HYDROLOGY REPORT

TO: PROJECT FILE

FROM: KEVIN DAVIS

SUBJECT: TUMBLEDOWN

DATE: 2/7/2008

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This report provides documentation supporting the conclusion that there would be no site-specific, measurable effects to hydrologic resources associated with implementation of Alternative 2 of ***Tumbledown Fuels Reduction Project.***

- The proposed action would not have a significant effect on any flood plains, wetlands, or municipal watersheds.
- The proposed action would not have a significant effect on any impaired watersheds.
- The proposed action would not have a significant effect on steep slopes or highly erodible soils.

In addition, the project would comply with direction for protecting water quality from the following sources:

- National Forest Management Act
- Endangered Species Act
- State of Idaho's implementation of the Clean Water Act
- Rules Pertaining to the Idaho Forest Practices Act (Title 38, Chapter 13, Idaho Code, 2000)
- Executive Order 11988, 11990, 12962
- Clean Water Act and amendments
- IPNF Forest Plan
- Inland Native Fish Strategy

National Forest Management Act

The National Forest Management Act (NFMA 1976) requires that the Forest Service insure that timber will be harvested from National Forest System lands only where: 1) soil, slope, or other watershed conditions will not be irreversibly damaged and 2) protection is provided for streams, streambanks, shorelines, lakes, wetlands, and other bodies of water from detrimental changes in water temperatures, blockages of water courses, and deposits of sediment, where harvests are likely to seriously and adversely affect water conditions or fish habitat.

Executive Order 11988

Executive Order 11988 – Floodplain Management (May 24, 1977, revised July 20, 1979) states objectives "to avoid to the extent possible the long and short term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct or indirect support of floodplain development wherever there is a practicable alternative".

Executive Order 11990

Executive Order 11990 – Protection of Wet Lands (May 24, 1977) states objectives "to avoid to the extent possible the long and short term adverse impacts associated with the destruction or modifications of wetlands and to avoid direct or indirect support of new construction in wetlands wherever there is a practicable alternative".

Executive Order 12962

Executive Order 12962 – Recreational Fishing (June 7, 1995) states objectives "to improve the quantity, function, sustainable productivity, and distribution of U.S. aquatic resources for increased recreational fishing opportunities by: (h) evaluating the effects of Federally funded, permitted, or authorized actions on aquatic systems and recreational fisheries and document those effects relative to the purpose of this order".

The Clean Water Act

The principal law governing pollution in the nation's streams, lakes, and estuaries is the Federal Water Pollution Control Act (P.L. 92-500, enacted in 1972), commonly known as the Clean Water Act (as amended in 1977, 1981 and 1987). The Clean Water Act is the primary federal law that protects the nation's waters, including lakes, rivers, aquifers, and coastal areas. The Act's primary objective is to restore and maintain the integrity of the nation's waters. Under the Clean Water Act 303(d) and the Environmental Protection Agency (EPA) regulation (40 CFR 130.2(J), 130.7), states are required to list which waters do not meet water quality standards. This list of impaired waters is commonly known as the "Section 303(d) list". The individual states are directed by the EPA to improve the aquatic conditions of those streams not supporting beneficial uses. Once a water body is listed as impaired, it is the state's responsibility to develop a Total Maximum Daily Load (TMDL) for each pollutant of concern. These TMDLs are then submitted to EPA for review and approval or disapproval. The status of the streams affected by this project is contained in the existing conditions section of this report. IDAPA 58.01.02.054.04 requirements for medium and low priority waters are to use best management practices to prohibit further impairment of the designated or existing beneficial uses.

Through the Clean Water Act, each state is required to provide guidance and direction to protect and restore water bodies. The State of Idaho has met this federal requirement through their state Best Management Practices (BMPs). The Forest Service must comply with state water

quality standards to the same extent as any other entity through section 313 of the Clean Water Act. The use of BMPs is also required in the Memorandum of Understanding between the Forest Service and the States as part of our responsibility as the Designated Water Quality Management Agency on National Forest System lands. The EPA and the State of Idaho are responsible for regulating these standards.

The Forest Service has agreements with the State to implement Best Management Practices or Soil and Water Conservation Practices for all management activities. Proposed activities will comply with the guidelines in the Soil and Water Conservation Handbook (Forest Service Manual 2509.22), which outlines Best Management Practices that meet the intent of the water quality protection elements of the Idaho Forest Practices Act.

Forest Plan Direction

The following lists the goals, objectives, and standards from the Idaho Panhandle National Forests Plan that are relevant to the watershed resource and the proposed action within the project area.

Goals:

Manage to emphasize the uniqueness of the visual quality, water quality, wildlife, fisheries, and recreation, around Hayden, Priest, Pend Oreille, and Coeur d'Alene Lakes.

Maintain high quality water to protect fisheries habitat, water based recreation, public water supplies, and be within state water quality standards.

Objectives:

Riparian Areas: Riparian Areas will be managed to feature dependant resources (fish, water quality, maintenance of natural channels, certain vegetation and wildlife communities) while producing other resource outputs at levels compatible for the objective for dependant resources.

Water: Management activities will comply with State Water Quality standards. This will be accomplished using BMPs. The outcome of these BMPs will be monitored to determine their effectiveness. Water quality that is below Forest Plan standards will be improved through restoration projects and through the scheduling of timber harvest and road building activities where appropriate.

Standards:

Management activity on Forest lands will not significantly impair the long term productivity of the water resource and ensure that state water quality standards will be met or exceeded.

Maintain concentrations of total sediment or chemical constituents within State standards.

Implement project level standards and guidelines for water quality contained in the Best Management Practices including those defined by State regulation or agreement between the State and Forest Service such as:

Idaho Forest Practices Act

State of Idaho Rules and Regulations and Minimum Standards for Stream Channel Alterations

Best Management Practices and Road Management Activities

Cooperate with the States to determine the necessary instream flow for various uses. Instream flows should be maintained by acquiring water rights or reservations.

Manage public water system plans for multiple use by balancing present and future resources with public water supply needs. Project plans for activities in public water systems will be reviewed by the water users and the State.

Streams not defined as public water systems, but used by individuals for such purposes, will be managed to the standards stated below or to the fisheries standards, whichever is applicable.

Activities within non-fisheries drainages, including first and second order streams, will be planned and executed to maintain existing biota. Maintenance of existing biota will be defined as maintaining the physical integrity of these streams. Best Management Practices (Appendix S of the Forest Plan), and riparian guidelines found in the Inland Native Fish Strategy (INFS) will be used to accomplish this objective.

Inland Native Fish Strategy

The Inland Native Fish Strategy (INFS) amended Forest Plans with the signing of the INFS decision notice in 1995. The INFS strategy provides direction for the management of fish habitat within the Interior West. Riparian management goals, riparian management objectives (RMOs) and standards and guidelines are listed within the INFS decision document (USDA Forest Service 1995).

Project Need

The ***Tumbledown Fuels Reduction Project*** proposes to 1) treat the areas adjacent to the values at risk in the Wildland Urban Interface to potentially alter fire behavior and reduce negative effects from a severe wildfire in and around these values, and 2) treat areas adjacent to travel routes, which would alter potential fire behavior and allow the use of the routes for emergencies. Treating these areas reduces the possibility of the routes becoming unsafe and unusable in the event of a wildfire emergency. Falling trees, dense smoke and severe heat could make these emergency routes unsafe.

Proposed Action (Alternative 2)

Small diameter trees and brush would be removed over approximately 700 acres in order to decrease fuel loadings and disrupt fuel continuity, thereby reducing the risk of wildfire spreading to adjacent land, and increasing the chance of successful suppression efforts. Fuel reduction treatments would employ a combination of mechanical methods to remove saplings, brush, and primarily small diameter (i.e. 4" to 14" diameter) mixed conifer species in areas of mortality attributed to insect attack, competition, and/or root disease. These treatments would result in long-term reduction of ladder fuels as well as reduction in live and dead fuel loadings. Priority would be given to retaining cedar-dominated riparian areas and large, healthy larch,

ponderosa pine, and white pine. Openings created by fuels reduction treatments would be planted with white pine, western larch and ponderosa pine.

Prescribed fire would be used to reduce hazardous fuels and recycle forest nutrients. In areas where slopes permit, an excavator would be used to pile woody debris. These piles would then be burned in late fall during periods of low fire danger.

Based upon field review of fuel conditions in the project area, approximately 671 acres are proposed for treatment. Individual treatment areas would range in size from 5-93 acres. Fuels treatments are described with the silvicultural diagnosis and prescriptions listed below.

Treatment Areas 1-6, 10-14, 16, 20, 25-32 (505acres) – Are a combination of **Irregular Shelterwood** and **Commercial Thinning**. Irregular shelterwood is a silvicultural term that describes a variable spatial arrangement of dominant and codominant trees of desired species (such as western white pine, ponderosa pine, and western larch) to provide seed and shade. This method would be applied where there is a lack of desirable trees to allow for a commercial thinning. Areas with a greater density of desired trees would receive a commercial thinning. Harvest will focus on leaving good form, full crowned, healthy trees (in the upper crown classes) in the following order of preference: western white pine, western larch, ponderosa pine and western redcedar as well as some healthy Douglas-fir. Additional fuel treatments would be machine grapple piling of created activity fuels and the burning of these piles. Underburning would generally take place on slopes steeper than 35%. Some tree planting would follow timber harvest in order to establish more early seral fire resistant species such as ponderosa pine and western larch.

Treatment Areas 8, and 21 (35 acres) - Are **Commercial thinning** with a focus on "low thinning" to remove trees in the lower crown classes which provide ladder fuels to the larger surrounding trees. The larger trees with higher crowns would be favored to leave. Some spot grapple piling would be needed in small areas with concentrations of activity fuels. No planting would be needed.

Treatment Areas 7, 9, 15, 17,18,22,23 (95 acres) - Are **Irregular Shelterwood (See previous description above).** Some grapple piling on slopes up to 35% and underburning on steeper slopes. Tree planting of western white pine, larch and ponderosa pine would follow to establish these early seral fire resistant species.

Treatment Area 19 (25 acres) – Liberation cut is a release harvest in a stand not past the sapling stage to free the favored trees from competition with older overtopping trees. This unit has thousands of sapling-sized western hemlock, larch, western redcedar, lodgepole pine and Douglas-fir per acre in need of precommercial thinning and release from poor formed overstory trees. No planting would be needed.

Treatment Area 99 (11acres) – Is a **Fuel break.** The fuel break would consist of felling hardwoods and brush species, precommercial thinning of conifers, and hand piling and burning of piles in an approximately two chain (132 foot) strip along strategic areas (primarily adjacent to private land).

Treatment Summary

Unit	Proposed Treatment Acres	Harvest System*			Underburn Acres	Grapple/Hand Pile Acres	Reforestation Acres
		CTL	T	S			
1	22	22				22	16
2	39		39			39	33
3	93			93	93		40

5	5		5			5	
6	40			40	40		27
7	22		22		22		22
8	18		18		18		
9	14			14	14		14
10	11		11			11	9
12	49		49			49	40
14	18		18		18		8
15	21		21			21	21
16	33	33				33	23
17	14	14				14	14
18	11			11	11		11
19	25		25			25	
20	56		56		56		28
21	17		17			17	
22	7			7		7	7
23	6		6			6	6
25	33	33				33	22
26	28	28				28	17
30	44	44			10	34	34
31	9	9				9	6
32	25	25			12	13	13
Fuelbreak	11					11	
Total	**671**	**208**	**287**	**165**	**294**	**377**	**411**

* Cut to Length (CTL), Tractor (T), Skyline (S)

Logging Systems -Vegetative harvest systems will include harvester/forwarder on about 208 acres, skyline yarding on about 165 acres, and tractor yarding on about 287 acres.

Fuel Treatment -Fuels would be treated in order to help improve the ability to suppress wildfires, restore fire as an ecological process, and to prepare the site for planting desired longer-lived species of ponderosa pine, larch, and white pine. To reduce existing fuels and those created by the vegetation treatment, there would be about 377 acres of grapple piling, about 294 acres of underburning. About 11 acres in the project are not conducive to broadcast burning or mechanized activity. In an effort to reduce hazardous fuel loadings and construct fuel breaks, hand crews will be used in these areas.

ROAD CONSTRUCTION AND MAINTENANCE:

A complete roads analysis plan for this project area was prepared through an interdisciplinary team process (Project File). No new permanent roads will be constructed. Treatment areas will be accessed using existing classified roads, existing unclassified roads, and new temporary roads. Approximately 1.87 miles of road that is currently impassible and needed for this project will be opened during project activities, and closed after treatment activities are completed.

The proposal will require construction of approximately 0.71 miles of new temporary roads. Temporary road construction is necessary to access National Forest System (NFS) land adjacent to private property and NFS Road #278 in the project area. Each new temporary road constructed will not exceed one half mile in length, and the combined distance of all new temporary road constructed in the project will not exceed one mile.

Traffic on newly constructed temporary roads and on roads opened for the project will be limited to project related activities. Newly constructed temporary roads and roads opened for the project will be gated during the project and decommissioned or placed back in storage after project activities are completed.

Status of roads in the project area before and after treatment

ROAD NUMBER	TREATMENT	Miles	Current Status	Status After Project
FSR 1050	Road Maintenance	3.70	Classified/Open	Classified/Open
FSR 278	Road Maintenance	12.80	Classified/Open	Classified/Open
FSR 278H	Road Maintenance	2.60	Classified/Open	Classified/Open
FSR 278HUC	Recondition	0.50	Classified/Open	Classified/Open
FSR 278HUD	Recondition	0.15	Classified/Open	Classified/Open
FSR 278K	Road Maintenance	1.50	Classified/Open	Classified/Open
FSR 278KA	Recondition	0.20	Classified/Open	Classified/Open
FSR 278L	Recondition	0.38	Classified/Storage	Classified/Storage
FSR 278LUA	Recondition	0.10	Classified/Impassible	Classified/Decommission
FSR 278LUB	Recondition	0.20	Classified/Open	Classified/Open
FSR 278P	Recondition	0.11	Classified/Impassible	Classified/Decommission
FSR 278UG	Recondition	0.51	Unclassified/ Impassible	Unclassified/Decommission
FSR 278UGAG	Recondition	0.11	Unclassified/ Impassible	Unclassified/Decommission
FSR 278UKAP	Recondition	0.20	Private Road	Private Road
FSR 278UKAQ	Recondition	0.10	Unclassified/Open	Unclassified/Open

ROAD DEFINITIONS
(From FSM 7705)

Temporary Road – Road constructed but not necessary for long-term resource management.

Decommissioning – Activities that result in the stabilization and restoration of unneeded roads to a more natural state. Includes removal of all stream crossings and full recontour of the entire road prism, introduction of woody debris, and revegetation as needed.

Storage – A method of retaining a permanent road for future use but removing features to eliminate hydrologic risks. Includes, recontour of unstable fill slopes, cutslope stabilization, ripping the road tread, installation of no-maintenance cross ditches, and revegetation. Also includes some kind of road closure method such as with a guard rail barrier, gate, an earthen berm, or a short section of full recontour.

Road Maintenance – The upkeep of a road necessary to retain or restore the road to the approved road management objective.

Reconditioning -- Maintenance activities performed prior to use, such as; removal of barricades, clearing trees and brush, general road blading, and construction of drain dips.

Classified Road – Road determined to be needed for long-term motor vehicle access.

Unclassified Road – Roads on National Forest lands that are not managed in the forest transportation system. Examples include abandoned roads, unplanned roads, and roads constructed previously but not included in the system for maintenance or regular upkeep.

ROAD NUMBER	TREATMENT	Miles	Current Status	Status After Project
FSR 278UKAR	Recondition	0.32	Unclassified /Impassible	Unclassified/Decommission
FSR 278Z	Recondition	0.34	Classified/Storage	Classified/Storage
Temporary Road 1	New Construction	0.14	N/A	Decommission
Temporary Road 2	New Construction	0.21	N/A	Decommission
Temporary Road 3	New Construction	0.12	N/A	Decommission
Temporary Road 4	New Construction	0.09	N/A	Decommission
Temporary Road 5a	New Construction	0.05	N/A	Decommission
Temporary Road 5b	New Construction	0.04	N/A	Decommission
Temporary Road 6	New Construction	0.06	N/A	Decommission

Transportation Activity Summary

Action	Miles
Road Maintenance	20.60
Reconditioning of Open Roads	1.35
Reconditioning of Closed Roads	1.87
Temp Road Construction	0.71
Grand Total	**24.53**

In addition to the aforementioned activities, the interdisciplinary team has identified the following opportunities to improve stream quality and/or fish habitat:

Remove an undersized culvert where FSR 278 crosses Tumbledown Creek and install a larger culvert. Apply crushed rock and improve surface and ditch drainage where FSR 278 crosses Tumbledown Creek, Gold Creek, North Gold Creek, Kickbush Gulch, and Granite Creek.

Proposed Area Geographic Assessment

The project area is located east of Lake Pend Oreille over an area that encompasses five second and third order watersheds from Cedar Creek, to the north, to North Gold Creek, to the south near the town of Lakeview. Elevations range from 6,400 at the highest point in the geographic area on Packsaddle Mountain, to about 2,100, the elevation at which all these streams flow into Lake Pend Oreille. The watersheds are characterized by steep headwater sections descending through dense surrounding subalpine forest communities. From 2,300 to 3,000 feet in elevation stream gradients decrease where streams flow over gentler terrain. Forest communities at this point in the watershed are more mesic where semi-shaded, and dry where exposed, particularly on southern aspects. Below 2,300 feet most of the streams flow steeply to the lake. The steep gradients in this last portion of the watershed are due to glacial era scouring of the Lake Pend Oreille basin that influenced the rejuvenation, or oversteepening, of the portion of streams directly adjacent to the lake. Precipitation in the project area is moderate with most of the annual precipitation coming during the winter in the form of snow. Rain-on-snow events can result in significant discharge and can lead to the largest peak flow of the year. The fire history of the area was described in the Environmental Impact Statement for the Packsaddle timber sale in 1995. The fire history of the Analysis Area was developed from a series of aerial photographs. Three major fires were documented. A wildfire in 1919 burned the upper sections of Tumbledown and Canyon Creeks. Several fires in 1926 burned many large areas throughout the Analysis Area, which totally encompasses the Tumbledown project area. A large fire in 1934 burned nearly all the Project area leaving only scattered areas unburned (Packsaddle EIS).

Aerial Photo Review

The 1935 photos show evidence of ground-based harvest in the early part of the twentieth century, primarily fire salvage. Barton Hump- 1993, Upper Cedar-1998, and some small-scale activity, primarily salvage, has occurred along FS Road 278 in the past twenty years (Project File). 2002 aerial photos were reviewed to assess individual project units for wet areas, sensitive landtypes, and riparian buffers. Areas of hydrologic concern were identified and field verification determined site specific mitigation measures to be taken if concerns in the field were warranted. Mitigation measures with respect to RHCA buffers are discussed under Integrated Design Features for the Protection of Floodplains, Wetlands, and Municipal watersheds and mitigation measures with respect to landtypes are discussed under Analysis on Steep Slopes or Highly Erodible Soils.

Idaho DEQ Water Quality Standards

None of the watersheds within the project area are listed as having designated beneficial uses under the Idaho Department of Environmental Quality's IDAPA 58.01.02, "Water Quality Standards and Wastewater treatment requirements". This refers to specific watersheds that support certain beneficial uses that are protected by the rules as established by Idaho DEQ. However, IDAPA 58.01.02, section 101.01, Nondesignated Surface Waters states; Surface waters not designated in sections 110 through 160 shall be designated according to section 39-3604, Idaho Code, taking into consideration the use of the surface water and such physical, geological, and chemical and biological measures as may affect the surface water. Prior to designation, undesignated waters shall be protected for beneficial uses, which includes all recreational use in and on the water and the protection and propagation of fish, shellfish, and wildlife, wherever attainable; and section 101.01.a; because the department presumes most waters in the state will support cold water aquatic life and primary or secondary contact recreation beneficial uses, the Department will apply cold water aquatic life and primary or secondary contact recreation criteria to undesignated waters unless Sections 101.01b and 101.01.c. are followed. Under Administrative Policy, Section 050., 01.02.a., Protection of Waters of the State, it states, wherever attainable, surface waters of the state shall be protected for beneficial uses which for surface waters includes all recreational use in and on the waters surface and the preservation and propagation of desirable species of aquatic life, and b., in all cases, existing beneficial uses of the waters of the state will be protected. Furthermore, North Gold Creek supports bull trout (Salvelinus confluentus) and westslope cutthroat trout (Oncorhyncus clarki lewisi) and therefore warrants a "default" beneficial use designation for supporting cold-water biota and salmonid spawning. Within North Gold Creek there has been significant Forest Service investment to improve spawning and rearing habitat for bull trout. Continued diligence on maintaining water quality in North Gold Creek in particular will be important for bull trout recovery efforts.

Two streams in the project area are listed under the impaired streams list (Idaho DEQ 303(d) list). North Gold Creek is listed as being impaired for sediment. Cedar Creek is listed as being impaired for temperature. The list of impaired streams is updated every two years in the Integrated 303(d)/305(b) report which lists updates to the impaired water bodies list and summarizes the status of those waters.

Lake Pend Oreille has designated beneficial uses under the IDEQ's IDAPA 58.01.02 for cold-water biota, salmonid spawning, primary contact recreation, domestic water supply, and special resource water. Lake Pend Oreille was first placed on the State of Idaho's 1994 Section 303(d) list in response to public comments concerning water quality. Lake Pend Oreille was retained on Idaho's 1996 and 1998 Section 303(d) lists. Comment letters received by EPA and DEQ during the 1998 listing cycle specifically indicated concern over water quality and nuisance algae in the near shore areas of the lake. A problem assessment prepared by DEQ in 1998 determined that the open waters of the lake did not exceed water quality standards and a TMDL was not warranted. The problems assessment also concluded that a nutrient nearshore TMDL should be developed for Lake Pend Oreille to prevent nuisance algae growth and to develop an associated implementation plan through which water quality concerns could be addressed. The nearshore TMDL for Lake Pend Oreille was prepared by Tetra Tech Inc. in collaboration with the Tri-State Water Quality Council, DEQ, and EPA and was approved by the EPA in 2002 (Pend Oreille Lake Nearshore TMDL Draft Implementation Plan, October, 2003).

Design Features for Watershed Protection

A number of design features will be incorporated into the project to protect watershed and aquatic resources. 1) Riparian Habitat Conservation Areas (RHCA) will buffer streams, floodplains, and wet areas, as described by the Inland Native Fish Strategy Guidelines (INFS) so as not to incur aquatic impacts. 2) Ground based tractor/mechanical harvesting will occur in such a manner that will minimize soil disturbance and comply with the IPNF 1987 Forest Plan and Regional Soil Quality Standards (2554.03-R1-Supplement 2500-99-1), see Soils report for more details. Existing skidding corridors will be used so as to adhere to forest plan soil management guidelines that state, a minimum of 85 percent of an activity area must remain in an acceptable soil quality condition (R1 Soil Quality Standards). 3) Mechanical harvesters will work on a slash mat whenever possible. 4) Landtypes with ratings of high for mass failure potential, surface erosion potential, and high or moderate sediment delivery potential, within the project area will be avoided so as to ensure that no sediment delivery or mass failure would occur. 5) All road construction will be temporary. Temporary roads will be ripped and seeded, and recontoured where necessary. 6) Inadequate or non-functioning road drainage features such as waterbars, ditches, and culverts will be improved or replaced. 7) Crossings over bull trout bearing streams will be improved, as outlined in attached review of bull trout crossings (Tumbledown Field Review, 5-25-2006), so as not to increase sediment addition to bull trout streams. Temporary effects from roads treatment at bull trout crossings is analyzed under Analysis of Flood Plains, Wetlands and Municipal Watersheds. 8) Best Management Practices (BMP's) have been prescribed for the Tumbledown Fuels Reduction Project and will be adhered to.

Integrated Design Features for the Protection of Flood plains, Wetlands and Municipal Watersheds

To prevent any significant/measurable effects to floodplains, wetlands or streams the following design features will be incorporated into the project:

Inland Native Fish Strategy: Commercial timber cutting during this project will be prohibited in Riparian Habitat Conservation Areas (RHCA's). These RHCA's include 300-foot (slope distance) protection zones for streams that have fish; 150-foot protection zones for perennial streams with no fish; 100-foot protection zones for intermittent streams and sensitive landtypes; and 150 feet slope distance from the edge of the maximum pool elevation around ponds, lakes,

reservoirs, and wetlands greater than 1 acre. Ephemeral draws would have a 50-foot (slope distance) protection zone if they are either directly tied to an intermittent channel or lack large woody debris and vegetation that prevent scouring or headcutting.

Some additions and adjustments of RHCA buffers were discussed during several field reconnaissance outings. Field review on 5-06-06 verified that the portion of unit 17 east of the most westerly tributary will be dropped for protection of aquatic resources. Much of the proposed unit is perennially wet due to the topography and north aspect of the hillside. The first primary tributary is buffered with a 150 RHCA which now forms the unit's eastern boundary. Temporary road construction to the remaining portion of unit 17 will not cross any perennial tributaries.

In unit 12, two tributaries to Tumbledown Creek exist in the SW1/4 of the NW1/4 of section 23. These tributaries will require an RHCA buffer that extends to the inner gorge of the drainage. If the temporary road construction extends over either tributary they will require an 18-inch culvert at both tributary crossings. These culverts will be removed and channel banks recontoured when the road is decommissioned at the end of the project.

In unit 8, road reconditioning of the 278LUA encroaches in the 300 foot RHCA to Tumbledown Creek. This road was identified for decommissioning in the Tumbledown Road Analysis Process because of the possibility of sediment additions to the stream and the lack of surface drainage. Beyond the eastern boundary of unit 8 the road continues with considerable portions of the road encroaching in the buffer. Reconditioning of this temporary road will end at the eastern boundary of unit 8 in the NE1/4 of the NW ¼ of section 23 before the road encroaches in the RHCA to Tumbledown. A slash filter windrow and waterbars will be necessary to mitigate surface erosion in the RHCA. The 278LUA will be decommissioned after the sale.

In unit 19, a wet area at the southern boundary in the NE ¼ of the SW ¼ of section 35, is greater than 1 acre and source to an intermittent stream flowing northwest of the 278H road, which is perennially wet. Field review on 5-06-06 verified that this portion of the unit will be dropped for protection of aquatic resources.

In unit 1, road 278N runs adjacent to the Cedar Creek riparian buffer. Although the terrain is gentle, wet areas associated with the Cedar Creek floodplain encroach into depressional features within the 300-foot buffer. During our site survey we found a road to the west that parallels the 278N that is outside of the 300-foot buffer and provides access to the same area. It is recommended that this undesignated road be used as an alternate route to avoid reconstructing a road within the 300-foot RHCA. This alternate route should be seeded and blocked to further use after the sale.

By incorporating these design features and RHCA's into the project, there would be no impacts to intermittent streams or wet areas. Research studies and monitoring results conducted on the Idaho Panhandle National Forest verify that when RHCA's or Buffer strips are incorporated into timber sales, sediment delivery to stream channels is not measurable or is negligible (USDA Forest Service 2000, 1999, 1998, 1997, Belt et al 1992, Reid and Hilton 1998).

Mitigation measures to reduce sediment addition to bull trout streams have been prescribed for North Gold Creek, Gold Creek, Granite Creek, Tom's Gulch, Tumbledown Creek, and Kickbush Creek. These mitigation measures include adding a base of coarse gravel to the

travelway, cleaning specific lengths of ditchline, replacing an undersized culvert at Tumbledown Creek, and installing water bars or rolling dips. All of these measures have the potential temporary effect of initially increasing the amount of fine sediment addition to the stream. This temporary effect will be short lived and involve negligible amounts of fine grained sediment. Once ditchlines and new gravel have imbricated and armored to flows sediment levels will reduce. The important feature of the mitigation measures is that future sediment additions from precipitation and increased traffic will be significantly reduced (See Tumbledown Field Review, Literature Review, I-4).

Field review of the #278 crossing of Tumbledown Creek revealed that the culvert is a fish barrier for native salmonids. There are a number of features about the crossing that create the barrier and should be corrected with the installation of a new pipe. Engineering and hydrology have measured the pipe and the features of the crossing. An oversized 5 foot diameter culvert will be countersunk below the grade of the existing streambed. This will allow substrate to be backfilled into the culvert to act as a natural streambed through its entire length. A section of stream above the culvert will be realigned with the new culvert to allow better passage of flows and ensure fish passage.

Analysis on Existing condition and impaired watersheds

303(d) Listed Streams

Two streams in the project area are listed under the impaired streams list (Idaho DEQ 303(d) list). North Gold Creek is listed as being impaired for sediment. Cedar Creek is listed as being impaired for temperature. Lake Pend Oreille is also listed under the IDEQ's IDAPA 58.01.02 for cold-water biota, salmonid spawning, primary contact recreation, domestic water supply, and special resource water. Lake Pend Oreille was first placed on the State of Idaho's 1994 Section 303(d) list in response to public comments concerning water quality and a nearshore TMDL was approved by the EPA in 2002. Implementation of the INFS guidelines and strict adherence to the aforementioned watershed design criteria would ensure that the proposed activities would not affect the existing conditions of temperature in the Cedar Creek watershed, sediment in the North Gold Creek watershed, or increased nutrient levels in the nearshore region of Lake Pend Oreille.

Historical Survey Data

Water resources were described and rated based on numerical data and field observations for the Packsaddle timber sale (1995) and included Cedar Creek, Tumbledown Creek, North and South Twin Creeks, and North Gold Creek watersheds, which are encompassed by the Tumbledown timber sale boundary. In this review Cedar Creek was given a rating of poor for channel stability because of a lack of characteristics that would imply that the stream is in dynamic equilibrium. Overall, the rating for Cedar Creek was poor due to the channel stability rating and a high rain-on-snow risk. Canyon and Brush Creeks received ratings of fair for channel stability and a rating of fair overall. Tumbledown was given a rating of good for channel stability due mainly to the fact that two of three reaches were in dynamic equilibrium. The two stable reaches were not considered susceptible to moving out of equilibrium. The overall rating for Tumbledown Creek was fair because of high predicted and observed increases in sediment yield. North Twin Creek received a fair rating for channel stability because of two upper reaches that were out of equilibrium. The two stable reaches received a susceptibility rating of no, meaning not likely to move out of dynamic equilibrium. Overall, because of a high road density

and a high predicted sediment increase, the rating of North Twin was fair. Much of South Twin Creek was noted to be out of dynamic equilibrium. For this reason the channel stability rating is poor and this, compounded by a high road density, resulted in an overall rating of poor for the watershed. Finally, North Gold Creek was given a rating of fair for channel stability, possibly due to past wildfires. Overall, North Gold was given a rating of fair for low sediment yield increases, fair channel stability, and stable reaches are not likely to move further out of equilibrium.

These ratings imply that certain reaches of their respective streams have been altered from a previous natural or un-impacted condition. Consistency with the Forest Plan is to comply with state water quality standards, which requires protecting beneficial uses. The shift in the aforementioned reaches that are not in dynamic equilibrium, thus not supporting beneficial uses, was considered to be primarily attributed to causes other than harvesting prior to the Packsaddle timber sale or associated road impacts. Roads and timber harvesting may have had a slight influence by increasing the magnitude of natural changes experienced by certain reaches of stream. The Proposed Action (Alternative 2) is not expected to impact aquatic resources due to adherence to design criteria to protect aquatic resources and through the reduction of hazardous fuels the sale will create a forest structure that will return portions of the watershed to pre-settlement conditions and will influence a trend toward a natural range of variability of hydrologic conditions. For further discussion of natural range of variability see rationale of effects for Peak Flow Increases.

Field observations in July and August of 2006 revealed that the streams in the sale area do not appear to have undergone major channel altering events that would be associated with road failures or soil stability issues within old harvest units. Channel features such as point bars, small woody debris, and riparian vegetation displayed characteristics synonymous with stable flows and sediment transport within a natural range of variability. Since no major channel perturbations were observed most of the emphasis for review was conducted on roads and unit boundaries and sensitive land encroachments.

Pfankuch (1975) (R1 Stream Reach Inventory and Channel Stability Evaluation) ratings data recorded in 1992 by J.W. Associates Inc. for the Packsaddle timber sale was interpreted for Cedar, Canyon, Brush, Tumbledown, North and South Twin, and North Gold Creeks for the Packsaddle Timber Sale and reveals that channel characteristics do provide resiliency to slight changes in the system (See Project File, R1 Stream Reach Inventory and Channel Stability Evaluation). The ratings were applied to the Stream Channel Stability Rating (modified Pfankuch procedure), (Rosgen, A Stream Channel Stability Assessment Methodology). The ratings are modified to “reduce the likelihood of applying the same numerical rating of good to C4 versus B4 stream types”. Ratings, adjusted for stream type, are shown in Table 1. The results show that, at the time the data was collected, some stream reaches showed stable channel characteristics, specifically the 3 reaches of Cedar Creek, 4 of the 5 reaches in Canyon Creek, 1 of the 3 reaches in Brush Creek, 1 of the 2 reaches in Tumbledown Creek, 1 of the 3 reaches in North Twin Creek, 1 of the 3 reaches in South Twin Creek, and 3 of the 5 reaches in North Gold Creek. These results vary slightly from the aforementioned channel stability and overall ratings from the Packsaddle watershed discussion for the respective streams and suggest that these streams have a degree of resiliency to channel perturbations. The modified Rosgen results are more consistent with site visits to proposed units in the respective watersheds which revealed that most stream lengths showed stable characteristics, i.e., abundant wood component, vegetated banks, and moss growth on larger in stream rocks.

Table 1. Conversion of Stability Rating to Reach Condition By Stream Type

Stream Name: Cedar Creek			
Reach #	**Rosgen Class**	**Pfankuch Score**	**Adjusted Rosgen**
1	A3b	44	Good
2	A5b	94	Good/Fair
3	B4a	56	Good
Stream Name: Canyon Creek			
Reach #	**Rosgen Class**	**Pfankuch Score**	**Adjusted Rosgen**
3	A4	66	Good
4	A4	91	Good
6	A4a+	72	Good
7	B4a	87	Poor
8	A4a+	71	Good
Stream Name: Brush Creek			
Reach #	**Rosgen Class**	**Pfankuch Score**	**Adjusted Rosgen**
1	no data	77	
2	A4a+	64	Good
3	A4a+	98	Fair
Stream Name: Tumbledown Creek			
Reach #	**Rosgen Class**	**Pfankuch Score**	**Adjusted Rosgen**
2	A4	83	Good
3	A3a+	93	Fair
Stream Name: North Twin Creek			
Reach #	**Rosgen Class**	**Pfankuch Score**	**Adjusted Rosgen**
2	A3a+	100	Fair
3	B4a	95	Poor
4	A4a+	82	Good
Stream Name: South Twin Creek			
Reach #	**Rosgen Class**	**Pfankuch Score**	**Adjusted Rosgen**
2	A4a+	113	Fair
3	A4	111	Fair
4	A4a+	90	Good
Stream Name: North Gold Creek			
Reach #	**Rosgen Class**	**Pfankuch Score**	**Adjusted Rosgen**
1	A3	64	Good
2	B4a	71	Fair
3	A4b	73	Good
4	A4	113	Fair
5	A4a+	86	Good

Analysis on Steep Slopes or Highly Erodible Soils

Landtypes with ratings of high for mass failure potential, surface erosion potential, and high or moderate sediment delivery potential, within the project area will be avoided so as to ensure that no significant erosion, mass failures or sediment delivery would occur. Analysis of landtypes within the Tumbledown project area reveals that several units have portions of the unit area

encroaching in areas of high mass failure potential and moderate sediment delivery potential. There are no unit encroachments on areas of high surface erosion potential.

Land Systems Index: The Land Systems Index (LSI) was created to assist the IPNF with specific land management issues. It is a tool used to rate the relative susceptibility of the soil to various severities of erosional processes.

Mitigations – Sediment Delivery Potential

With concern to sediment delivery potential, there are numerous units that have encroachments in areas rated as moderate. Areas of moderate sediment delivery potential exist in units 6, 7, 8, 9, 10, 12, 15, 16, 17, 20, and 21. The following are sediment delivery mitigations for each unit.

Unit 6 poses a low concern for sediment delivery due to moderate gradient slopes, skyline harvest, implementation of RHCA's, and adequate coarse woody debris on the ground to provide sediment retention.

Unit 7 poses no concern for sediment delivery due to its distance from active streams and low gradient receiving slopes.

Unit 8 poses no concern due to its distant proximity to active streams and low gradient receiving slopes.

Unit 9 has a small encroachment into a landtype of moderate sediment delivery potential on the southeast boundary that does not pose a concern due to low gradient slopes and its distance to active streams.

Unit 10 poses no concern mainly due to its distant proximity to active streams.

Unit 12 borders the 300 foot RHCA to Tumbledown Creek and the slope gradient adjacent to the creek is 0 to 20 percent. A temporary road will be constructed outside the RHCA to contour across these low gradient slopes and it is recommended to create a slash filter windrow on the north edge of the road to ensure that no sediment enters Tumbledown Creek. RHCA's and culverts associated with this road are mentioned in Integrated Design Features for the Protection of Floodplains, Wetlands, and Municipal Watersheds. The temporary road in unit 12 will be recontoured after use and covered with available slash and seeded within one season to prevent problems that could arise with leaving the road on the landscape over winter.

Unit 15 poses no concern due to a thick cover of coarse woody debris on the ground and since a slash filter windrow will be used on the skid haul route on the south edge of the unit which is outside of the 150 foot RHCA.

Unit 16 poses no concern mainly due to low gradient slopes in the unit and also because of an optimal level of organic matter to encourage infiltration of overland flow.

Unit 17 was visited on 5-25-06 and the proposed unit boundary beyond the first primary stream crossing has been dropped due to extensive wet areas and concerns with RHCA buffers and impacts to the ground in these areas. The first primary tributary is buffered with a 150 foot RHCA which now forms the unit's eastern boundary.

Both units 20 and 21 will be mitigated with a slash mat on skid trails where possible and harvested trees will have limbs and tops dispersed on the ground. Waterbars will be installed at regular intervals on the 278H to reduce surface erosion. No haul will be allowed after September 30th to prevent the possibility of sediment delivery to North Gold during bull trout spawning. A slash filter windrow will be constructed above the 278H on the south boundary of unit 20 to mitigate for any sediment transport leaving the unit boundary. No skidding of trees will occur on the 278H. Physical characteristics that mitigate the potential for sediment delivery are moderate slope gradients outside the RHCA and adequate coarse woody debris on the ground. The project hydrologist, fisheries biologist, and the project leader conducted a field review of these units on 4-12-07. No evidence of sediment leaving either unit was observed. Some erosion on the 278H was evident but no sediment reached North Gold from the road. The RHCA between unit 20 and 21 and the 278H is very well vegetated and functions as an effective sediment trap. See pictures in project file.

Mitigations – Mass Failure Potential

With concern to mass failure potential, the steep sections of the SW portion of unit 30 that descend to Lake Pend Oreille should be avoided so as not to increase the risk of mass failure potential on steep slide prone slopes.

In unit 3, just south of Brush Creek, two old mass failures are a result of unstable subsurface geology. The revegetation of brush on the slopes indicates that the event occurred several years ago and the vegetation is now stabilizing the slope. The presence of the slides indicates that the slope is inherently unstable and this area of unit 3 should be buffered/omitted. No trees should be removed from the south side of Brush Creek at 1050 road crossing to the NW corner of unit 3.

The southwest corner of unit 19 should be buffered since it encroaches on landtype unit 106 which exhibits high mass failure on steep slopes above Lake Pend Oreille.

The southern boundary of unit 20 and part of 21, portions south of the 278H road, should be excluded since they encroach in landtype unit 106 also.

WEPP (Watershed Erosion Prediction Project)

Disturbed WEPP

WEPP (Watershed Erosion Prediction Project) was used to predict the probability of surface runoff, erosion, and sediment delivery to streams from three of the units that were felt to pose the greatest risk of the latter variables. Disturbed WEPP was used to model changes in forest conditions after harvest and slash treatment. At best, any predicted runoff or erosion value, by any model, will be within only plus or minus 50 percent of the true value. Erosion rates are highly variable, and most models can predict only a single value. Replicated research has shown that observed values vary widely for identical plots, or the same plot from year to year (Elliot and others 1994; Elliot and others 1995; Tysdal and others 1999). Site characteristics such as climate/precipitation, soil texture, treatment type, ground slope, length of unit, percent of vegetative cover, and percent soil rock content are entered in the model. Once these values are entered the model runs the simulation for the specified number of years. Thirty years of climate simulation is recommended to be adequate to generate average output values.

Results of WEPP model runs are included in the project file, exhibit I-8. Three harvest units that are believed to have the highest relative probability of sediment addition to live water were modeled. The values were input according to stand exam data and harvest prescriptions for the treatment, gradient, length and cover data. In all three runs of the model, the worst case scenario was chosen for entered variables, i.e., steepest slopes, shortest RHCA distance. Values for soil texture and percent rock were input according to landtype information. The upper element of the slope was used to model the conditions found within the boundary of the harvest unit. The lower element of the slope was used to model the conditions found in the RHCA.

Unit 6, in the upper portion of the Tumbledown Creek watershed, would be harvested using skyline methods and then underburned. This would simulate the conditions of a low severity burn, which was used as the treatment. Gradient in the harvest unit is 35 percent for a length of 1,000 feet. Cover in the unit after the fire is estimated to be 85 percent. The percentage of rock fragments in a soil type of sandy loam is estimated to be 15 percent. The undisturbed RHCA was modeled as closely resembling the ground conditions under the canopy of 20 year old trees. The 150 foot RHCA has a slope of 35 percent, sandy loam soil, 100 percent cover, and 15 percent rock fragments in the soil. Based on 30 years of simulated climatologic influence the probability of sediment delivery to Tumbledown Creek within the first year following harvest activity is 27 percent. This can also be interpreted that there is a 73 percent chance that there would be no sediment delivery. In the event of sediment delivery up to .062 tons/acre of sediment could be delivered to the stream through the 150 foot RHCA. Mitigations to sediment delivery from unit 6 to Tumbledown Creek are, adequate coarse woody debris on the ground to retain mobilized sediment, a 150 foot RHCA in the upper portion and a 300 foot RHCA below the lower portion of the unit, which would be effective to trap and retain sediment that leaves the unit boundary, and skyline harvest would have minimal ground disturbance.

Unit 12, in the middle to lower portion of Tumbledown Creek, would be harvested via ground-based tractor and slash would be grapple and hand piled then burned. Since more of the ground would be affected but less of the area would be burned this would more closely resemble the ground conditions modeled by 5 year old trees. Affected burn areas would be limited to the radius of the slash piles or slightly more and sediment transport is likely to be minor within a small contained area. Gradient in the harvest unit is 35 percent lessening to 10 percent lower in the unit for a distance of 800 feet. Ground cover is 100 percent and rock content in a sandy loam soil is 40 percent. The 300 foot RHCA has a slope of 10 percent steepening to 30 percent at the inner gorge of Tumbledown Creek. The mature forest was modeled by 20 year old trees, 100 percent ground cover and 20 percent rock fragments in the soil. Based on 30 years of simulated climatologic influence the probability of sediment delivery to Tumbledown Creek within the first year following harvest activity is 10 percent or, a 90 percent chance that there would be no sediment delivery. In the event there is sediment delivery up to .152 kilograms/meter could be delivered to the stream. Mitigations to sediment delivery from unit 12 to Tumbledown Creek are moderate slopes within the harvest unit, a 300 foot RHCA would be effective to trap and store any sediment that leaves the unit boundary, and a slash filter windrow constructed to contour across the unit below the temporary road.

Unit 20, in the lower portion of North Gold Creek, would be harvested using ground-based tractor methods and then underburned. This would simulate the conditions of a low severity burn, which was used as the treatment. Gradient in the harvest unit is 15 percent for a length of 800 feet. Cover in the unit after the fire is estimated to be 85 percent. The percentage of rock fragments in a soil type of sandy loam is estimated to be 15 percent. The RHCA was modeled as

closely resembling the ground conditions under the canopy of 20 year old trees. The 300 foot RHCA has a slope of 75 percent, sandy loam soil, 100 percent cover, and 15 percent rock fragments in the soil. Based on 30 years of simulated climatologic influence the probability of sediment delivery to North Gold Creek within the first year following harvest activity is 23 percent. This can also be interpreted that there is a 77 percent chance that there would be no sediment delivery. In the event of sediment delivery up to .062 tons/acre of sediment could be delivered to the stream through the 300 foot RHCA. Mitigations to sediment delivery from unit 20 to North Gold Creek are moderate slopes within the harvest unit, a 300 foot RHCA which would be effective to trap and store any sediment that leaves the unit boundary, a slash filter windrow along the south unit boundary, installation of waterbars at regular intervals on the 278H, no skidding of trees on the 278H, and no haul would be allowed after September 30th to prevent the possibility of sediment delivery to North Gold during bull trout spawning. The project hydrologist, fisheries biologist, and the project leader conducted a field review of these units on 4-12-07. No evidence of sediment leaving either unit was observed. Some erosion on the 278H was evident but no sediment reached North Gold from the road. The RHCA between unit 20 and 21 and the 278H is very well vegetated and is an effective sediment trap. (See exhibit I-7).

WEPP: Road

WEPP: Road was used to model road erosion and sediment delivery conditions at the Tumbledown Creek crossing on the #278 road. This is a known problem section of road where the proposed action is to replace the culvert with one that will improve fish passage, add aggregate to the road surface, and provide additional drainage to minimize erosion and sediment delivery. WEPP: Road uses site characteristics such as climate/precipitation, soil texture, road design, surface type (native or graveled), traffic conditions, road grade, length and width, and the grade length and width of the buffer. After the variables are input the model simulation is run for the specified 30 year period. The first simulation was run to model the existing conditions at the #278 road Tumbledown Creek crossing. The results estimate that annually 878 pounds of sediment leave the road surface and are transported through the buffer. Changes to the crossing that would mitigate sediment delivery to Tumbledown Creek are, installation of a rolling dip to divert surface runoff and reduce delivery distance to less than 100 feet, addition of aggregate rock to the road surface which would reduce surface erosion and rutting at the crossing, and diversion of 70 feet of the stream away from the road to create a vegetated buffer. Running the model with these changes results in a reduced amount of road prism erosion and no sediment leaving the buffer area (See exhibit I-8). These types of improvement are expected at all crossings where road improvements would take place (See exhibit I-4).

Analysis of Peak Flows

Methods

Potential increases in peak flows were analyzed using “A Procedure for Evaluating Risk of Increasing Peak Flows from Rain on Snow Events by Creating Openings in the Forest Canopy”, (Kappesser, 1991). This method utilizes significant causal factors that have a greater influence in altering peak flows. These causal factors include elevation range, size of the opening created in the canopy, percent of crown cover removed, and a combination of aspect and slope. The causal factors are given weighted coefficients and multiplied to obtain a risk rating. This is done for each prescribed Tumbledown cutting unit within the respective watershed. All prescribed units

are summed together to obtain the risk factor of all units within the watershed. The peak flow increases are determined by using the following formula:

$$\frac{\text{Watershed area (acres)} + \text{sum of risk ratings for all cutting units}}{\text{Watershed area (acres)}} = \text{peak flow multiplier}$$

The multiplier is used to estimate increases in the 2 year flood event, bankfull flow may be substituted. Where the existing peak flow is unknown, the multiplier may be used to compare proposed alternatives including the "do nothing" alternative (Kappesser, 1991).

Peak flow increases were analyzed for Cedar (Canyon and Brush Creeks tributaries to Cedar), Tumbledown, North and South Twin, and North Gold Creeks. Q2 (2 year stream discharges) were estimated for each stream using predictive equations developed for the Idaho Panhandle National Forest by Embry (1981). This value was then multiplied by the peak flow multiplier to determine the Q2 discharge after the project had occurred. The results were computed in a spreadsheet (Evaluating Risk of Peak Flow Increases), (See exhibit I-10). The value, 2 year flood increase, can be compared to the Q2 discharge(Embry) to obtain the actual predicted increase in the 2 year flood.

Discussion of Peak Flow Increases

Tumbledown Creek – The estimated Q2 discharge for Tumbledown Creek was 43 cfs(cubic feet per second). The estimated 2 year flood increase was 44.7 cfs, a 4% increase in the Q2 discharge. This change in peak flow is relatively small and is not expected to have an adverse impact on Tumbledown Creek.

Cedar Creek – The estimated Q2 discharge for Cedar Creek was 56 cfs. The estimated 2 year flood increase was 56.4 cfs, less than a 1% increase in the Q2 discharge. This is not expected to have an adverse impact on Cedar Creek.

North Twin Creek – The estimated Q2 discharge for North Twin Creek was 41 cfs. The estimated 2 year flood increase was 41.4 cfs, a 1% increase in the Q2 discharge. This is not expected to have an adverse impact on North Twin Creek.

South Twin Creek – The estimated Q2 discharge for South Twin Creek was 36.9 cfs. The estimated 2 year flood increase was 37.7 cfs, a 2% increase in the Q2 discharge. This is not expected to have an adverse impact on South Twin Creek.

North Gold Creek – The estimated Q2 discharge for North Gold Creek was 403 cfs. The estimated 2 year flood increase was 403.9 cfs, a .2% increase in the Q2 discharge. This is not expected to have an adverse impact on North Gold Creek.

Rationale to support no adverse impacts from small increases in peak flows exists from the past fire history of the area. Large stands of even-aged, seral tree species are evidence that many of the historical fires in the area were large, hot, stand-replacing fires (Packsaddle Final EIS, 1995). Oblique aerial photos from 1933 show that much of the landscape was open and brush covered (See 1933 Photo, exhibit I-11). Thus, precipitation in the form of rain and snow would not be influenced as greatly by the buffering capacity and precipitation interception of a mature forest canopy. Flows would have been flashier and peaks potentially greater than those experienced today. Historically, streams would have adapted to flow regimes that had a higher

range of variability than that experienced at present. Spring peak flows and rain-on-snow peak flows may have been greater due to a greater percentage of watershed areas exposed to accumulate additional snow loads and react to the influence of warm maritime air-masses that create rain-on-snow conditions. Existing characteristics such as the amount of woody debris, discussed in Analysis on Existing Conditions and Impaired Watersheds, would also provide resiliency to minor increases in peak flows.

Cumulative Effects

The cumulative effects analysis area is the same as the project area boundary and encompasses approximately 5,611 acres. This analysis area begins at the highest units in the respective watersheds and continues to the confluence with Lake Pend Oreille. It is not likely that effects would be realized upstream from harvest units but would occur downstream. The actual treatment acres within the analysis area is 671. The Tumbledown Fuels Reduction Timber Sale is not expected to have site-specific measurable effects to hydrologic resources. This document describes site specific design criteria and mitigation measures that would be adhered to in order to prevent impacts to watershed resources. The Tumbledown Fuels Reduction Timber sale area is spread over five watersheds with a minimal percentage of area treated within each watershed and a number of mitigation measures to protect hydrologic resources. RHCA's, compliance with Regional Soil Quality Standards, Clean Water Act, National Forest Management Act, and the 1987 Forest Plan, use of harvesters on a slash mat, avoidance of sensitive landtypes, use of temporary roads, and improvement of road crossings over bull trout bearing streams, strict adherence to selected BMP's, haul restrictions, and use of slash-filter windrows, would greatly reduce the possibility for sediment delivery to occur, and the analysis of potential increases in peak flows shows that impacts from increases would be negligible. No other timber sales on Forest Service System Lands are proposed in the immediate vicinity of the project area at this time.

Cumulative effects were considered in 1995 for the Packsaddle timber sale. The project area for Packsaddle overlapped much of the sale area for Tumbledown and therefore considered some of the same watersheds in the effects analysis. The Sensitive Fish Biological Evaluation in the Record of Decision, summarized habitat condition for the following streams; Gold Creek, Kickbush Creek, Cheer Creek, North Gold Creek, and Branch North Gold Creek. North Gold Creek is in the Tumbledown project area. The habitat conditions stated for North Gold Creek were, some erosion problems, mostly associated with private development near the mouth of the creek. Past logging activities within riparian and active stream channel areas are evident. Under the Cumulative Effects section it further states, no cumulative effects are anticipated with the proposed action since water and sediment yields would not be measurably affected (Packsaddle, FEIS, Record of Decision). Recent observations in the field of channel characteristics support this conclusion as trends in channel changes seem to be stabilizing and management-induced changes from roads or harvest units have had a negligible influence (Project File).

Ongoing and reasonably foreseeable activities in the vicinity of the sale area are: routine road maintenance, noxious weed treatment, treatment of the powerline corridor, public firewood collection, and fire suppression. Routine road maintenance would improve road drainage over time, reducing sediment delivery to streams and addressing point sources of chronic sediment delivery to streams. Noxious weed activities would follow guidelines established by the Sandpoint Noxious Weeds Control Project EIS (USDA Forest Service 1998). No effects, other than those described by the weed control project and its adaptive strategy, are expected to occur.

Treatment of the powerline corridor has been conducted in strict accordance with the Inland Native Fish Strategy and activities have been monitored by the Forest Service. All tree felling is completed by ground crews and lopped and scattered; thence, no ground disturbance. Only the tallest 1/3 of the overstory is removed during these operations to protect water temperature. Large woody debris frequency is not affected by this project as the felled trees remain on site. The other habitat parameters, bank stability, undercut bank, width to depth ratio, and pool quality and frequency are not impacted in any way by these activities. Therefore, there is no effect to fisheries or watershed from felling these hazard trees. Standard regulations restricting the cutting of firewood amount to language that states that cutting near streams or wetlands would be avoided. The activities of fire suppression may in some instances retain existing watershed qualities, and prevent short term impacts associated with fire, such as, temperature increases, turbidity increases, and increases in peak flows. The intent of this project to reduce fire danger through silvicultural prescriptions, coupled with fire suppression and wise fire use, is expected to maintain water quality in the associated streams.

Summary of Effects

This report concludes that there would be no site-specific, measurable effects to hydrologic resources associated with implementation of Alternative 2 of Tumbledown Fuels Reduction Project.

- The proposed action would not have a significant effect on any flood plains, wetlands, or municipal watersheds.
- The proposed action would not have a significant effect on any impaired watersheds.
- The proposed action would not have a significant effect on steep slopes or highly erodible soils.

Design features that would be incorporated into Alternative 2 would provide the necessary mitigation to reduce negative impacts to aquatic resources. 1) Riparian Habitat Conservation Areas (RHCA) will buffer streams, floodplains, and wet areas, as described by the Inland Native Fish Strategy Guidelines(INFS). 2) Ground based tractor/mechanical harvesting would occur in such a manner that would minimize soil disturbance and comply with the IPNF 1987 Forest Plan and Regional Soil Quality Standards (2554.03-R1-Supplement 2500-99-1), see Soils Report for more details. Existing skidding corridors would be used so as to adhere to forest plan soil management guidelines that state, a minimum of 85 percent of an activity area must remain in an acceptable soil quality condition (R1 Soil Quality Standards). 3) Mechanical harvesters would work on a slash mat whenever possible. 4) Landtypes with ratings of high for mass failure potential, surface erosion potential, and high or moderate sediment delivery potential, within the project area would be avoided. 5) All road construction would be temporary. Temporary roads would be ripped and seeded, and recontoured where necessary. 6) Inadequate or non-functioning road drainage features such as waterbars, ditches, and culverts would be improved or replaced. 7) Crossings over bull trout bearing streams would be improved, as outlined in attached review of bull trout crossings (Tumbledown Field Review, 5-25-2006), so as not to increase sediment

addition to bull trout streams. Temporary effects from roads treatment at bull trout crossings is analyzed under Analysis of Flood Plains, Wetlands and Municipal Watersheds. 8) Best Management Practices (BMPs) have been prescribed for the Tumbledown Fuels Reduction Project and would be adhered to.

The proposed action (Alternative 2) would protect water quality and meet the aquatic resource standards and objectives described by the IPNF Forest Plan using a combination of Design Features, Best Management Practices, and Inland Native Fish Strategy guidelines. This combination of water quality protection measures would also make Alternative 2 consistent with Federal, State, and local laws and requirements imposed for the protection of the environment. This consistency includes compliance with the requirements of the Federal Water Pollution Control Act as amended by the Clean Water Act, 33 U.S.C. §1251. Pollutants of concern would not increase in any water quality limited segments a result of implementation of Alternative 2.

/s/ Kevin Davis
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/s/ Jason Gritzner
Jason Gritzner
North Zone Hydrologist

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