobble embeddedness would decrease through reduction of sediment; resiliency would increase through introduction of historic fire systems (non-lethal fire) and reduction in biomass and late seral species resulting in an overall improvement in the aquatic habitat conditions.

Forest Plan and Regulatory Consistency: Each alternative was evaluated at the subwatershed level to ensure they were consistent with the Clearwater Forest Plan, and if applicable the "no measurable increase" as agreed to in the Stipulation Agreement. All alternatives are consistent with the applicable criteria.

All alternatives are consistent with Clean Water Act by protecting beneficial uses. Fisheries habitat would be maintained in the short term through the design of the vegetative activities to meet the Forest Plan standards and/or "no measurable increase" in sediment requirement. In the long term habitat would improve as vegetative resiliency increases, streamside shade is reestablished, and chronic sediment sources are removed.

All alternatives are consistent with the Endangered Species Act by maintaining and/or improving aquatic conditions.

Pete King Creek –

No Action

?? Sediment sources would still exist
?? Longer-term recovery of stream temperatures
?? No improvement in vegetative structure, function and resiliency
?? Does not take care of the whole aquatic ecosystem

All Action Alternatives

Sediment yield from vegetative management and road construction would result in:

?? Maximum 2 percent increase in sediment
?? Peak flow increases from 4 to 5 percent
?? ECAs increase a maximum of 2.9 percent (from 8.3 to 11.2).
?? Duration of Peak Flows increase from 13 to 15 percent then decreases 1 to 2 percent per year.
?? No measurable increase in sediment
?? Channel structure and function maintained

(Yields don't account for past road obliteration or removal of sediment and assume temporary roads remain)

Overall

?? Sediment would decrease by removing sediment sources, and roads at high risk of landslides
?? Stream temperatures would decrease through riparian planting and retention of shade in PACFISH buffers
?? Vegetative resiliency would improve
?? Aquatic resiliency would improve by taking care of all the parts of the ecosystem.

Canyon Creek Existing Conditions

The **Canyon Creek** watershed, including Cabin and Mystery Creeks, drains 12,275 acres of forested lands. Its aspect is generally south, and its elevation range is from 1,565 feet at the mouth, to 5,040 feet. The average annual precipitation in the watershed is 43 inches. Runoff peaks in May or June and is low August through November. Cedar is the dominant tree in the channel bottoms with mixed shrubs being subdominant.

The majority of the watershed is composed of low-moderate relief uplands and breaklands. The parent material is grussic Idaho Batholith granites, granitics and micaceous gniesses and shists. Canyon Creek, a fourth order stream, has 64 percent type A channel, 31 percent type B channel, and 5 percent type C channel.

The natural sediment production rate for the Canyon Creek watershed is 17 tons/mi^2/yr. The estimated geomorphic threshold is 207 percent over natural, or 52 tons/mi^2/yr. Sediment delivery is generally high on the steep slopes, especially the breaklands, and low elsewhere.

Management activities began in the Canyon Creek watershed in 1954 with the construction of FS Road 101. Current road density is approximately 5 mi/mi^2. Timber harvest began in 1965 and continued through 1980's on National Forest lands. To date, approximately 7,600 acres have been harvested, including land cleared for roads.

During the 1995-96 flood events, Canyon Creek experienced a total of 23 slides with seven slides occurring in Upper Canyon. Most were road related, ranging from less than 25 cubic yards to more than 1,000 cubic yards.

The Forest Plan requires that Canyon Creek be managed as a "high fishable" stream. Current sediment levels are 33 percent over natural at the mouth of Canyon Creek (within standard). Its critical reaches of South Fork Canyon, above South Fork, and Mystery Creek are all within standard with 30 percent, 34 percent, and 36 percent, respectively. This determination does not include additional reductions in sediment with the recent completion of 1.5 miles of road obliteration within the drainage.

Table 3-86 displays each of the subwatersheds and the percent peak flow over natural, percent of sediment over baseline and whether or not the percent of sediment meets Forest Plan standards based on the type of stream it is. In addition, the table shows whether the desired conditions for cobble embeddedness are met. The table shows that Canyon meets the Forest Plan standard for sediment, but does not meet the desired condition for cobble embeddedness, therefore the Stipulation Agreement of “no measurable increase” applies to the whole watershed. In addition, each of subwatersheds do not met the desired cobble embeddedness levels, therefore the Stipulation Agreement of “no measurable increase” would be applied to these subwatersheds.

Table 3-86: Canyon Creek Sediment/Forest Plan Summary

Watershed	Peak Flow % Over Natural	Sediment % Over Baseline	Sediment Within Forest Plan Standard?	% Cobble Embeddedness	Within CE Desired Condition?	Sediment Standard Percent
Canyon	7	27	Yes	38	No (+4%)	NMI (4%)*
SF Canyon	7	22	Yes	33	No (+3%)	NMI (4%)
Upper Canyon	9	33	Yes	39	No (+4%)	NMI (6%)
Mystery	9	36	Yes	59	No	NMI (4%)

*NMI = No measurable increase

Fisheries: Bull trout have not been observed in the Canyon Creek drainage. Most steelhead use is limited to the first 2.5 miles of the mainstem of Canyon Creek.

Summer Rearing Habitat: Canyon Creek includes A, B and C type channels. Considering an error range of +/- 5 percent, the overall conditions of the summer rearing habitat in the A and B channels are meeting the desired level. The C channel is slightly below the desired level, primarily due to the higher than desired maximum temperature which may be attributed to lack of shading from the past activities and fires. The high pool to riffle ratio is due to the low gradient of the C channel.

Winter Rearing Habitat: The overall winter habitat conditions in the A and B channels are within the error range of meeting the desired level. The C channel is below the desired level, due to high cobble embeddedness and pool to riffle ratio.

Spawning Habitat: The overall conditions of the spawning habitat are below the desired level for all channels. The amount of fine material in the stream (channels A and C) and temperatures (all channels) are the major limiting factors.

Riparian Habitat: The riparian habitat conditions are below the desired level for all channels. The limited amounts of acting and potential woody debris are the primary factors for the poor riparian rating. Some of the low levels of acting and potential woody debris is due to natural conditions from past fires which have set back vegetative succession in some areas to younger tree/brush species which do not contribute high amounts of large woody debris. Canyon Creek has especially low levels of potential woody debris indicating some riparian management may need to occur in order to promote recruitment.

Management Considerations: Ensure no measurable increase in sediment for watersheds not meeting standards. Improvements in pool quality are one option to achieve the "high fishable" standard. Future projects should not reduce potential woody debris levels. In addition, stream temperatures need to be maintained or improved in Canyon Creek and its tributaries to maintain spawning temperatures below 13°C.

Table 3-87: Habitat Function Summary for Canyon Creek

Habitat	Desired Condition	A Channel Reach Existing Condition	B Channel Reach Existing Condition	C Channel Reach Condition
Summer Rearing	**80%**	**79%**	**80%**	**73%**
Max. Temperature	14-17°C	19.2^{o}C	17.5^{o}C	19.9^{o}C
Pool Quality	3	1.9	1.8	3.6
In-Stream Cover	3	3.5	2.9	3.6
Pool-Riffle Ratio	40:60	49:51	52:48	99:1
Winter Rearing	**80%**	**78%**	**80%**	**57%**
Cobble Embeddedness	25-35%	33%	38%	89%
Pool-Riffle Ratio	40:60	49:51	52:48	99:1
Pool Quality	3	1.9	1.8	3.6
Spawning	**80%**	**72%**	**64%**	**64%**
% Fines Sediment	12-24%	25%	18%	38%
In-Stream Cover	3	3.5	2.9	3.6
Pool Quality	3	1.9	1.8	3.6
Max. Temperature	13°C	14.6^{o}C	17°C	19°C
Riparian	**80%**	**57%**	**59%**	**74%**
Potential Debris	80 pieces/100 meters	35 pieces	22 pieces	14 pieces
Acting Debris	40 pieces/100 meters	11 pieces	20 pieces	43 pieces
Bank Cover	3	2.1	2.3	4.6
Bank Stability	3	5	5	4.9

Canyon Creek Environmental Consequences

Table 3-88: Maximum Percent Increase in Sediment from Baseline Condition (WATBAL)

Watershed	Sediment Standard Percent	Alt.	2001 Existing Condition	2002	2003	2004	2005	2006
Upper Canyon	No Measurable Increase (4%)	2-5 6	33 33	33 35	33 37	33 37	33 35	33 33
South Fork Canyon	No Measurable Increase (4 %)	2,3a 3 4,5 6	22 22 22 22	22 24 21 22	24 24 21 24	22 24 21 24	22 22 21 22	21 19 19 19
Mystery Creek	No Measurable Increase (6%)	2-5 6	36 36	36 36	36 36	36 33	33 30	30 27
Canyon @ Mouth	No Measurable Increase (4 %)	2,3,3a 4,5 6	27 27 27	27 29 29	27 29 29	27 31 29	25 27 25	23 25 23

Watersheds within the optimum size range for the model (4-40 mi^2) consider a **4 percent** increase in sediment output to be **essentially immeasurable.**
Watersheds less than the above stated size range consider a **6 percent increase** in sediment to be **essentially zero and not measurable** using standard methodologies (Simon 2000, Patten 2000).

Upper Canyon: Under all action alternatives the WATBAL model predicts a maximum sediment increase of 4 percent from Alternative 6 to occur from 2003-2004. Peak flows show very little increase, only one percent to 10 percent above baseline for one year, and then they begin to recede. ECAs, which are at 18.6 percent prior to implementation in 2001, increase the most with Alternative 6, but it is only 2.3 percent above the existing condition. The Duration of Peak Flows (Tpeak) in the watershed is quite high at a maximum of 28 percent above baseline. This represents an increase of only 2 percent over existing condition; however, it can be an indicator of elevated risk. Stream channels in the upper reaches are relatively stable B2/B3 types but change to predominantly sensitive A3 types further downstream. Bank stability is rated as good to excellent, which indicates that the stream tolerates a higher duration of peak flows. Therefore a slight increase in the duration of peak flows would not reduce the resiliency of the streams, especially given the slight (1 percent increase in ECAs in Alternative 6 and no measurable increase in sediment under any alternative). In addition, PACFISH buffers would provide a sediment filter for any sediment created from harvest and burning (1999, 2000 Monitoring Reports). There would be no increase in stream temperature since riparian vegetation is retained in PACFISH buffers.

Upper Canyon: (Alternative 6 results in the maximum increase, all other alternatives are less)

- Maximum sediment increase 4 percent
- Maximum 1 percent increase in ECAs (9-10 percent)
- Maximum 2 percent increase in Tpeak (28-30 percent)
- No measurable increase in sediment
- No change in channel structure or function because streams have good bank stability, there is a slight increase in ECAs and there would be no measurable increase in sediment.
- No increase in stream temperatures

South Fork Canyon: Activities in this watershed vary slightly by alternative, but all include temporary road construction, plus tractor and skyline harvest on approximately 200 acres. Channel types in the watershed are predominantly A3a-A4 types that are rated as very high to extreme in their sensitivity to disturbance. Under all alternatives the maximum sediment increase is 2 percent above existing conditions, which meets the “no measurable increase” criteria and would not be measurable at the mouth of the stream. There are no increases

South Fork Canyon:

- Maximum 2 percent increase in sediment
- No increase in ECAs
- No increase in peak flows
- No change in channel structure or function
- No measurable increase in sediment
- No increase in stream temperatures

in either peak flow or ECA values with any alternatives. All alternatives would maintain channel structure and function due to no measurable increase in sediment and no increases in peak flow or ECA values. The ridge top road does not cross stream channels, therefore would not directly introduce sediment to the streams. In addition, implementation of PACFISH buffers are effective in filtering sediment delivery to the streams. There would be no increase in stream temperature since riparian vegetation is retained in PACFISH buffers.

Mystery Creek:

- No increase in sediment
- Maximum 1 percent increase in ECAs (9-10 percent)
- No increases in peak flows
- No increase in Tpeak
- No measurable increase in sediment
- No change in channel structure or function because streams have good bank stability, there would be no increase in sediment or peak flows

Mystery Creek: The activities proposed for this watershed vary slightly by alternative, but at the most (Alts 2-5) disturb only 157 acres. There are no increases in sediment or peak flows, and ECAs increase by less than one percent. The Duration of Peak Flows (Tpeak) is currently at 26 percent, and 20 percent is considered threshold. Tpeak does not increase at all with the implementation of this proposal. Though this value is high the stream channels are quite stable (A2, B3) and the watershed itself has a very high Geomorphic Threshold (240 percent above baseline), also an indicator of stability. Channel structure and function would be maintained due to no measurable increase in sediment, a less than 1 percent increase (from 9 to 10 percent) in ECAs and no increase in Tpeak. In addition the streams are quite stable. There are no indications that the channel has ever experienced damage due to past increases in water yield (BA, p. 45).

Cumulative Effects Alternative 1: No activities would occur and natural processes would continue. Sediment sources would still exist and continue to direct sediment into the streams. Stream temperatures would remain above desired conditions. The streams would continue to recover slowly from the effects of the fires in the 1930s. Noxious weeds would not be treated and would continue to expand, increasing the potential for sediment.

In the long term stream temperatures would decrease as vegetation slowly grows back along the stream channels burned earlier in the century. Natural succession would continue. Vegetation would continue to change species composition to late seral species, which are not adapted to fire. Stand densities would continue to increase. The likelihood of a large stand replacing fire would increase as densities and late seral species increase. Another large fire could retard the recovery of the watershed. The resiliency of the watershed would decrease.

Cumulative Effects of Alternatives 2 – 6: The cumulative effects analysis evaluates all activities within the Canyon Creek watershed. It includes all harvest, prescribed burning, road construction, and reconstruction, road obliteration/long-term maintenance, reconstruction, and noxious weed treatment. There is no private land within the drainage

Summary of activities considered in the cumulative effects analysis:

Alternatives 2- 6

- ✍✍17 miles of road obliteration throughout Canyon Creek
- ✍✍16 miles of long-term storage throughout Canyon Creek
- ✍✍1.4 miles of temporary road construction
- ✍✍9 acres of noxious weed treatment

Reasonably Foreseeable Actions: Future salvage sales may occur, but are not planned at this time. If they were to occur they would likely remove only a small (less than 20 percent) of the live basal area over a small area, and would not have increase ECAs, peak flows or sediment. These projects would undergo separate environmental analysis to evaluate cumulative effects. There are no other activities that cumulatively affect water yield, sedimentation or aquatic habitat other than those described above.

Sediment

WATBAL modeling at the mouth of Canyon Creek includes all Upper and South Fork Canyon as well as Mystery Creek. All the activities discussed above under the tributaries are also included.

WATBAL modeling indicates a maximum sediment increase of 4 percent under Alternatives 4 and 5, a two percent rise with alternative 6, and no increases with Alternatives 2, 3, and 3a. For all the alternatives the increases are under 4 percent, and as such would not be measurable at the mouth of the stream. There are very small increases in ECAs (< 2 percent) and a one percent increase in peak flows; consequently, there would not be sufficient energy to change sediment dynamics or flow regimes in the watershed. Duration of Peak Flows (Tpeak) are currently at 21 percent above baseline, and would increase by one percent in Alternatives 4, 5, and 6. Alternatives 2, 3, and 3a have no predicted rise in Tpeak.

Road obliteration and long-term storage may also result in short-term increases in sediment but would result in long-term improvement in aquatic conditions by removing chronic sediment sources. There would be less sediment by taking action, versus leaving the sediment sources there. Applications of BMPs (see Design Criteria, Appendix B) are also effective in minimizing sediment from road obliteration/long-term storage (USDA Forest Service, 1999, 2000 Monitoring Reports).

Cumulative Effects No Action

?? Sediment sources still exist
?? Long-term recovery in stream temperatures
?? No improvement in vegetative resiliency
?? Does not take care of the whole aquatic ecosystem

Cumulative Effects Alternatives 2, 3, and 3a

?? Decreases sediment
?? No change in stream temperatures
?? Improves vegetative resiliency
?? Improves aquatic resiliency by taking care of the whole

Cumulative Effects Alternative 4 and 5

?? Decreases sediment
?? No change in stream temperatures
?? Begins improvement of vegetative resiliency

Cumulative Effects Alternative 6

?? Decreases sediment
?? No change stream temperatures
?? Improves vegetative resiliency
?? Improves aquatic resiliency by taking care of the whole system

Temperature/Woody Debris: Ignition for underburns would occur outside of riparian areas, however, some small localized burning within the riparian area may occur. This burning would be isolated and not of the magnitude to change overall stream temperatures. Harvest activities retain PACFISH buffers; therefore there would be no change in stream temperatures or woody debris.

Landscape Resiliency: Underburning and harvest activities would improve the resiliency of the landscape by reducing the potential for large, lethal, stand-replacing wildfires on the breaklands and colluvial mid-slopes. These activities would change

species composition to trees more tolerant to fire. In addition, patch sizes would increase to resemble sizes more reflective of past disturbance processes.

Aquatic Habitat: Cumulatively, sediment would decrease through removal of chronic sediment sources and the alternatives reduce the likelihood of large catastrophic wildfires similar to those that occurred at the turn of the century.

Forest Plan and Regulatory Consistency: Each alternative was evaluated at the subwatershed level to ensure they were consistent with the Clearwater Forest Plan, and if applicable the "no measurable increase" as agreed to in the Stipulation Agreement. All alternatives are consistent with the applicable criteria.

All alternatives are consistent with Clean Water Act by protecting beneficial uses. Fisheries habitat would be maintained in the short term through the design of the vegetative activities to meet the Forest Plan standards and/or "no measurable increase" in sediment requirement. Stream temperatures do not increase under any alternative. In the long term habitat would improve as vegetative resiliency increases, streamside shade is reestablished, and chronic sediment sources are removed. All alternatives are consistent with the Endangered Species Act by maintaining and/or improving aquatic conditions.

Deadman Creek Existing Conditions

The **Deadman Creek** watershed drains 12,642 acres of forested lands. Elevation range is from 1,500 feet at the mouth, to 5,000 feet. The average annual precipitation is 47 inches. Runoff peaks in May or June and is low in August through November. Cedar is the dominant tree in the channel bottoms with dogwood being subdominant.

The majority of the watershed is composed of old surfaces, breaklands, and colluvial midslopes. The parent material is weathered granitic rock. Deadman Creek, a fifth order stream, has 87 percent type A channel and 13 percent type B channel.

The natural sediment production rate for the Deadman Creek watershed is 17 tons/mi^2/yr. The estimated geomorphic threshold is 207 percent over natural. Sediment delivery is generally high on the steep slopes, especially the breaklands, and low elsewhere. Deadman Creek is similar to Pete King Creek in that there is a tendency for sediment to increase and deposit at a faster rate than the increased runoff can remove it, causing the stream to be sediment surplus and energy limited.

Management activities began in the 1960's with roading and timber harvest**.** Approximately 2,400 acres have been harvested and road density is approximately 2 miles/square mile.

During the 1995-96 flood events, eight slides occurred in the Deadman Creek watershed. Three slides along the mainstem were road related (481 and 5541 roads) and ranged from 26 to 1,000 cubic yards, and five slides were attributed to a clearcut harvest unit along the West Fork of Deadman.

The Forest Plan requires that Deadman Creek be managed as a "high fishable" stream. Current sediment levels are 5 percent over natural at the mouth of Deadman Creek (within standard). As shown in Table 3-89, critical reaches of West Fork, East Fork, and Middle Forks of Deadman Creek are all within standard with 23 percent, 0 percent, and 5 percent, respectively. Although logging and roading activities have produced additional sediment and runoff, the stream is being managed below its geomorphic threshold as stream integrity and equilibrium are maintained. Cobble embeddedness averages 45 percent for Deadman Creek, which is outside the fisheries desired condition. The critical reaches are also outside the cobble embeddedness desired condition, therefore the Stipulation Agreement of “no measurable increase” in sediment applies.

Table 3-89: Deadman Creek Sediment/Forest Plan Summary

Watershed	Peak Flow % Over Natural	Sediment: % Over Baseline	Sediment Within Forest Plan Standard?	% Cobble Embeddedness	Within CE Desired Condition?	Sediment Standard Percent
Deadman	2	5	Yes	45	No	NMI (4%)
EF Deadman	1	0	Yes	44	No	NMI (6%)
WF Deadman	5	23	Yes	46	No	NMI (4%)
MF Deadman	1	5	Yes	46	No	NMI (4%)

Sediment values are based on WATBAL output
Percent cobble embeddedness is based on stream survey data
EF Deadman is rated a “C” channel type in the Forest Plan, but there are none in the stream. Desired condition is based on a “B” channel type

Fisheries: Bull trout have not been observed in Deadman Creek drainage. Steelhead use occurs throughout the entire system from the mouth to the headwaters. Migration barriers have limited steelhead movement the upper end of the drainage.

Summer Rearing Habitat: The overall condition of the summer rearing habitat is at the desired level for the B channel and below that for the A channel. The A channel has a higher than desired maximum temperature which may be attributed to lack of shading from the past activities and fires. Pool quality is also limiting in both channels, which can be attributed to the lack of potential and acting woody debris and high stream energy.

Winter Rearing Habitat: The overall winter habitat conditions are below the desired level for both channels. Cobble embeddedness is rated high, and the pool to riffle ratio is lower than desired.

Spawning Habitat: The overall condition of the spawning habitat for the A channel is below the desired level, but within the error range for the B channel. The amount of fine material in the stream and temperature are the major limiting factors in the A channel.

Riparian Habitat: The riparian habitat conditions are below the desired level for both channels. The limited amounts of acting and potential woody debris are the primary factors for the poor riparian rating. Some of this is due to natural conditions from past fires that have set back vegetative succession in some areas to younger tree/brush species, which do not contribute high amounts of large woody debris. Deadman Creek has especially low levels of potential woody debris, indicating some riparian management may need to occur to promote recruitment.

Management Considerations: Ensure no measurable increase in sediment for watersheds not meeting standards. Improvements in pool quality are one option to achieve the "high fishable" standard. Future projects should not reduce potential woody debris levels. In addition, stream temperatures need to be maintained or improved in Deadman Creek and its tributaries to maintain spawning temperatures below 13°C.

Table 3-90: Habitat Function Summary for Deadman Creek

Habitat	Desired Condition	A Channel Reach Existing Condition	B Channel Reach Existing Condition
Summer Rearing	**80%**	**72%**	**80%**
Max. Temperature	16-17°C	20.5°C	16.5°C
Pool Quality	3	2.1	1.9
In-Stream Cover	3	4.5	4.8
Pool-Riffle Ratio	40:60	24:76	31:69
Winter Rearing	**80%**	**60%**	**69%**
Cobble Embeddedness	25-35%	47%	45%
Pool-Riffle Ratio	40:60	24:76	31:69
Pool Quality	3	2.1	1.9
Spawning	**80%**	**64%**	**76%**
% Fines Sediment	22-24%	31%	29%
In-Stream Cover	3	4.5	4.8
Pool Quality	3	2.1	1.9
Max. Temperature	13°C	16.5°C	13°C
Riparian	**80%**	**63%**	**53%**
Potential Debris	80 pieces/100 meters	26 pieces	15 pieces
Acting Debris	40 pieces/100 meters	20 pieces	8 pieces
Bank Cover	3	3.6	3.2
Bank Stability	3	4.9	5

Deadman Creek Environmental Consequences

Table 3-91: Maximum Percent Increase in Sediment from Baseline Condition (WATBAL)

Watershed	Sediment Standard Percent	Alt.	2001 Existing Condition	2002	2003	2004	2005	2006
MF Deadman	No measurable increase (4 %)	2, 3a, 6 3 4, 5	5 5 5	7 5 7	9 5 7	9 5 7	7 5 5	5 5 5
WF Deadman	No measurable increase (4 %)	All Alts	20	20	20	22	22	20
EF Deadman	No measurable increase (6 %)	All Alts	0	1	2	2	1	0
NFDeadman	No measurable increase (6 %)	All Alts	0	1	2	2	1	0
Deadman Mouth	No measurable increase (4 %)	2,3,3a,5,6 4	5 5	7 5	9 5	9 5	7 5	5 5

Watersheds within the optimum size range for the model (4-40 mi^2) consider a **4 percent** increase in sediment output to be **essentially immeasurable.**

Watersheds less than the above stated size range consider a **6 percent increase** in sediment to be **essentially zero and not measurable** using standard methodologies (Simon 2000, Patten 2000).

Middle Fork Deadman:

- Maximum 4 percent increase in sediment
- Less than 1 percent increase in ECAs
- Less than 1 percent increase in peak flows
- No measurable increase in sediment
- No change in channel structure or function
- Consistent with Forest Plan

Middle Fork Deadman: Proposed activities in the Middle Fork include underburning and harvest, which would disturb approximately 350 acres. There is a predicted sediment increase of 4 percent above existing conditions as a result of implementing Alternatives 2, 3a, or 6. There is less than one percent increase in ECA and peak flow. This level of increase would cause no measurable changes in sediment at the mouth of the stream. Most of the units are tributary to sensitive A3 channel types; however, given the low predicted changes in flow and sediment regime, stream channel structure and function would be maintained.

West Fork Deadman:

- Maximum 2 percent increase in sediment
- Less than 2 percent increase in ECAs
- No increase in peak flows
- Maximum 2 percent increase in Tpeak (from 14 to 16 percent)
- No measurable increase in sediment
- Consistent with Forest Plan
- No change in channel structure or function
- No change in stream temperatures

West Fork Deadman: None of the action alternatives would increase sediment levels by more than 2 percent above existing conditions, and as such would not be measurable at the confluence of West Fork Deadman and mainstem Deadman. Peak flows would not increase under any alternatives and ECAs would rise by less than 2 percent. The Duration of Peak Flow is currently at 14 percent above natural conditions, and is predicted to rise a maximum of 2 percent for two years and then begin to recede to pre-project levels. The Geomorphic Threshold for this channel is 201 percent above baseline, which is indicative of a stable, resilient stream system. The level of impact proposed would cause no measurable changes in stream conditions. Stream temperatures would not change with the retention of PACFISH buffers.

East Fork Deadman: There is a predicted 2 percent sediment increase resulting from Alternatives, 2, 3,3 a, 5,and 6, and increases in and peak flow do not exceed one percent. The Duration of Peak Flows is currently at 2 percent above natural conditions and increases a maximum of 4 percent under Alternatives 2, 3, 3a, and 6. Most of the units are tributary to stable (A2/A2a) channel types that would not be adversely impacted by the level of disturbance planned in this watershed. There would be no measurable changes in stream conditions as a result of this proposal.

East Fork Deadman:

- ?? Maximum 2 percent increase in sediment
- ?? Less than 1 percent increase in ECAs
- ?? Less than 1 percent increase in peak flows (1-2 percent)
- ?? Maximum 2 percent increase in Tpeak (from 2 percent to 4 percent)
- ?? No measurable increase in sediment
- ?? Consistent with Forest Plan
- ?? No change in channel structure or function

North Fork Deadman: The North Fork drainage has proposed underburning of approximately 170 acres in all alternatives. Additionally, reconstruction of 1.5 miles of Road 483 and 0.3 miles of Road 481 to access units in other watersheds is also proposed. The activities are predicted to increase sediment a maximum of 2 percent under all alternatives, with no anticipated rise in peak flow or Duration of Peak Flow. ECAs do increase by less than 1 percent. Changes in sediment regime of this magnitude would not be measurable at the mouth of the stream, and would cause no impacts to channel structure or function.

North Fork Deadman:

- ?? Maximum 2 percent increase in sediment
- ?? Less than 1 percent increase in ECAs
- ?? No increase in peak flows
- ?? No measurable increase in sediment
- ?? Consistent with Forest Plan
- ?? No change in channel structure or function

Cumulative Effects Alternative 1: No activities would occur and natural processes would continue. Sediment sources would still exist and continue to direct sediment into the streams. Stream temperatures would remain above desired conditions. The streams would continue to recover slowly from the effects of the fires in the 1930s. Noxious weeds would not be treated and would continue to expand, increasing the potential for sediment.

In the long term stream temperatures would decrease as vegetation slowly grows back along the stream channels burned earlier in the century. Natural succession would continue. Vegetation would continue to change species composition to late seral species, which are not adapted to fire. Stand densities would continue to increase. The likelihood of a large stand replacing fire would increase as densities and late seral species increase. Another large fire could retard the recovery of the watershed. The resiliency of the watershed would decrease.

Cumulative Effects Alternatives 2 – 6

The cumulative effects analysis evaluates all activities within the Deadman Creek watershed including past activities that are accounted for in the existing condition. It includes all harvest, prescribed burning, road construction, and reconstruction, road obliteration/long-term maintenance, and noxious weed treatment. There is no private land within the drainage

Summary of activities considered in the cumulative effects analysis

All alternatives

- 17 miles of road obliteration
- 16 miles of long-term storage
- 8 miles of temporary road construction
- 248 acres of noxious weed treatment

Reasonably Foreseeable Actions: Future salvage sales may occur, but are not planned at this time. If they were to occur they would likely remove only a small (less than 20 percent) of the live basal area over a small area, and would not have increase ECAs, peak flows or sediment. These projects would undergo separate environmental analysis to evaluate cumulative effects. There are no other reasonably foreseeable actions, on private or federal land that would affect water yield, sediment or aquatic conditions.

Sediment: Alternatives 2, 3, 3a, 5,and 6 are predicted to increase sediment a maximum of 4 percent, and Alternative 4 is not anticipated to increase sediment at the mouth of Deadman Creek. Peak flows show no increase, and ECA values do not rise more than 2 percent in any alternative. Given the minimal amount of planned activity in the drainage, the overall resilient nature of the channel (Geomorphic Threshold=207 percent), and a good mix of stable channel types, stream channel structure and function would be maintained. Temporary road construction is accounted for in the WATBAL model and is assumed to be a permanent road in the model. The temporary roads are located on ridgetops and do not include stream crossings, therefore the effects of the temporary roads would actually be less than that predicted.

Road obliteration and long-term storage may also result in short-term increases in sediment but would result in long-term improvement in aquatic conditions by removing chronic sediment sources. There would be less sediment by taking action, versus leaving the sediment sources there. Furthermore, the reconstruction of the Middle Butte and Van Camp Roads would result in an overall decrease in sediment due to the stabilization of problem areas and control of surface runoff.

Temperature/Woody Debris: Ignition for underburns would occur outside of riparian areas, however, some small localized burning within the riparian area is likely to occur. This burning would not be of the magnitude to change overall stream temperatures. All

harvest activities retain PACFISH buffers; therefore there would be no change in stream temperatures or woody debris. No mixed severity burns are proposed in Deadman Creek.

Landscape Resiliency: Prescribed burning and harvest activities would improve the resiliency of the landscape by reducing the potential for large, lethal, stand-replacing wildfires on the breaklands and colluvial mid-slopes. These activities would change species composition to trees more tolerant to fire.

Aquatic Habitat: Cumulatively, sediment would decrease through removal of chronic sediment sources and the reduction of the likelihood of large catastrophic wildfires similar to those that occurred at the turn of the century.

Forest Plan and Regulatory Consistency: Each alternative was evaluated at the subwatershed level to ensure they were consistent with the Clearwater Forest Plan, and if applicable the "no measurable increase" as agreed to in the Stipulation Agreement. All alternatives are consistent with the applicable criteria.

All alternatives are consistent with Clean Water Act by protecting beneficial uses. Fisheries habitat would be maintained in the short term through the design of the vegetative activities to meet the Forest Plan standards and/or "no measurable increase" in sediment requirement. Stream temperatures do not increase under any alternative. In the long term habitat would improve as vegetative resiliency increases, streamside shade is reestablished, and chronic sediment sources are removed. All alternatives are consistent with the Endangered Species Act by maintaining and/or improving aquatic conditions.

Bimerick Creek Existing Conditions

The **Bimerick Creek** watershed drains 9,549 acres of forested lands. Elevation range is from 1,700 feet at the mouth, to 5,562 feet. The average annual precipitation is 46 inches. Runoff peaks in May or June and is low in August through November. Cedar is the dominant tree in the channel bottoms with alder being subdominant.

The majority of the watershed is old surfaces, breaklands, and frost churned ridges. The parent material is highly weathered granitics. Bimerick Creek, a third order stream, has 100 percent type A channel from its mouth up to Bimerick Falls, which acts as a barrier to fish migration further up the stream.

The natural sediment production rate for the Bimerick Creek watershed is 15 tons/mi^2/yr. The estimated geomorphic threshold is 218 percent over natural. Sediment delivery is

Deadman

Cumulative Effects No Action

?? Sediment sources still exist
?? Long-term recovery in stream temperatures
?? No improvement in vegetative resiliency
?? Does not take care of the whole aquatic ecosystem

Cumulative Effects Alternatives 2, 3, 3a, 5 and 6

?? No measurable increase in sediment
?? No increase in peak flows
?? Maximum 2 percent increase in ECAs (from 2 percent to 4 percent)
?? Maintains channel structure and function
?? Overall decreases sediment
?? No change in stream temperatures
?? Improves vegetative resiliency
?? Improves aquatic resiliency by taking care of the whole

Cumulative Effects Alternative 4

?? No measurable increase in sediment
?? No increase in peak flow
?? No increase in ECAs
?? Maintains channel structure and function
?? Decreases sediment
?? No change in stream temperatures
?? Begins improvement of vegetative resiliency but doesn't restore mixed fire regimes

generally high on the steep slopes, especially the breaklands, and low elsewhere.

Management activities began in the Bimerick Creek watershed in the 1930s with roading for fire control and follow-up planting after large wildfires. Current road density is approximately 0.5 mi/mi^2. Harvesting has not occurred in the watershed. To date, approximately 10 acres have been cleared for roads.

The Forest Plan requires that Bimerick Creek be managed as a "high fishable" stream. This standard is being met for sediment production, since estimates from WATBAL show there has been no increase in sediment in the watershed. Roading activities have not produced additional sediment and runoff, and the stream is being managed below its geomorphic threshold as stream integrity and equilibrium are maintained. Cobble embeddedness averages 17 percent, which is within the fisheries desired condition.

Table 3-92: Bimerick Creek Sediment/Forest Plan Summary

Watershed	Peak Flow % Over Natural	Sediment: % Over Baseline	Sediment Within Forest Plan Standard?	% Cobble Embeddedness	Within CE Desired Condition?	Sediment Standard Percent
Bimerick	0	0	Yes	17	Yes	High Fish 55%

Fisheries: Population data shows that the extent of anadromous fisheries in the Bimerick Creek drainage is in the lower 0.5 miles due to migration barriers. Westslope cutthroat trout and brook trout are present upstream from the migration barriers. Limited steelhead trout spawning and rearing occurs in the lower, accessible stream reach.

Summer Rearing Habitat: The overall condition of the summer rearing habitat is below the desired level. The primary reason is the higher than desired maximum temperature that may be attributed to lack of shading from the past fires. Pool quality is also limiting which can be attributed to the lack of acting woody debris and potential woody debris.

Winter Rearing Habitat: The overall winter habitat condition is within the error range of the desired level. The lack of pool quality and low pool to riffle ratio are limiting factors. Cobble embeddedness is rated good.

Spawning Habitat: The overall condition of the spawning habitat is below the desired level. Temperature and pool quality are the factors limiting spawning habitat.

Riparian Habitat: The riparian habitat condition is below the desired level. The limited amounts of acting and potential woody debris are the primary factors for the poor riparian rating. This is mostly due to natural conditions from past fires that have set back vegetative succession in some areas to younger tree/brush species, which do not contribute high amounts of large woody debris.

Management Considerations: Improvements in pool quality are one option to achieve the "high fishable" standard. Future projects should not reduce potential woody debris levels. In addition, stream temperatures need to be maintained or improved in mainstem Bimerick Creek and its tributaries to maintain spawning temperatures below 13°C.

Table 3-93: Habitat Function Summary for Bimerick Creek

Habitat	Desired Condition	A Channel Reach Existing Condition
Summer Rearing	**80%**	**69%**
Max. Temperature	16-17°C	19.5°C
Pool Quality	3	2.2
In-Stream Cover	3	3.6
Pool-Riffle Ratio	40:60	22:78
Winter Rearing	**80%**	**78%**
Cobble Embeddedness	25-35%	17%
Pool-Riffle Ratio	40:60	22:78
Pool Quality	3	2.2
Spawning	**80%**	**70%**
% Fines Sediment	22-24%	10%
In-Stream Cover	3	3.6
Pool Quality	3	2.2
Max. Temperature	13°C	19°C
Riparian	**80%**	**53%**
Potential Debris	80 pieces/100 meters	32 pieces
Acting Debris	40 pieces/100 meters	7 pieces
Bank Cover	3	1.4
Bank Stability	3	5

Bimerick Creek Environmental Consequences

Table 3-94: Maximum Percent Increase in Sediment from Baseline Condition (WATBAL)

Watershed	Sediment Standard Percent	Alt.	2001 Existing Condition	2002	2003	2004	2005	2006
Bimerick	High Fish	2,3,3a,6	0	15	30	35	21	8
Mouth	55%	4, 5	0	0	0	0	0	0

Bimerick Creek: Alternative 4 proposes no activities in the Bimerick area and thus maintains the existing condition of the watershed. Alternative 5, which proposes only underburning in Bimerick Creek, would not increase sediment or peak flow values, and ECAs would increase by less than one percent.

Alternatives 2, 3, 3a, and 6 cause a maximum sediment increase of 35 percent. ECAs, peak flow, and Duration of Peak Flow are predicted to increase 20 percent, 8 percent, and 25 percent, respectively. Although the flow values indicate elevated risk of channel degradation, stream survey data shows a resilient system that is not sensitive to changes in flow or sediment. Channel types in Bimerick are steep, bedrock and boulder dominated (A2a, A1a) reaches with a very low sensitivity to disturbance and an excellent recovery potential. Bank stability is rated as "excellent", and current cobble embeddedness is 18-21 percent. All activities in the watershed would be staggered over several years to allow hydrologic recovery between entries.

Bimerick:

Alternatives 2, 3, 3a, 6

?? Staggered entries to allow for recovery
?? Maximum 35 percent increase in sediment, which peaks in 2004 and substantially decreases afterwards
?? Less than 20 percent increase in ECAs
?? Maximum 8 percent increase in peak flows (from 0-8 percent)
?? Maximum 25 percent increase in Tpeak
?? No change in channel structure or function because stream channel is not sensitive to changes in flow or sediment
?? Consistent with Forest Plan

Cumulative

?? Decrease in sediment from road 481
?? Improved vegetative resiliency
?? Decreased risk of catastrophic wildfire

Alternative 4

?? No change

Cumulative

?? No change in sediment
?? Decreased vegetative resiliency
?? Increased risk of wildfire

Alternative 5

?? No increase in sediment
?? No increase in peak flow
?? Less than 1 percent increase in ECAs
?? No change in channel structure

Cumulative

?? Decrease in sediment from road 481
?? Slight improvement of vegetative resiliency
?? Slight decreased risk of catastrophic wildfire

Bimerick Cumulative Effects

The only other activity that is planned to occur in the Bimerick watershed is 22 acres of noxious weed spraying. There is no private land.

Sediment: Other than what is described above, there would be only a minor decrease in sediment from alternatives 2, 3, 3a, and 6 due to reconstruction of road 481. No road decommissioning or long-term storage is proposed.

Temperature/Woody Debris: All alternatives maintain stream temperatures and woody debris because PACFISH buffers would be applied resulting in no changes in vegetation adjacent to the stream. Ignition for mixed severity burns would occur outside of riparian areas, however, some small localized burning within the riparian area is likely to occur. This burning would not be of the magnitude to change overall stream temperatures.

Vegetative resiliency: Alternatives 2, 3, 3a and 6 would remove off-site ponderosa pine and restore the site to species that are adapted to site conditions. The ponderosa pine is declining in health, and is experiencing increased insect and disease mortality. If the trees remain it is likely they would be consumed in a wildfire, which could have its own consequences on the aquatic ecosystem. The prescribed burning and harvest activities would improve vegetative resiliency within Bimerick Creek.

Alternative 5 would only accomplish the underburning activities, therefore is would only slightly improve vegetative conditions. Under Alternative 4 vegetative conditions would continue to decline.

Aquatic Habitat: Cumulatively, peak flows and sediment would increase due to removal of the off site ponderosa pine, but not to the degree that the recovery of aquatic ecosystems would be retarded. PACFISH buffers would assist in filtering overland sediment to the streams. In addition, most of the activity is located on old surfaces, which are relatively flat. The short-term increase in sediment and peak flows should be considered in context of the long-term reduction of the likelihood of large catastrophic wildfires similar to those that occurred at the turn of the century. As the ponderosa pine continues to decline, the long-term threat increases.

Forest Plan and Regulatory Consistency: Each alternative was evaluated at the subwatershed level to ensure they were consistent with the Clearwater Forest Plan. All alternatives are consistent with the Forest Plan.

All alternatives are consistent with Clean Water Act by protecting beneficial uses. Fisheries habitat would be maintained in the short term through the design of the vegetative activities to meet the Forest Plan standards. Stream temperatures do not increase under any alternative. In the long term habitat would improve as vegetative resiliency increases. All alternatives are consistent with the Endangered Species Act by maintaining and/or improving aquatic conditions.

Apgar, Glade, and Rye Patch Creeks Existing Conditions

The analysis area includes the **Apgar, Glade, and Rye Patch Creek** drainages. Apgar Creek drains 1,037 acres, Glade Creek drains 3,119 acres, and Rye Patch Creek drains 1,449 acres of forested lands. Elevation range is 1,600 feet at the mouth, to 4,500 feet for Apgar Creek. Glade Creek ranges from 1,590 feet to 4,853 feet, and Rye Patch Creek ranges from 1,560 feet to 4,600 feet. The average annual precipitation is 40 inches for Apgar, 43 inches for Glade, and 38 inches for Rye Patch. Runoff for each peaks in May or June and is low in August through November. Cedar is the dominant tree in the channel bottoms of Apgar and Glade, with dogwood being subdominant. In Rye Patch, cedar is dominant in the channel bottoms, with spruce being subdominant.

The Apgar Creek watershed consists of breaklands, colluvial midslopes, and old surfaces. The Glade Creek watershed consists of old surfaces and breaklands, and the Rye Patch watershed consists of breaklands, mountain slopes and ridges, and old surfaces. Parent materials range from highly weathered granitics to border zone schists. Apgar and Rye Patch Creeks have 100 percent type A channel. Glade Creek has 57 percent type A channel, 8 percent type B channel, and 35 percent type C channel. All are second order streams.

The natural sediment production rate for the Apgar Creek watershed is 53 tons/mi^2/yr, and the estimated geomorphic threshold is only 11 percent over natural. This low number is most likely exaggerated by WATBAL due to the small size of the watershed. The natural sediment production rate for the Glade Creek watershed is 19 tons/mi^2/yr, and the estimated geomorphic threshold is 196 percent over natural. The natural sediment production rate for the Rye Patch Creek watershed is 48 tons/mi^2/yr, and the estimated geomorphic threshold is only 38 percent over natural. Again, this low number may be exaggerated due to the small size of the watershed. Sediment delivery is generally high on the steep slopes, especially the breaklands, and low elsewhere.

Management activities, consisting of timber harvest and roading, began in the Apgar Creek watershed in 1981; the Glade Creek watershed in 1965; and the Rye Patch Creek watershed in 1974. Approximately 150 acres of the Apgar Creek watershed has been harvested, with a road density of 1 mi/mi^2; the Glade Creek watershed has had 1,100 acres harvested, with a road density of 5 mi/mi^2; and 300 acres of the Rye Patch watershed has been harvested, with a road density of 1 mi/mi^2.

Apgar, Glade and Rye Patch each experienced one road related slide during the 1996-97 flood events. A harvest related (clearcut) slide occurred in Glade Creek. In addition, Rye Patch Creek also experienced a natural slide.

The Forest Plan requires that Apgar, Glade, and Rye Patch Creeks be managed as "high fishable" streams. At their mouths, current sediment levels are 1 percent over natural for Apgar, 13 percent over natural for Glade, and no increase for Rye Patch. Although logging and roading activities in these watersheds have produced additional sediment and runoff, each stream is being managed below its geomorphic threshold as stream integrity

and equilibrium are maintained. As noted in Table 3-95, cobble embeddedness for Apgar, Glade, and Rye Patch Creeks averages 63 percent, 50 percent, and 55 percent, respectively, which are outside the fisheries desired condition, therefore the Stipulation Agreement "no measurable increase" in sediment applies.

Table 3-95: Apgar, Glade and Rye Patch Sediment/Forest Plan Summary

Watershed	Peak Flow % Over Natural	Sediment: % Over Baseline	Sediment Within Forest Plan Standard?	% Cobble Embeddedness	Within CE Desired Condition ?	Sediment Standard Percent
Apgar	2	1	Yes	63	No	NMI* (6%)
Glade	6	13	Yes	50	No	NMI (4%)
Rye Patch	2	0	Yes	55	No	NMI (6%)

NMI* = No measurable increase

Fisheries: No bull trout or steelhead have been observed in the Apgar drainage. Any potential steelhead use would be limited to the lowest two reaches. No bull trout have been observed in the Glade drainage. Steelhead were only observed near the mouth in the lowest stream reach. In Rye Patch Creek, cutthroat trout were observed in the lower reaches, and some steelhead near the mouth. No bull trout have been documented in the drainage. Several migration barriers have been identified, resulting in limiting fish distribution to approximately the first ½ mile from the mouth of the stream.

Summer Rearing Habitat: The overall condition of the summer rearing habitat is below the desired level for Apgar. The primary reason is the higher than desired maximum temperature that was estimated on values from Glade Creek. Since temperature data was not available for Apgar and Rye Patch creeks, information from Glade Creek was used. Pool quality is also limiting which can be attributed to the high cobble embeddedness and sand substrate that may be filling the pools. The overall summer rearing habitat is below the desired level for the A channel of Glade Creek, with the main limiting factors being temperature and pool quality. The B channel of Glade Creek is within the error range of the desired level, and its C channel meets the desired level for summer rearing habitat. Rye Patch Creek is below the desired level, with temperature (which was based on temperatures in Glade Creek) and pool quality being the main limiting factors.

Winter Rearing Habitat: The overall winter habitat condition is below the desired level for Apgar, Glade (A and B channels), and Rye Patch Creeks. The high amount of cobble embeddedness is the primary limiting factor. Lack of high quality pools was an issue for all three streams. The C channel of Glade Creek meets the desired level for winter rearing habitat.

Spawning Habitat: The overall condition of the spawning habitat is below the desired level for Apgar, Glade, and Rye Patch Creeks. The amount of fine material in Apgar, Rye, and the B and C channels of Glade Creek, and stream temperatures in all three drainages are the major limiting factors.

Riparian Habitat: The riparian habitat condition is below the desired level in Apgar and Glade Creeks, and within the error range for Rye Patch Creek. The limited amounts of acting and potential woody debris are the primary limiting factors. This is mostly due to natural conditions from past fires that have set back vegetative succession in some areas to younger tree/brush species, which do not contribute high amounts of large woody debris.

Management Considerations: Ensure projects result in "no measurable increase" in sediment. Improvements in pool quality and potential debris are two options to achieve the "high fishable" standard. Future projects should not reduce potential woody debris levels. In addition, stream temperatures need to be maintained or improved in Apgar, Glade, and Rye Patch Creeks and their tributaries to maintain spawning temperatures below 13°C.

Table 3-96: Habitat Function Summary for Apgar, Glade, and Rye Patch Creeks

Habitat	Desired Condition	A Channel Reach Existing Condition	B Channel Reach Existing Condition	C Channel Reach Existing Condition
Apgar Creek				
Summer Rearing	**80%**	**71%**		
Max. Temperature	16-17°C	17.5^{o}C		
Pool Quality	3	1.5		
In-Stream Cover	3	2.3		
Pool-Riffle Ratio	40:60	39:61		
Winter Rearing	**80%**	**54%**		
Cobble Embeddedness	30-35%	63%		
Pool-Riffle Ratio	40:60	39:61		
Pool Quality	3	1.5		
Spawning	**80%**	**46%**		
% Fines Sediment	22-24%	28%		
In-Stream Cover	3	2.3		
Pool Quality	3	1.5		
Max. Temperature	13°C	17.5^{o}C		
Riparian	**80%**	**62%**		
Potential Debris	80 pieces/100 meters	32 pieces		
Acting Debris	40 pieces/100 meters	23 pieces		
Bank Cover	3	2.2		
Bank Stability	3	4.8		
Glade Creek				
Summer Rearing	**80%**	**72%**	**78%**	**80%**
Max. Temperature	14-16°C	17.5^{o}C	17.5^{o}C	17.5^{o}C
Pool Quality	3	1.7	2.9	3.7
In-Stream Cover	3	3.3	3.3	4.2
Pool-Riffle Ratio	40:60	34:66	78:12	93:7

Habitat	Desired Condition	A Channel Reach Existing Condition	B Channel Reach Existing Condition	C Channel Reach Existing Condition
Winter Rearing	**80%**	**77%**	**72%**	**82%**
Cobble Embeddedness	30-35%	50%	57%	91%
Pool-Riffle Ratio	40:60	34:66	78:12	93:7
Pool Quality	3	1.7	2.9	3.7
Spawning	**80%**	**69%**	**59%**	**71%**
% Fines Sediment	12-14%	12%	23%	37%
In-Stream Cover	3	3.3	3.3	4.2
Pool Quality	3	1.7	2.9	3.7
Max. Temperature	13°C	17.5^{o}C	17.5^{o}C	17.5^{o}C
Riparian	**80%**	**72%**	**71%**	**66%**
Potential Debris	80 pieces/100 meters	54 pieces	34 pieces	16 pieces
Acting Debris	40 pieces/100 meters	30 pieces	35 pieces	25 pieces
Bank Cover	3	2.2	3.1	4.6
Bank Stability	3	5	5	5
Rye Patch Creek				
Summer Rearing	**80%**	**72%**		
Max. Temperature	16-17°C	17.5^{o}C		
Pool Quality	3	1.0		
In-Stream Cover	3	3.3		
Pool-Riffle Ratio	40:60	39:61		
Winter Rearing	**80%**	**57%**		
Cobble Embeddedness	30-35%	55%		
Pool-Riffle Ratio	40:60	39:61		
Pool Quality	3	1.0		
Spawning	**80%**	**52%**		
% Fines Sediment	22-24%	24%		
In-Stream Cover	3	3.3		
Pool Quality	3	1.0		
Max. Temperature	13°C	17.5^{o}C		
Riparian	**80%**	**76%**		
Potential Debris	80 pieces/100 meters	68 pieces		
Acting Debris	40 pieces/100 meters	30 pieces		
Bank Cover	3	2.9		
Bank Stability	3	4.7		

Apgar, Glade and Rye Patch Environmental Consequences

Note in the Final EIS the geomorphic threshold was applied to Apgar and Rye Patch because they do not contain major fisheries. The “High Fish” standard was applied to Glade Creek. For the Supplemental EIS the “no measurable increase” in sediment is

being applied to ensure the most conservative approach in the analysis. Because of this, several additional units were dropped to ensure no measurable increase in sediment.

The following table compares the maximum percent increase in sediment from baseline conditions for all alternatives and their designated Forest Plan Standards.

Table 3-97: Maximum Percent Increase in Sediment from Baseline Condition (WATBAL)

Watershed	Sediment Standard Percent	Alt.	2001 Existing Condition	2002	2003	2004	2005	2006
Apgar	Basic (maintain under 11%)	2,3a	1	3	5	6	5	4
		3,4,5	1	3	5	6	5	5
		6	1	3	6	8	7	7
Glade	High Fish (maintain under 55%)	2,3,3a,5,	13	17	20	22	17	11
		6	13	13	13	13	11	10
		4	13	13	13	13	11	11
Rye Patch	Basic (maintain under 38%)	2,3,3a,6	0	4	8	10	7	4
		4	0	0	0	0	0	0
		5	0	2	5	6	3	0

Apgar Creek: Apgar Creek is a small (1.63 square mile) watershed. The stream is quite sensitive to changes in flow and sediment regime as evidenced by its very low Geomorphic Threshold (11 percent over baseline) and the predominance of extremely sen0sitive A4 channel types. Accordingly, activities planned in the drainage are limited. Under Alternatives 2, 3, 3a, 4, and 5, the maximum sediment increase predicted is 6 percent above the baseline condition. Peak flows only increase by at most 2 percent above baseline conditions to a maximum of 3 percent. Equivalent Clearcut Acres are at 4.4 percent of the watershed and increase to 8.7 percent. The Duration of Peak Flows, currently at 5 percent, rises only 3 percent.

Alternative 6 has predicted sediment increases to 8 percent above baseline and ECAs that rise to 11 percent of the watershed. Peak flows and the Duration of peak flow rise to 4 and 10 percent, respectively. Though this is a sensitive watershed it is unlikely that the Geomorphic Threshold would be exceeded. Given the use of PACFISH buffers and relatively low impact helicopter and skyline logging systems, adverse channel changes are not anticipated, and the proposed activities would not impair downstream beneficial uses.

There are no other reasonably foreseeable actions that would cumulatively add to the direct and indirect effects of the proposed action in Apgar Creek.

Apgar:

Alternatives 2, 3, 3a, 4 and 5

- ?? Maximum 6 percent increase above baseline
- ?? Less than 5 percent increase in ECAs (from 4.4 to 8.7 percent)
- ?? Maximum 2 percent increase in peak flows (from 1 to 3 percent)
- ?? Duration of peak flow increases from 5 to 8 percent
- ?? No change in channel structure or function due to use of low impact harvest systems, retention of streamside filters (PACFISH buffers) and small increases in peak flows and duration of peak flows.
- ?? No measurable increase in sediment
- ?? Consistent with Forest Plan

Alternative 6

- ?? Maximum 8 percent increase above baseline
- ?? Maximum increase in ECAs to 11 percent
- ?? Maximum increase in peak flows to 10 percent
- ?? Maximum Duration of peak flow increases to 10 percent
- ?? No change in channel structure or function due to use of low impact harvest systems, retention of streamside filters (PACFISH buffers) and small increases in peak flows and duration of peak flows.
- ?? No measurable increase in sediment
- ?? Consistent with Forest Plan

Glade Creek. Proposed activities in the drainage include, harvest, mixed severity burning, and underburning. In Alts 2, 3, 3a, 5 and 6 these actions cause a predicted sediment increase of 9% (to 22% above baseline) with no change in peak flow and a less than one percent increase in ECA.

Alternative 4, which drops underburning and mixed severity burning, has no increase in sediment or peak flows, and less than one percent rise in ECAs. Stream reaches tributary to the units range from very stable A1/A2 to C5 types that have a very high sensitivity to disturbance. All of the proposed activities would cause no adverse impacts to channel structure or function.

There are no other reasonably foreseeable actions that would cumulatively add to the direct and indirect effects of the proposed action in Glade Creek.

Glade:

Alternatives 2, 3, 3a, 5 and 6

?? Maximum 9% increase in sediment
?? Less than 1 percent increase in ECAs (from 6 to 7 percent)
?? No increase in peak flows
?? No change in channel structure or function

Alternative 4

?? No increase in sediment above baseline
?? Less than 1 percent increase in ECAs No increase in peak flows)
?? Duration of peak flow increases from 5 to 10 percent
?? No change in channel structure or function

All Alternatives

?? No measurable increase in sediment
?? Consistent with Forest Plan

Rye Patch Creek. Rye Patch is a small watershed with a geomorphic threshold that is 38 percent above baseline sediment levels. Channel types (A3a-A4a) are quite sensitive to changes in sediment and flow regime, and are very slow to recover from adverse impacts. Alternatives 2, 3, 3a, and 6 propose a combination of underburning and harvest in the drainage. Sediment is predicted to increase 10 percent above baseline conditions and peak flows are predicted to rise 3 percent. ECAs rise from the existing condition of 3.6 percent to 11.6 percent.

Alternative 4, which proposes no underburning, disturbs 147 acres through commercial thinning and regeneration harvest. This alternative causes no increase in sediment and a one percent rise in peak flow. ECAs increase from the existing condition of 3.6 percent to a maximum of 8.2 percent of the watershed.

Alternative 5 is similar to those discussed above but disturbs approximately 100 less acres. The maximum sediment increase is 6 percent above existing condition, while ECAs and peak flow rise to 8.3 and 3 percent, respectively. None of the proposed alternatives exceed the geomorphic threshold for this watershed; therefore, there would be no changes in channel structure or function.

Rye Patch

Alternatives 2, 3, 3a, and 6

- Maximum 10 percent increase in sediment above baseline
- Increase in ECAs to 11.6 percent
- Maximum 3 percent increase in peak flows
- No change in channel structure or function due to use of low impact harvest systems, retention of streamside filters (PACFISH buffers) and small increases in peak flows

Alternative 4

- No increase in sediment above baseline
- Less than 5 percent increase in ECAs (from 3.6 to 8.2 percent)
- Maximum 1 percent increase in peak flows (from 2 to 3 percent)
- No change in channel structure or function due to use of low impact harvest systems, retention of streamside filters (PACFISH buffers) and small increases in peak flows

There are no other reasonably foreseeable actions that would cumulatively add to the direct and indirect effects of the proposed action in Rye Patch Creek.

Lochsa River Face Drainages Existing Conditions

Several areas above the river do not have delineated drainages. Water, from these areas, flows directly into the Lochsa River. Most of these areas are on breaklands. There have been no past management activities within these drainages; therefore, management activities have not contributed sediment to the Lochsa River.

Lochsa River Face Drainages Environmental Consequences

Because the river face is comprised of numerous small, undelineated watersheds, WATBAL was not used to model the proposed activities. The Water Erosion Prediction Project (WEPP) erosion model was used in its place.

Table 3-98 displays the results of the WEPP modeling. The probabilities depict the chance that over a thirty-year period some sediment would be delivered. The units modeled drain into unnamed tributaries of the Lochsa River, the mainstem river itself, and Fish Creek below Hungery Creek. Depending on the affected stream, the standards/criteria applied are:

- The "No Effect" Standard (Clearwater Forest Plan) was applied to the mainstem Lochsa River and mainstem Fish Creek. It means that sediment increases must not exceed 45 percent above baseline conditions.
- The "Basic Standard" (Clearwater Forest Plan) is applied to fishless tributaries. It means that the stability and equilibrium of the channel is maintained, and that downstream beneficial uses are not impaired. Typically, the Geomorphic Threshold is used to determine if a stream meets this standard.
- For streams that do not currently meet the Forest Plan sediment standard or cobble embeddedness objective, the "no measurable increase" criteria from the 1993 Forest Plan Lawsuit Stipulation of Dismissal was applied.

A summary of modeling assumptions include:

- All buffers are a minimum of 150 feet.
- Prescribed burns were assumed to lose 15 percent of riparian vegetation to "backing fire".
- All the activities used canopy removal values similar to WATBAL modeling.

Table 3-98: Probability of Sediment Delivery: 30-Year Return Period North Lochsa River Face Drainages by Activity & Alternative: 300' RHCA

Activity	Alt. 2 (acres)*	Alt. 3 (acres)*	Alt. 3a (acres)*	Alt. 4 (acres)*	Alt. 5 (acres)*	Alt. 6 (acres)*	Mean Prob. of Sed delivery
Underburn	1674	1674	1272	--	1674	1674	7%
Mixed Severity Burn	1103	1103	930	--	1103	1103	7%
Regeneration Harvest	534	534	534	--	387	534	7%
Commercial Thin	37	37	37		37	37	7%
Conversion	19	19	19	--	--	19	7%
Acres	3367	3367	2,834	-	3201	3367	
Mean Prob. of sed. delivery	7%	8%	7%	-	8%	7%	

* The acres listed in the table represent only modeled acres. Many of the smaller units were not modeled since the larger acreages were showing no sediment delivery.

The table displays the mean probability of sediment delivery by both activity and alternative. In both cases the risks are essentially equal. To interpret the probabilities, for example in Alternative 6, the 7 percent value means that for a thirty year period there is a 93 percent chance that no sediment would be delivered. The model also predicts the mean sediment output (over 30 years) to be 0.0 tons/acre.

To interpret the probabilities, for example in Alternative 6, the 7 percent value means that for a thirty year period there is a 93 percent chance that no sediment would be delivered.

All the model runs depicted above are based on a 300' or greater riparian buffer. Because many of the proposed units have interior, fishless streams that would be held to the "Basic" standard, the WEPP model was also run using a 150' stream buffer. That information is displayed in Table 3-99.

Tabe 3-99: Probability of Sediment Delivery: 30-Year Return Period North Lochsa River Face Drainages by Activity & Alternative: 150' RHCA

Activity	Alt. 2 (acres)*	Alt. 3 (acres)*	Alt. 3a (acres)*	Alt. 4 (acres)*	Alt. 5 (acres)*	Alt. 6 (acres)*	Mean Prob. of Sed delivery
Underburn	1674	1674	1272	--	1674	1674	9%
Mixed Severity Burn	1103	1103	930	930	1103	1103	10%
Regeneration Harvest	534	534	534	--	387	534	7%
Commercial Thin	37	37	--	--	37	37	7%
Conversion	136	136	136	--		136	5%
Acres	3484	3484	2872	930	3201	3484	
Mean Prob. of sed. delivery	8%	8%	8%	10%	8%	8%	

* The acres listed in the table represent only modeled acres. Many of the smaller units were not modeled since the larger acreages were showing no sediment delivery.

The same acreages were modeled for both buffer widths. The one exception is the units proposed for species conversion. The unit modeled for a 300' buffer did not have adjacent fishless channels, so another one was selected. It appears from these data that the 300' buffer width is slightly more effective than the 150' width in stopping sediment delivery. However, it should be noted that differences in slope length, existing canopy, and percent removal also influence the probabilities. Regardless of buffer width, the overall probability of delivery remains essentially the same for all alternatives. The probability of delivery by activities is also similar, but is slightly higher for burning.

There is a predicted increase in sediment from some of the units with 150' buffers. They are mixed severity burn units 12, 22, and 23, and delivered sediment is anticipated to rise 26, 16, and 12 percent, respectively. Underburn unit #14 also has a predicted sediment increase of 26 percent. The "Basic" standard for these tributaries has been estimated to be 150 percent above baseline conditions; therefore, they would remain in standard, and would cause no adverse channel impacts. A discussion of how the WEPP model was applied to Clearwater Forest Plan standards may be found in the North Lochsa Face SEIS Project File.

In addition to WEPP modeling, of the "face drainage" activities, an analysis of channel types, landform, and surface erosion characteristics indicates a low risk of channel degradation. In the Fish Creek below Hungery Creek drainage, the three prescribed burn units (#12, 13, 14) comprise 409 acres of mixed landtypes including breaklands, low relief hills, mountain uplands, alluvial features, etc. The parent materials are predominantly grussic and non-grussic granites and gneisses. Because these units are proposed for burning, their risk of surface erosion is an important attribute. For all three combined, 79 percent, 11.5 percent, and 9.3 percent of the area is rated as low, moderate, and high, respectively, for surface erosion. All of the high risk (for surface erosion) landtypes occur in Unit #13, where 41 percent of its area falls in that category. Additionally, all three units are tributary to stable, B2, B3, and A2 channel types, which are rated low and very low in sensitivity to disturbance. The underburn units that were modeled (135, 140, 162) occur in breakland and colluvial midslope landforms. They have highly weathered, granitic parent material, and a low to moderate risk of surface erosion. Channel types tributary to these units are very stable A2 and B2 types that have excellent recovery potential and a very low sensitivity to disturbance.

Based on analysis of the WEPP model output, channel type data, and Landtype/LTA erosion risks, the activities proposed for the face drainages meet the "no effect" sediment standard for the Lochsa River, the "no measurable increase" stipulation, and the "Basic Standard" where required (Complete WEPP model output is part of the NLF Project File).

The cumulative effects resulting from activities on the Face areas have been considered within the context of the entire Lochsa Subbasin.

Effects Summary

Sediment

All the proposed activities comply with their relevant standards; therefore, no adverse impacts are anticipated due to sediment increases. Because most of the drainages must meet the "no measurable" increase criteria of the 1993 Forest Plan Lawsuit, predicted sediment delivery would not exceed the 4-6 percent range discussed previously. For watersheds currently meeting the Forest Plan sediment standards (Fish Creek, Willow Creek, Horn Creek, Hungery Creek, Pete King Creek, and Bimerick Creek), the predicted increases are quite small and would cause no adverse channel degradation. Bimerick Creek under alternatives 2, 3a, 5, and 6 shows a relatively large (35 percent) increase in sediment production. This quantity is well within the 55 percent increase allowed under the Forest Plan, and given the overall stability of the channel is unlikely to degrade aquatic conditions.

Stream Flow & Channel Stability

In general, peak flow increases across all alternatives and watersheds are well within the commonly accepted thresholds discussed previously. Exceptions to this statement occur in Walde, Upper Canyon, and Bimerick Creek where the Duration of Peak Flow (Tpeak) exceeds 20 percent. In Walde and Bimerick Creeks stream survey data collected by Clearwater Biostudies indicates the channels are resistant to adverse impacts: They have stable banks with strongly rooted riparian vegetation, large channel substrate, and stream types that are resilient with a good recovery potential. Upper Canyon, although probably more sensitive to flow changes, has adequate bed and bank stability to avoid adverse impacts.

Stream Temperature

None of the action alternatives are expected to increase stream temperatures in fish-bearing streams. Stream temperatures should decrease in Fish and Pete King Creek quicker than no action, through planting of riparian areas. Although there may be some localized removal of vegetation from prescribed burning activities, this is anticipated to affect small areas and would have minimal, localized effects on stream temperatures in headwater streams. Mixed severity burns would be monitored and implementation adjusted if needed. Based on this none of the alternatives further increase temperatures, which is a pollutant of concern.

Lochsa River Existing Conditions

The entire Lochsa River was evaluated to determine if there would by any cumulative effects that would foreclose future options or have cumulatively significant adverse effects. A large part of the upper Lochsa River drainage is in "checkerboard" ownership, with private ownerhip alternating sections. Plum Creek harvest and road building activities are ongoing in the Spruce, Brushy, Papoose, Parachute, Shotgun, Russain,

Crooked Fork, and Walton Creek drainages. Additional road construction and timber harvest on private lands is expected to occur for at least the next decade.

A 1994 survey of the Lochsa River suggests there may be an improving trend in substrate conditions. Data collected in the lower Lochsa River (downstream of Fire Creek) in 1934 was compared to recent data collected in 1994 in the same stream reaches. In 1934, percent fines were ten percent higher than in 1994. This elevated condition was believed to be a result of the large fires in 1910, 1919 and in 1934. Large amounts of sediment were added to the Lochsa River again between 1950 and 1963 during the construction of Highway 12. Additional sediment inputs occurred in the 1960's with the Idaho jammer roading and logging of the tributary watersheds. The Lochsa River is currently recovering from these impacts. The State of Idaho currently lists the Lochsa River as being a water quality limited segment due to temperature.

The 1995-96 flood events caused 10 slides along the mainstem of the Lochsa River in the project area. Six of these slides were related to FS Roads 5515 and 481 and ranged from less than 25 cubic yard to 200 cubic yards. One slide was related to clearcut harvest units that were less than 25 to 100 cubic yards. Three slides were natural and ranged from less than 25 to 1,000 cubic yards.

Lochsa River Environmental Consequences

The Lochsa River Basin downstream to Lowell was evaluated to determine cumulative effects. An increase in erosion and resulting sedimentation is the main potential concern with the implementation of this project.

Alternative 1 (no action): No harvest, road building or burning would occur under the no action alternative. Sediment-producing sites on existing roads would eventually be corrected through normal road maintenance, but would be dependent on funding, which may delay their repair. Because the proposed burning was, in part, to reduce fuels, the risk of larger fires in the watershed would increase under Alternative 1. Concomitant to that risk is the increased probability of surface erosion, and a subsequent increase in delivered sediment to aquatic systems. There are 70 miles of obliteration survey (funded through the Northwest Power Planning Council) that would still be carried out under Alternative 1. The removal of in-channel sediment traps in Walde, Pete King, and WF Pete King Creeks would not be completed.

There would be no direct effects to aquatic habitats from the selection of the No Action alternative. Indirect effects include the long-term, but slow recovery of aquatic habitats from past management and wildfire-related impacts. Parameters expected to recover include sediment loading, riparian vegetation, instream wood, and water temperature. These would take decades to occur. Other indirect effects include: 1) delays in active restoration projects that were designed to accelerate aquatic and riparian recovery (i.e. riparian planting, road obliteration, and underburning), and 2) increases in fuel loading across the landscape.

Pete King, Fish, Canyon, Deadman, Bimerick, Apgar, Glade, and Rye Patch Creeks currently do not meet Desired Future Condition (DFC) guidelines. This is due to a lack of large wood, and higher than preferred cobble embeddedness levels and water temperatures. The proposed riparian planting and road obliteration projects would address these concerns in a shorter time frame than if left to recover at a "natural" pace.

The no action would also result in increased fuel loadings and an increased risk of stand replacement fires in the next 10 to 50 years (*see Fire Risk section*). Intense wildfires such as those seen in 1929 and 1934 may burn large areas, including along streams. A repeat of those fires could result in direct fish mortality, as well as increases in water temperatures, surface erosion, mass wasting, and channelized delivery of sediment to streams. In the event of large wildfires, aquatic habitats could be negatively affected by increases in sediment, water temperature, and peak flows. Apgar, Glade and Canyon Creek drainages are identified as having the highest risk for fire (*see Vegetation section*). Degradation from potential wildfires could set back the aquatic recovery already occurring in project area streams for one to five decades. Further delays would limit the ability of threatened or sensitive fish species to sustain or increase their populations in the project area drainages.

Cumulative Effects Alternatives 2 – 6

The analysis considered past actions including road building, landslides, fires, and logging. Present actions include road maintenance, road obliteration, and active timber projects; and future actions include prescribed fire, road obliteration, and District timber sales (mostly salvage). The risks associated with catastrophic fire and major landslide events, however, adds a measure of uncertainty that cannot be accounted for.

The watershed cumulative effects analysis area for this proposal encompasses the upper Lochsa River (including mixed ownership land in the Crooked and Brushy Fork drainages), and the upper and lower mainstem river including the project area, and downstream to Lowell.

Activities upstream of the project area include harvest and roadbuilding on private and Federal land, and wildland fire on both ownerships. Current Forest Service harvest activities are occurring in the Shoot Creek, Crooked Fork, and Brushy Fork drainages. All of the Forest Service actions are being implemented using PACFISH standards and guidelines, and are abiding by and meeting the stipulations of the Clean Water Act, Clearwater Forest Plan, State of Idaho Water Quality Guidelines, Beneficial Uses, etc.

Plum Creek operations in past years included those three watersheds plus Papoose, Shotgun, Walton, Pack, and Spruce Creek. Plum Creek activities are in the majority governed by the Idaho Forest Practices Act, and in some instances, such as Walton Creek (Goat Roost Project) by Stream Segment of Concern Best Management Practices. The native fish habitat conservation plan with National Marine Fisheries Service and the U.S. Fish and Wildlife Service was signed November 20, 2000.

Although some sediment would be delivered as a result of these activities, the quantities and duration are expected to be small, and within the carrying capacity of a large river such as the Lochsa. Consequently, no downstream effects are anticipated from management activities in the upper basin.

Wildland fires (excluding wilderness fires) have occurred in the Parachute Creek watershed (Bear Camp Fire), and in the Rock/Haskell/Crooked Fork watershed (Crooked Fire) in the summer of 2000. The Bear Camp Incident was a 275-acre fire started in logging slash. The fire burned relatively quickly, and did very little damage to riparian areas (Smith 2000). Only a small percentage of sediment filtering capacity was damaged due to this fire. The Crooked Fire, which burned approximately 4800 acres near Lolo Pass, did burn quite intensely in several areas. As a result, sediment-carrying overland flow increased delivery to local streams, and in some instances the fire burned to the active channel. The loss of riparian area also increases the probability of sediment delivery. The most intensely burned areas were identified in the Burned Area Report (Jones, et al 2000), and restoration activities (contour falling, tree planting) have begun. Monitoring transects of stream channel conditions (Riffle Stability Indices) have also been surveyed and documented. However, there is a high likelihood of increased sediment delivery as a result of this fire. The magnitude, however, would vary with 1) the duration and intensity of fall rains prior to reestablishment of vegetation or a protective snow cover, and 2) the extent to which peak flows increase as a result of tree mortality. Sediment increases are expected to be well within the “no effect” standard for the Lochsa River, which, according to the Clearwater Forest Plan allows for a 45 percent rise above baseline levels. It is also anticipated that there may be short term increases in stream temperature in small drainages (Rock and Haskell) tributary to Crooked Fork Creek; However, those increases would most certainly be negated by the large volumes of water at the confluence of Crooked and Brushy Creek, and even more so when Crooked Fork joins Colt Killed Creek to form the Lochsa River.

In summary, there would be sediment delivery to the upper Lochsa River as a result of wildfire and harvest activities. There is also a good probability of slight fire-related increases in stream temperature in a few small tributaries. The overall effects, however, would result in no overall decrease in habitat quality, or degradation of channel form and function.

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The recovery trend within National Forest lands of the Lochsa River drainage from past wildfires, roading, and timber harvest could be rated as a positive, but slow process due to the past road and timber harvest activities from the early 1950's to 1994. The recent 1995-96 flood events set back recovery in a few drainages (i.e. Squaw, Papoose and Pete King Creeks). Recovery of the riparian areas along most of the fish bearing tributaries is positive, but a slow process. Minimal timber harvest within 100-

150 feet of these streams has occurred within the last ten years and none is planned in the future due to PACFISH direction in the Forest Plan.

Vegetative conditions should improve along these streams and their non-fish bearing tributaries over the next 10-20 years. Full recovery may take over 50-100 years for the smaller streams and much longer (i.e., western red cedar habitats) along the wider riparian areas of the larger streams. Full recovery along streams with roads existing within 150-300 feet is not expected, but vegetative conditions are expected to improve and provide additional streamside cover and potential woody debris. The recent amendment to the Forest Plan to include more refined riparian management objectives (PACFISH) would maintain and/or accelerate the attainment of improved instream and riparian conditions within the National Forest lands. In addition, the upgraded road maintenance program and intensive road obliteration program within the Lochsa River drainage would accelerate recovery.

In addition to the upstream activities discussed above, only road obliteration and broadcast burning may deliver a small and temporary amount of sediment to the Lochsa River as a result of this proposal. The quantity of sediment delivered is expected to be far less than that delivered to the river during the 1995-96 flood events. Wolman pebble count data gathered in the Lochsa River before and after these events revealed no meaningful change in riffle sediment levels (Wolman Pebble Count Data for Selected Stations on the Lochsa River, Powell and Lochsa Ranger Districts, 1994 and 1996. Clearwater BioStudies, Inc. September 1996). The Lochsa River apparently has sufficient energy to handle even very large sediment events. Therefore there would be no cumulative sediment effects on the Lochsa River from proposed activities.

Due to watershed size, WATBAL was not used to model potential sediment increases to the Lochsa River. Because it has already been established that measurable change would not occur in Fish and Hungery Creeks or their tributaries, the likelihood of measuring sediment increases in the Lochsa are even less probable. This is due to the small quantities of sediment predicted; the magnitude of flow—and therefore sediment carrying capacity—of the river, and also due to the distance from the proposed activities. Given practical measurement constraints, it has been suggested that attempts to detect cumulative effects should focus on third to fourth order basins (Megahan 1999), whereas the Lochsa at this point is a seventh order stream. MacDonald (1989) states there is a steady decline in the ease of detecting cumulative effects from second to fourth order basins. This is due to both the effects of dilution, and also the methods by which change is measured.

The Forest is currently monitoring substrate conditions, fish populations, and fish habitat quality in all eight major watersheds in the project area, including Fish and Hungery Creeks. To monitor the efficacy of the mitigation of the burn units, on-the-ground field reviews would be conducted of sample watersheds. The review team would consist of a fisheries biologist, hydrologist, soil scientist, fire management personnel, and a silviculturist. The results of those reviews would be used to modify future burns (if necessary) to ensure compliance with water quality standards, to meet terms and

conditions of the Biological Opinion as well as to ensure that silvicultural objectives are being met.

The Lochsa River, Walde, Nut, Canyon, South Fork Canyon, West Fork Deadman, Glade, West Fork Pete King and Fish Creeks are currently listed as a Water Quality Limited Segment, with temperature the pollutant of concern. Due to the implementation of full PACFISH buffers, it is expected that no measurable increase in water temperatures would occur. The effectiveness of riparian buffers in controlling stream temperatures has been well documented in the literature (Brown and Krygier, 1970; Brown et al., 1971; Swift and Messer, 1971). More recent data from the Lochsa River Subbasin Assessment (Bugosh 1999) concludes "…summer temperatures above the state water quality criteria are natural conditions in the subbasin and that aquatic life has successfully adapted to these conditions…" Additionally, a large river system such as the Lochsa relies more on water depth to maintain temperatures, as contrasted to a smaller stream where shade from riparian vegetation plays a more important role.

Forest Plan and Regulatory Findings: As noted before all action alternatives are consistent with the Clearwater Forest Plan and the Stipulation Agreement, where it applies. All action alternatives are consistent with the Clean Water Act and Endangered Species Act. The project is designed to ensure that there are limited effects, in duration and magnitude, in the short term and neutral or beneficial effects in the long term to the aquatic ecosystem. This is accomplished by

The North Lochsa Face Ecosystem Management Project project is designed to ensure that there are limited effects, in duration and magnitude, in the short term and neutral or beneficial effects in the long term to the aquatic ecosystem.

- Ensuring there are "no measurable increases" in sediment from vegetative and road construction activities in those watersheds that do not meet Forest Plan standards;
- Incorporating design criteria (Chapter 2) and monitoring, such as required for the mixed severity burns, to ensure that the actions meet resource objectives.
- Locating road construction in areas of very low risk of landslides
- Not harvesting in riparian areas thereby retaining streamside shade and woody debris
- Increasing vegetative resiliency to decrease the likelihood of stand replacing fires that could further retard improvement in the watersheds
- Taking a conservative approach in the use of WATBAL.
- Further accelerating watershed recovery by taking care of the whole ecosystem, including the vegetative conditions, and removing chronic sediment sources, planting riparian areas currently unvegetated, and removing sediment traps.