Priest River
Subbasin Assessment
and Total Maximum Daily Load

Idaho Department of
Environmental Quality

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Priest River Subbasin Assessment and Total Maximum Daily Load

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ACRONYMS USED IN THIS REPORT

Government Agencies and Citizen Groups

BAG	Panhandle Basin Advisory Group
IDEQ	Idaho Department of Health and Welfare, Division of Environmental Quality
DEQ	Idaho Department of Environmental Quality (department status as of June 2000)
EPA	U.S. Environmental Protection Agency
IDFG	Idaho Department of Fish and Game
IDH&W	Idaho Department of Health and Welfare
IDL	Idaho Department of Lands
IDPR	Idaho Department of Parks and Recreation
IDWR	Idaho Department of Water Resources
IWRB	Idaho Water Resources Board
UI	University of Idaho
USDA-SCS	U.S. Department of Agriculture, Soil Conservation Service (renamed National Resources Conservation Service, NRCS)
USFS	U.S. Department of Agriculture, Forest Service
USF&WS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WAG	Priest Lake Watershed Advisory Group (same group as Priest Lake Management Plan Steering Committee)

Other

BMPs	Best Management Practices
BURP	Beneficial Use Reconnaissance Project
CWE	Cumulative Watershed Effects process
DO	Dissolved oxygen
EC	Electrical conductivity
FPA	Idaho Forest Practices Act
HI	Habitat Index (DEQ)
HUC	Hydrologic Unit Code
MBI	Macroinvertebrate Biotic Index (DEQ)
NIPF	Non-industrial Private Forest
RIBI	Reconnaissance Index of Biotic Integrity (DEQ)
RPV	Residual Pool Volume
SMA	Special Management Area
SMP	Special Management Problem
SSBMPs	Site Specific Best Management Practices
SSOC	Stream Segments of Concern
TMDL	Total Daily Maximum Load
TN	Total nitrogen
TP	Total phosphorus
WBAG	Water Body Assessment guidance (DEQ)

CONVERSION FACTORS APPLICABLE IN THIS REPORT

Multiply	To	Obtain
Metric		**English**
centimeter (cm)	0.3937	inch
cubic kilometer (km^3)	0.2399	cubic mile
cubic meter (m^3)	35.31	cubic foot
hectare (ha)	2.47	acre
kilogram (kg)	2.205	pound
kilogram per hectare (kg/ha)	0.8922	pounds per acre
kilometer (km)	0.6214	mile
liter (l)	1.057	quart
meter (m)	3.281	foot
metric ton	1.102	ton (short)
square meter (m^2)	10.76	square foot
English		**Metric**
Acre	0.405	hectare
acre-feet (ac-ft)	1,219.68	cubic meters
cubic feet per second (cfs)	0.028	cubic meters per second
feet (ft)	0.3048	meters
mile (mi)	1.609	kilometer
square mi^2	2.6	square kilometer

To Convert ºC (degrees Celsius) to ºF (degrees Fahrenheit), use the following equation:

ºF = (1.8 x ºC) + 32

ABBREVIATED MEASUREMENT UNITS

ac	acre
ac-ft	acre-feet
cfs	cubic feet per second
cm	centimeter
ha	hectare
kg	kilograms
kg/ha/yr	kilograms per hectare per year
l	liter
m	meter
m^2	square meter
mg/L	milligrams per liter
mi^2	square mile
mL	milliliter
m. ton	metric ton
μg/L	micrograms per liter
μmhos	micromhos per centimeter (electrical conductivity)

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Information and insight to watershed characteristics in this Priest River Subbasin Assessment and TMDL came from many sources. I would like to thank personnel in the following offices for taking the time and effort in supplying information for this report: U.S. Forest Service at the Priest Lake Ranger District, Sandpoint Ranger Station, and Coeur d'Alene Supervisors Office; Idaho Department of Fish and Game in the Coeur d'Alene Regional Office; Idaho Department of Lands in their efforts at conducting the Cumulative Watershed Effects (CWE) process in numerous Priest River basin watersheds; National Resources Conservation Service in Sandpoint; and the Idaho Soil Conservation Commission in Coeur d'Alene.

-Glen Rothrock

SECTION 1. EXECUTIVE SUMMARY

Water Quality at a Glance

Hydrologic Unit Code	17010215 - Priest River Basin (Figure 2-1 & 2-2)
Basin Area	981 square miles
Listed Water Quality Limited Segments	Trapper Creek, Two Mouth Creek, East River, Tango Creek, Reeder Creek, Kalispell Creek, Lamb Creek, Binarch Creek, Lower West Branch Priest River, Lower Priest River
Beneficial Uses Affected	Cold Water Biota, Salmonid Spawning
Pollutants of Concern	Sediment, temperature
Known Land Uses	Forestry, agriculture, urban

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Prolog

A draft Subbasin Assessment (SBA) for the Priest River basin was published in July 2000, and a draft SBA and Total Maximum Daily Load (TMDL) was published in December 2000. These two documents were reviewed by: the Panhandle Basin Advisory Group (BAG); the Priest Lake Watershed Advisory Group (WAG); TMDL coordinators for Idaho Department of Environmental Quality (DEQ) and the Environmental Protection Agency (EPA); and land managers in the basin such as the U.S. Forest Service (USFS), the Idaho Department of Lands (IDL), and certain private land owners. In accordance to EPA guidelines for TMDLs, the draft SBA and TMDL (December 2000) underwent an advertised 45 day public comment period that ended January 29, 2001. This was followed by an advertised public meeting on January 31 in the Priest Lake area hosted by the Priest Lake WAG. Comment packages and oral comments were received regarding the determined status of: streams found to be in Full Support of their beneficial uses and thus proposed for removal from the Idaho §303(d) list, and streams found as Not Full Support of a beneficial use(s), or impaired, and thus would undergo a TMDL process. A summary of significant comments received, and the DEQ response to those comments, are found in Appendix B of this document.

This final version of a required TMDL document for the Priest River basin, i.e. a Subbasin Assessment and TMDL, represents a few modifications regarding determined support status of §303(d) listed streams that were presented in the two previous draft documents. These modifications were in part based on additional information collected and analyzed through the summer of 2000, including numerous electro-fishing surveys by DEQ, and also in response to comments received, and from recommendations by the Priest Lake WAG. The modifications in this final TMDL compared to draft versions are:

- the draft recommendation to de-list Kalispell Creek (December 2000) is changed to TMDL development,
- the draft recommendation to de-list Binarch Creek (December 2000) is changed to deferral of a support status call until further fish population data is gathered during 2001, and
- Lamb Creek, which was recommended for TMDL development in the draft SBA (July 2000), is now considered as Full Support of cold water biota beneficial use based on DEQ electro-fishing results gathered in 2000.

Introduction to the Subbasin Assessment and Total Maximum Daily Load Process

Section 303(d) of the Federal Clean Water Act (CWA) requires states to prepare a list of waters not meeting state water quality standards. These are impaired waters which do not fully support one or more of their beneficial uses of: domestic water supply; recreation in or on the water; cold water biota (i.e. cold water inhabitants such as insects, reptiles, and fish); and salmonid (trout) spawning. These water bodies may become impaired because of a pollutant input that has reached a level damaging the beneficial use. An example for northern Idaho streams is excess sediment input, which may cover gravel and cobble beds required for salmonid spawning, and may also fill in pools that are critical fish habitat. Based on section 303(d) requirements, it is contingent upon a State to: 1) identify impaired waters and what beneficial uses are being impaired, 2) determine the pollutant(s) causing the impairment, 3) determine the amount of pollutant entering the water body from both natural background sources and human-caused sources (pollutant load), 4) calculate and propose a pollutant load reduction such that the calculated annual load is one that a water body can assimilate without violating a state's water quality standards (Total Maximum Daily Load), and 5) proportionally allocate the TMDL among the various point and non-point pollutant sources.

In 1989 Idaho DEQ submitted to EPA its first §303(d) list as Appendix D of the 1988 Water Quality Status Report, a required biennial report under section §305(b) of the CWA. A stand-alone §303(d) report was submitted in 1992 with 31 water segments listed state-wide, none within the Priest River basin. The 1992 Water Quality Status Report (IDEQ 1992) did list all of the Priest River basin stream segments shown in the introductory box on page 1, except for Trapper Creek. Priest River basin stream segments listed in Appendix A and D of the 1992 report were considered to have Supported/Threatened, Partial Support, or Not Supported status among the various categories of beneficial uses. A history of the 1988 and 1992 §305(b) listings for Priest River basin streams are shown in Appendix A of this report.

Because of dissatisfaction by environmental organizations with the §303(d) process and progress in Idaho, litigation against EPA was initiated in 1993. In 1994 the EPA, in conjunction with state and federal agencies and also through the public comment process, developed a §303(d) list for Idaho that totaled 962 water body segments (streams, rivers, lakes and reservoirs) considered as water quality impaired or limited. This list included pollutants of concern and a State-wide priority ranking which took into account the severity of the pollution. The 1994 and subsequent 1996 §303(d) listing included ten water body segments in the Priest River basin; nine extracted from 1988 and 1992 §305(b) reports, and the addition of Trapper Creek. All segments were given a "low priority" status.

In response to the developments described above, DEQ initiated a program of comprehensively evaluating water bodies throughout the state to better determine which segments are water quality limited, and which water bodies are fully supporting their designated and existing beneficial uses, and thus should not be included on a §303(d) list (i.e. de-listed from the 1994/96 list). DEQ began a Beneficial Use Reconnaissance Project (BURP) which since 1994 has sent summer crews out to collect aquatic invertebrate samples, evaluate stream habitat conditions, and conduct electro-fishing surveys. A 1996 Waterbody Assessment Guidance (WBAG) was developed (IDEQ 1996), which provides a structured process to utilize BURP data, other fish sampling surveys, and basically any and all current and scientifically valid information available to make a judgment call on whether a water body segment is fully supporting its beneficial uses. Evaluation of this information in essence forms the Subbasin Assessment portion of a TMDL document. Progress on and results of DEQ's efforts, as well as modifications of the 1996 WBAG process, were presented in the DEQ 1998 §303(d) List (IDEQ 1999), approved by EPA in May of 2000.

Summary of Priest River Subbasin Assessment and TMDL

The Priest River basin is 981 square miles in area. The basin is primarily within the northwest corner of the Idaho Panhandle, in Bonner and Boundary counties (Figure 2-1). Headwaters of Upper Priest River originate within the Nelson Mountain Range of British Columbia, and headwaters of major streams on the western side of the basin originate in northeast Washington. The basin is flanked on the east by the Selkirk Mountain range, and bordered on the west by the mountain crest separating the Kaniksu and Colville National Forests. Elevation within the basin ranges from 2,075 ft at the city of Priest River to more than 7,000 ft within the Selkirks. There are approximately 1,315 miles of perennial streams in the basin, and a major lake complex, Priest Lake and Upper Priest Lake.

All §303(d) listed stream segments have been assessed through the BURP process. Other information from recent stream and watershed surveys was collected and summarized in this report, including: 1) fish population sampling conducted by the Idaho Department of Fish and Game, IDL, and the USFS, 2) stream habitat surveys and measurements conducted by USFS, and by a DEQ Use Attainability survey in 1992, 3) computer analysis of watershed features conducted through a Geographical Information System (GIS), with data supplied by USFS, IDL, and the U.S. Geological Survey, 4) data collected through an IDL - Cumulative Watershed Effects inventory on many of the listed watersheds, and 5) a stream bank erosion survey sponsored by DEQ and the Idaho Soil Conservation Commission. In addition to the §303(d) listed streams in the basin, BURP surveys and other information was available for many of the major streams in the basin which are not §303(d) listed.

Judgement of cold water biota and salmonid spawning beneficial use status for §303(d) listed streams was initially determined through the amended 1996 WBAG flow-chart procedure (IDEQ 1999). The first step in this procedure is to determine if there are major exceedances of numeric criteria cited in the Idaho Water Quality Standards. There are numeric criteria regarding stream temperature, as elevated stream temperatures may affect cold water related beneficial uses. In almost all cases, temperature sensors placed within basin streams provide a record whereby current Standards criteria are being exceeded for cutthroat spawning and incubation in July, and also EPA numeric criteria for bull trout rearing and spawning from July - September. However, temperature criteria are being reevaluated by DEQ, along with negotiations with EPA on setting agreed upon revised State standards. While stream temperature data is presented in this report, there are no §303(d) listing decisions.

The second step in cold water biota support status determinations is to examine the BURP Macroinvertebrate Biotic Index (MBI) scores. For the large majority of basin streams, MBI scores indicate Full Support (MBI ≥ 3.5). There were no stream segments that had MBI scores ≤ 2.5 which indicates Not Full Support (impaired). For some streams the MBI was less than 3.5 (Needs Verification), and the next step in the amended WBAG flow chart is to examine fish population structure. In most cases the status call remained as Needs Verification because of the dominance of an introduced salmonid (brook trout) and suppressed populations of native cutthroat trout and bull trout. The next and final flow chart step examines the BURP Habitat Index (HI) scores. For most basin streams making it to this step, the status call remained as NV since the vast majority of basin HI scores were below the Full Support cutoff score of HI < 100.

Regardless of the support status call from the WBAG flow chart procedure, all §303(d) listed streams and watersheds were examined in the light of other additional information collected, in particular fish density and population structure data, stream habitat data, and results of watershed sediment yield calculations. Examination of such data as an important part of support status determinations is a procedure jointly agreed to by DEQ and EPA (McIntyre 2000), and is referred to as WBAG+.

Evidence suggests that in some basin streams, sediment, which is largely sand sized particles related to a dominance of granitic geology, is excessive. This has resulted in a high percentage of fines within spawning beds, reduction of pool volume, and channel systems out of equilibrium with characteristics such as channel widening along with stream bank cutting and erosion. In the Priest River basin, excess sediment and channel disequilibrium has been linked to: historic large fires; historic logging practices and initial construction of a transportation network to bring timber to market; current timber activities and the existing road network; agricultural practices such as wet meadow draining through cross ditches, channel straightening, and cattle access to streams; urbanization with clearing and excavation in riparian areas and construction of substandard private roads; and lack of road maintenance. Confounding the analysis of sediment effect on the biotic community are the issues of: legacy land use, fire, and natural geological conditions versus sediment input from current land use activities; and effects from the introduction of non-native competing salmonids including brook trout in streams and lake trout within Priest Lake.

Determinations of cold water biota beneficial use status for this report took into account both the WBAG results and a best professional judgment of whether the additional information ("+" of WBAG) indicated that excess sediment has impaired beneficial uses. Status call judgments fell into several categories of decisions and debate. Trapper Creek, Two Mouth Creek, and Tango Creek (all northern basin streams), were clearly Full Support including viable populations of native cutthroat trout. On the other hand, mid-western streams draining into Priest Lake, and lower western streams draining into Lower Priest River were more difficult to access because of low numbers or absence of cutthroat trout.

The mid western basin streams Lamb Creek and the upper reach of Reeder Creek had abundant brook trout, but absence of cutthroat trout. These reaches are judged as Full Support and recommended for de-listing based on adequate MBIs and brook trout populations. This decision may be disputed based on a fisheries management objective for recovery of cutthroat trout. Sediment source load calculations for Lamb Creek are included in this report because of a high current sediment load, which apparently is not affecting brook trout, but the current load would likely have to be reduced for establishment of cutthroat trout. Kalispell Creek on the other hand, exhibits low numbers of both brook trout and cutthroat, and is judged Not Full Support. However, sediment load calculations and USFS assessments suggest that the current sediment load is not the impairment factor. Regardless of this assessment of current sediment load, the Priest Lake WAG recommends that for any stream segment exhibiting NFS, a de-listing is not warranted and the watershed should undergo a TMDL. This report follows the WAG recommendation.

The lower western stream, Lower West Branch Priest River, has overall suppressed salmonid populations (main stem), in combination with a high current sediment load. A TMDL has been prepared for this stream. While the Middle Fork and North Fork of East River (lower eastern streams) are judged as FS, there appears to be a suppression of cutthroat trout in lower reaches of the two forks as compared to upper reaches (although fishing pressure and elevated water temperature may be a factor). Sediment source load calculations are included in this report for the Middle and North Forks as a resource for any future fisheries management efforts to strengthen the cutthroat population. Sediment reduction efforts in the Middle Fork may also become a fisheries management planning objective because the Middle Fork is the only lower basin stream in which bull trout are found.

Table 1-1 presents a summary of beneficial use status calls and §303(d) List recommendations that are detailed in this Subbasin Assessment and TMDL report. Included are four listed segments in which there is a request for deferment of status calls. These segments are: Reeder Creek from the middle reach to the mouth; the 2.5 mile main stem of East River; Binarch Creek; and the entire §303(d) listed length of Lower Priest River. Reasons for request of deferral are given in Table 1-1, and judgement of beneficial use status for these segments would be presented in the 2002 DEQ §303(d) List. Also, the §303(d) list for East River includes dissolved oxygen (DO) as a concern. There have been no recorded DO measurements taken in this stream system. Therefore, East River remains on the §303(d) list for DO.

Table 1-1. Results of Water Body Assessments for the Priest River Basin based on Application of the Available Data

§303(d) Listed Watershed	Assessed Support Status	Reasons segment to be de-listed for sediment as pollutant of concern	Reason that Segment is deferred for support status determinations
Trapper Creek	CWB and SS show FS.	CWB not impaired by sediment. SBA supports DEQ 1998 §303(d) de-listing.	N.A.
Two Mouth Creek	CWB and SS show FS.	CWB not impaired by sediment.	N.A.
Tango Creek	CWB and SS show FS.	CWB not impaired by sediment. SBA supports DEQ 1998 §303(d) de-listing. Also de-listed for Nutrients as pollutant.	N.A
Binarch Creek	CWB and SS judged as NFS. Support status based on single BURP electro-fishing effort. INSI.	N.A.	Needs further fish survey within Binarch Creek Research Natural Area.
Kalispell Creek	CWB is judged as NFS . SS shows FS. TMDL developed	N.A.	N.A.
Reeder Creek: headwaters down to elev. 2680’	CWB and SS show FS.	CWB not impaired by sediment.	N.A.
Reeder Creek: elev. 2680’ down to mouth	Needs laboratory analysis of 2000 BURP macroinvertebrate samples.	N.A.	Primary middle reach BURPed in year 2000. Data not yet available for status call.
Lamb Creek	CWB and SS show FS.	CWB not impaired by sediment. SBA supports DEQ 1998 §303(d) de-listing.	N.A.
Middle Fork East River	CWB and SS show FS.	CWB not impaired by sediment. SBA supports DEQ 1998 §303(d) de-listing.	Segment remains listed for dissolved oxygen. Needs DO measured.
North Fork East River	CWB and SS show FS.	CWB not impaired by sediment.	Segment remains listed for dissolved oxygen. Needs DO measured.
Main Stem East River	BURP MBI shows FS. INSI because of lack of fish sampling data.	N.A.	Needs a current fish survey. Needs DO measured.
Lower West Branch Priest River	CWB shows NFS. SS shows NFS in lower reach. TMDL developed.	N.A.	N.A.
Lower Priest River	Support status will be determined upon final acceptance of Idaho River Ecological Assessment methods. INSI	N.A.	Final acceptance of Idaho Rivers Ecological Assessment. River needs current fish survey by IDFG.

CWB = Cold water biota beneficial use
SS = Salmonid spawning beneficial use
FS = Full Support of beneficial use
NFS = Not Full Support of beneficial use
SBA = Priest River Subbasin Assessment
N.A. = Not Applicable
INSI = Insufficient Information to make a beneficial use status call

SECTION 2. PRIEST RIVER SUBBASIN ASSESSMENT - 4TH ORDER HUC LEVEL

2.1 Characterization of the Watershed

2.1.0 Introduction

The Priest River basin is 981 square miles in area. The basin is primarily within the northwest corner of the Idaho Panhandle (761 mi^2 of the basin), within Bonner and Boundary counties (Figure 2-1). Headwaters of Upper Priest River originate within the Nelson Mountain Range of British Columbia (24 mi^2 of the basin). Headwaters of major streams on the western side of the basin originate in northeast Washington (198 mi^2 of the basin). The basin is flanked on the east by the Selkirk Mountain range, and bordered on the west by the mountain crest separating the Kaniksu and Colville National Forests. Elevation within the basin ranges from 2,075 ft at the city of Priest River to more than 7,000 ft within the Selkirks. The linear distance from the Canadian border to the city of Priest River is 57 miles.

Hydrologically, the Basin has four major complexes or divisions: 1) Upper Priest River and its tributaries, 2) Upper Priest Lake covering 1,338 acres and receiving Upper Priest River and other tributaries, and including a 2.7 mile outflow channel called The Thorofare which drains to Priest Lake, 3) Priest Lake which covers 23,300 acres and has numerous tributaries, and 4) Lower Priest River, created as outflow from Priest Lake, flows a distance of 45 river miles to its confluence with the Pend Oreille River at the city of Priest River and has several major tributaries.

Within the Priest River basin there are ten §303(d) listed stream segments (Figure 2-2 and Table 2-1). These segments are: Trapper Creek flowing into Upper Priest Lake; Two Mouth Creek, Tango Creek, Reeder Creek, and Kalispell Creek flowing into Priest Lake; Lamb Creek, Binarch Creek, East River, and Lower West Branch Priest River flowing into Lower Priest River; and the main stem of Lower Priest River beginning at the confluence with Upper West Branch Priest River. General information regarding watershed size, elevation ranges, gradient and channel type, and base flow is presented in Table 2-2. A history of listing in State §305(b) and §303(d) reports beginning in 1988 is found in Appendix A.

Clarification is needed regarding some of the stream segment boundaries originally listed in the 1994/96 §303(d) reports as revised in the DEQ 1998 §303(d) List (Table 2-1). For Kalispell Creek, Lamb Creek, and Lower West Branch, the upper boundary in the 1998 §303(d) List (IDEQ 1999) is the Washington - Idaho state line. However, a significant portion of the headwaters and watershed lands of these streams reside in Washington. Any TMDL implementation for sediment reduction would have to take into account these upper areas to be effective in stream improvement. For the most part there should not be a jurisdictional problem for the State of Idaho, since most of the Washington land in the western basin is Idaho Panhandle National Forests managed from the Priest Lake Ranger District. Therefore, assessments in this report will include stream segments and lands within Washington.

One further clarification is needed for the East River. The original listing stated a boundary of, "headwaters to Priest River." This was originally interpreted to mean the headwaters of Middle Fork East River to the mouth. For undocumented reasons, the boundary was changed to the North Fork East River in the 1998 §303(d) List. This SBA document will consider the entire East River drainage.

The structure of this report is to present a general characterization of the Priest River basin in Section 2; to provide pertinent assessment details for each of the listed §303(d) streams in Section 3 including proposed de-listing and proposed TMDL development for water quality impaired streams; and in Section 4 develop a TMDL loading analysis and allocation for determined impaired streams. The necessity for individual assessments of listed 5th order watersheds in Section 3 is that they are widely separated geographically within the basin, and there is considerable variability in basin characteristics including land use intensity levels when moving from north to south.

Table 2-1. Priest River Basin: Water Body Identification Numbers, and 1994/96 §303(d) Listing Categories

Stream Name	Water Body Identification Number	Pacific Northwest Rivers System	Boundaries as Listed in 1994 §303(d)	Revised Boundaries in 1998 §303(d)	Pollutant/ Parameter Listed[a]
Trapper Creek	ID-17010215-017	1432	Headwaters to Upper Priest Lake		Sed, Halt
Two Mouth Creek		1427	Headwaters to Priest Lake		Sed, Halt
East River	ID-17010215-003 ID-17010215-004	1415	Headwaters to Priest River	Headwaters of Middle Fork to North Fork confluence. Headwaters of North Fork to Priest River.	Sed, DO, Temp, Flow
Tango Creek	ID-17010215-021	1428	Headwaters to Priest Lake		Sed, Nut
Reeder Creek	ID-17010215-023	1424	Headwaters to Priest Lake		Sed
Kalispell Creek	ID-17010215-024	1421	Priest River/ Lake Basin	WA line to Priest Lake	Sed
Lamb Creek	ID-17010215-025	1419	Headwaters to Priest Lake	WA line to Priest Lake	Sed
Binarch Creek	ID-17010215-026	1418	Headwaters to Priest River		Sed
Lower West Branch Priest River	ID-17010215-030	1411	No Boundaries Stated	WA line to Priest River	None Listed
Lower Priest River	ID-17010215-001	1407	Upper West Branch Priest River to Pend Oreille River		Sed

a = Sed: Sediment
Halt: Habitat Alteration
DO: Dissolved Oxygen
Nut: Nutrients
Temp: Temperature

2.1.1 Physical and Biological Attributes

2.1.1.1 Climate

Climatological information is primarily derived from weather monitoring stations within the USFS Priest River Experimental Forest, about 15 miles north of the city of Priest River (Figure 2-1). The current “control” weather station is at elevation 2,380 ft, about the same as Priest Lake surface elevation, with records dating back to 1916 (Finklin 1983).

The climate is transitional between a northern Pacific coastal type and a continental type (Finklin 1983). July and August are the only distinct summer months and temperatures are relatively mild because of the

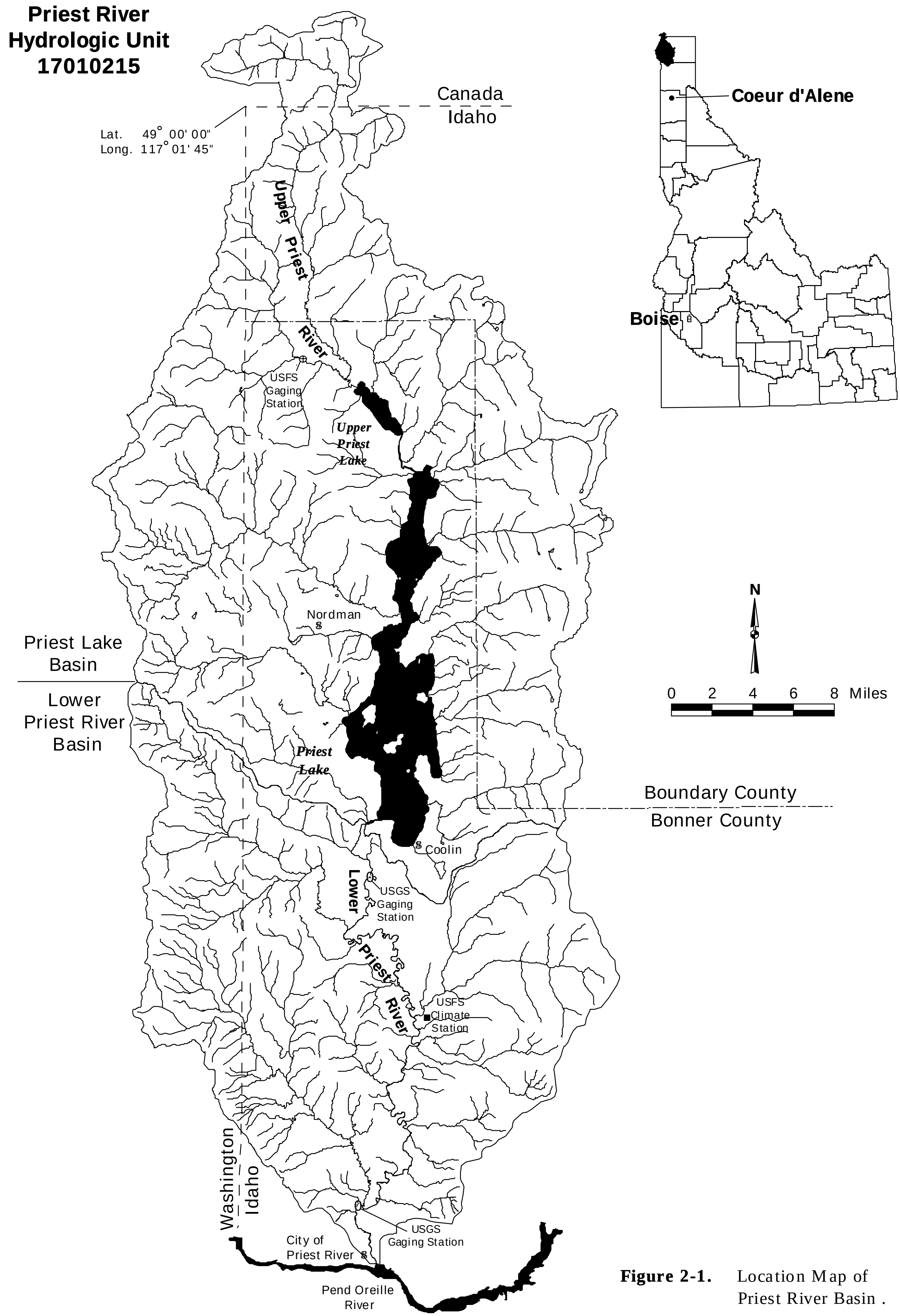

Figure 2-1. Location Map of Priest River Basin .

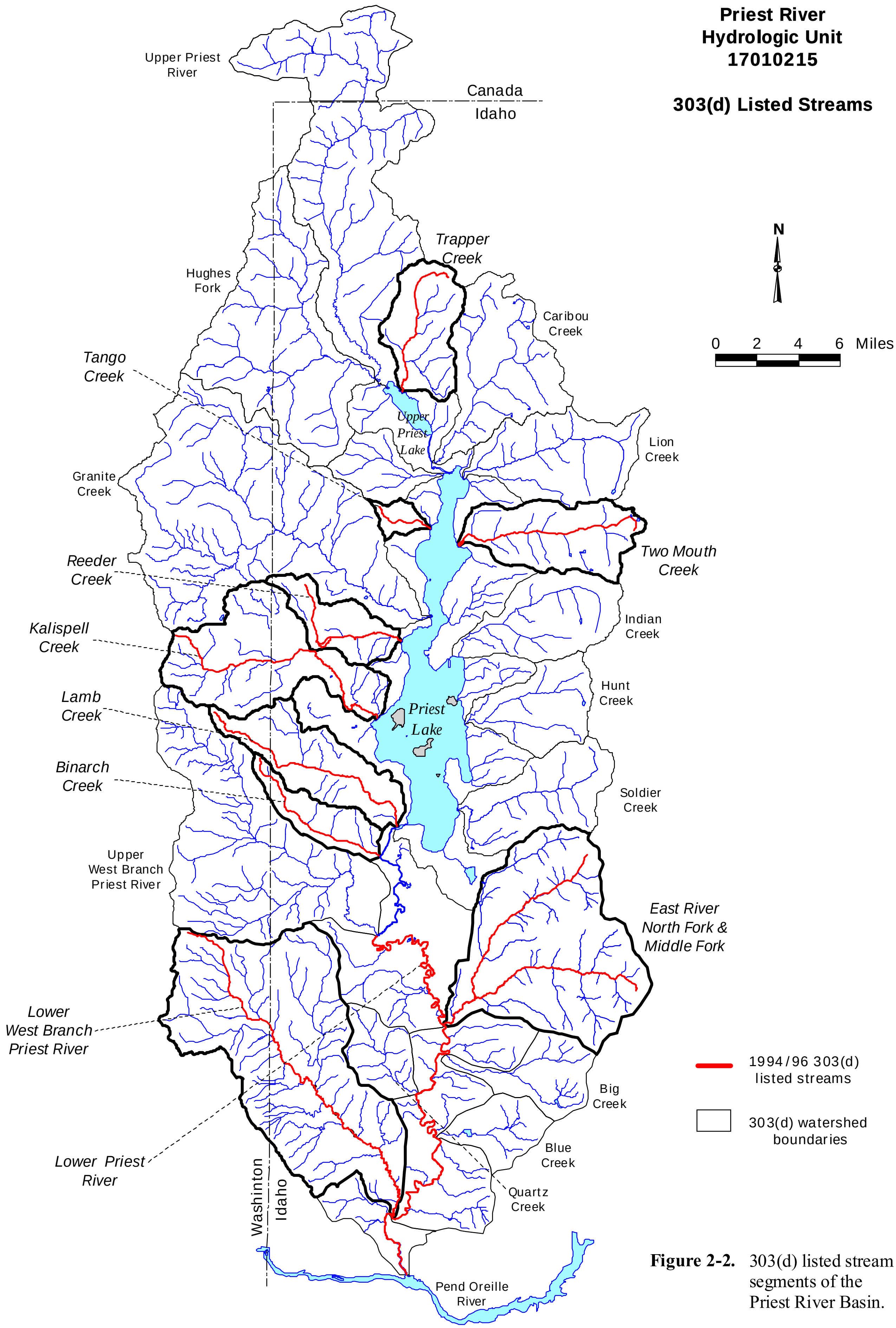

Figure 2-2. 303(d) listed stream segments of the Priest River Basin.

Table 2-2. Priest River Basin: General Characteristics of the §303(d) Listed Stream Segments

Stream Name	Watershed Size (acres)	Elevation Range (ft)	Stream Length (miles)	Stream Order	% Rosgen Channel Type and Gradient C, F, D, E <1.5%	% Rosgen Channel Type and Gradient B+A ≥1.5%	Summer Base Flow near mouth (cfs)
Trapper Creek	12,292	2438-6500	7.9	4th	14%	86%	9[b]
Two Mouth Creek	15,565	2438-7292	10.3	3rd	6%	94%	20[a]
East River							
Main stem	1,881	2230-2280	2.5	4th	100%	0%	55[b]
North Fork	19,494	2280-6706	10.0	3rd	40%	60%	13[b]
Middle Fork	21,788	2280-6706	8.9	3rd	20%	80%	24[b]
Tango Creek	2,003	2438-5200	3.3	1st	0%	100%	1[b]
Reeder Creek	8,291	2438-5074	7.7	2nd	63%	37%	5[a]
Kalispell Creek	25,210	2438-5552	14.6	4th	70%	30%	16[a]
Lamb Creek	15,616	2438-5476	12.8	3rd	56%	44%	6[a]
Binarch Creek	7,232	2420-4170	8.5	2nd	51%	49%	3[b]
Lower West Branch Priest River	56,835	2100-5600	25.3	4th	84%	16%	36[b]
Lower Priest River	219,980	2074-2300	35.3	5th	100%	0%	450[a]

a = flow determined from continuous gage height recorder station
b = flow determined from single BURP flow measurement, summer base flow

pacific maritime influence (average daily summer maximums are around 82ºF). Winter temperatures also are relatively mild compared to areas east of the Rocky Mountains. Annual precipitation (rain and melted snow) averages 32 inches at the "control" weather station. Average precipitation within the peaks of the Selkirk Mountains can reach 60 inches (UI 1995). At elevations above 4,800 ft snowfall accounts for more than 50% of total precipitation (Finklin 1983). The wettest months normally are November, December, and January. The elevation zone between 2,000 ft and approximately 3,500 ft is subject to rapid snow melt from warm and moist mid to late-winter rain storms. The result is that some of the basin watersheds with a high percentage of sensitive snowpack acreage, in particular the lower half of the western side of the basin, can have high discharge rain-on-snow events.

2.1.1.2 Hydrology

The Priest River basin has abundant tributaries (Figure 2-2), with approximately 1,315 miles of perennial streams. Upper and Lower Priest River flow north to south, while the aspects of most other tributaries are east and west. Tributaries on the northern and eastern sides of the basin originate in the Selkirk Mountains and a large percentage of their stream channels are moderate to steep gradient B and A channel type flowing through deep V-shaped mountainous valleys. On the western side of the basin, from Reeder Creek down to Lower West Branch Priest River, a large percentage of the stream lengths have gradual gradients (<1.5%) flowing through valley floodplains with Rosgen C, F, D and E channel types (Rosgen 1985).

A good overall description of surface water volume generated in the basin can be obtained from data at two USGS gauging stations (Figure 2-1). Station Priest River Near Coolin (at the Dickensheet campground), is located 5.2 miles downstream from the Priest Lake outlet dam. Period of record for this station began in 1948. Flow data at this point on the Lower Priest River represents drainage into and from Upper and Lower Priest Lakes in addition to a couple of minor tributaries between the outlet dam and the gauging station. The land drainage area is 600 mi^2, or about two-thirds of the total basin. River flow is partly regulated by the Priest Lake outlet dam which began operation in 1951 (IWRB 1995).

Mean annual runoff at the station near Coolin, through Water Year (WY) 1998, is 931,800 ac-ft (Brennan *et al*. 1999). Approximate calculations produce an average annual yield of surface runoff from land in the Priest Lake basin at 2.4 ac-ft/acre. Surface water yields vary around the lake basin ranging from around 3.0 ac-ft/acre to 1.2 ac-ft/acre (estimates for WY 95, Rothrock and Mosier 1997). Greater yields are from watersheds in the Selkirk Mountains with high elevations, deep snow pack, and considerable rock outcrop in the higher portions of the watershed. Lesser yields are from west side watersheds with lower elevations, less snowpack, and extensive low gradient, glacial till and outwash valleys where aquifers are recharged.

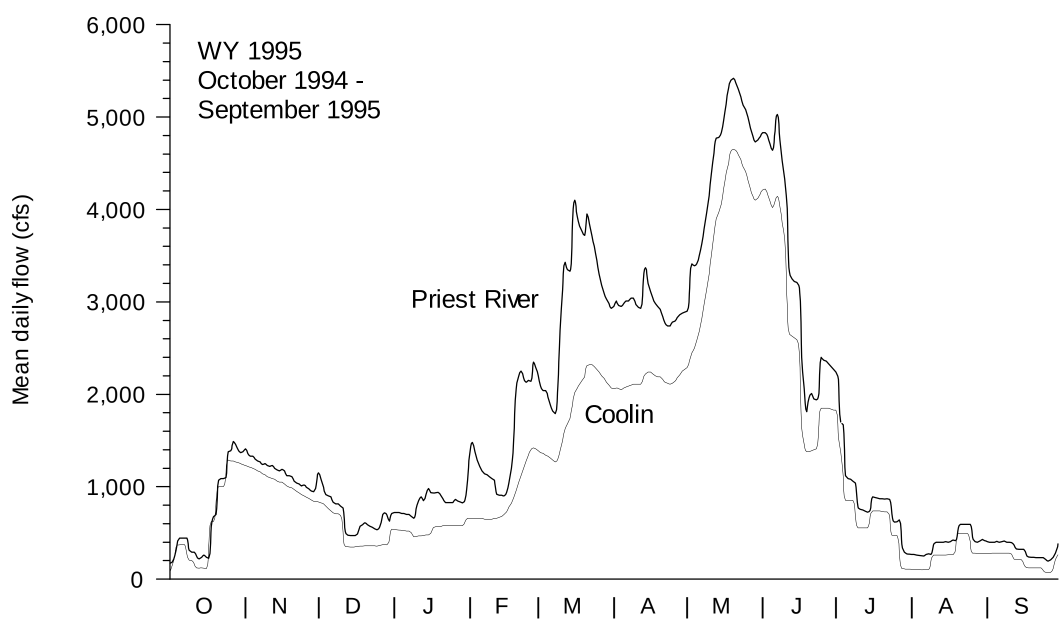

Figure 2-3. Mean daily flow of Lower Priest River for Water Year 1995 as recorded at the USGS gauging stations Priest River Near Coolin (12394000) and Priest River near Priest River (12395000).

Mean daily flow pattern for WY 1995 is shown in Figure 2-3 (Brennan *et al*. 1996). WY 1995 was selected because annual runoff was very close to the period of record average, and there also is considerable measured flow data from Priest Lake tributaries associated with a baseline lake study (Rothrock and Mosier 1997). The annual spring runoff began in mid March corresponding with initial periods of spring warming (daytime maximum air temperatures between 40 - 50 ºF), and rain-on-snow events in lower to mid elevation ranges. Peak flow typically occurs from mid May to early June when daytime air temperatures exceed 80ºF and rapidly melts the mid to high elevation snowpack.

The downstream USGS gauging station is Priest River Near Priest River, located 2.7 miles north of the city of Priest River, at river mile 3.8. Flow records were taken intermittently between 1903 and 1928, and have been taken continuously since 1929. Average annual runoff between WY 1950 - 1998 was 1,249,000 ac-ft. Extremes of annual runoff have been 515,135 ac-ft in 1977, and 2,135,175 ac-ft in 1974. Highest recorded daily mean flow was 10,700 cfs in May 1997, and lowest daily flow was 150 cfs in November 1979.

The average annual runoff for WY 1950 - 1998 at the lower station represents a 25% gain from the upper station. This is water gained from basin watersheds south of Binarch Creek with a total of about 340 mi^2 basin land area. There is consumptive use of river water between the two stations for domestic water supply and agriculture purposes, but percentage extraction is less than 5% of the flow. The two stations also closely bracket the land area that drains into the §303(d) listed segment of Lower Priest River. Surface water yield from this southern one-third of the basin calculates to around 1.4 ac-ft/acre. This is less yield than the Priest Lake basin primarily because of lower average elevation and depth of snow pack. Note in Figure 2-3 a more pronounced rise of the hydrograph during mid-February through late April at the lower station. This likely reflects that the southern one-third of the basin has a higher percentage of lowland to middle elevation acreage (2,100 - 3,500 ft) than the Priest Lake basin. This low to mid elevation sensitive snow pack readily yields runoff during the initial late winter - early spring warmup and rain events.

Of the §303(d) listed streams, Two Mouth, Reeder, Kalispell, and Lamb Creeks have fairly comprehensive water flow records for WY 94 and 95 as a result of the Priest Lake study (Rothrock and Mosier 1997). Lower Priest River is well documented with the USGS stations. For the remaining five listed streams, water measurements are few with no history of gauging stations.

2.1.1.3 Geology and Soils

Geological investigations and mapping of the Priest River basin have been conducted by Savage (1965, 1967) and Miller (1982). Summaries, maps and updates of this work are provided by Bonner County (1989), Buck (1983), McHale (1995), IWRB (1995), and Rothrock and Mosier (1997).

Bedrock of the Priest River basin can be divided into two distinct groups (Figure 2-4). The older is the Precambrian Belt Supergroup series forming the basement complex. The belt series is composed of mildly metamorphosed sedimentary rocks including argillites, siltites, and quartzites (Savage 1967). The oldest and most prevalent of the series is called the Prichard Formation. Uplifting of the belt series constitutes a major rock type within the western half and southeastern portion of the basin. It is common to have metadiabase sills (black igneous rock) layered between belt rock beds. Belt geology weathers to predominately clay and silt sized particles.

The second type of bedrock is the igneous Kaniksu Batholith formation, also called the Selkirk igneous complex. The formation is cretaceous in age. The rock mass is composed of muscovite-biotite granodiorites and quartz monzonite granitic rocks. The plug-shaped Kaniksu batholith pushed up through the precambrian metasedimentary bedrock (McHale 1995). The overlying older bedrock was eroded to

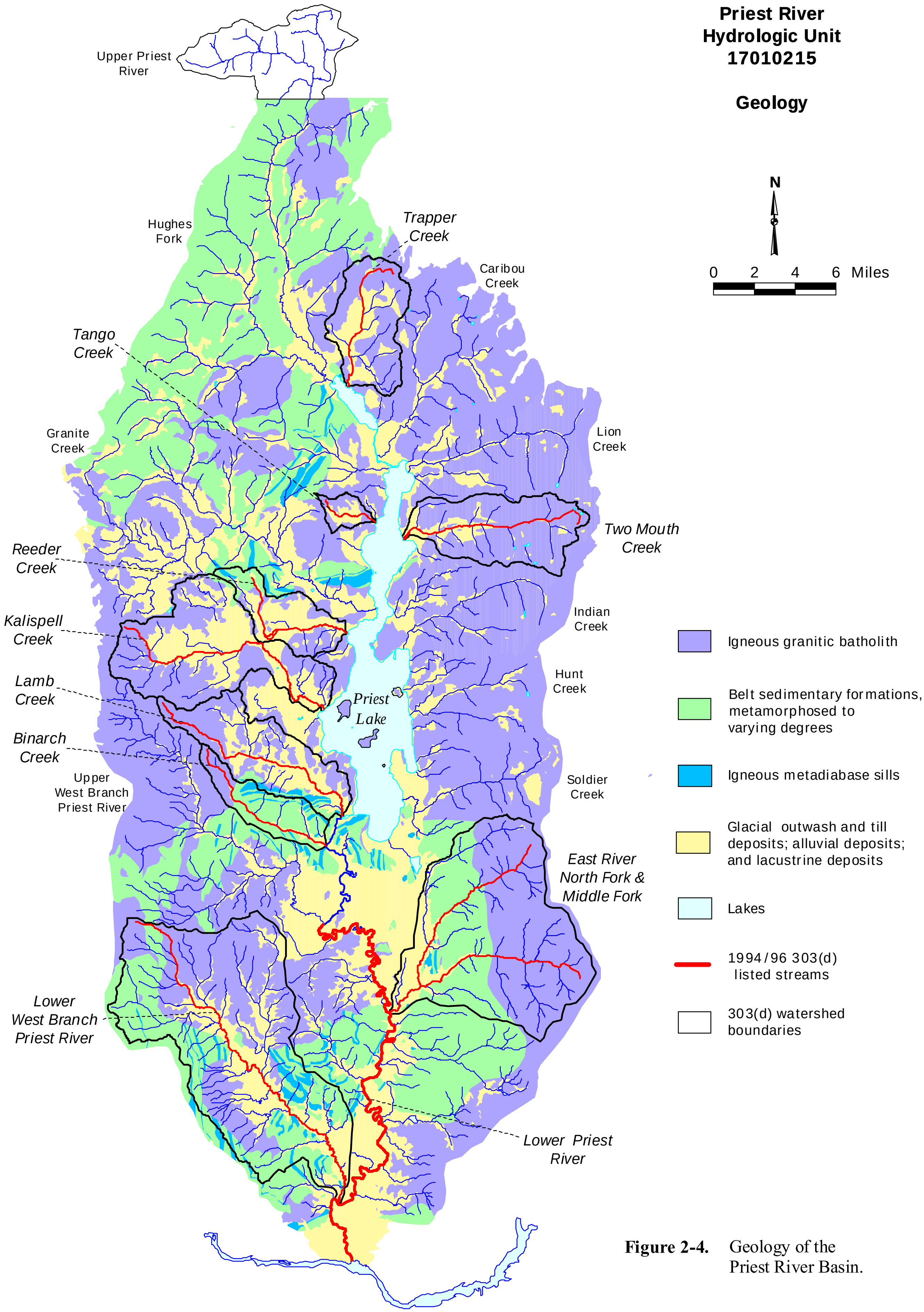

Figure 2-4. Geology of the Priest River Basin.

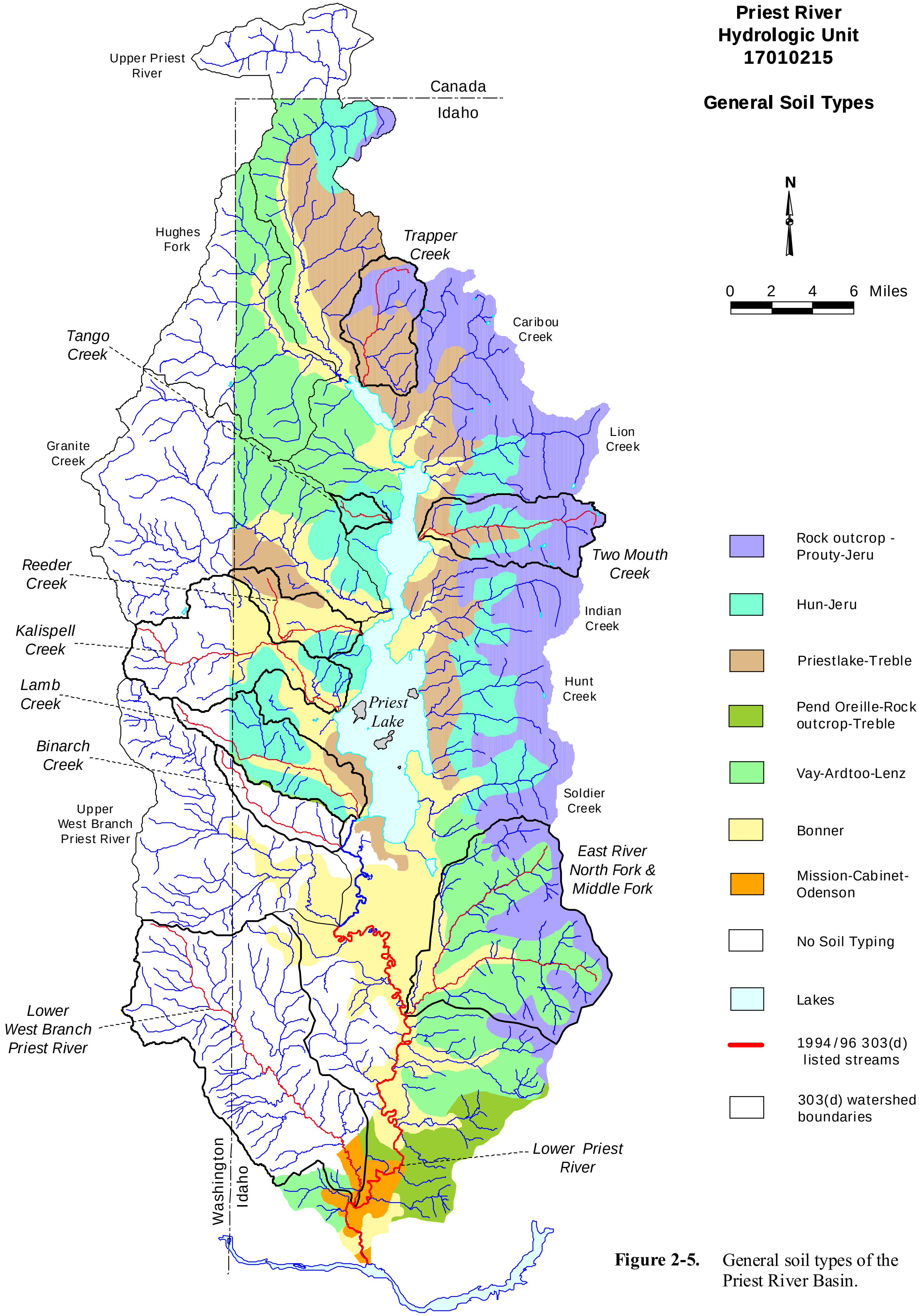

Figure 2-5. General soil types of the Priest River Basin.

Table 2-3. Descriptions of General Soil Map Units in the Priest River Basin (USDA-SCS 1982)

Bonner County General Soil Map Units (USDA-SCS 1982)	**Soil description**
All general soil groups in the basin	Soils: a mantle of volcanic ash and loess. Rock outcrop: areas of exposed granite, gneiss, and schist on ridges and convex mountainsides.
Rock outcrop - Prouty-Jeru	Glacial till and residual origin. *Rock outcrop, and moderately deep and very deep, steep and very steep, moderately permeable soils; on mountains at high elevations*. Extensive areas of rock outcrop are found at the higher elevations of eastern Priest River basin. Prouty residual soils are on ridges and convex side slopes of mountains. The surface and subsoil are gravelly loam, and the substratum is extremely stony sandy loam. Jeru glacial till soils are on mountainsides. Soil strata are very stony sandy loam.
Hun-Jeru	Glacial till and residual origin. *Deep and very deep, rolling to very steep, moderately rapidly permeable soils; on mountains*. Jeru glacial till warm soils are on foot slopes and on steep and very steep mountainsides. Surface layer is very stony sandy loam, subsoil is gravelly sandy loam, and substratum is very cobbly sandy loam. Hun residual soils are on very steep slopes, with gravelly silt loam at the surface, a subsoil of very gravelly sandy loam, and a substratum of extremely cobbly loamy sand.
Priestlake-Treble	Glacial till origin. *Very deep, well drained, moderately steep to very steep soils: on foothills and mountainsides*. Priestlake soils are on the cooler, north-facing mountainsides. Surface layer is gravelly sandy loam, subsoil very gravelly sandy loam, and substratum is very gravelly loamy sand. Treble, high precipitation soils are at the lower elevations on foothills and the warmer south-facing slopes. Surface layer is gravelly sandy loam, subsoil very gravelly sandy loam, and substratum very cobbly loamy course sand. Klootch and Kruse soils are also common.
Pend Oreille-Rock outcrop-Treble	Glacial till and residual origin. *Very deep, well drained, rolling to very steep soils, and Rock outcrop; on foothills and mountainsides.* Pend Oreille soils are on the lower and cooler, north-facing foothills and mountainsides. Surface layer and subsoil are silt loam, and substratum is gravelly or cobbly sandy loam. Treble soils are on the warmer south-facing side slopes of foothills and mountains. Surface layer is gravelly sandy loam, subsoil very gravelly sandy loam, and substratum very cobbly loamy course sand. Of minor extent are poorly drained Hoodoo and Sagle soils, and deep Lenz, Ardtoo, Vay, and Bonner soils.
Vay-Ardtoo-Lenz	Residual origin. *Moderately deep to very deep, moderately steep to very steep, moderately permeable and moderately rapidly permeable soils; on mountains*. Ardtoo soils are on south-facing side slopes. Surface and subsoil layers are gravelly sandy loam or very gravelly coarse sandy loam. Substratum is weathered gneiss. Vay soils are on the colder and more moist, north-facing side slopes and in ravines. Surface layer is silt loam, subsoil very gravelly sandy loam, and substratum is weathered granite.
Bonner	Glacial outwash origin. *Very deep, level to undulating, well drained soils; on terraces*. Surface layer is silt loam, subsoil is gravelly silt or sandy loam, and the substratum is very gravelly loamy sand or very gravelly coarse sand. In the Priest River basin there are pockets within the outwash of very deep and poorly drained alluvial, lacustrine, and organic derived soils.
Mission-Cabinet-Odenson	Glacial silty lake-laid sediment. *Very deep, level to hilly, somewhat poorly drained to excessively drained soils; on alluvial fans, terraces, and dunes.* Mission soils are in higher areas of terraces. Shallow to a hardpan and somewhat poorly drained. Surface layer is silt loam, subsoil is silt and clay loam, and substratum is fine sand to silty clay. Odenson soils are in the lower, wetter areas on terraces. Soils are very deep and poorly drained. Surface layer is silt loam, subsoil is silty clay loam, and substratum very fine sandy loam to silty clay.

expose the batholith. The batholith intrusion caused regional tectonic swelling which formed the Selkirk Mountains to the east of Priest Lake (Harvey 1994). Batholith is the predominant bedrock of the eastern side of Priest River basin, extending north to the Trapper Creek watershed. Areas of granitic formations are also found on the west side. Granitics weather to very fine gravel and sand sized particles (1 - 8 mm).

Periods of glaciation and ice retreats left extensive surface deposits overlying bedrock in the basin (Figure 2-4), and had great influence on soil development. These deposits include mixes of boulders, gravels, sands, silts, and clays. Soil origin groups from ice are: glacial till soils on foot slopes and mountainsides formed from unconsolidated material deposited by glacial ice; and glacial outwash soils in lowlands deposited by ice meltwater in layers of clay, sand and gravel. Other soil origin groups are: alluvial soils formed from deposits along stream banks and in alluvial fans; lacustrine deposits of fine clay, silt, and sand, associated with glacial lakebeds; and organic soils derived predominantly from herbaceous plants. The geologies of the lower Priest River drainage are more weathered than those in the Priest Lake basin because the lower basin did not experience the ice flows of the last glaciation (USFS 1999).

A Bonner County soil survey conducted by the Soil Conservation Service (USDA-SCS 1982) provides detailed soil mapping (1:24,000 map scale) for the east side of the basin, on State and private land, from Trapper Creek down to the city of Priest River. Detailed SCS soil mapping does not exist for the west side of the basin on federally owned and private land. There is also a SCS General Soil Map (1:380,160 scale) constructed for the areas that have been soil typed and this map shows broad areas that have a distinctive pattern of soils, relief, and drainage (USDA-SCS 1982). The General Soil Map has been updated to include the west side of the Priest Lake basin to the Washington Border (Figure 2-5, unpublished data provided by the SCS Coeur d'Alene office). Descriptions of these soil groups are presented in Table 2-3. The USFS has supplied a base geology landtype map for the western half of the basin which was used for calculating natural sediment yield from forested land (see Figure 4-2, page 163). Landtype units are based on local geomorphology, hydrology, and soil characteristics. General soil types could be inferred from this map (Niehoff *pers comm*).

The soil profile of many undisturbed soils in the area begin with a surface layer of an organic duff mat of needles, leaves and twigs, and a highly decomposed organic layer beneath. Below is a mantle of volcanic ash and loess (wind-deposited silt). The volcanic ash cap of basin soils plays an important role because soil productivity is highest with a thick ash cap, and surface erosion is often low because of rapid water infiltration through the cap (Janecek Cobb *pers comm*). Most commonly, basin soils are deep and well drained with a high component of gravel and sand. Glacial outwash and till are extensive in the foothills and lowlands surrounding Priest Lake and the valley bordering Lower Priest River. Much of the material is coarse grained and deep, and around Priest Lake supports unconfined aquifers. Within these glacial deposits are pockets of lacustrine fine grained silts and clays, and organic soils. Moderately steep to very steep mountainsides of the basin have primarily residual soils, bedrock weathered in-place. Particularly in the higher elevations of Priest Lake basin there are extensive areas of rock outcrop.

Because of the predominance of granitic geology, a major sediment component to streams is sand sized particles. Also, lowland stream segments have entrenched themselves into outwash deposits. Assessment of basin streams in the lowlands of gradual gradient often shows extensive stream beds of thick sand. This is particularly true of §303(d) listed streams on the west side from Reeder Creek down to the city of Priest River. An important yet difficult part of the SBA and TMDL process is to partition this bedload into what would occur naturally and what has been accelerated by land use activities.

With land use disturbance there is a high inherent hazard for surface erosion in the basin because of the rather extensive landscape of moderate to steep slopes (15 to 65%), soils derived from granitics, and glaciated land (IDL 1997a). In general, the inherent mass failure hazard in the basin is rated as moderate. From the standpoint of road building and erosion, areas of belt rock geology are considered fairly stable against surface erosion (IDEQ 1997). Areas of glacial till and granitic residual soils are considered an unstable geologic condition for roads.

2.1.1.4 Vegetative Cover and Wildfire

Vegetation of the area varies in association with: dry to moist to wetland soil conditions, slope aspect, elevation, precipitation and temperature, wildfire history, plant diseases, and land use patterns. The area is predominately coniferous forest. In the higher elevations of the Selkirk range, subalpine fir and Engelmann spruce are the dominant species. A large area on both the east and west sides of the basin, below about 5,000 ft elevation, is occupied by western red cedar and western hemlock in moist soils, and Douglas-fir, grand fir, western larch, white pine, lodgepole pine, and ponderosa pine in semi-dry to dry soils. There are some spectacular stands of old growth cedar.

Historically, western white pine and western larch were dominant species along with a mix of other long-lived species such as ponderosa pine that established after major wildfires (USFS 1999). White pine has suffered severe mortality rates due to the introduced blister rust pathogen. Along with effective fire suppression over the last fifty years and a century of timber harvesting and replanting, disturbance and successional regimes have been altered and the make-up of the basin's coniferous species has changed. The basin's forests now have a high component of Douglas-fir, grand fir, western hemlock, and western red cedar which are more shade-tolerant trees, and which are more abundant now than their historic levels (USFS 1999). Currently, forest sections in the southern basin are experiencing mortality caused by the Douglas-fir beetle triggered by significant blowdown and breakage in the winter of 1996/97 from ice and heavy snow.

Understory and open field shrubs and forbs include: thimbleberry, huckleberry, ceanothus, pachistima, mountain maple, devil's club, ocean spray, and snowberry (Javorka 1983). Along stream riparian areas are birch, aspen, cottonwood, alder, dogwood, and willow. Numerous wetlands with associated vegetation are in the basin. Hager Lake Fen, a valley peatland (uncommon in Idaho) in the lower Kalispell Creek watershed, has received considerable scientific research with its vast habitat and flora diversity including plants considered rare in the state (Bursik 1994).

No endangered plants as listed under the federal Endangered Species Act (1973), are known to exist in the area (USFS 2000c). Ute ladies'-tresses (*Spiranthes diluvialis,* a rare orchid) is listed as threatened in Boundary and Bonner Counties, and water howellia (*Howellia aquatilis*) is listed as threatened for the Idaho Panhandle National Forests (USFS 2000c). There are rare, threatened, and endangered plant species listed under various state and federal criteria, i.e. Regional Federal Sensitive Plants, Taxa of Federal and State Concern, and Taxa of State and Federal Watch Lists (Javorka 1983 and USFS 1988).

A rather extensive invasion of noxious weeds has occurred in the basin. Species include spotted knapweed, meadow and orange hawkweeds, Dalmation toadflax, and Canadian thistle. An aggressive weed control project has been proposed and is being implemented on National Forest lands (USFS 1996).

As in any forested area, wildland fires have been a major factor in the Priest River basin by affecting the characteristics of vegetative cover and ultimately drainage runoff. Prior to Euro-American settlement, fire was the most influential pulse disturbance on the landscape, with an estimated occurrence of large fires around 100 to 150 years. Lightning strikes are common in the basin, and it is also believed that Native Americans used fire for clearing purposes (USFS 1999). From early recorded history (after settlement in the late 1800s), there were large stand-replacing fires between the years of 1880 and 1939 (Figure 2-6). In some watersheds such as Kalispell and Lamb Creeks, over 50% of the landscape experienced large burns, and some areas have been burned over two and three times. In other watersheds, such as Lower West Branch Priest River, most of the landscape has been spared large fires over the past century. The Forest Service believes that in some watersheds, early century fires were so extensive that increased water yields from the hydrologic openings reached a point where the natural channel size could not handle them (USFS 1999). Recurrent flooding damaged stream banks and widened streams. As stream width increased, riparian trees toppled. Historically, fires had a major role in stream dynamics (Janecek Cobb *pers comm*).

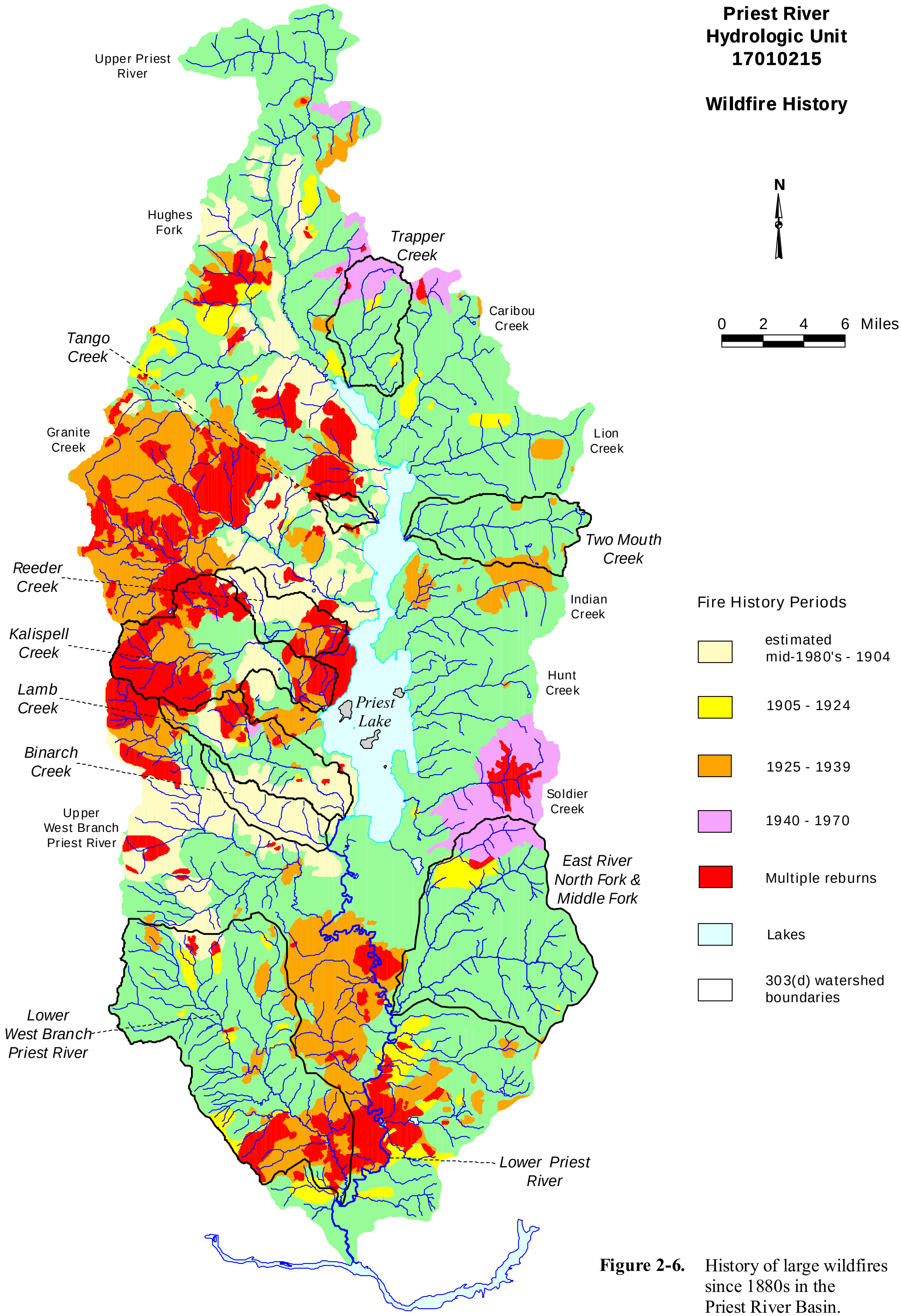

Figure 2-6. History of large wildfires since 1880s in the Priest River Basin.

Early century logging patterns often related to the fire history, and in burned areas, logging practices may have hindered natural stream recovery after fire (USFS 1999). In burned watersheds there was mostly salvage logging operations, and this included the taking of burnt and toppled riparian conifers. Left in place, these riparian trees would have started the process of stabilizing stream channels by creating log steps, trapping bedload sediments and forming channel bars (USFS 1999). In watersheds not experiencing large fires between 1880 -1939, such as Lower West Branch, there was extensive early century logging where the target was large and valuable species such as white pine.

While there has been effective fire suppression in modern times, there were two large fires in 1967 which burned out of control: one in the Trapper Peak area northeast of Upper Priest Lake, and also the Sundance Mountain fire, east of Coolin (Figure 2-6).

2.1.1.5 Fisheries

Historically, four native salmonids have been reported in the Priest River basin: westslope cutthroat trout, bull trout, mountain whitefish, and pygmy whitefish. Other native fishes are northern pike minnow (*Ptychocheilus oregonensis*, formerly squawfish), largescale sucker, longnose sucker, slimy sculpin, shorthead sculpin, longnose dace, speckled dace, peamouth chub, and redside shiner (USFS 1999). Introduced species include brook trout, rainbow trout, brown trout, and in 1925 lake trout (mackinaw) were planted in Priest Lake. Kokanee salmon were introduced to the lake during the 1940s, and became an extremely popular fishery. But, for various postulated reasons including the introduction of mysis shrimp in the 1960s, the kokanee population declined in the 1970s and now there are only remnant populations in Priest Lake and Upper Priest Lake. Priest Lake also has largemouth bass and yellow perch. The fishery in Blue Lake (southeastern section of the basin) includes pumpkinseed, brown bullhead and channel catfish.

In 1998 the USF&WS listed bull trout (*Salvelinus confluentus*, a distinct species of char), as threatened under the federal Endangered Species Act (1973). The westslope cutthroat trout is considered a Species of Special Concern by the State of Idaho, and as a "sensitive species" by Region 1 of the USFS. Cutthroat trout can be found in most tributaries in the basin, but the current range of bull trout is limited, primarily found in streams of the northern one-third of the basin and Upper Priest Lake. Both species have stream resident populations, and migratory populations that are adfluvial (residing in Upper and Lower Priest Lakes), or fluvial (Lower Priest River). By historic accounts both species in all three life history strategies (resident, adfluvial, fluvial) were abundant in the basin system (Bjornn 1957), but now geographic range and population numbers are diminished. Cutthroat trout are mainly found as resident populations in headwater streams, although there is still a reasonably robust adfluvial population in Upper Priest Lake (Corsi *pers comm*). There is a diminished or depressed adfluvial cutthroat population in Priest Lake, and a diminished fluvial population in Lower Priest River.

The Idaho Department of Fish and Game has established several protective limitations: bull trout must be released if caught in any waters; tributaries to Upper Priest Lake and The Thorofare had been closed to fishing since 1945, but in 2000 regulations were changed to allow catch-and-release fishing; Upper Priest Lake is catch-and-release only; and there are restrictions on cutthroat trout fishing in tributaries to Lower Priest Lake. Tributaries to Lower Priest River are under general fishing regulations.

The decline in bull trout and cutthroat populations has been attributed to several factors. Both species have preferred instream habitat conditions of: cold and clear water; riffles, runs and pool tailouts with gravel beds of low percent fines for spawning; and deep pools with complex cover for feeding, resting and over-wintering. In many basin watersheds, a century of land use has led to some degradation of stream habitat. There also is the food and space competition factor of introduced brook trout which are now abundant in basin streams. Brook trout have less stringent environmental requirements than the native trout and do sufficiently well within the low gradient, depositional stream segments with sandy-silty bottoms and low quality pools. IDFG believes that the presence of brook trout, with few or no cutthroat or bull trout present in a stream where they were historically present, is possibly an indication that water quality has declined (IDFG, 2001). Brook trout may also have a reproductive advantage over bull trout because they mature earlier, and hybridization of the two species can occur and may be a detriment to isolated bull trout populations (Panhandle Bull Trout TAT 1998a).

The expansion of lake trout in Priest Lake and also recently in Upper Priest Lake is believed to have suppressed bull trout and cutthroat throat populations due to predation on juvenile adfluvial fish (Panhandle Bull Trout TAT 1998a). The Priest Lake outlet dam built in 1950 also prevented migration upstream from Lower Priest River into the lake, but the reconstructed dam (1978) has radial gates opening from the bottom.

Prior to the federal listing of bull trout, a Bull Trout Conservation Plan was introduced by the office of Idaho Governor Philip Batt (State of Idaho 1996). The majority of the Priest Lake basin was identified as a key bull trout watershed, recommended for habitat protection and restoration. A bull trout Problem Assessment, and Conservation Plan have been completed for the Lake Pend Oreille key watershed (Panhandle Bull Trout TAT 1998b, and Lake Pend Oreille Bull Trout WAG 1999). These plans will be used as templates for development of assessments and conservation plans for Priest Lake. Plans for Priest Lake will not, however, be prepared prior to completion of this SBA and TMDL. Bull trout plans may be incorporated into the implementation phase of applicable TMDLs.

2.1.1.6 Stream Characteristics

Streams of the northern and eastern portion of the basin (starting north at Hughes Fork and Upper Priest River and moving down the east side to East River, Figure 2-2), have a high percentage of their stream length in B and A channel types, with long segments of moderate to steep gradients, 4 - 15% and steeper. Tributary streams are characterized by steep, highly confined, bedrock, boulder, 1st and 2nd order streams that combine into the main stem. Streams have falls and cascading rapids, and interspersed gravel-riffle, sand-silt, and boulder-bedrock bottom types. Conifer shade is plentiful except in areas where logging prior to the Idaho Forest Practice Act (FPA), adopted in 1974, eliminated large cedar and hemlock down to the stream bank. Log jams in the streams are common in these stretches. Within lower segments of the main stem streams, there are moderate gradient B channels (1.5 - 4%); and gradual gradient (<1.5%) segments that are either confined F channel or unconfined C channel types. Some segments have abundant gravel and cobble in riffles, runs and pool tailouts. In depositional zones there are also segments of thick granitic sand. In lower stream sections there are areas of floodplain development. Road construction up the stream valleys has in places restricted the effective function of the floodplains. There are several large areas of wetlands-wet meadows, such as Hughes Meadows.

On the western side of the basin, Granite Creek represents a transition from northern and eastern stream types to west and southwest types. Granite Creek is the single largest watershed in the basin at 64,024 acres, and spring high flow near the mouth typically nears 1,000 cfs. The extensive tributary system of the north and south forks are similar to northern streams in gradient, conifer cover and stream bed composition, except that mountain ridges are lower in elevation than the Selkirks. Logging activity and road density is greater in the Granite Creek watershed compared to drainages to the north.

Beginning at Reeder Creek and moving south down to Lower West Branch, these west side streams are significantly different in character than northern and eastern streams. These streams, flowing east, have a long, low profile with little increase in elevation between the mouth and headwaters. The U-shaped valleys are representative of the effects of continental glaciation (USFS 1989). From 50 - 80% of the main stem lengths are low gradient, less than 1.5%, and often less than 0.5%. Channel type can be confined F or G, unconfined C or E channel, or unconfined braided D channel. Considerable floodplain development is evident ranging from 50 to greater than 500 feet wide. On a relative basis, basin wide, the western watersheds have had a moderate to high level of land use including timber harvesting and road building, urbanization, and agriculture which has included cross drainage and channel straightening in an effort to convert some of the wetlands and wet meadows to hay cropping and cattle grazing.

The riparian area of unconfined channels is mainly alder, willow, dogwood and other shrubs. The soil is often too moist for conifers. Where banks are confined, there can be dense conifer overstory. There is a sufficient gravel and cobble component in the watershed soils for recruitment to streams, and there are stretches of riffles, runs and pool tailouts with suitable gravels for spawning. There are however long stretches of stream beds with thick sand and high cobble embeddedness. There is also a silt and clay component where there is belt rock geology. In the lowlands, meander pools are common and woody debris pools are mostly formed from alder and willows which may not last past high flow seasons. Beaver dams and ponds are very common and play an unique role in the ecology of these lowland streams. Main stem headwaters and tributary streams from the foothills and mountains are mainly B and A channel type, with large woody debris and boulder pools. These streams are extremely important as they contain the few cutthroat populations (resident) that remain in the mid to lower western basin.

2.1.2 Cultural Characteristics

2.1.2.1 Land Ownership and Land Use

Land ownership within the Priest River basin is shown in Figure 2-7, with a breakdown of ownership acreage by general land use designations presented in Table 2-4. Over 85 percent of the basin is forested, administered by state, federal and Canadian provincial agencies. The majority of west side land is Idaho Panhandle National Forests administered through the USFS Priest Lake Ranger District. These public lands are managed primarily for timber production, but some lands are Special Management Areas (including experimental forests and recreation areas), Research Natural Areas, federal grazing allotments, and some land is leased for cabin and business development (Figure 2-8).

Table 2-4. Ownership and Land Use within the Priest River Basin

	Land Use Categories in Acres					
Ownership	**Timber**	**Special Mgt. Areas, Research Natural Areas**	**Hay Cropping, Range Land, Grazing Allotments**	**Residential, Business, Recreation**	**Totals**	**% of Basin Total**
Canada	15,354	--	--	--	15,354	2.4
Idaho Panhandle National Forests	266,716	27,743	23,031	5,891	323,380	51.5
U.S. Bureau of Land Mgt.	616	--	--	--	616	0.1
Idaho Department of Lands	172,497	21,455	9,279	359	203,590	32.4
Idaho Dept of Parks & Rec.	--	--	--	846	846	0.1
Private Industrial Timber	8,668	--	--	--	8,668	1.4
Private	12,781	--	30,149	6,481	49,410	7.9
Open Water	--	--	--	--	25,948	4.1
Total	476,631	49,198	62,459	13,577	627,812	

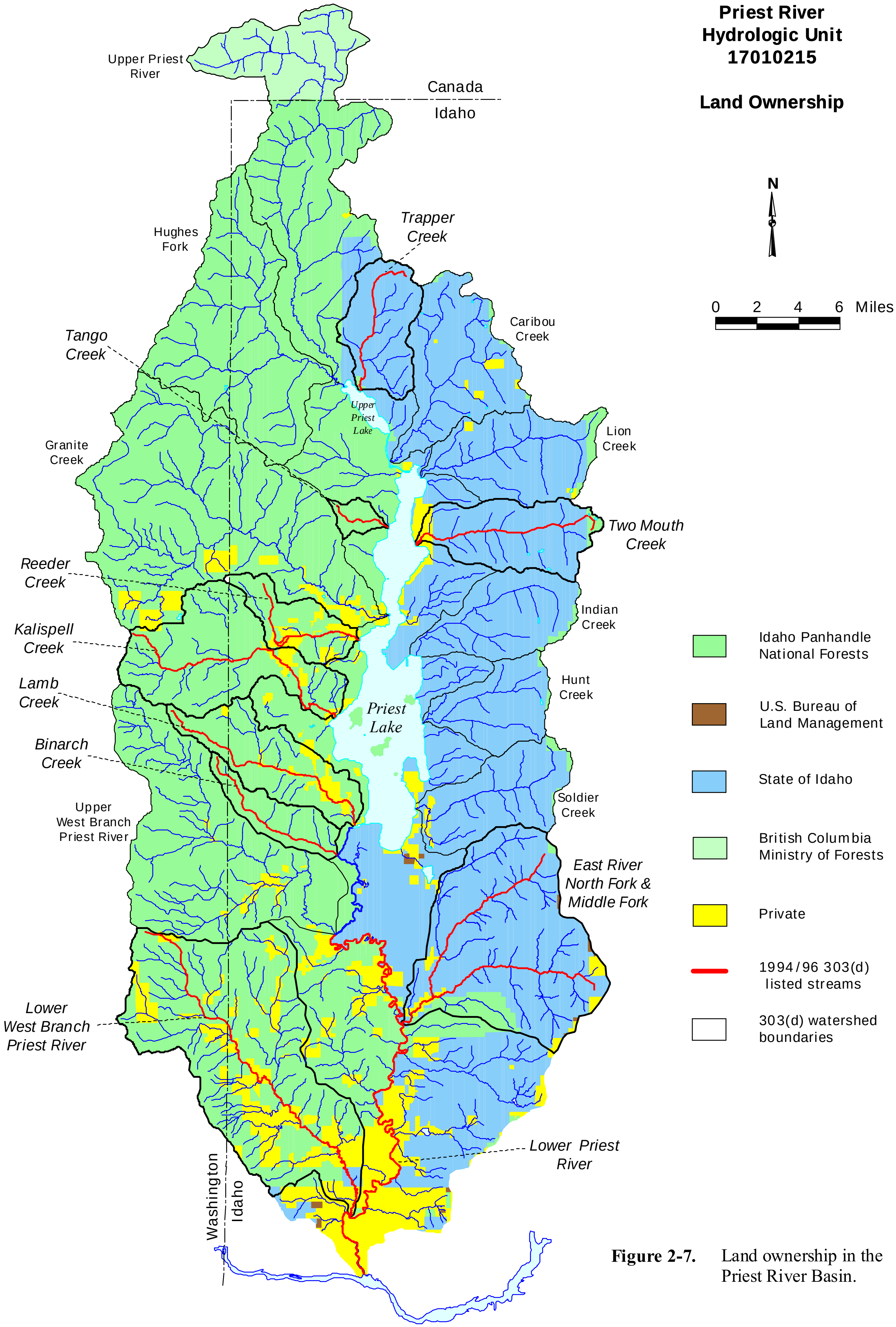

Figure 2-7. Land ownership in the Priest River Basin.

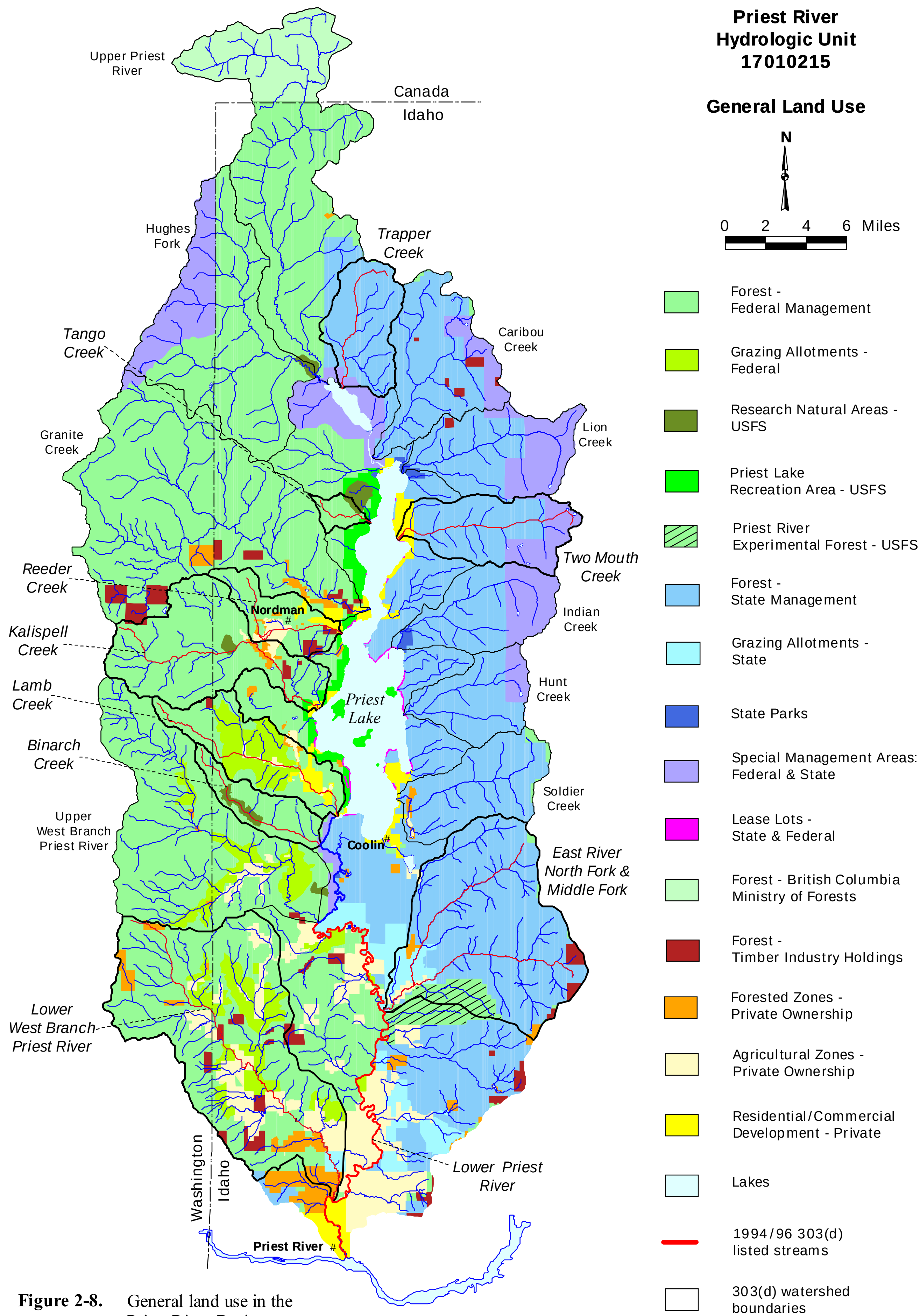

Figure 2-8. General land use in the Priest River Basin.

The majority of the basin's eastern side is owned by the State of Idaho with the northern boundary incorporating the Trapper Creek watershed. Most of this land is administered by the Idaho Department of Lands under the State Endowment Trust. Through the years, various property exchange agreements have transferred a substantial acreage of private industrial timber lands to the state, as well as to the National Forest. State land is primarily managed for timber production, but some state land is leased for lake cottages, and there are some state grazing allotments. The Idaho Department of Parks and Recreation manages a portion of state land as the Priest Lake State Park.

Private lands comprise about 9% of the basin. Around the Priest Lake shoreline 25% of the property is privately owned (Bonner County 1989), and it is there that the most concentrated residential and business development has occurred in the lake basin. The major private ownership block and residential center is the area surrounding the city of Priest River and the lower half of Priest River. In the land use map (Figure 2-8) substantial private acreage along Lower Priest River and Lower West Branch have been classified as agricultural. In these zones there has been a degree of land clearing followed by hay cropping and cattle grazing. Other private lands have been classified as timber, or Non-industrial Private Forest (NIPF). Land activities on NIPF have importance in regards to sediment yield to streams because results of forest audits have shown that NIPF land-owners generally have more departures from BMPs than found in other ownerships (IDL *et al*. 1993). The three categories of private ownership: residential, agricultural, and timber (excluding industrial timber), are meant only as general and approximate acreages and boundaries. Timber harvesting followed by road building and residential lot development occur throughout private lands; there are non-industrial forest practices on agricultural lands; and there are small grazing acreages with horses, cattle, sheep and llamas in rural-residential and forest lands.

There are also blocks of private industrial timber lands. These lands are owned by Burlington Northern Inc. Timber, DAW Forest Products, Crown Pacific, and Stimson Lumber Company.

Land ownership within watersheds of the §303(d) listed streams is presented in Table 2-5. Ownership acreage has been separated out between Idaho and Washington. The upper watershed portions of listed Kalispell Creek, Lamb Creek, Binarch Creek, and Lower West Branch, as well as non-listed Upper West Branch which is a major tributary to the listed Lower Priest River, and also the non-listed Granite Creek and Hughes Fork, reside in the state of Washington. The 1998 §303(d) List revised the boundaries of the first three streams above, listing them as segments beginning at the Washington line (IDEQ 1999). However, for effective reduction in sediment load when stipulated by a TMDL, land use and acreage in Washington must be considered. For the most part this should not be a jurisdictional problem for the State of Idaho because management of federal lands comes from the Priest Lake Ranger District. But jurisdiction is a problem on private lands engaged in timber production and agriculture in Washington.

Special Management Areas and Research Natural Areas (RNA) in the Priest River basin highlight unique resources (IWRB 1995). These include: Upper Priest Lake Scenic Area, Salmo-Priest Wilderness Area, Priest Lake Recreation Area on the western shoreline, the Selkirk Crest Special Management Area, Priest River Experimental Forest, Binarch RNA, and Potholes RNA. Upper Priest River is currently being proposed for Wild River designation under the national Wild and Scenic Rivers Act.

2.1.2.2 Protected River Designations, Minimum Stream Flow, Appropriated Water Use

There are state protected streams, as designated with legislative authority by the Idaho Water Resources Board (IWRB 1995). Upper Priest River, Upper Priest Lake, and The Thorofare are designated as State Natural Rivers with major restrictions on instream alterations to preserve their scenic and recreational values, and to protect fish and wildlife habitat. Hughes Fork, Granite Creek, Trapper Creek, Lion Creek,

Table 2-5. Ownership in §303(d) Watersheds of the Priest River Basin

	Ownership Categories in Acres, Percentages in Parenthesis						
	Federal		Private		Idaho	Open	
Stream	Idaho	Wash.	Idaho	Wash.	State	Water	Total
Trapper Creek	273 (2)	--	0	--	12,039 (98)	0	12,292
Two Mouth Creek	821 (5)	--	573 (4)	--	14,136 (91)	34 (0.2)	15,565
East River	3,552 (8)	--	1,975 (5)	--	37,637 (87)	0	43,163
Tango Creek	2,003 (100)	--	0	--	--	0	2,003
Reeder Creek	5,986 (72)	52 (0.6)	2,253 (27)	0	--	0	8,291
Kalispell Creek	8,670 (34)	15,179 (60)	1,286 (5)	74 (0.3)	--	3	25,210
Lamb Creek	10,470 (67)	2,850 (18)	2,199 (14)	98 (0.6)	--	0	15,616
Binarch Creek	6,517 (90)	715 (10)	0	0	--	0	7,232
Lower West Branch Priest River	24,473 (43)	18,270 (32)	11,233 (20)	2,132 (4)	727 (1)	0	56,835
Lower Priest River	62,301 (28)	48,637 (22)	38,041 (17)	2,296 (1)	67,885 (31)	820 (0.4)	219,980

Two Mouth Creek, Indian Creek, and the upper two-thirds of Lower Priest River are designated as State Recreational Rivers to preserve and protect fish and wildlife habitat, but with stream bed alterations allowed for maintenance and construction of bridges and culverts. In addition there are streams under the Northwest Power Planning Council Protected River Program for resident fish and wildlife, and these include the §303(d) listed streams, Tango Creek, Kalispell Creek, North and Middle Forks East River, and Moores Creek a tributary to Lower West Branch.

In 1951 the State of Idaho completed construction of the outlet structure at the mouth of Priest Lake, and the dam was reconstructed in 1978. A primary purpose for the dam was to stabilize summer lake levels for recreation use. Avista Utilities (formerly Washington Water Power Company) operates and maintains the outlet structure. Prior to completion of the dam, Lower Priest River summer flows were approximately 200 cfs greater than they are today (IWRB 1995). IDFG has listed a minimum recommended rearing flow for adult and juvenile cutthroat trout and adult rainbow trout in the river as 200 cfs from August 1 to October 31, with an optimum rearing flow of 400 cfs (IWRB 1995). Flows at the upper USGS gage site commonly fall well below 200 cfs during August and September. The IWRB has investigated spring - summer alternative operations of the outlet structure to enhance Lower Priest River flow, and conducted public hearings on this issue in 1995. But to date no changes in operation have been agreed upon. The IWRB and Avista are working on agreements to alter the autumn operating scheme to produce more gradual river flows during the annual lake drawdown of 3 feet.

Water appropriations are primarily nonconsumptive with water rights for recreation, aesthetics, fish and wildlife held by the State of Idaho. Appropriated consumptive uses of basin waters is small, approximately 20,000 ac-ft annually mainly for irrigation and domestic water supplies. No hydropower projects are located within the Priest River basin.

2.1.2.3 Regional History and Population

Accounts of the history, cultural resources, and archaeology of the Priest River area, along with published resource material, are presented by Bonner County (1989), Hudson (1983), IDPR (1988), IWRB (1995), and Rothrock and Mosier (1997).

Pertinent to the origins of timber land use in the basin was the Northern Pacific Railroad, which in the 1880s linked northern Idaho to the rest of the nation. Rail transportation provided access to markets that needed forest products. Government and industry surveys had recorded the abundance of large stands of timber in the Priest River basin. Midwestern lumber companies, such as Weyerhauser and Humbird, purchased land and began logging operations. The first large scale logging was conducted in the Lower West Branch watershed with selective harvesting of large and valuable trees (USFS 1999). In the Priest Lake area, railroad spurs, flumes and splash dams were built to move logs down major tributaries. Logs were transported across the lake to the outlet, and floated down Lower Priest River to mills at Priest River. These log drives continued until 1950 when the initial Priest Lake Outlet Dam was constructed.

National concern over conservation of natural resources led to the Forest Reserve Act of 1891, under which the Priest River Forest Reserve was established, in 1897. The Forest Homestead Act of 1906 provided for settlement of lands, primarily associated with agriculture, resulting in many privately owned tracts within the Forest Reserve. The Forest Reserve subsequently evolved into the Kaniksu National Forest, and later was combined with other forests to become the Idaho Panhandle National Forests. Excluded from federal ownership was the area east of Lower Priest River and Priest Lake which became Idaho state lands through indemnity land selection.

Estimated population of the Priest River basin for 1994 was 4,400 people (IWRB 1995). In 1994 the city of Priest River had a residential population of 1,680 (IWRB 1995). Population fluctuates widely within the Priest Lake basin, and this reflects the recreation based nature of the area. In 1994 the Bonner County Assessor's Office reported 1,707 single family residences in the Priest Lake area, about 72% of these on privately owned property (Bonner County Assessor's Recap, Priest Lake Area). Approximately 15% of these residences have year-round occupancy. During peak season (mid-summer), second homes and cabins become occupied by families. The average, weekend peak season resident population for Priest Lake (excluding resort lodging) was estimated by Bonner County at 4,945 persons.

2.1.2.4 Area Industry

Timber harvesting and lumber mill processing has long been and remains the most important industry in the Priest River basin. Over eighty-five percent of the basin's land is publicly owned, and these lands are managed primarily for sustained yield timber production in mostly second-growth stands. Exclusions from the timber base include Special Management Areas (SMA) such as the Upper Priest Lake Scenic Area and the Selkirk Crest SMA. Timber harvesting also occurs on private holdings.

The bulk of state owned property is considered commercial forest land and administered by IDL. These state lands are managed under the Idaho Constitution as endowment land where revenues generated from timber sales are placed in trust for state education. The annual cut for the Priest Lake Supervisory Area is currently established at 16 million board feet (MMBF)/year (IDL 2000b). Timber harvesting on national forest land is administered by the USFS Priest Lake Ranger District. Sustained annual yield for the District is estimated at 8-12 MMBF/year. Currently, there is accelerated timber harvesting activity on west side lands in association with a significant Douglas-fir beetle infestation (USFS 1999).

Road construction associated with timber harvesting, as well as construction of unpaved residential and recreational access roads, has long been recognized as a potential significant source of sediment delivery to forest streams. Erosion and runoff problems from unpaved roads can be compounded by recreational use of these roads, and insufficient funding to properly maintain roads. An extensive network of unpaved roads, with associated zones of upslope cut banks, drainage ditches, downslope fills, and stream crossings, exists in the Priest River basin. A conservative estimate is 3,000 miles of unpaved roads, which includes historic roads now closed, trials, and spurs. Many watersheds have road densities exceeding 3 miles/mi^2 and some road densities approach 10 miles/mi^2.

It is extremely difficult to quantify the road network because of incomplete inventories (particularly on private lands), and the network is constantly changing with construction of new roads, annual reopenings, closures, and permanent abandonments (road obliteration with culverts pulled and erosion control measures applied). Some roads have seasonal closures in association with grizzly bear recovery management (USFS 1995), and mountain caribou recovery management (IDL 1992). Some of the road network has been constructed for public transportation, recreational access, and residential access. Pertinent details of the road network for §303(d) listed streams and TMDL considerations will be presented in Section 3.

Agriculture and livestock have been a part of the basin history since the early 1900s, but the extent of this industry, particularly in the Priest Lake basin, is probably less wide spread now than at any time in the past (Priest Lake Planning Team and Rothrock 1995). There are significant acres of commercial livestock and hay cropping operations in the lower half of the basin.

Although interest in mineral extraction in the basin has surfaced from time to time since the turn of the century, no large scale mining operations have ever been shown to be feasible (IWRB 1995). Where mining has occurred the primary metals of interest included lead, gold, silver, and zinc. Currently there are no active mines. There are active sand and gravel pits to support construction activities.

In the Priest Lake basin a primary industry is based on recreation/tourism in the way of resorts, marinas, and related services. This industry extends down to the city of Priest River as seasonal home owners and tourists use retail services. There has been substantial growth of tourism and summer home construction during the 1990s, including visitations during the winter months with the popularity of snowmobiling.

2.1.2.5 Local Groups Working on Water Quality Issues

In 1991 the Idaho Legislature directed the formation of a Priest Lake Planning Team whose purpose was to formulate a water quality management plan for Priest Lake. The 12 member planning team was composed of individuals representing local watershed land managers, user groups, and interest groups. The planning team completed a lake management plan in 1995, and in 1996 the plan was adopted by legislative vote, and signed into Idaho Code by Governor Philip Batt. The planning team was restructured into a 15 member Priest Lake Management Plan (PLMP) Steering Committee, and continues to provide direction for DEQ implementation of lake plan programs. In 1997, the Panhandle Basin Advisory Group (BAG) nominated and DEQ Administration appointed the steering committee as a Watershed Advisory Group (WAG) to review, comment and provide recommendations on the Priest River SBA and TMDL, and as community liaison for TMDL implementation.

The Idaho Water Resource Board adopted the Priest River basin component of the Comprehensive State Water Plan in 1990 (IWRB 1990), and reviewed the required 5 year reevaluation of the Basin Plan in 1995 (IWRB 1995). As previously described in Section 2.1.2.2, actions of the IWRB include designation of State protected river reaches, application for minimum stream flows, and evaluation of operations of the Priest Lake outlet dam. The Basin Plan has included substantial public participation throughout the development and review process (IWRB 1995).

The Panhandle Bull Trout Technical Advisory Team (representatives from state and federal agencies, and tribes) has compiled a draft problem assessment for the Priest Lake key watershed, and had formed a Priest Lake Bull Trout WAG. While there are ongoing fish surveys and enhancement work in Upper Priest Lake and its tributaries, the final bull trout Problem Assessment and Conservation Plan for Priest Lake has been put on hold. Recently, the USF&WS has initiated efforts to establish a Bull Trout Recovery Goal and Recovery Criteria for the Priest River basin to be included in the Clark Fork Recovery Chapter.

Personnel of the USFS Priest Lake Ranger District and IDL Priest Lake Supervisory Area administrator major land holdings in the basin, including management of road building, maintenance, and timber sales. These agencies are very involved in water quality issues, and both have representatives on the PLMP steering committee.

The Idaho Soil Conservation Commission, Bonner Soil and Water Conservation District, and the National Resources Conservation Service, continue to initiate programs with local ranchers in the Priest River basin for water quality improvement such as sign-up for the Conservation Reserve Program.

The Selkirk Priest Basin Association is a private organization that has been very active within the basin regarding environmental oversight, public information, and litigation. They are represented on the PLMP Steering Committee.

The Kalispel Tribe of Indians, Natural Resources Department, adopted a Fish and Wildlife Management Plan in 1997 that establishes a commitment to improving natural resources throughout Kalispel Ceded Lands (KNRD 2001).

2.2 Water Quality Concerns and Status

2.2.1 Water Quality Limited Segments Occurring in the Subbasin

In 1994 and again in 1996, ten segments within the Priest River basin were classified as water quality limited under Section 303(d) of the CWA. Waterbody identification numbers, stream segment boundaries, and listed pollutants are found in Table 2-1 (see also Figure 2-2). Watershed size, stream length, channel type, and summer base flow is shown in Table 2-2. The history of listing through evaluation of beneficial uses in §303(d) reports and §305(b) State Water Quality Status Reports, is found in Appendix A.

All Priest River basin §303(d) streams are listed for sediment pollution (except Lower West Branch which had no listed pollutants of concern, but sediment is implied). Nutrients are a listed pollutant for Tango Creek, and dissolved oxygen and temperature are listed for East River. Habitat alteration is listed for Trapper Creek and Two Mouth Creek, and flow alteration is listed for East River.

It is DEQ's position that habitat and flow alterations, while they may adversely affect beneficial uses, are not pollutants under Section 303(d) of the CWA, and therefore, TMDLs will not be developed to address habitat and flow alterations as pollutants (IDEQ 1999). EPA is in agreement with this position and has incorporated it into their new §303(d) rules (CFR July 13, 2000). Implementation of these rules is on hold until at least January 2002.

The 1998 §303(d) List recommended removal (de-listing) of the following Priest River basin water bodies from the 1996 §303(d) List as DEQ determined that they were meeting their beneficial uses: Middle Fork East River, Lamb Creek, Tango Creek, and Trapper Creek (IDEQ 1999). The 1998 §303(d) List was approved by EPA on May 1, 2000. However, for Priest River basin the 1998 §303(d) List was determined without the full benefit of information collected, analyzed and presented in this Subbasin Assessment.

2.2.2 Applicable Water Quality Standards

2.2.2.1 Beneficial Uses

Surface waters in Idaho are protected by a set of rules established in Water Quality Standards and Wastewater Treatment Requirements, which are part of the Administrative Rules of the Department of Environmental Quality, Volume 58, Title 01, Chapter 02 (these rules were moved from Volume 16 to 58 when DEQ became a department in 2000). These rules protect "beneficial uses" of the surface waters of the state. Beneficial uses are established in IDAPA 58.01.02.100 as follows (IDEQ 2000):

Water supply

waters which are suitable or intended to be made suitable for:

- *agricultural* - crop irrigation and water for livestock,
- *domestic* - drinking water,
- *industrial* - water for industrial purposes.

Aquatic life

waters which are suitable or intended to be made suitable for the protection and maintenance of viable communities of aquatic organisms and populations of significant aquatic species as follows:

- *cold water biota* - optimal growing temperatures below 18º C (64º F),
- *warm water biota* - optimal growing temperatures above 18º C (64° F),
- *seasonal cold water* - cool and cold water biota, where cold water aquatic life may be absent during, or tolerant of, seasonally warm temperatures,
- *salmonid spawning* - which provide or could provide habitat for active, self-propagating populations of salmonid fishes.

Recreation

waters are those which are suitable or intended to be made suitable for:

- *primary contact recreation* - prolonged and intimate contact by humans or for recreational activities when the ingestion of small quantities of water is likely to occur. Such activities include, but are not restricted to, those used for swimming, water skiing, or skin diving.

- *secondary contact recreation* - recreational uses on or about the water and which are not included in the primary contact category. These activities may include fishing, boating, wading, infrequent swimming, and other activities where ingestion of raw water is not likely to occur.

Wildlife Habitat

waters which are suitable or intended to be made suitable for wildlife habitats.

Aesthetics

applies to all surface waters of the state.

Beneficial uses for many Idaho water bodies are listed in the Water Quality Standards. However, the only §303(d) listed segment in the Priest River HUC that is currently cited in the Standards is Lower Priest River, from Priest Lake to the mouth (cited in IDAPA 58.01.02.110.06). Lower Priest River has the

Table 2-6. Designated and Existing Beneficial Uses for §303(d) Listed Streams in the Priest River Basin

	Aquatic Life		Water Supply			Recreation			
Stream Name	**Cold Water Biota**	**Salmonid Spawning**	**Dom.**	**Agri.**	**Ind.**	**Pri-mary**	**Sec-ondary**	**Wildlife Habitats**	**Aesthet-ics**
Trapper Creek	D*	E		D^	D^	D*		D^	D^
Two Mouth Creek	D*	E		D^	D^	D*		D^	D^
East River									
Mainstem	D*	E	E	D^	D^	D*		D^	D^
Middle Fork	D*	E	E	D^	D^	D*		D^	D^
North Fork	D*	E	E	D^	D^	D*		D^	D^
Tango Creek	D*	E		D^	D^		D*	D^	D^
Reeder Creek	D*	E		D^	D^	D*		D^	D^
Kalispell Creek	D*	E	E	D^	D^	D*		D^	D^
Lamb Creek	D*	E	E	D^	D^	D*		D^	D^
Binarch Creek	D*	E		D^	D^		D*	D^	D^
Lower West Branch Priest River	D*	E	E	D^	D^	D*		D^	D^
Lower Priest River	D	E	D	D^	D^	D		D^	D^

D = “Designated” in 58.01.02.110.06 of Idaho Water Quality Standards and Wastewater Treatment Requirements.
D* = “Default Designation” of Undesignated Surface Waters as established through 58.01.02.101 of Standards.
D^ = Designation applies to all surface waters of the state.
E = “Existing use” identified as result of Beneficial Use Reconnaissance Project monitoring or observation.

following designated beneficial uses: domestic water supply, cold water biota, primary and secondary contact recreation, and as a special resource water. The remaining §303(d) listed streams do not have specific beneficial use designations in IDAPA 58.01.02.110. These water bodies are assigned interim designations of cold water biota and primary contact recreation or secondary contact recreation (IDAPA 58.01.02.101.01). For non-designated uses of a particular water body, an “existing use” such as salmonid spawning may be assigned based on the results of the DEQ - BURP monitoring, or other documented data and observations. Existing beneficial uses are those uses that existed on or after November 28, 1975, the effective date of the CWA. Designated and existing uses for Priest River basin §303(d) listed streams are presented in Table 2-6.

2.2.2.2 Criteria for Protecting Beneficial Uses

Beneficial uses are protected by a set of criteria, which include *narrative* criteria for sediment and nutrients, and *numeric* criteria for toxic substances, fecal coliform bacteria, dissolved oxygen, pH, chlorine, dissolved gas, ammonia, temperature and turbidity (IDAPA 58.01.02.250). Numeric criteria for those water quality parameters that would be applicable (potential violation of Standards) in the Priest River basin are listed in Table 2-7. The current version of the Standards, adopted April 5, 2000, contain

Table 2-7. Selected Criteria Supportive of Designated Beneficial Uses in Idaho Water Quality Standards

Designated and Existing Beneficial Uses			
Primary Contact Recreation	**Secondary Contact Recreation**	**Cold Water Biota**	**Salmonid Spawning during spawn and incubation period for inhabiting species**
Water Quality Standards Prior to year 2000: IDAPA 16.01.02.250			
500 FC/100 ml any time; and 200 FC/100 ml in 10% of samples over 30 days; and Geometric mean of 50 FC/100 ml of five samples over 30 days.	800 FC/100 ml any time; and 400 FC/100 ml in 10% of samples over 30 days; and Geometric mean of 200 FC/100 ml of five samples over 30 days.	pH between 6.5 and 9.5 DO exceeds 6.0 mg/L	pH between 6.5 and 9.5. DO exceeds 6.0 mg/L in water column DO exceeds 5.0 mg/L intergravel
		22°C (72°F) or less daily maximum with a maximum daily average no greater than 19°C (66°F)	13°C (55°F) or less daily maximum with a maximum daily average no greater than 9°C (48°F) Bull trout: daily average of 12°C or less during June, July & August for rearing; and daily average of 9°C or less during September & October for spawning.
		turbidity shall not exceed background by more than 50 NTU instantaneous or more than 25 NTU for more than 10 consecutive days.	
Water Quality Standards Adopted April 5, 2000: IDAPA 58.01.02.250			
406 *E. Coli*/100 ml any time; or Geometric mean of 126 *E. Coli*/100 ml of five samples over 30 days.	576 *E. Coli*/100 ml any time; or Geometric mean of 126 *E. Coli*/100 ml of five samples over 30 days.	pH, DO, temperature, and turbidity same as above.	pH, DO, and temperature same as above.
		Seasonal Cold Water - IDAPA 58.01.02.250.03. Between summer solstice - autumn equinox: 27°C or less daily maximum, daily average of 24°C or less.	
		Temperature Exemption - IDAPA 58.01.02.80.04. Exceeding the temperature criteria in Section 250 will not be considered a water quality standard violation when the air temperature exceeds the ninetieth percentile of the seven-day average daily maximum air temperature calculated in yearly series over the historic record measured at the nearest weather reporting station.	
EPA Bull Trout Temperature Criteria: Water Quality Standards for Idaho, 40 CFR Part 131			
			7 day moving average of 10°C or less maximum daily temperature for June, July, August, and September for bull trout rearing and spawning.

some revisions and additions from prior rules that are pertinent to the Priest River SBA. These revisions include: using counts of *E. coli* bacteria as Standards violation criteria for primary and secondary contact recreation instead of fecal coliform (FC) bacteria; a new temperature exemption clause; and the addition of Seasonal Cold Water aquatic life use designation which may be applicable for Lower Priest River. The EPA has established bull trout temperature criteria for most streams in the Priest Lake basin, and also the East River in the Lower Priest River subbasin. EPA has listed specific stream names falling within the bull trout temperature criteria (Water Quality Standards for Idaho, 40 CFR Part 131). The EPA criteria is shown in Table 2-7.

Narrative criteria for sediment (IDAPA 58.01.02.200.08) states that: "Sediment shall not exceed quantities specified in section 250 or, in the absence of specific sediment criteria, quantities which impair designated beneficial uses. Determinations of impairment shall be based on water quality monitoring and surveillance and the information utilized as described in Subsection 350."

Narrative criteria for excess nutrients (IDAPA 58.01.02.200.06) states: "Surface waters of the state shall be free from excess nutrients that can cause visible slime growths or other aquatic growths impairing designated beneficial uses."

Narrative criteria for floating, suspended or submerged matter (IDAPA 58.01.02.200.05) states: "Surface waters of the state shall be free from floating, suspended, or submerged matter of any kind in concentrations causing nuisance or objectionable conditions or that may impair designated beneficial uses. This matter does not include suspended sediment produced as a result of nonpoint source activities."

The CWA requires States to designate which beneficial uses that surface waters support. Water Quality Standards consist of uses and criteria; some criteria are use specific (numeric criteria of IDAPA 58.01.02.250), others apply regardless of use (general surface water criteria of IDAPA 58.01.02.200 including narrative sediment and nutrient criteria). If a water body has designated or established existing beneficial uses, numeric criteria specific to the use apply to the water as a minimum requirement for support status.

2.2.3 Summary and Analysis of Existing Water Quality Data

2.2.3.1 Inventory of Data Sources

A table has been prepared which summarizes various data collection efforts in the Priest River basin since 1986 (Table 2-8).

- The DEQ BURP sampling of macroinvertebrates and measurements of habitat parameters has been conducted on all §303(d) wadable streams in the Priest River basin, as well as the large river BURP protocol on Lower Priest River (IDEQ 1997b). On some but not all streams, there has been BURP electro-fishing efforts. In 1999 the BURP protocol called for the sampling of fecal coliform and *E. coli*, but only a few listed streams in the basin were sampled. The results of BURP monitoring are primary data for indicating support status of beneficial uses for listed streams, and these support status assessments are presented in Section 2.2.3.4. BURP surveys have also been conducted on several non-listed streams in the basin, and these are (Figure 2-2): Upper Priest River, Hughes Fork, Gold Creek (a tributary to Hughes Fork), Caribou Creek, Lion Creek, Indian Creek, Hunt Creek, Soldier Creek, Big Creek, main stem Granite Creek, South Fork Granite Creek, and Upper West Branch Priest River.

Table 2-8. Available Data Sources for §303(d) Listed Streams in the Priest River Basin

Period of Record	Sampling and Monitoring Programs	Trapper Creek	Two Mouth Creek	East River			Tango Creek	Reeder Creek	Kalispell Creek	Lamb Creek	Binarch Creek	Lower WB Priest River	Lower Priest River
				Main Stem	Middle Fork	North Fork							
1994-2000	DEQ BURP: habitat and macroinvertebrates	2 sites	2 sites	1 site	3 sites	2 sites	1 site	3 sites	5 sites	4 sites	3 sites	4 sites	1 site
1994-2000	DEQ BURP: electro-fishing		Y		Y	Y		Y	Y	Y	Y	Y	
1986-1999	IDFG, USFS, IDL,USGS snorkel or electro-fishing	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y
1997-2000	DEQ, IDL temperature monitoring (HOBO®)	Y	Y	Y	Y	Y			Y		Y	Y	
1990-1999	DEQ, USGS fecal coliform sampling		Y					Y	Y	Y		Y	Y
1997-1998	USFS R1/R4 fish habitat inventory									Y			
1990-1999	USFS Priest Lake Ranger District: field surveys, notes and measurements.						Y	Y	Y	Y	Y	Y	
1993-1995	DEQ Priest Lake study: water column chemistry, physical measurements, water flow	Occass. samples, measur., & flow	Routine samples, measur., & flow				Occass. samples, measur., & flow	Routine samples, measur., & flow	Routine samples, measur., & flow	Routine samples, measur., & flow			
1991-1994	DEQ Stream Segment of Concern assessments:	Y	Y										
1992	DEQ Use Attainability assessments: habitat	Y	Y	Y	Y			Y	Y	Y	Y	Y	
1995-2000	IDL Cumulative Watershed Effects assessments: habitat	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y	
1990-1998	USGS flow and water column chemistry												Y
2000	Stream bank erosion survey: KSSCD			Y	Y				Y	Y		Y	Y

- The IDFG in its role as State fisheries management for basin streams and lakes has conducted various fish population surveys through snorkel, electro-fishing, netting, and creel census (IWRB 1995). Data also includes bull trout redd counts. Bull trout surveys have increased since the federal listing of this species (Panhandle Basin Bull Trout TAT 1998a). USFS personnel have also conducted electro-fishing surveys within west side streams, as well as IDL on some east side streams.

- DEQ and IDL have installed continuous instream temperature recorders (Onset Computer Corp., HOBO®) within many streams of the basin. Daily average thermographs have been developed for those streams measured.

- The USFS has conducted fish habitat surveys using the R1/R4 Habitat Inventory Procedure on two streams, Lamb Creek and Upper West Branch. This is a survey on major lengths of a stream, and data collected includes: pool frequency, pool formation, residual pool volume, percent fines, and notes on fish encountered.

- USFS personnel from the Priest Lake Ranger District and regional office in Sandpoint have extensive knowledge, and field notes in file cabinets, of watershed and instream conditions of west side streams, along with experience of installing fish habitat enhancement features. Watershed inventories of lower west side streams were particularly extensive in preparation for the Douglas-fir beetle Environmental Impact Statement (USFS 1999). These surveys included channel typing, frequency and formation of pools, habitat ranking, and measurement of percent fines within riffles, pool tailouts and pools. Some USFS data has been gleaned from field notes; a limited amount of quantitative data was available through the annual Watershed and Fisheries Monitoring Results for the Panhandle National Forest (USFS 1992 and 1993); information was extracted from the Douglas-fir beetle EIS (USFS 1999); and recent watershed data has been supplied through a GIS - Kaniksu Geographic Assessment.

- From 1993 - 1995 DEQ conducted a base line water quality study of Priest Lake (Rothrock and Mosier 1997). This included measurement of most streams tributary to the lake with a goal of calculating nutrient and sediment loads. For major stream tributaries to Priest Lake there was routine sampling for: nutrients, suspended sediment, and fecal coliform; instantaneous measurements of dissolved oxygen, temperature, pH, conductivity and turbidity; and stream gauging efforts to establish daily hydrographs. For minor flow streams and streams tributary to Upper Priest Lake there was occasional sampling and physical measurements, a few instantaneous flow measurements, and no stream gauging.

- From 1991 - 1994 Trapper Creek and Two Mouth Creek were evaluated by DEQ for beneficial use impairment and fish habitat condition as Stream Segments of Concern under the Idaho Anti-degradation Agreement with EPA (IDEQ 1994). This work included quantitative measurements such as Wolman pebble count, pool complexity, percent embeddedness, habitat area, Riffle Armor Stability Index, and collection of macroinvertebrates. Fish surveys were done by IDFG.

- In 1992 DEQ conducted a stream habitat survey throughout the Idaho Panhandle to develop a Use Attainability and Beneficial Use Status Assessment (Hartz 1993). Habitat parameters were qualitatively assessed, and there were length measurements of riffles, runs, and pools. Dimension measurements of pools were sufficient to estimate residual pool volumes. All §303(d) listed wadable streams in the Priest River basin, except Tango Creek, had at least one assessment site.

- The USGS has long standing gauged flow stations on two sites of Lower Priest River (Figure 2-1), as well as routine water quality sampling at the lower river station every other year (Brennan *et al.* 1999).

Table 2-9. Selected Parameters and Explanation of Scoring from Idaho Department of Lands Cumulative Watershed Effects (CWE) Process for Idaho (IDL 2000a)

CWE Parameter	Explanation of Scoring
Surface Erosion Hazard Rating	Low, Medium, High: based on a matrix of slope categories (0-30%, 31-60%, and >60%) and predominant soil parent material.
Mass Failure Hazard Rating	Low, Medium, High: based on a matrix of slope categories (0-30%, 31-60%, and >60%) and predominant bedrock/parent material.
Sediment Delivery Score Erosion Source and Delivery Rating from Forest Road Network to Stream Channels. Scores also developed for skid trails and mass failures.	Low, Moderate, High: based on qualitative, weighted point scoring matrix of erosion signs from cut slopes, fill slopes, ditches, and road surfaces. Total sediment source score multiplied by a delivery factor of 1, 2, or 3 reflecting estimated delivery of sediment to stream channels. CWE sediment score converted to tons/mile sediment delivered to streams based on research in LeClerc Creek, WA (McGreer *et al.* 1997)
Canopy Removal Index (CRI) Removal of conifer canopy from harvesting and fire as a percent of total watershed area, adjusted for percent natural canopy closure and openings for other land uses.	From aerial photography, outline areas of forest canopy removal in 20% removal categories. This is removal from timber harvest and fire, and does not include areas of natural openings (rock outcrop or wet meadows for example), nor does it include openings created for other land uses (agriculture). Compute acreages of canopy removal areas and multiply by percent removals. Estimate percent natural canopy closure of the watershed and multiply against acres of forest canopy removed.
Channel Stability Index (CSI)	Low (most favorable), Medium, High (least favorable). Instream qualitative scoring from 8 categories, evaluating: stream bank condition, large woody debris, and channel bottom stability.
Hydrologic Risk Rating (HRR)	Low, Moderate, High. Based on rating curve with CSI on X axis and CRI on Y axis. For example, a CSI of 30 and a CRI of 0.2 (20%) produces HRR = Low, while a CSI of 30 and CRI of 0.75 produces HRR = High.
Temperature Adverse Condition Yes (adverse condition) for any stream channel segment within 200 foot contour interval in which determined canopy closure/ temperature rating is High.	Low or High. Using aerial photography, for each stream segment between 200 foot contours estimate overall percent canopy cover over the stream channel within the segment. Based on salmonid species present, compare determined canopy cover (%) with target canopy cover (%) which varies according to elevation (the higher the elevation the less target canopy cover). If determined canopy cover is less than target cover, the segment is rated as high.

- Under a Memorandum of Understanding with DEQ, the IDL has conducted Cumulative Watershed Effects (CWE) surveys in most §303(d) listed watersheds of the Priest River basin. CWE protocol (IDL 2000a) inventories unpaved forest roads (mostly state and federal roads) for GIS mapping, and collects erosion estimates to identify nonpoint sediment sources. This CWE data is used in TMDL sediment load calculations. The CWE protocol also includes: estimates of stream channel conifer canopy for indications of temperature adverse condition; qualitative assessment of stream reaches for channel stability; and from estimates of watershed canopy removal along with channel stability, forms a hydrologic risk assessment. Since CWE terminology and scoring results are presented throughout Sections 3 and 4 of this report, a summary of terminology and scoring methods has been prepared (Table 2-9).

- Under a Memorandum of Understanding between DEQ, the Kootenai-Shoshone Soil Conservation District, Idaho State Soil Conservation Commission, and USDA Natural Resources Conservation Service (NRCS), a trained crew conducted stream bank erosion surveys during the summer of 2000 within many watersheds of the Coeur d'Alene and Priest River basins. The crew used a GPS unit to map location, and to store stream bank condition scores and measurements in the GPS data dictionary. The end result through NRCS methods and calculations is to develop a Lateral Recession Rate of bank erosion to be used in TMDL sediment load estimates and channel stability analysis.

2.2.3.2 Summary of Basin Water Quality

This section presents an overview of water quality characteristics in the basin. More specific data including temperature thermographs is presented for each §303(d) listed stream in Section 3.

Flow Characteristics - A summary of basin hydrology has previously been presented in Section 2.1.1.2. Specific flow characteristics of listed streams are found in Section 3.

Water Column Parameters - A good data base of water quality sampling exists for streams in the Priest Lake basin and Lower Priest River near the mouth. There has been very little water column data collected from streams of the lower basin (Binarch Creek south), except for temperature recorders placed within East River, Lower West Branch, and Binarch Creek. Some data parameters can be inferred or estimated for lower basin streams collectively, as a whole, by knowing the water volume and water quality characteristics of Priest Lake as it creates the river, and by knowing the water volume and characteristics of the river near the mouth. A proportional equation was established to estimate the influence of certain parameters (TP and TSS for example) of inflowing lower streams (including Lamb Creek) as they changed the data between the lake and lower river station.

pH and DO - No single measurement of DO has been below the cold water biota and salmonid spawning criteria of 6.0 mg/L (Table 2-7), and only a very few pH measurements have been below 6.5 pH. The lowest DO recorded in lake basin streams was 8.2 mg/L and most measurements are greater than 10 mg/L. Lowest DO for the lower river was 7.7 mg/L, and during the warm water summer months DO typically ranges between 8 - 10 mg/L. Most pH values for the river range between 7 - 8.0 units.

Temperature - There are general stream temperature patterns that emerged from the various placements of continuous HOBO® recorders, (excluding the data for Lower Priest River), and these are:

- The warmest period of stream temperatures is late July through mid August.
- Temperatures do not exceed the cold water biota criteria of 19°C daily average, or the daily maximum of 22°C.
- Temperatures in the lower and middle reaches of main stem stream channels commonly exceed the salmonid spawning criteria for cutthroat trout spawning and incubation during July (9°C daily average). Daily averages from early July to early August have mostly ranged between 12.5 – 15°C, with daily maximums reaching 18.9°C. Daily average in Lower West Branch reached 16.8°C as measured in early August 2000. Temperatures in the headwaters of main stems and feeding tributaries have far less percentage exceedances for cutthroat spawning and incubation, and typically have daily averages between 10 – 12°C, and even less than 10°C.
- Temperatures in the lower and middle reaches of main stem stream channels have a high rate of exceedance of the EPA bull trout criteria (7 day moving average of 10°C daily maximum for July through September). There are also exceedances of the bull trout criteria in the State Standards (Table 2-7), but the rate is less than exceedance of the EPA criteria. Again, headwater stream segments have far less exceedances or none at all.
- Lower Priest River near the mouth exceeds the cold water biota criteria during July and August, with mean daily temperatures reaching 23.5°C in 1998. In summer months the river is more a cool water habitat than cold since it largely consists of upper layer water from Priest Lake (the dam radial gates open at the bottom, but only 10 feet or so from the lake surface). Also, the river has miles of wide and shallow slow moving water, with an open view to sky, which leads to warming.

Dissolved Minerals - Using Electrical Conductivity (EC) as a measure of dissolved minerals and salts, the Priest River basin is considered to have soft water with low concentrations of dissolved material. East side streams from Trapper Creek down to Soldier Creek are extremely low, ranging from 10 - 20 *u*mhos EC during spring snow melt, and not much higher in other seasons. On the other hand, Upper Priest River and Hughes Fork measure around 80 *u*mhos during spring, and reach 150 *u*mhos by late summer and fall. These higher values likely reflect extensive belt rock parent geology within the watersheds of the northern streams compared to the dominant granitic geology of eastern streams (Figure 2-4). For mid-western streams from Granite Creek down to Lamb Creek, EC ranges 30 - 40 *u*mhos during spring and 60 *u*mhos by mid-summer. At Lower Priest River the spring range is 40 - 50 *u*mhos (Priest Lake is a consistent 45 - 50 *u*mhos year-round). By late summer the range is 60 - 100 *u*mhos. When using a proportional equation, the lower basin stream composite in late summer calculates to 85 - 180 *u*mhos.

Phosphorus and Nitrogen - Priest Lake basin streams are mostly low in TP and TN. Annual averages for northern and eastern streams, along with Granite Creek, range from 5 - 11 *u*g/L TP, and during spring high flow the averages are only slightly higher. On occasion there is a moderate suspended sediment (TSS) spike with an associated TP reaching 50 *u*g/L. Averages for TN range from 65 - 150 *u*g/L. West side streams from Reeder Creek down to Lamb Creek have higher nutrient concentrations. During the base flow period, TP averages range 14 - 25 *u*g/L and during spring the averages increase to 20 - 40 *u*g/L. Concentrations as high as 90 - 120 *u*g/L TP were recorded in association with high TSS events. The guideline criteria established by EPA for TP concentrations in streams which enter lakes is 50 *u*g/L (EPA 1986). Averages of TN range from 110 - 750 *u*g/L in west side lake basin streams.

Mid to lower western streams have large areas of wetlands, wet meadows, and pasture converted from wetlands and meadows. Vegetative decay, soil characteristics, and possibly agricultural practices produce surface water and ground water with relatively high (within Priest River basin) inorganic and organic nitrogen, iron, and tea colored to reddish brown colored water from iron and organics.

TP samples in Lower Priest River near the mouth have ranged from <10 - 52 *u*g/L (sampled on even years, 1990 to 1998). In 1990 and 1992 when sample size each year was n=23, annual averages were 9 and 16 *u*g/L respectively. During spring runoff concentrations are commonly 20 - 30 *u*g/L. Given that Priest Lake TP is consistently around 5 *u*g/L throughout the year, the spring runoff concentrations observed near the river mouth represents a significant TP input from the lower basin stream composite, and from silt resuspension and bank erosion within the river.

Suspended Sediment and Turbidity - Suspended sediment concentrations during spring runoff are low for northern and eastern lake basin streams. Averages are mostly around 2 mg/L TSS, although Upper Priest River had an average of 9 mg/L in spring 1995. Maximum value sampled was only 17.2 mg/L. Most bedload material in these streams are sized from sand grains and bigger, and would not be reflected in the TSS samples. For Granite Creek and Reeder Creek in the west, TSS in spring is higher, averaging 4.5 mg/L with a maximum 33 mg/L. For Kalispell and Lamb Creeks, averages are near 15 mg/L and maximums reach 65 mg/L. At the highest TSS levels, turbidity in Kalispell Creek reached 25 NTU and at Lamb Creek 40 NTU. The Kalispell Creek sampling included an ISCO sampler, which obtained multiple samples per day during spring runoff of 1995. This data showed that the cold water biota criteria of 25 NTU over background for more than 10 consecutive days would not be approached at Kalispell Creek, and not likely at Lamb Creek.

Sampling for suspended sediment in Lower Priest River has been on an infrequent basis during spring runoff (2-3 samples per runoff period). From visual observations the river seems to be quite turbid during high flow. For one sample in May 1998 the value was 49 mg/L TSS, and in late April 1996 a value of 116 mg/L was recorded. For the latter sample however, the corresponding turbidity was only 9.5 NTU and the TP was <10 *u*g/L, which makes this TSS value suspect. Given that Priest Lake outflow is <1 mg/L TSS throughout the year, a spring runoff concentration around 50 mg/L TSS near the river mouth represents a significant sediment input from the lower basin, again including silt resuspension and bank erosion within the river.

Visual observations of Lower West Branch show a very turbid water during spring runoff. This watershed, as with other lower basin watersheds, has a large area of low elevation sensitive snowpack, moderate to high land use activity, and inventoried sources of significant land and stream bank erosion. The Lower West Branch watershed is flashy, i.e. it responds quickly to winter and early spring rains and flow rate increases rapidly. Two DEQ sampling runs have been made on the Lower West Branch, in May of 1997 and 1998. Both runs were on the falling limb of the spring hydrograph. TSS near the mouth reached 48 mg/l with a corresponding 36 NTU. There is reason to suspect that if sampling occurred on Lower West Branch during the rising limb of the hydrograph, and possibly also on other lower basin streams, that the cold water biota turbidity criteria might be approached, assuming that a background concentration for spring runoff could be established.

<u>Bacteria</u> - Nearly 60 samples for fecal coliform bacteria (FC) were taken between 1993 - 1995 in lake basin streams. Highest value sampled was 270 FC colonies/100 ml at Lamb Creek, but the vast majority of samples were below 50 FC/100 ml (see Table 2-7 for bacteria Standards). Sampling at Lower Priest River shows a maximum of 120 FC/100 ml, with most samples below 50 FC/100 ml. There was also BURP sampling of bacteria on lower west side streams in September 1999. Two samples on Goose Creek, a tributary to Upper West Branch, showed high levels, 660 and 2,100 FC/100 ml (770 and 2,000 *E. coli*/100 ml respectively). These values for *E. coli* exceed the single sample secondary contact recreation criteria of year 2000 revised Standards. The results are attributed to direct access of cattle to the stream. On Upper West Branch below the confluence of Goose Creek, values of 4 samples averaged 87 FC/100 ml and 132 *E. coli*/100 ml. This suggests that the threshold criteria for primary contact recreation of 126 *E. coli*/100 ml geometric mean over 5 samples may have been exceeded.

Macroinvertebrates and Fish - BURP sampling of benthic aquatic organisms within riffle habitat is used to calculate Macroinvertebrate Biotic Index (MBI) scores which are heavily relied upon for determining support status of the cold water biota beneficial use (Section 2.2.3.3). The MBI score is a weighted composite of seven metrics from the laboratory taxonomic identification of samples: percent EPT (mayflies, stoneflies, and caddisflies), Hilsenhoff biotic index, percent scrapers, percent dominance, EPT index, taxa richness, and Shannon's H′ diversity index (IDEQ 1996). MBI scores of 3.5 or greater indicates that the macroinvertebrate assemblage is Not Impaired. All MBI scores collected, for both §303(d) listed streams and non-listed basin streams, are presented in Table 2-10.

A total of 54 MBI scores were determined within the Priest River basin (both listed and non-listed streams). The MBI data has been presented as a box plot (Figure 2-9), using the stem-and-leaf method (SYSTAT 1992). Forty-eight of the scores were 3.5 or higher (89%). The range was 2.6 - 5.3. No MBI scores were below 2.5, or indicating an Impaired macroinvertebrate assemblage. Overall, most riffles within basin streams, with a sufficient gravel component, will support a good assemblage of cold and clean water macroinvertebrates. The issue, as discussed later, appears to be whether excessive sedimentation in some streams has limited the natural area of gravel habitat to support these organisms, thereby reducing the quantity of food source to fish.

Results of fish sampling, and source of data are also presented in Table 2-10. Only three species are listed; westslope cutthroat trout, bull trout, and brook trout. Data is presented in density, fish/100 m^2. **Extreme caution must be taken when comparing results among streams**. Some surveys were done by snorkeling, some by electro-fishing. Electro-fishing methods used by IDFG often include multiple passes within a length sector; methods used by DEQ - BURP crews and USFS are most often single pass sampling. Some fish surveys by USFS were identified as presence/absence, but with stream length and

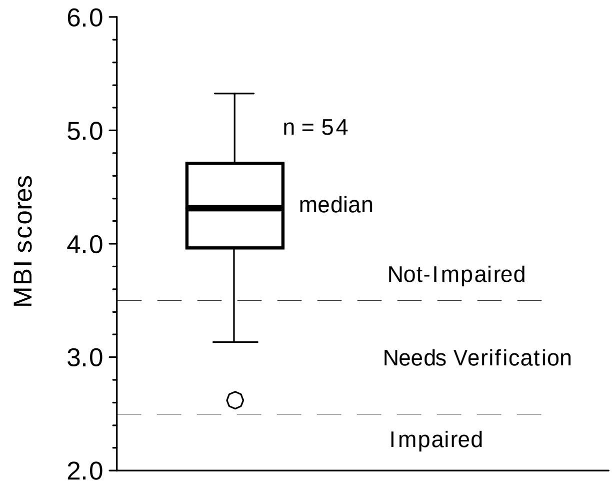

Figure 2-9. Box plot of all MBI scores obtained in the Priest River basin.

width recorded, the data was calculated to density numbers. Seldom were block nets used in electro-fishing surveys (to prevent downstream or upstream escape) and field notes indicated some escape of larger fish. Lastly, BURP electro-fishing protocol since 1998 does not attempt in-the-field speciation of young-of-the-year (YOY) salmonids in the length range of about 20 - 70 mm (juvenile salmonids beginning around 70 mm are recorded as species). The smallest fish captured are simply categorized as YOY salmonids, and samples are vouchered for laboratory identification. Fish surveys by IDFG, USFS, and earlier BURP work, recorded all YOY as specific species.

While the fish sampling data are quite variable, a geographical pattern around the basin does emerge, and the streams of Table 2-10 are ordered geographically (see also Figure 2-2). For the majority of northern streams tributary to Upper Priest Lake, cutthroat trout is the dominant salmonid species (Horner *et al.* 1999, Fredericks 1999, and IDEQ 1994). Within tributaries to Hughes Fork, Upper Priest River, and within Trapper Creek, cutthroat densities are commonly between 3 - 8 fish/100 m^2, and on occasion have ranged between 20 - 26 fish/100 m^2 (Trapper Creek, East Fork Trapper Creek, and Cedar Creek, a tributary to Upper Priest River). Some fish sampled are adult adfluvial cutthroats. In the main stem of Upper Priest River, cutthroat density is low, 0.3 fish/100 m^2 (Horner *et al.* 1999). Bull trout exist within these streams, mostly in low numbers, but density was around 5 fish/100 m^2 in Trapper Creek. Bull trout redds have been routinely counted by IDFG in Trapper Creek since 1993, and have ranged from 0 - 8 redds/yr within the total stream stretch surveyed.

Within the northern streams brook trout are mostly low in numbers, below 0.5 fish/100 m^2, or absent altogether in the surveys. Two exceptions have been Ruby Creek and Rock Creek (tributaries to Upper Priest River), which have high brook trout densities. IDFG electro-fished these streams in 1998, and in Ruby Creek brook trout were dominant and very abundant with density estimated at 34 fish/100 m^2 (Fredericks 1999). All brook trout shocked were removed from the stream. Within Rock Creek, north of Ruby Creek, brook trout were codominant with cutthroats, and captured brook trout were also removed. In a 1999 follow-up survey, 117 brook trout were shocked and removed from Ruby Creek (Fredericks and Venard 2000). Ineffectiveness of the 1998 brook trout removal was in part attributed to extensive woody debris and vegetation cover. Brook trout are considered resistant to over-exploitation because of early age-at-maturity, short life span, and ability to use a wide range of spawning habitats.

Table 2-10. DEQ BURP Scores for Macroinvertebrates (MBI), and Results of Fish Sampling, Priest River Basin

		Fish Surveys: Data Presented in fish/100 m^2 - See Footnote "a"					
Streams (L)= §303(d) Listed (NL)= Non-listed	**BURP MBI Scores**	**Data Source[b]**		**Westslope Cutthroat Trout**	**Bull Trout**	**Brook Trout**	**YOY[c]**
Northern Streams							
(L) Trapper Creek	5.0, 5.1	IDFG:	1989-98	9.3 (1-27)	4.1 (2-8)	low	--
East Fork		IDFG:	1989-98	17.1 (12-22)	0	0	--
(NL) Hughes Fork	4.9, 4.1	IDFG:	1998	3.3	1.4	0.1	--
Boulder Creek		IDFG:	1998	5.5 (4-7)	0	0	--
Muskegon Crk		IDFG:	1998	8.7	0	0	--
Jackson Creek		IDFG:	1998	7.5	0	0	--
Gold Creek	4.7, 5.1	BURP:	1998	2.7	1.8	0.2	0.6
(NL) Upper Priest River	4.8, 4.6	IDFG:	1998	0.3	0.03	0.02	--
Ruby Creek		IDFG:	1998	1.0	0.02	34.4	--
Cedar Creek		IDFG:	1998	21.8	0.03	0	--
Cedar Creek		USFS:	1998	20.2 (1-39)	0.7	0	--
Lime Creek		USFS:	1998	6.6 (4-13)	0	0	--
Rock Creek		IDFG:	1998	3.1	0.1	2.8	--
Malcom Creek		IDFG:	1998	4.6	5.4	0	--
Eastern Streams							
(NL) Caribou Creek	4.4, 5.3	IDFG:	1998	0 LP	0 SP	low	--
		BURP:	2000	0	0	0.7	0.2
(NL) Lion Creek	5.2, 4.9	IDFG:	1983-94	8.6 (1-14)	0.04	0	--
		IDL:	1997	0	0	0	--
		BURP:	2000	0.4	0	0.1	0
(L) Two Mouth Creek	4.0, 4.2	IDFG:	1987-94	14.6 (12-17)	0.1	0.2	--
		BURP:	1994	4.1	0.1	1.1	--
		IDL:	1997	2.3	0	0	--
(NL) Indian Creek	4.9	IDFG:	1983-94	13.4 (7-23)	1.3 (0-5)	2.0 (0-5)	--
		BURP:	1994	7.1	0	0.4	--
(NL) Hunt Creek	4.7, 4.1	BURP:	2000	5.3	0 HP-SNP	0	0
(NL) Soldier Creek	3.3, 4.8	BURP:	1998	0 LPHS	0 SP	2.0	0.5
(L) East River							
Main stem	4.0	IDFG:	1986	0	0	0.2	--
Middle Fork	4.4, 4.2, 4.4	IDFG:	1986	8.1 (0-24)	0.7 (0-2)	1.1 (0-3)	--
Middle Fork		BURP:	1997	0.2	0.4	2.3	--
Middle Fork		IDL:	1998	11.6 (4-18)	0.4	0.4	--
Keokee Creek	4.0	IDL:	1998	18.2	0	0	--
Tarlac Creek		IDFG:	1986	0	4.4	2.1	--
Uleda Creek		IDFG:	1986	4.4	6.6	0	--
North Fork	4.4, 4.3	IDFG:	1986	1.1 (0-4)	0 SP	4.3 (1-12)	--
North Fork		BURP:	1998	0 LPHS	0	1.4	3.6
(NL) Big Creek	3.9, 3.9	IDFG:	1986	4.8 (0-8)	0 HP-SNP	11.4 (3-17)	--
Main stem		BURP:	1997	1.2	0	11.2	--
Happy Fork		IDFG:	1986	13.9 (7-21)	0	60 (13-106)	--
North Fork		IDFG:	1986	7.6	0	8.2	--

Table 2-10. Continued

Streams (L)= §303(d) Listed (NL)= Non-listed	BURP MBI Scores	Data Source[b]		Westslope Cutthroat Trout		Bull Trout		Brook Trout		YOY[c]
		Fish Surveys: Data Presented in fish/100 m^2 - See Footnote "a"								
Western Streams										
(L) Tango Creek	4.5	USFS:	1996	2.3		0	HPU	0.9		--
(NL) Granite Creek Main stem	4.4, 4.5	IDFG:	1987-94	0.5		0.2		0.2		--
		BURP:	1997	0.05		0		0.2		--
South Fork	4.6, 5.0	IDFG:	1983-94	2.1	(0-7)	0.5	(0-3)	1.5	(0-7)	--
South Fork		BURP:	1997	0.2		0.2		0.5		1.1
South Fork		KNRD:	1997	7.9	(1-20)	0		0.8	(0-3)	--
(L) Reeder Creek	3.9, 4.1	BURP:	2000	0	HP-CU	0	HPU	1.8		2.3
		BURP:	2000	0		0		75.6		0
(L) Kalispell Creek Main stem	3.1, 3.3, 4.4, 4.0, 4.0	USFS:	1996	0.1		0	HP-SNP	3.0	(2-4)	--
		BURP:	2000	0.1		0		1.1		0.1
Hungry Creek		USFS:	1996	in pools		0		abundant		--
4 tributaries		USFS:	1998	0	LPHS	0		6.7	(0-11)	--
(L) Lamb Creek	3.7, 4.2, 3.4, 3.4	USFS:	1995	0	LPHS	0	HP-SNP	9.5		--
		BURP:	2000	0		0		14.1		1.9
(L) Binarch Creek	4.5, 2.6, 3.6	IDFG:	1986	0.2		0	HPU	3.2		--
		BURP:	2000	0.8		0		0		0
(NL) Upper West Branch Main Stem	4.3, 4.8, 4.6	IDFG:	1986	0		0	HP-SNP	2.0	(1-3)	--
		BURP:	1999	0.07		0		1.2		1.2
Solo Creek		USFS:	1999	0.8		0		2.8		--
(L) Lower West Branch Main Stem	3.7, 4.3, 4.0, 3.6	IDFG:	1987	0	LPH	0	HP-SNP	1.8	(0-5)	--
		BURP:	2000	0		0		0.6		0.1
Moores Creek		USFS:	1998	0		0		44.3		--
Moores Creek		IDFG:	1987	0		0		19.3	(2-30)	--
Bear Paw Crk		USFS:	1998	present		0		present		--
Ojibaway Crk		USFS:	1998	0.5		0		4.7	(2-11)	--
(NL) Quartz Creek	MBIs not yet available	IDFG:	1987	0.5		0	HP-SNP	28	(4-57)	--
		BURP:	2000	0.9		0		3.4		1.3
(L) Lower Priest River	IRI not available	USGS:	1998	KP		LP		KP		--

a = For surveys of multiple reaches or multiple years, first number is average, and the range is within parenthesis.

b= IDFG 1986: Horner *et al*. 1987
IDFG 1987: Horner *et at*. 1988
IDFG 1983-94: IWRB 1995
IDFG 1989-98: IDEQ 1994, Horner *et al*. 1999
IDFG 1998: Fredericks 1999, Horner *et al*. 1999
USFS 1996: USFS File Data
USFS 1998-99: USFS 1998b
KNRD 1997: Kalispel Natural Resource Department, 1997
BURP 1994-00: DEQ File Data
IDL 1997: IDL File Data

c = For DEQ BURP electro-fishing in 1998 - 2000, young-of-the-year (YOY) salmonids were not speciated and counted separately.

KP= known to be present from field observations; LP= likely present; LPHS= likely present in headwater streams;
SP= suspected to be present; HPU= historic presence unknown; HP-CU= historically present, current presence unknown;
HP-SNP= historically present, suspected not present now.

Northern streams are unique from other basin streams in at least 3 ways: 1) fishing had been prohibited since the late 1940s, but regulations in 2000 allowed catch-and-release, 2) there are adfluvial cutthroat trout and bull trout in Upper Priest Lake, and 3) land use activity has been low to moderate with forest practices as the only major land use activity.

In east side streams tributary to Priest Lake, from Caribou Creek down to Soldier Creek, cutthroat trout are mostly the dominant salmonid (IDEQ 1994 and IWRB 1995). Densities can be high, such as in Two Mouth Creek, averaging around 15 cutthroats/100 m^2 in IDFG surveys between 1987-94, and cutthroat densities were also good in Lion and Indian Creeks (IDFG snorkel surveys between 1983-94). Salmonid numbers as a whole were very low in Caribou Creek and Soldier Creek, but sampling has been minimal. Bull trout were present in low numbers in Lion Creek, Two Mouth Creek and Indian Creek. From historical accounts adfluvial bull trout were common in Priest Lake and likely migrated for spawning to most streams tributary to the lake. Brook trout were present in most east side streams, mostly in low numbers.

East River and Big Creek, two east side streams tributary to Lower Priest River, have been electro-fished. Bull trout are present in the Middle Fork East River, and also were found in two Middle Fork tributaries, Tarlac Creek and Uleda Creek. Bull trout samples did include an occasional fluvial adult. Cutthroat densities within the Middle Fork and Big Creek commonly range between 3 - 12 cutthroats/100 m^2 with a sample maximum of 24 fish/100 m^2. Brook trout are common in the Middle Fork. Brook trout are dominant in the North Fork East River where cutthroat density was low, and no bull trout were sampled although they are suspected to be present. Brook trout densities in Big Creek were found to be one of the highest in the basin. Average density was around 11 brook trout/100 m^2, and in one reach density was 107 fish/100 m^2 (Horner *et al*. 1987).

Moving over to the west side, sample densities within the main stem of Granite Creek have been low for all salmonids, but this is a large stream and difficult to sample. Bull trout have been present in the sampling. The South Fork of Granite Creek is a major tributary and considered to have good fish habitat conditions. Cutthroat trout are dominant, and in one snorkel survey the average density of six sampling stations was 8 cutthroats/100 m^2 with a maximum of 20 fish/100 m^2 (Kalispel Natural Resource Dept. 1997). Bull trout are present in low numbers, and average brook trout densities have not exceeded 1.5 fish/100 m^2.

For the remaining western streams, from Reeder Creek south to Lower West Branch, brook trout are clearly the dominant species, cutthroat densities are very low and are mostly found in headwaters and small tributaries, and no bull trout have been sampled in the last 15 years. In mid to lower main stem reaches of Reeder, Kalispell, Lamb, and Binarch Creeks, average brook trout densities ranged from 0 - 12 fish/ 100 m^2. In the main stems of Upper West Branch and Lower West Branch, brook trout densities were lower averaging around 2 fish/100 m^2, and are considered unproductive stream reaches (Horner *et al*. 1988). Some tributary streams and main stem headwaters have been found to have high densities of brook trout. Moores Creek, a tributary to Lower West Branch, averaged 19 brook trout/100 m^2 with a maximum of 30 fish/100 m^2, and Quartz Creek averaged 28 brook trout/100 m^2 with a maximum of 57 fish/100 m^2 (Horner *et al*. 1988). The headwaters of Reeder Creek exhibited 76 brook trout/100 m^2 (BURP electro-fishing in 2000).

There have been no recent netting, angling, creel census, or electro-fishing surveys by IDFG in Lower Priest River. In 1998 the USGS conducted, for the first time, backpack and boat electro-fishing at the lower river station (Brennan *et al.* 2000). The only salmonid captured was mountain whitefish. A total of 21 mountain whitefish were captured (density was not reported), representing 15% of the total catch.

The dominant species sampled was largescale sucker (*Catostomus macrocheilus*), with 45 individuals and 33% of total catch. From field observations and conversations with local fishermen, it is known that the river does contain fluvial cutthroat trout, and also brown trout, rainbow trout, and brook trout. Based on sampling in Middle Fork East River, the Lower Priest River likely contains some fluvial bull trout.

Stream Habitat - DEQ - BURP surveys included stream habitat evaluations resulting in a Habitat Index (HI) score (IDEQ 1996). For streams with a riffle/run prevalence, which were the vast majority of basin streams surveyed, there were eleven parameters measured or qualitatively assessed. Four primary parameters with maximum scores of 20 each were: percent fines as measured by Wolman pebble counts; qualitative assessment of instream cover for fish; qualitative assessment of gravel/cobble embeddedness by fine sediment; and a score for variety of depth habitats in the way of riffles, runs, glides and pools. Secondary parameters with a maximum score of 15 each were: channel shape (good scores for trapezoidal channels where undercut banks or overhanging vegetation are dominant, to poor scores for inverse trapezoidal channels); the pool+glide/riffle+run ratio (or slow/fast ratio) based on measured lengths; and the measured wetted width/depth ratio. Finally, four parameters of a maximum 10 points each were evaluated qualitatively: stream bank vegetation protection; lower bank stability; disruptive pressures to stream banks (cattle grazing for example); and zone of influence (width of riparian zone and level of human induced influence within riparian zone).

Maximum HI score for the Northern Rockies ecoregion is 165. HI scores of ≥100 are considered Not Impaired habitat (61% or more of maximum), scores <65 are considered Impaired habitat. All HI scores calculated in the basin are shown in Table 2-11.

As described in Section 2.2.3.3, BURP HI scores play a secondary role to biological parameters in determining beneficial use support. Since seven habitat parameters are qualitatively assessed there is some question about the repeatability among BURP crews in the habitat assessment process. One example is variation in identifying pool, riffle, run and glide habitats in the field (IDEQ 1999). In addition, most BURP evaluations were made in main stem channels. There is a lack of habitat assessments in streams tributary to the main stems. However, habit evaluations often give insight to macroinvertebrate and fish sampling results, and habitat evaluations can be used as a guide when considering support status under the WBAG+ policy (see Section 2.2.3.3).

Also included in Table 2-11 are results from the 1992 DEQ Use Attainability (UA) surveys (Hartz 1993). These surveys were done on most streams which were assessed later by BURP, and often in the same general locality. The reach lengths evaluated were approximately 20 times bankfull width, similar to BURP. Habitat scores were based on qualitative assessments and included such factors as substrate composition, instream cover, stream bed deposition or scouring, pool quality and complexity, canopy cover, and condition of stream banks. All habitats within the reach were measured for length and width, and this allowed a calculation of number of pools per 100 m. All pools encountered were measured for length, mean width, maximum depth, and depth at tail crest. Pool creator was also recorded. By applying a conversion factor of 0.75 to maximum pool depth as an approximation of mean depth, an estimated Residual Pool Volume (RPV) for each pool was calculated and extrapolated to cubic meters RPV per kilometer stream length. RPV is the amount of water remaining in pools if the stream went to zero flow.

Other habitat measurements and evaluations have been collected by the USFS, DEQ, and IDL. This data is included in Section 3 for each §303(d) watershed evaluated.

A total of 52 BURP HI scores were collected throughout the basin (both listed and non-listed streams). Unlike the MBI results, the majority of HI scores were below the established Not Impaired cutoff score (67% of HIs <100). Only two scores however were below 65, or into the Impaired range. Maximum HI recorded was 117, average score was 92, or 56% of maximum score. A total of 41 DEQ Use Attainability sites were evaluated, and the mean habitat score was 137 (good), or 70% of maximum score.

Table 2-11. DEQ - BURP Habitat Scores (HI), DEQ Use Attainability Scores, and Selected Habitat Values: Priest River Basin

	DEQ BURP Data			DEQ 1992 Use Attainability			
Streams (L)= §303(d) Listed (NL)= Non-listed	HI Scores[a]	Stream Percent Gradient	Percent Fines	Habitat Rating & Scores[b]	No. Pools/ 100 m	Riffle-run Wetted Width (m)	Residual Pool Volume m^3/ km
Northern Streams							
(L) Trapper Creek	M= 108	1.6	29	--	--	--	--
	U= 96	2.5	9	good 161	4.8	4.4	104
(NL) Hughes Fork	L= 82	1.0	31	poor 103	3.7	5.5	741
	M= 89	1.0	26	good 154	3.8	4.7	157
Gold Creek	L= 112	4.0	20	--	--	--	--
	M= 113	4.0	33	--	--	--	--
(NL) Upper Priest River	L= 85	1.5	16	good 147	1.1	10.1	3,498
	M= 78	1.9	27	good 158	0.5	11.1	553
				exce 171	2.0	10.5	2,462
				good 154	0.7	11.4	8,847
Eastern Streams							
(NL) Caribou Creek	L= 88	1.2	35	fair 126	1.2	9.8	1,053
	M= 108	1.6	12	good 151	2.1	11.9	5,589
				good 157	0.7	11.8	384
(NL) Lion Creek	L= 93	0.9	13	fair 112	0.9	10.1	394
	M= 107	2.0	17	exce 179	3.1	5.4	1,214
(L) Two Mouth Creek	L= 96	2.0	16	good 139	1.6	5.1	159
	M= 98	4.2	7	fair 121	1.6	6.6	50
(NL) Indian Creek	M= 107	4.0	10	good 159	2.9	6.5	746
(NL) Hunt Creek	L= 89	3.0	16	good 139	2.5	5.5	69
	M= 108	3.7	11	good 161	4.8	4.8	153
(NL) Soldier Creek	L= 52	1.0	85	--	--	--	--
	M= 100	3.5	23	exce 174	1.6	6.1	347
				exce 180	3.7	7.6	156
(L) East River							
Main stem	L= 80	0.4	10	--	--	--	--
Middle Fork	L= 89	1.4	11	poor 83	2.4	8.5	2,308
	M= 95	3.0	28	fair 130	0.6	6.8	132
	U= 94	2.9	15	good 137	4.7	6.0	710
North Fork	L= 78	1.0	35	--	--	--	--
	U= 110	5.0	21	--	--	--	--
(NL) Big Creek	L= 92	2.0	44	--	--	--	--
	U= 75	1.9	45	--	--	--	--

Table 2-11. Continued

	DEQ BURP Data			DEQ 1992 Use Attainability			
Streams (L)= §303(d) Listed (NL)= Non-listed	HI Scores[a]	Stream Percent Gradient	Percent Fines	Habitat Rating & Scores[b]	No. Pools/ 100 m	Riffle-run Wetted Width (m)	Residual Pool Volume m^3/ km
Western Streams							
(L) Tango Creek	L= 117	5.0	31	--	--	--	--
(NL) Granite Creek							
Main stem	L= 85	1.0	54	fair 116	1.1	11.7	668
	M= 88	0.5	30	good 150	0.7	10.6	37
				exce 170	0.7	6.4	234
South Fork	L= 94	2.0	27	--	--	--	--
	U= 118	4.0	39	--	--	--	--
(L) Reeder Creek	L= 105	6.0	24	fair 132	6.2	3.7	178
	U= 103	2.0	46	--	--	--	--
(L) Kalispell Creek	L= 70	1.0	52	--	--	--	--
	L= 95	1.3	44	fair 119	1.3	5.0	695
	M= 74	1.0	93	--	--	--	--
	M= 92	3.3	25	fair 105	6.4	3.0	220
	U= 77	3.0	53	--	--	--	--
(L) Lamb Creek	L= 72	0.5	60	fair 117	6.0	3.0	122
	L= 97	2.5	51	--	--	--	--
	U= 97	3.0	32	vpoor 65	1.4	3.0	2
	U= 99	3.5	46	USFS R1/R4	1.8	4.2	128
(L) Binarch Creek	L= 115	2.7	24	good 144	6.6	3.0	291
	M= 77	4.0	100	--	--	--	--
(NL) Upper West Branch	--	--	--	exce 176	5.2	8.1	2,175
	LM= 101	1.5	42	poor 95	5.1	6.2	1,227
	M= 108	0.6	87	poor 102	4.9	4.4	890
	U= 101	0.5	69	--	--	--	--
(L) Lower West Branch	L= 65	0.5	39	--	--	--	--
	M= 68	0.5	73	poor 105	0.7	6.4	29
	MU= 48	1.0	100	poor 104	0.9	5.2	351
	U= 83	0.5	94	--	--	--	--

a: L= Lower reach sites; M= Middle reach sites; U= Upper reach sites. Maximum HI score = 165.
b: 0 - 69= very poor; 70 - 104= poor; 105 - 134= fair; 135 - 164= good; 165 - 195= excellent

The BURP HI statistics for the Priest River basin indicate an overall mediocre cold water biota habitat condition. Or perhaps portions of the HI scoring scheme and criteria do not specifically fit well for the Priest River basin where there is extensive base granitic geology with glacial till and outwash stream valleys and lowlands.

Some of the BURP habitat parameters were frequently at or below a mid-point score (≤50% of the maximum point total for the parameter). In the primary habitat group, percent fines were below mid-point for 73% of the BURP sites (26% fines or more). This is consistent with observations that sand is a major stream bed component within the granitic watersheds. This also ties into assessments of cobble embeddedness which were below mid-point score for 43% of the BURP sites (50% or more embeddedness). Actual measurements of cobble embeddedness have been made on Trapper Creek (IDEQ 1994) and South Fork Granite Creek (Kalispel Natural Resource Dept. 1997), both considered good fish habitat streams. Embeddedness in lower reaches of these streams averaged greater than 50%. A basin wide analysis of percent fines and embeddedness indicates a less than abundant condition of clean, loose gravels and cobbles optimum for spawning beds and macroinvertebrate habitat.

Instream cover complexity is the presence of various structural elements such as submerged large woody debris, boulders and cobbles, and undercut banks. These structures help maximize fish production by reducing predation, providing refuge, producing micro-habitats that minimize fish energy requirements and provide macroinvertebrate habitat, and overall increase carrying capacity (USFS 1999). The BURP instream cover scores were below mid-point at 31% of the sites. In some cases such as Lower West Branch, low productivity of brook trout are considered to be largely related to poor instream cover conditions (Horner *et al*. 1988).

Of the BURP secondary habitat parameters with a maximum 15 point score, the slow/fast ratio was below mid-point at 92% of the sites. On some streams such as Lower West Branch and Upper West Branch which are often deep and barely wadable, the distinction between lateral scour pools, glides, and runs is often difficult to make and very subjective. Pools provide very important salmonid fish habitat in the way of survival under harsh winter conditions, protection from high summer water temperatures, avoidance from predation, and summer rearing habitat (MacDonald *et al*. 1991). The BURP results indicating overall mediocre pool habitat frequency seem to be also reflected by the UA surveys where number of pools averaged only 2.9 pools/100 m. Seldom were there more than 5 pools/100 m. Narrative in USFS and IDL documents refer to extensive historic logging of riparian cedar and hemlock (prior to the Idaho FPA), and this harvesting reduced the recruitment of large woody debris which are pool formers (USFS 1999).

Another potential parameter to assess the extent of pool habitat is the Residual Pool Volume (RPV). The RPV could serve as an indicator of changes in the sediment load due to forest practices, i.e. pools filling with excessive sediment discharge from roads and stream crossings (MacDonald *et al*. 1991). For comparison among streams, the RPV data of Table 2-11 needs to be stratified either by bankfull width or riffle-run wetted width because the wider the stream, the more relative pool volume. All UA measurements were taken in the low base flow period of late July to early September, so the more accurately measured riffle-run average wetted width is preferred over the more subjectively determined bankfull width.

The RPV data have mainly been presented as a potential monitoring parameter for streams that will undergo a TMDL, implementation for sediment load reduction, and follow-up effectiveness monitoring. This author is hesitant to use the RPV data when considering impairment due to excess sediment because of the variability of the RPV data itself, the variability in features that create pools and thus frequency of pools, and insufficient reference data for comparison. As an example of data variability, the group of streams with average wetted widths ranging from 10 - 12 m exhibited a vast range in RPV from 37 - 8,847 m^3/km. These are the larger main stems such as Upper Priest River, Granite Creek, and Caribou Creek. The maximum RPV was in one reach of Upper Priest River (a 276 m reach), with only two pools

(0.7 pools/100 m), but very large and deep. Another example is within the wetted width group of 7.5 – 10 m where four streams ranged from 1,053 - 2,308 m^3/km RPV, but one reach in Soldier Creek was only 156 m^3/km. And yet the Soldier Creek site had a good frequency of small, boulder created pools (3.7 pools/100 m), and the UA habitat score for this reach was 180, the highest recorded in the basin.

The most comprehensive RPV data are for Lamb Creek developed from a USFS R1/R4 Habitat Inventory Procedure where 8.3 miles of Lamb Creek were surveyed (about three-fourths of the stream length). This stream would be representative of many moderate flow, lower west side streams of extensive low gradient channel and sandy bottoms, historic large fires followed by road building and salvage logging, current logging levels, and some grazing activity. The Lamb Creek watershed also has a moderate level of urbanization in the lower end. Among the 9 reaches that the USFS surveyed, mean wetted width was 4.2 m. The measured RPV among the reaches ranged from 20 - 294 m^3/km and averaged 128 m^3/km. Pool frequency was low, 1.8 pools/100 m, and the primary pool creator was stream meander, and secondly woody debris. The Use Attainability RPV in the 3 - 5 m wetted width group (9 streams), averaged 282 m^3/km with also a higher pool frequency.

Another BURP secondary parameter that was almost always below mid-point score was the wetted width/depth ratio (90% of scores below mid-point, or ratios 15 and greater). For all BURP scores the mean wetted width/depth ratio was 27 (or 3/15 in BURP scoring). The width/depth ratio may serve as a potential parameter to indicate excess sediment accumulation that would reduce stream depth, and to maintain channel capacity, a corresponding increase of stream width (MacDonald *et al*. 1991). A decrease in depth tends to reduce the number of pools. An increase in channel width is achieved through bank erosion and a corresponding increase in direct sediment input to the stream

Large scale canopy openings in the watershed followed by increases in the magnitude of peak flows can lead to an increase in channel width. Widespread stand replacing fires between 1890 - 1939 within headwaters of western watersheds such as Kalispell Creek and Upper West Branch are believed to have caused water yields to increase to the point where the natural channel size could not handle them. Recurrent flooding damaged stream banks and widened streams (USFS 1999). Streams that cut through sandy or other non-cohesive substrates tend also to be wide and shallow (MacDonald *et al*. 1991), and this would be the case for many basin streams flowing through valleys of glacial till and outwash. The observed wetted width/depth ratios then, may be reflecting a basin history of large fires, increased sediment production from road building and logging along with some grazing impact, stream courses through natural sandy substrate, and in part a reflection of methodology by using wetted measurements at low water.

DEQ now believes that the wetted width/depth ratio does not appropriately convey an occurrence of channel widening. Future BURP protocol will likely revise the measurement and habitat index scoring of channel dimensions.

2.2.3.3 Evaluation Methods of Beneficial Use Support Status

Wadable Streams

IDAPA 58.01.02.053 codifies DEQ's procedure to determine whether a water body fully supports designated and existing beneficial uses. It relies heavily upon biological parameters and aquatic habitat, and is a procedure presented in the Water Body Assessment Guidance (WBAG, IDEQ 1996). WBAG requires the use of the most complete data available to make beneficial use support status determinations. Figure 2-10 provides an outline of the wadable stream assessment process for support status determinations of the beneficial uses: cold water biota, salmonid spawning, and primary contact recreation. The evaluation method and sequence for cold water biota determinations shown in Figure 2-10 represents a change in the 1996 WBAG methods as documented in the 1998 §303(d) List (IDEQ 1999). The change places primary weight of determination to biology and secondary weight to habitat evaluation as opposed to equal weight for biology and habitat in the 1996 WBAG.

Figure 2-10. Determination Steps and Criteria for Support Status of Beneficial Uses in Wadable Streams: Section 1.2 - DEQ 1998 §303(d) List

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Cold Water Biota

Numeric Standard Exceedance → Major = NFS

↓ None or Minor

FS ← MBI score ≥ 3.5

MBI score < 2.5 → NFS

2.5 ≥ MBI ≤ 3.5

↓ NV

RIBI = NI ← RIBI Assessments

Call is FS

↓ RIBI = NV

FS ← HI score ≥ 100

HI score < 64 → NFS

64 ≥ HI ≤ 99

↓ NV

Call is NV

Salmonid Spawning

Numeric Standard Exceedance → Major = NFS

↓ None or Minor

FS ← 3 age classes including juveniles

↓ No

FS ← 2 age classes & HI ≥73

↓ No → NFS

If no fish data exists, beneficial use is

Not Assessed

Primary Contact Recreation

exists if ingestion of small quantities of water is likely to occur (2000 Standards)
must meet bacteria water quality standard
if no bacteria data, then support status defaults to cold water biota support call
if cold water biota is NFS then primary contact is Not Assessed

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An agreement by DEQ and EPA in March 2000 calls for the support status determinations above to be reviewed in light of additional biological, habitat, and water chemistry data recently collected within a basin, as well as agency reports with solid findings or conclusions. This additional assessment of support status determinations is referred to as WBAG+. Best professional judgement based on this additional information may result in a support status call other than that determined from the above WBAG flow chart method.

FS =Full Support, NFS =Not Full Support, NV =Needs Verification (inconclusive), NI =Not Impaired

Based on EPA and public comment of the 1998 §303(d) List, along with experience that DEQ has gained from the initial years of water body assessments, a major revision of the WBAG process is being undertaken. The final form and use of this revision (WBAGII) will not however be in place until 2001. In the interim, agreements have been made with EPA to supplement the 1998 WBAG process (using BURP data) with evaluation of additional data collected within the watershed by DEQ and other agencies such as IDFG and USFS (McIntrye 2000). This additional data may include fish population structure and fish density, various instream habitat measurements, and results of watershed sediment load calculations. This interim process for a SBA and TMDL due in year 2000 is labeled WBAG+, with the "+" equating to the additional data assessed outside of the Figure 2-10 flow chart. This "+" information is used to either support or refute a particular water body assessment conclusion based on the Figure 2-10 flow chart.

Initial assessments of Figure 2-10 are for Numeric Standard exceedances. For the Priest River basin, indications of temperature criteria exceedances rely on: data collected by continuous recording HOBO® sensors placed in some basin streams; a continuous recording data logger for Lower Priest River at the lower river station (1998 only); and to only a minor extent, numerous instantaneous measurements for some Priest Lake tributaries. For exceedance evaluation of dissolved oxygen, pH, ammonia, turbidity, and fecal coliform, there is routine data for many tributaries to the lake. For Lower Priest River monthly sampling occurs from April - September every other year for the above parameters (Brennan *et al*. 1999). Fecal coliform and *E. coli* samples were taken on a few §303(d) listed streams in 1999. In no case throughout the basin has there been sufficient bacteria sampling to assess the geometric mean criteria over a 30 day period (Table 2-7).

Evaluation of Numeric criteria exceedances are judged as either "minor" or "major" (IDEQ 1996). This is a best professional judgement based on the data at hand regarding the degree to which the magnitude and duration of the exceedance affected the biota (or human health), and whether exceedances are responsible for the water body not fully supporting its beneficial use(s). Declaration of a major exceedance produces a Not Full Support (NFS, Impaired) status, and overrules any Full Support (FS) status developed from BURP data. If there are no exceedances or only minor exceedance levels, support status evaluations for cold water biota and salmonid spawning turn to the BURP and other supporting data.

The data collected within the Priest River basin show that there have been no Numeric Criteria exceedances within §303(d) listed streams except for stream temperature. It seems clear that for most main stem channels in the basin, lower and middle reaches will exhibit temperatures that exceed the cutthroat spawning and incubation criteria in July (Table 2-7), the State Standards bull trout criteria for July - September, and the EPA bull trout criteria for July - September. In the 1998 §303(d) List, a suggested major exceedance was 3°C above criteria levels (IDEQ 1999). Also, the Standards Temperature Exemption (IDAPA 58.01.02.80.04, 4-5-00) cites exemption of Standards violation based on threshold criteria of air temperatures. For this SBA, stream temperature exceedances were not judged against the Temperature Exemption provision (air temperatures are available from the Priest River Experimental Forest, but they have not been obtained and calculated into a yearly series).

Stream temperature criteria as presented in the Standards, and the relationship to aquatic life beneficial uses has been a subject of great discussion within DEQ and EPA. DEQ is currently conducting a study to reevaluate temperature issues in Idaho, and as directed by the 1998 §303(d) List, waters with only temperature as a suspected cause of impairment have been placed on a separate list (IDEQ 1999).

Once Numeric criteria have been assessed, and show no or minor exceedances, Figure 2-10 drops down to biological criteria. For cold water biota, a MBI score ≥ 3.5 gives FS, and <2.5 gives NFS. Most Priest River basin streams have two or more BURP sites and MBI scores. Generally, the lowest MBI of the stream reaches surveyed is the determining score, i.e. if one segment has a MBI <2.5 and the other(s) are FS, the entire stream is NFS. If a reasonable explanation is evident in the difference of MBI outcomes, such as a land use change, than a boundary change on the stream can be made to better focus where along the water body impairments are occurring (IDEQ 1999).

A BURP site with 2.5 ≥ MBI ≤ 3.5 is labeled Needs Verification (NV, inconclusive). In this case the stream is evaluated with the Reconnaissance Index of Biological Integrity (RIBI). This is an outcome based on qualitative and quantitative fish data (IDEQ 1996). The RIBI assessment includes examining the fish population structure as to presence of pollution intolerant species, a dominance of pollution tolerant or introduced species, and age class representation. A RIBI assessment may be Not Impaired (NI) which gives the stream segment FS, or the RIBI evaluation may be NV. If the latter is the case, the stream segment is then evaluated through the BURP HI score. Support status calls based on the HI scores are shown in Figure 2-10.

For salmonid spawning support status, either BURP, IDFG, or USFS fish survey data was used. FS is given if three age classes of fish, including juveniles (fish <100 mm) are present. If this condition is not met, then two size classes present in addition to a HI score of ≥ 73 gives a status of FS. If this second condition is not met then support status is NFS. If no fish length data exists, then the salmonid spawning beneficial use is Not Assessed.

For primary contact recreation, if there are no or minor numeric exceedances of bacteria data, support status is FS. If data does not exist, then the cold water biota status is examined. If cold water biota is FS, then so is primary contact. If cold water biota is NFS, then primary contact is Not Assessed (NA). While domestic water supply is an existing use in the Priest River basin, it is entirely for individual homesteads. The domestic water supply Turbidity Criteria is only applicable to water bodies designated as small public water supplies (IDAPA 58.01.02.250.03.a.iii.1), and thus does not currently apply in the basin. The Toxic Substance criteria for domestic water supply has not been assessed in the basin. Therefore, domestic water supply status is evaluated through the cold water biota status, either FS or NA. Agricultural water supply is evaluated by narrative criteria. Industrial water supply, wildlife habitat, and aesthetics beneficial uses are always FS according to WBAG assumptions.

Following determination of cold water biota and salmonid spawning beneficial use through Figure 2-10, this SBA considered the support status calls in light of additional information collected in the watershed, or the “+” of WBAG. Analysis of the additional information was often the fish and habitat data presented in section 2.2.3.2, along with other evaluations presented within the assessments of 5th order HUCs in Section 3. For some watersheds, analysis included sediment load calculations.

Use of WBAG+ where sediment is the listed pollutant of concern seems to closely relate to beneficial use status based on the Standards Sediment Narrative Criteria. Assessment of the narrative criteria of excessive sediment, such that “designated beneficial uses are impaired” (i.e. a major exceedance), is particularly complicated for west side main stem streams from Reeder Creek south to Lower West Branch. These streams have extensive lengths of low gradient depositional channels which exhibit a high percentage of segments with thick sandy substrate. Suitable gravel and cobble habitat for cutthroat spawning (and where applicable bull trout spawning) seems limited. A predominance of sandy substrate, high width to depth ratios, low quality pools that fill with sand, and sections of eroding stream banks, are some characteristics that may be attributed to excessive sediment accumulation.

Complications for assessment of a major sediment exceedance include: 1) what portion of this condition reflects the natural granitic geology, and glacial outwash and till soils that have a high sand content that is erodible, and which the streams cut through, and in which there were natural accelerated erosion rates from pulse-type disturbances, 2) what portion of this condition is related to land use legacy or historic timber harvesting prior to the Idaho FPA, where for example there was intensive logging and road construction in what is now the FPA Stream Protection Zone, and also historic agricultural practices such as stream channel straightening, and 3) what portion of this condition is related to current land use activities over the last 30 years or so? The question is: would a TMDL implementation for sediment reduction based on current land use activities have any observable effect on improving the impaired beneficial uses? [Note: the

EPA comment on the draft SBA regarding this sentence was, that under the Clean Water Act, the first question to answer is "*Is sediment input resulting in water quality standards (e.g. beneficial uses and water quality criteria) not being met*?"].

A further complication is the presence of introduced salmonids. In all streams of the mid to lower western basin, brook trout are present, and are often abundant and reach harvest-size. Brook trout populations clearly show that the salmonid spawning beneficial use criteria in the 1996 WBAG is being met. However, in many basin streams the fish sampling results indicate that cutthroat numbers are suppressed compared to likely historic population numbers, and bull trout are either extremely low in numbers or they are absent in streams that they likely inhabited historically. Are these population trends of native sensitive species due to habitat impairment from excessive sediment? What role has the introduced brook trout, and introduced lake trout in Priest Lake played in suppressing the populations of native species? And again, will TMDL implementation for sediment reduction ultimately lead to improved habitat conditions that will result in improved population numbers for the native salmonids?

Large Rivers

In 1997 DEQ established a separate sampling protocol for large rivers (IDEQ 1997b). From a practical standpoint of sampling and safety considerations, biological collections and habitat measurements in rivers needed a different approach than in wadable streams. From the standpoint of waterbody ecology, lowland large rivers would have a naturally different makeup of macroinvertebrate communities than upland streams, and the assemblage of attached algae on rocks (periphyton) can be a useful bioassessment to judge human disturbance impact within rivers.

The §303(d) listed segment of Lower Priest River was sampled by the large river protocol in 1998 (one site). Beneficial use status based on the data collected will be judged through the Idaho Rivers Ecological Assessment, currently a draft framework (IDEQ 2001) which will be incorporated into the second iteration of the Idaho Water Body Assessment (WBAGII). Evaluation of Standards exceedances of Numeric Criteria still apply in large rivers.

Support status for aquatic life beneficial use in rivers is based on four ecological components: 1) River Macroinvertebrate Index, a composite of five macroinvertebrate metrics which have some different components than the MBI (for example, percent elmid beetles), 2) River Fish Index, a composite of ten fish metrics including number of cold water native species, percent sculpin, and percent sensitive native individuals, 3) River Diatom Index, a multi metric index based on the assemblage of diatom species, such as percent siltation tolerant species, and 4) River Physicochemical Index, a composite of eight water quality parameters such as temperature, DO, total phosphorus, and fecal coliform. Results of the above four indexes are weighted and integrated into a singular score, 1-100 scale, and then the support status call is based by the integrated score.

For salmonid spawning beneficial use in large rivers, an assessment is made by IDFG on whether a self-sustaining salmonid fishery exists and has been recently documented.

2.2.3.4. Summary Status of Beneficial Uses for Basin Streams

Table 2-12 presents the support status calls for §303(d) listed streams. Discussion of data leading to the support status decisions is presented in detail in Section 3 as each listed stream and its 5th order watershed is examined.

Status calls of Table 2-12 fall into 3 categories:

Table 2-12. Priest River Basin §303(d) Listed Streams: Beneficial Use Support Status

Stream Name	Cold Water Biota	Salmonid Spawning	Primary Contact Rec.	Secondary Contact Rec.	Domestic Water Supply	Agri. Water Supply
Trapper Creek	FS	FS	FS			
Two Mouth Creek	FS	FS	FS			
East River Main stem Middle Fork North Fork	 INSI FS FS	 INSI FS FS	 INSI FS FS			 FS FS FS
Tango Creek	FS	FS		FS		
Reeder Creek Elev. 2680' - Mouth Elev. 2680' - Headwaters	 INSI FS	 INSI FS	 FS	 FS		 FS
Kalispell Creek	NFS	FS	FS		NA	FS
Lamb Creek	FS	FS	FS		NA	FS
Binarch Creek	NFS[a] INSI	NFS[a] INSI		NA		
Lower West Branch Priest River	NFS	NFS[a]	FS		NA	FS
Lower Priest River	TE INSI	FS	FS	FS	NA	FS

FS = Full Support: NFS = Not Full Support: NA = Not Assessed by data collection
TE = Major temperature exceedance of the Standards - cold water biota criteria
INSI = Insufficient Information to make a Status Call
NFS[a] = Based on BURP electro-fishing results and WBAG criteria, salmonid spawning for mid-lower Binarch Creek and middle to lower reaches of Lower West Branch are Not Full Support. However, there are known self propagating cutthroat populations in Binarch Creek, and self propagating brook trout populations in Lower West Branch.

1. §303(d) listed streams proposed for de-listing with sediment as the listed pollutant of concern

   Trapper Creek, Two Mouth Creek, Tango Creek, Reeder Creek from headwaters to elevation 2680', Lamb Creek, Middle Fork East River, and North Fork East River

2. §303(d) listed streams evaluated as impaired for cold water biota beneficial use, and recommended for a sediment TMDL

   Lower West Branch Priest River, Kalispell Creek

3. §303(d) listed streams with currently, insufficient information to completely assess beneficial use status, and status call proposed for deferment until the 2002 §303(d) listing cycle.

   Reeder Creek from elevation 2680' to mouth, East River main stem, Binarch Creek, and Lower Priest River

Some stream segments proposed for de-listing were based on MBI scores consistently above 3.5, Full Support salmonid spawning, and additional fish data that clearly supported a FS status call. These segments were Trapper Creek, Two Mouth Creek, Tango Creek, and middle to upper reaches of Middle Fork East River and North Fork East River.

Lower West Branch on the other hand is judged as Not Full Support and recommended for a TMDL based on poor salmonid densities, poor habitat scores, and a current, high sediment load. A status call of NFS is made even though all four MBIs were ≥3.5.

Kalispell Creek is judged as Not Full Support of cold water biota beneficial use based primarily on electro-fishing results showing low salmonid density. Excess sand bedload within Kalispell Creek is presumed part of its impairment cause. Sediment load calculations along with information supplied by the Forest Service seems to suggest that the current sediment load within this watershed is very moderate, and not the root cause of impairment. Regardless of this assessment of current sediment load, the Priest Lake WAG recommends that for any stream segment exhibiting NFS, a de-listing is not warranted and the watershed should undergo a TMDL. This report follows the WAG recommendation.

Likewise, Binarch Creek is judged as Not Full Support based primarily on electro-fishing results showing low salmonid density. Here also the calculated current watershed sediment load is moderate. For Binarch Creek however the NFS is based on a single DEQ electro-fishing survey, and this SBA recommends support status deferral until further fish sampling is conducted during the summer of 2001.

Lamb Creek and the upper reach of Reeder Creek had abundant brook trout, but absence of cutthroat trout. These reaches are judged as Full Support and recommended for de-listing based on adequate MBIs and brook trout populations. This FS beneficial use status call is disputed by EPA and IDFG in their comment packages to the draft SBA and TMDL (Appendix B). It is the opinion of IDFG that the presence of brook trout, with few or no cutthroat or bull trout present in a stream where they were historically present, is very possibly an indication that water quality has declined (IDFG 2001). In a response letter from DEQ to EPA regarding this matter, DEQ concludes that salmonid spawning and cold water biota beneficial use exhibited by resident trout in these stream segments do meet FS status and current water quality standards (Mabe 2001). DEQ considers that there has been insufficient evidence provided by IDFG to equate the decline of cutthroat trout as primarily related to sediment loading. The same considerations are given for a Full Support status assigned to the lower reach of North Fork East River, although brook trout there are less abundant than Lamb Creek and upper Redder Creek.

In Section 4, sediment source load calculations for Lamb Creek are included for informational purposes if a future interagency plan was developed for restoration of native species. Likewise, sediment load calculations are included for East River as a resource for any future fisheries management efforts to strengthen both the cutthroat trout and bull trout populations.

Lower Priest River has been labeled with a major temperature exceedance for cold water biota where July to mid-August mean daily temperatures at the lower river USGS station ranged from 20 - 23.5°C in 1998 (Brennan *et al*. 1999). These warm temperatures may be adverse physiologically for the resident salmonids: fluvial cutthroat, mountain whitefish, the introduced brook trout, rainbow trout and brown trout, and also fluvial bull trout if they do exist in the river. By all historic accounts cutthroat trout were once thriving and a dominant salmonid in the river. IDFG believes that the combination of warm water, habitat degradation, and introduced salmonids have played a role in the decline of fluvial cutthroat (Horner *pers comm*). In regards to spawning, the only salmonid in which major spawning activity occurs within the river would be the mountain whitefish as other Priest River salmonids primarily spawn in tributaries (Horner *pers comm*). The whitefish spawning period is considered October - March where temperatures are cold.

Warm, mid-summer temperatures would be expected because the river originates as the upper water layer of Priest Lake (epilimnetic water). There is belief among IDFG biologists that since construction of the outlet dam in 1950, and regulation of the summer lake level for recreation purposes, river temperatures are higher now than prior to the dam. However, there is an insufficient historic water temperature record to make a definitive comparison.

Beyond temperature considerations, the cold water biota beneficial use status for Lower Priest River, using the Idaho Rivers Ecological Assessment (IREA, IDEQ 2001), cannot be judged at this time because the IREA methods and calculations are still in draft form and have not undergone complete review and public comment. By the fall of 2001 this tool will be ready to use for a support status call. It is recommended that Lower Priest River remain on the §303(d) List with sediment as the pollutant of concern until evaluated with the IREA. Support status conclusions would be presented in the 2002 §303(d) listing cycle. Salmonid spawning beneficial use is rated as FS based on the single electro-fishing effort conducted by USGS in September 1998 near the lower river station. This data shows multiple age classes of mountain whitefish.

2.2.4 Water Quality Data Gaps

In field survey work there seldom seems to be sufficient data and information to make completely confident judgements about the ecosystem. For §303(d) listed water bodies there are a few cases where either insufficient or lack of information has made determinations of beneficial use status particularly difficult.

Reeder Creek - Up until the summer of 2000 there had been no instream evaluations within the 5 miles of the middle, low gradient reach which is about 63% of total stream length. The BURP macroinvertebrate and habitat data collected in 2000 have not yet been processed.

Binarch Creek - USFS or DEQ needs to conduct an update survey on the cutthroat population within the Binarch Creek Research Natural Area. At a single BURP electro-fishing site downstream of the RNA boundary (sampled in 2000), cutthroat trout were present but with low density. DEQ has requested the USFS to conduct fish sampling during the summer of 2001.

Lower West Branch - BURP electro-fishing in 2000 provided a needed supplement to the 1987 fish survey by IDFG, and placement of a temperature sensor in 2000 provided the first temperature record other than a few spot measurements. It is suspected that Lower West Branch may approach the cold water biota turbidity standard during spring runoff, and this should be investigated.

East River – To judge cold water biota and salmonid spawning beneficial use within the 2.5 mile main stem segment of East River, there needs to be a current electro-fishing effort. The only recorded sampling was within a single reach by IDFG in 1986 that showed low salmonid density. DEQ will conduct fish sampling during the summer of 2001. The East River is also on the §303(d) list with dissolved oxygen (DO) as a concern. No known measurements of DO have been taken within the stream system. DEQ will obtain DO measurements during the summer of 2001 within the Middle Fork, North Fork, and main stem.

Lower Priest River - A comprehensive fish survey by IDFG within the river is needed for use with the Fish River Index of Biotic Integrity as part of the large river bioassessment process, and also for a more complete assessment of salmonid spawning status. DEQ has requested IDFG to conduct an electro-fishing survey within at least one reach during the summer of 2001. In addition, a single BURP site is insufficient to properly assess a water body segment 35 miles in length. Another BURP sampling should be conducted closer to the mouth.

2.3 Pollutant Source Inventory

2.3.1 Point Sources

Within the Priest River basin there are no NPDES permitted point source discharges, and no known point sources covered by a general permit.

2.3.2 Nonpoint Sources

For all §303(d) listed streams, sediment is a pollutant of concern. The following is a general inventory of both assumed and observed sources of sediment in the basin. Details in the way of extent and locality of watershed sediment sources and delivery are given for each listed §303(d) stream in Section 3.

2.3.2.1 Background Sediment Production

Hillslope Erosion **-** Natural erosion processes include hillslope creep, mass failure, and surface erosion. A common land type in the basin is “gently to moderately sloping glaciated land, derived from granitics” (IDL 1997a and IDL 1997b). In the IDL - CWE assessments, this land type is considered to have a high inherent hazard for surface erosion and a moderate inherent hazard for mass failure. Characterization of west side watersheds by the USFS identifies geologic creep as the dominant erosional process operating in undeveloped forest conditions, with surface erosion as a minor erosional process (USFS 1999).

Fire, Flooding, and Instream Erosion **-** The historic cycle of large wildland fires (estimated at a 100 - 150 year cycle for the Priest River basin), is normally considered as an event followed by significant short-term sedimentation pulses to streams. However, it is felt by some USFS hydrologists and soil scientists that historic, large stand replacing fires on the west side of the basin may not have greatly led to accelerated surface erosion because of the volcanic ash cap below the organic duff layer (Niehoff *pers comm*). The ash cap is very porus and allows rapid water infiltration into the shallow groundwater stratum. Instead, intense fires may have produced a glazing effect on the ash cap, creating a hydrophobic condition. This condition accelerates water runoff, along with the open canopy from fire, but without a pronounced surface erosion scouring effect. Particularly during episodic precipitation, snowmelt, and flood events following a large fire, excess water runoff would have resulted in excessive stream energy, along with log debris dams, leading to significant stream bed cutting and bank erosion. Current instream degradation in the way of sediment accumulation, pool filling, and channel widening of some west side streams, such as Kalispell Creek, Lamb Creek, and Upper West Branch are in part attributed to large stand replacing fires between 1880 - 1940 (USFS 1999). The last large fires in the basin were in 1967, burning headwater lands of Soldier Creek and Trapper Creek.

2.3.2.2 Sediment Production Related to Human Land Use

Timber Harvesting Prior to the Idaho FPA **-** Early and mid twentieth century timber harvesting was both in burnt and disease/insect affected areas for salvage logging, and in lands of unburnt, mature growth stands for selective harvest of high value species such as white pine, spruce, hemlock and cedar. During this time there was construction of railroad lines and spurs, flumes and chutes, and a network of transportation roads, skid trails, jammer roads and spurs, and stream crossings. Some of the early transportation system was built close to streams, and within the streams themselves (chutes and flumes). In some areas there were clear-cuts of cedar and hemlock within riparian zones. IDL and USFS land managers consider that these early practices lead to a significant yield of sediment to basin streams and that impairment within some basin streams, such as Kalispell Creek, still reflect these legacy practices.

Current Timber Harvesting **-** Timber harvesting under the Idaho FPA (in effect since 1974), incorporates BMP standards for road building, harvesting design and extraction methods, stream crossings, maintenance, and the establishment of a Stream Protection Zone (SPZ). Still, as harvesting continues to be a major activity in the basin, there is ongoing disturbance and compaction of forest soils and ephemeral swales by heavy machinery, skidding, and construction of new roads, stream crossings, and landings. Besides unpaved roads as a known significant sediment source, there is also tractor excavated skid trails where the tractor blade scrapes and removes the volcanic ash cap (Niehoff *pers comm*). The method of tractor excavated skid trails has declined in recent years on USFS lands in the basin (Janecek Cobb *pers comm*).

Collectively, there is a significant number of small block, forested acres in the basin that are privately owned and logged, and these are called Non-industrial Private Forest (NIPF). Harvesting activities on these lands fall within the regulations of the FPA as administered by IDL. Forest audits conducted by a team of experts indicate that NIPF land owners generally have more departures from BMPs than found on public and industrial lands (IDL *et al*. 1993). Observations in the basin indeed show some poor practices on NIPF lands that lead to high sediment yield and these include: clear cutting on steep slopes which have lead to mass failures into streams; insufficiently sized and constructed stream crossings which have high erosion and slumping; and poorly built entrances onto main roads which in some cases have completely blocked main road drainage ditches.

Roads: Public Agency and Timber Industry - A road system in forested lands includes: the road surface along with water runoff management structures such as rolling dips and cross culverts; down gradient fillslopes and up gradient cutslopes; drainage ditches; and stream crossings. Road systems produce sediment mass and a percentage of that mass is delivered to basin streams. A common observed and measured feature of road segments is high variability in the mass of sediment produced, and many road segments produce little sediment but a few segments produce a large amount (Luce and Black 1999). The forested road density in the Priest River basin is generally moderate to high, ranging from 2 - 7 mi/mi^2 in many 5th order watersheds (Table 2-13).

Sediment production from the road surface will vary according to such factors as inherent erodibility and runoff producing capacity of the soil and running surface, degree of gravel capping, road gradient and road segment length, sufficiency and maintenance of water runoff management structures, and road use. Road surface erosion may be accelerated by rut formation when vehicles travel the road during the wet, spongy conditions of spring thaw and peak runoff. Road rutting is commonly observed in the Priest River basin, and the rutting channelizes water, increasing runoff velocity and erosional forces. Sediment production from the road surface and other parts of the road system does not equate to sediment yield to a stream. The ratio of yield to production often depends on the sediment exit point in proximity to stream locale, including the area of intervening forest floor which serves to function as a sediment trap settling area (Megahan and Ketcheson 1996).

Sediment production also comes from fillslopes and cutslopes. The cutslopes can contribute sediment to drainage ditches through soil creep, sheet wash, rilling, and slumping. A cutslope can intercept the shallow subsurface flow of forested floors, and this groundwater will surface and weep at the cutslope, at times accelerating erosion and slumping. Within the basin it is common to see weeping and high erosion rates on steep cutslopes, particularly within glacial till soils such as Priestlake-Treble.

Some road maintenance practices produce loosened soil which increases sediment production and yield. For example, a practice on some Bonner County roads in the basin is to yearly, scrape the drainage ditches and pile the spoils on top of the ditch crest. This practice removes ditch vegetation that holds sediment in place, breaks up armoring, and creates significant loose sediment. Observations during fall rains along these roads show very turbid ditch runoff discharging directly into streams.

Table 2-13. **Road Statistics for Priest River Basin Watersheds Based on either: Draft USFS Kaniksu Geographic Assessment (USFS 2000a); IDL - CWE Assessment; or DEQ GIS Analysis**

Streams (L)= §303(d) Listed (NL)= Non-listed c, d, e = source of data		Watershed area (mi^2)	Total road density (mi/mi^2 area)	Active road density[a] (mi/mi^2)	Stream crossing frequency (#crossings/mi of stream)	Riparian road density (total road mi/ mi^2 riparian area)[b]
Northern Streams						
(NL)	Hughes Fork[c]	60.1	3.1	--	0.6	2.5
(NL)	Upper Priest River[c]	77.6	1.2	--	0.6	1.4
(L)	Trapper Creek[d]	19.2	2.1	1.7	0.9	2.9
Eastern Streams						
(NL)	Caribou Creek[c]	32.8	1.3	--	0.7	1.4
(NL)	Lion Creek[c]	28.5	1.4	--	0.7	2.6
(L)	Two Mouth Creek[d]	24.3	3.2	2.4	1.3	3.7
(L)	Indian Creek[c]	23.5	2.4	--	1.2	4.0
(L)	Hunt Creek[c]	18.7	3.0	--	1.0	3.7
(L)	Soldier Creek[c]	20.6	2.1	--	0.7	2.5
(L)	Middle Fork East River[e]	34.0	4.3	3.2	1.4	6.2
(L)	North Fork East River[e] +main stem, - Lost Creek	23.5	5.1	3.1	1.4	5.9
(NL)	Big Creek[c]	15.3	7.1	--	1.8	6.6
Western Streams						
(L)	Tango Creek[e]	3.1	4.1	1.6	1.4	6.5
(NL)	Granite Creek[c]	99.3	3.0	--	0.6	3.1
(L)	Reeder Creek[e]	13.0	5.9	2.9	1.0	2.9
(L)	Kalispell Creek[e] w/o Diamond Crk subshed	3.0	3.0	1.9	0.8	3.6
(L)	Lamb Creek[e]	24.4	6.2	4.1	1.5	5.7
(L)	Binarch Creek[e]	11.3	5.4	2.2	1.2	5.7
(NL)	Upper West Branch[c]	71.0	5.9	--	1.0	5.5
(L)	Lower West Branch[e]	88.8	5.3	4.0	1.3	4.3
(NL)	Quartz Creek[c]	11.4	5.0	--	1.3	5.2
(L)	Priest River basin[c]	979.0	3.8	--	0.8	3.8

a= Active roads are: total roads - (closed and abandoned roads, and may include old jammer roads; and roads obliterated that have not been accounted for, i.e. not subtracted from the total road network)

b= All riparian road densities are from Draft USFS Kaniksu Geographic Assessment, and equals miles of the total road network divided by the determined riparian area surrounding perennial streams.

c= Data from Draft USFS Kaniksu Geographic Assessment, d= IDL - CWE Assessments, e= DEQ GIS Analysis

Mass failures occur along road systems, often more frequent than the mass failure rate in nondisturbed forests. Mass failures have been partially inventoried in the basin, and overall they occur at a relative low frequency. There are inventoried failures, however, that have slumped considerable tonnage of sediment directly into stream courses.

Some basin watersheds have a significant length of road within 20 - 300 ft of perennial streams. These stream course roads may be on steep benches where there is some distance to the stream, but steep slopes provide little sediment settling function and there is direct runoff to the stream. There are also stream course roads along low gradient valleys which encroach into the riparian and floodplain zones. Besides the high potential of direct sediment yield to streams, these roads can also lessen the function of floodplains by both decreasing flooded area and reducing the degree of stream meander. In some basin watersheds, estimates of riparian road density are as high as 10 - 15 mi/mi^2 riparian area (Panhandle Bull Trout TAT 1998a).

The overall trend in the basin of public agency and timber industry roads is a gradual reduction of the road network mileage. Some roads have been closed, abandoned and/or obliterated; old jammer roads have become brushed in; and new road networks are more efficiently designed and maintained.

Private Roads and Driveways **-** The basin trend in private road density, as associated with conversion of land for rural homesteads, is on the increase. When these roads are inventoried it is clear that many of them do not meet the standards of FPA roads. They are often not capped with gravel, they tend to become heavily rutted, and thus frequently graded which produces loose soil, and they do not have sufficient water runoff management structures when built on steep slopes. Home ownership along stream courses is desirable, and thus overall, there is a high potential of sediment delivery from private roads to streams.

Stream Crossings **-** Sediment yield to streams on a per area basis is generally highest at stream crossings. Sediment production from the road system that approaches stream crossings can be delivered directly, unless there is a good system of pre-crossing runoff diversion, and a presence of structures such as sediment traps or check dams within the approaching ditch line. Gravel armoring of road approaches is another method of reducing sediment yield. Stream crossing culverts can be undersized, damaged, or become plugged, leading to cutslope, road segment, and fillslope failures into the stream. Excessive velocity from culvert discharges can gouge out the downstream channel, which in turn can leave a sufficient drop between the culvert lip and stream bed to prevent upstream fish migration.

Frequency of stream crossings is high in parts of the basin, reaching 2 crossings/mile of perennial stream. Inventoried crossings in the basin range from: well maintained, proper functioning, with BMPs such as gravel armor at the aprons and sediment traps within approaching ditches; to poorly functioning and maintained stream crossings with obvious high sediment erosion and slumping, along with stream bed damage downstream of the culvert discharge.

Agriculture **-** Alfalfa and hay cropping on private lands occurs within the mid-western and lower portions of the basin. For the most part, this activity produces only minor amounts of sediment export except during times of periodic tillage. There are stream segments within private agriculture land that in the past have been straightened. Also, drainage channels have been constructed in surrounding wet soil lands to expedite the spring drainage of water and subsequent tending to hay crops. By eliminating stream meander and creating channelized draining, stream energy increases to the point of widening and damaging stream banks, greatly increasing sediment yield. Occasionally, there is mechanical re-deepening of cross drainage channels, and for the short term this greatly creates additional sediment to the parent stream.

Cattle grazing occurs on private lands as well as federal and state range allotments. There are several observed stream sections where direct cattle access has severely damaged stream banks and eliminated riparian vegetation needed for bank stability and stream shading.

In areas of cattle access to streams, there also is potential for fecal coliform pollution. To date, bacteria sampling has only shown two occurrences of instantaneous numeric criteria exceedance. Goose Creek, a stream tributary to Upper West Branch, had sample values of 770 and 2,000 *E. coli*/100 ml which exceeds the secondary contact criteria of year 2000 revised Standards.

Urbanization **-** Urban sources of sediment include runoff from access roads, driveways, disturbed hillslopes, and particularly new excavation and construction activities. Also observed is the removal of vegetation from stream riparian zones not regulated by the FPA (no commercial sale of timbered logs). Homestead development in the basin is often comprised of 5 - 20 acre ranchettes, which include large grazing animals that often have free access to streams running through private property.

Instream Bank Erosion **–** From recorded field observations and results of the 2000 stream bank erosion survey, it is known that stream bank erosion can be a significant direct sediment contributor to basin streams. There are reaches along main stems of C and F channel types with one or two confining banks that are at times high and steep. Areas have been documented where super saturated clay banks are eroding and sloughing, as well as unconsolidated sand-gravel-cobble banks. At times this is a natural condition related to insufficient root stabilizing vegetation. But there are observations where the condition has been obviously exacerbated by historic riparian logging, adjacent road fills, cattle access, and 4x4 access.

It is extremely difficult to partition current stream bank erosion rates to related factors such as: 1) natural occurring and remnants of effects from historic fires followed by increased flows, 2) remnant effects of historic timber harvesting in the riparian zone and construction of a transportation network, 3) excess stream energy of peak flows related to hydrologic openings from timber harvesting, 4) channel straigtening and conversion of wetlands and wet meadows for agriculture purposes, 5) excess current sediment loads which leads to a decrease in stream depth, and 6) the effect of floodplain encroaching roads, as the road can interfere with the stream’s natural tendency to seek a steady state gradient, and at high discharge periods may cause the stream to erode stream banks and the stream bed.

2.3.3 Data Gaps for Pollutant Sources

Within the last decade, between the development of GPS recording methods and computer GIS analysis, road surveys through the IDL - CWE assessments, and watershed surveys by the USFS, a good deal of information has been gathered on potential sediment yield sources in the basin. There was a particularly large volume of watershed information gathered in the lower western basin in association with the Douglas-fir beetle EIS. There was very little information however, that would lead to a reasonable estimate on the yield of sediment from eroding stream banks. A stream bank erosion survey conducted on selected stream segments within the basin during 2000 did provide some data for this assessment. Additional surveys of this type are still needed especially on private lands where cattle have free access to streams.

2.4 Summary of Past and Present Pollution Control Efforts

2.4.1 Idaho Department of Lands and Private Timber Industry

Since the 1970s, the Rules and Regulations pertaining to the Idaho Forest Practices Act (IDAPA 20.02.01) have caused State (IDL) and private industrial timber managers to take actions which reduce sediment production due to timber management (Best Management Practices, BMPs). Present timber harvests, road building, stream crossings, and maintenance, have all shown an overall improvement in relation to water quality within the watershed. IDL also administers the FPA for Non-industrial Private Forest (NIPF) timber harvests, but from observations in the basin, the level and effectiveness of BMPs applied fall short of those observed on state, federal, and private industrial lands.

Specific activities by IDL, private industry, and the USFS within the basin, meant to minimize or prevent erosion and sedimentation of streams include: 1) reconstruction of many older roads to meet current standards, 2) improved drainage structures, water bars, grass seeding, and relocating out of riparian areas, 3) upgrading of culvert sizes to prevent catastrophic failure, 4) natural dirt roads have been surfaced with gravel to eliminate road surface erosion, 5) temporary road closure activities with gates and/or berms, and 6) permanent road abandonment (or obliteration, with culverts removed and appropriate erosion control measures applied).

In 1990, Upper Priest River, Trapper Creek and Two Mouth Creek were designated as Stream Segments of Concern under Idaho's Antidegradation Agreement with EPA. A Local Working Committee (LWC) was formed, and the LWC findings were: "that the beneficial uses cold water biota (i.e. trout rearing) and salmonid spawning particularly in regard to the adfluvial westslope cutthroat trout, were not fully supported, and that road construction/maintenance problems, wildfire, and logging were all factors contributing to the stream's condition" (IDL 1991). The LWC established Site Specific Best Management Practices (SSBMPs), and these were adopted and have been applied by IDL (Trapper and Two Mouth Creeks), and USFS (Upper Priest River) since 1991. Some general areas of the SSBMPs include: 1) wider Stream Protection Zones (SPZs), and broader restrictions of harvesting, ground skidding and slash burning in SPZs of perennial class II streams and intermittent streams, 2) construction of slash filter windrows around stream crossings on new roads, 3) planned road construction or reopening of existing roads on geologically unstable land forms shall be reviewed and approved by an interdisciplinary team, and 4) increased inventory, inspection and maintenance of road surfaces, culverts, ditches, cuts and fills.

During the 1990s an IDL Cumulative Watershed Effects (CWE) process was developed (IDL 2000), a process that was designed to be incorporated into the FPA. The CWE process, as previously described in Section 2.2.3.1 (Table 2-9), has been applied in many of the basin's watersheds, both on State and Federal land. One outcome of the CWE process is that if an adverse condition related to cumulative effects of Forests Practices is detected, there is a requirement to develop and apply CWE Management Prescriptions (beyond the standard FPA - BMPs) to address the condition.

2.4.2 U.S. Forest Service

The national Forest Management Act (1976) requires that the Forest Service manage for a diversity of fish habitat to support viable fish populations. Management of Idaho Panhandle National Forest land in the Priest River basin follows standards for aquatic resources identified in the Forest Plan of the IPNF, as amended by the Inland Native Fish Strategy (USFS 1999). Forest Plan goals and objectives in part stipulate that fish habitats will be managed to maintain and improve the habitat of Management Indicator Species (MIS). This includes analysis of cumulative effects of proposed land use activities, and monitoring of aquatic habitats. The westslope cutthroat trout for example is considered a MIS for the basin.

Specific USFS forest management activities to minimize or prevent erosion and sedimentation of streams include those described in the 2nd paragraph of Section 2.4.1 above. USFS management guidelines are intended to meet or exceed the Idaho FPA. In the past ten years the Priest Lake Ranger District (PLRD) has obliterated approximately 160 miles of roads (through contracts), in an effort to restore fish and wildlife habitat (Janecek Cobb *pers comm*). As part of the current Douglas-fir beetle project, the PLRD is removing roads in riparian areas. USFS personnel have also constructed instream fish habitat enhancement structures such as artificial pools.

The USFS examines watersheds and streams on federal land with descriptors of Properly Functioning, Functioning at Risk, and Not Properly Functioning. Several west side watersheds in the basin have been identified with high percentages of the latter two categories, and the stream systems are considered hydrologically destabilized. The USFS establishes Desired Future Condition (DFC) characteristics for specific stream systems, and then sets management goals and objectives so that the systems may eventually reach the DFC. Within USFS documents, legacy issues such as large wildfires and historic logging practices have been identified as main contributing factors to a current condition of disequilibrium for some streams, and the USFS believes that these systems are heading toward a trend of stabilization (USFS 1999). The Binarch Creek watershed is an example. In other systems such as Lower West Branch, it is believed that the channel will not move towards stability until large-scale rehabilitation projects are implemented.

2.4.3 Agriculture and Grazing

Agricultural BMPs have been implemented to a minor degree within the basin, mainly consisting of fencing to deny cattle access to streams. Within the past couple of years however, the Idaho Soil Conservation Commission, the federal National Resources Conservation Service, Sandpoint office, and the Bonner Soil and Water Conservation District, have been quite involved in both assisting with development of TMDLs on agricultural lands, and initiating conservation programs with local ranchers.

As a recent example, the above organizations have established a comprehensive ranch management plan for a fairly large cattle and hay cropping ranch within a lower basin watershed. The land owner has signed a Continuous Conservation Reserve Program agreement whereby 2 miles of a badly degraded stream will be fenced off from cattle, and riparian shrubs will be planted along the stream banks. Another part of the stream rehabilitation, financed from a recently obtained cost-share grant, will be installation of several drop log structures with a goal of developing stream bank and stream bed stability, and form fish habitat pools.

2.4.4 Priest Lake Management Plan

Most efforts of the Priest Lake Management Plan, with implementation managed by the DEQ regional office in Coeur d'Alene, have to this point been focused on pollution prevention programs within and around the perimeter of Priest Lake. The plan however does encompass the entire Priest Lake basin, and there have been certain projects aimed at reducing home development impact on riparian zones near the mouths of streams, and ensure that new commercial and residential development along streams incorporate erosion control BMPs.

SECTION 3. ASSESSMENTS OF WATERBODIES AND WATERSHEDS, 5TH ORDER HUC

3.1 §303(d) Listed Streams Proposed for De-listing, with Sediment as the Listed Pollutant of Concern: Includes Streams De-listed in the DEQ 1998 §303(d) List

A. Trapper Creek

Summary
Trapper Creek was added to the 1994 §303(d) list, and retained on the 1996 list, as a result of a Stream Segment of Concern (SSOC) designation in 1990 under Idaho's Antidegradation Agreement with EPA. Listed pollutants are sediment and habitat alteration. In 1990 a SSOC Local Working Committee (LWC) was established. The LWC findings were: "that the beneficial uses cold water biota (i.e. trout rearing) and salmonid spawning particularly in regard to the adfluvial westslope cutthroat trout, were not fully supported, and that road construction/maintenance problems, wildfire, and logging were all factors contributing to the stream's condition" (IDL 1991). The LWC established Site Specific Best Management Practices (SSBMPs), and these were adopted and have been applied by IDL.

Based on BURP data collected in 1994 at two assessment sites, fish population data collected by the IDFG from 1991 - 1998, stream habitat data collected through SSOC monitoring in 1991, and IDL - CWE surveys conducted in 1995, Trapper Creek was found to fully support all of its designated and existing beneficial uses. Trapper Creek was de-listed from DEQ's 1998 §303(d) List with sediment as the listed pollutant of concern (IDEQ 1999). This SBA supports the de-listing.

3.1.A.1 Physical and Biological Characteristics

Trapper Creek is a 4th order tributary to Upper Priest Lake (Figure 2-2), with a watershed size of 12,292 acres and a main stem length of 7.9 miles (Table 2-2). There are approximately 29 miles of perennial streams in the watershed. Trapper Creek originates in the Selkirk Mountain crest and flows southwest to the upper lake. Tributaries to the main stem flow east to west. Elevation of the watershed ranges from 2,438 ft at the lake to 6,600 ft at Phoebe Tip. Average annual precipitation increases from 32 inches at the mouth to 50 - 60 inches at high elevations. Precipitation is mostly snow with a snowmelt dominated runoff pattern. Based on hydrographs for WY 1994 and 1995 established on Lion Creek and Two Mouth Creek (east side streams south of Trapper, see Two Mouth Creek hydrograph, Figure 3-4), high flow occurs between late April to mid-June (Rothrock and Mosier 1997). Peak flow in late spring is associated with daytime air temperatures greater than 80°F. Late winter rain-on-snow runoff events occasionally occur, but for Trapper Creek with its northern latitude, the effect on the daily flow pattern would likely be minimal.

Higher elevations of the watershed are glacially scoured resulting in thin or absent soils and relatively thin and isolated glacial drift patches (IDL 1997a). Bedrock type is granitic batholith (Figure 2-4). Most rock outcrop is hard, durable, and slightly weathered material. The general soil map of the basin describes high elevation soils as residual origin, Prouty-Jeru (Figure 2-5, Table 2-3). The main stem course, as well as most tributary stream courses, is within a glaciated valley with till deposited by receding glaciers (IDL 1997a). Glacial till general soil type is Priestlake-Treble. Soils in the watershed are considered to have a high inherent hazard for surface erosion (IDL 1997a).

Conifers in lower to mid-elevations include western hemlock, western red cedar, western white pine, Douglas-fir, grand fir, and western larch. Higher elevations support primarily Englemann spruce and subalpine fir, interspersed with numerous rock outcrops, scree slopes, and brushy areas. In 1967 the Trapper Peak Fire removed about 2,000 acres of conifer canopy in the headwaters (Figure 3-1c).

Figure 3-1a. Trapper Creek Watershed: streams, gradients, and sampling sites.

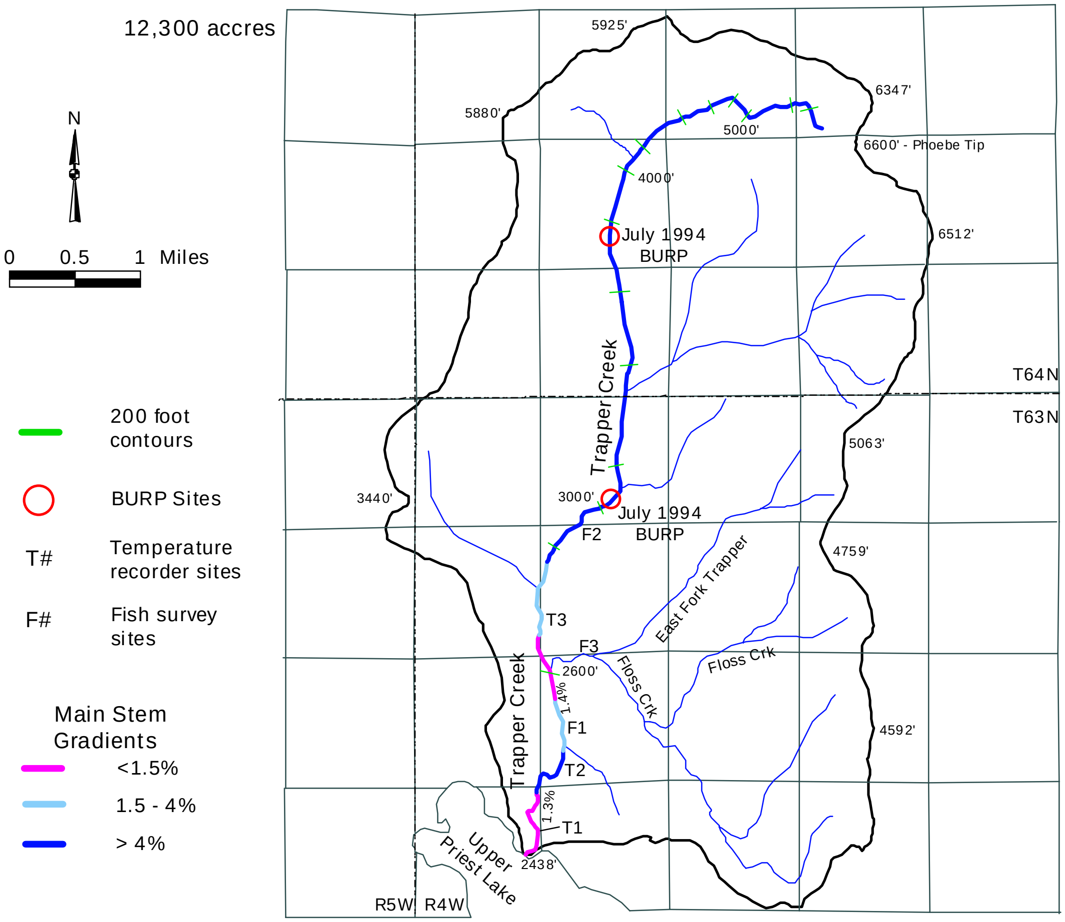


Figure 3-1b. Roads in the Trapper Creek Watershed.

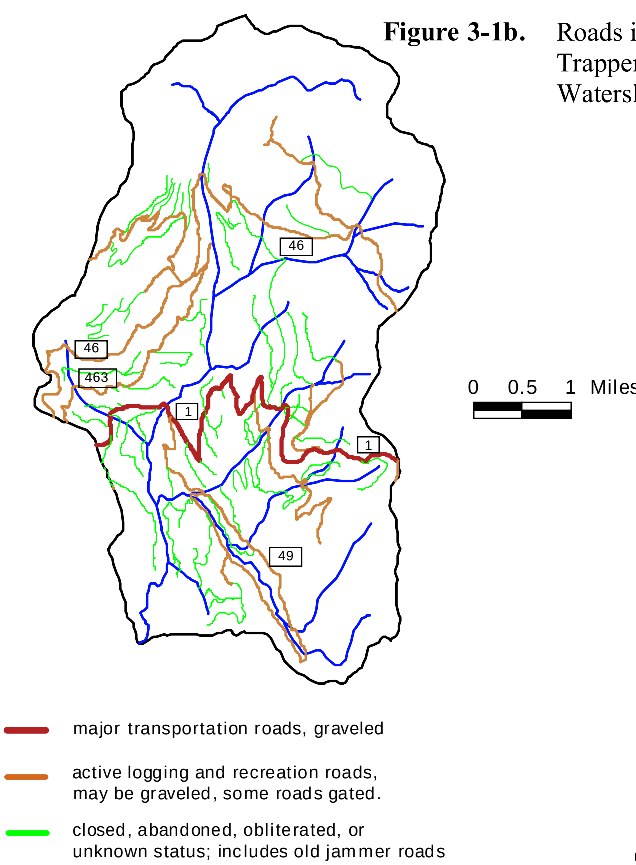
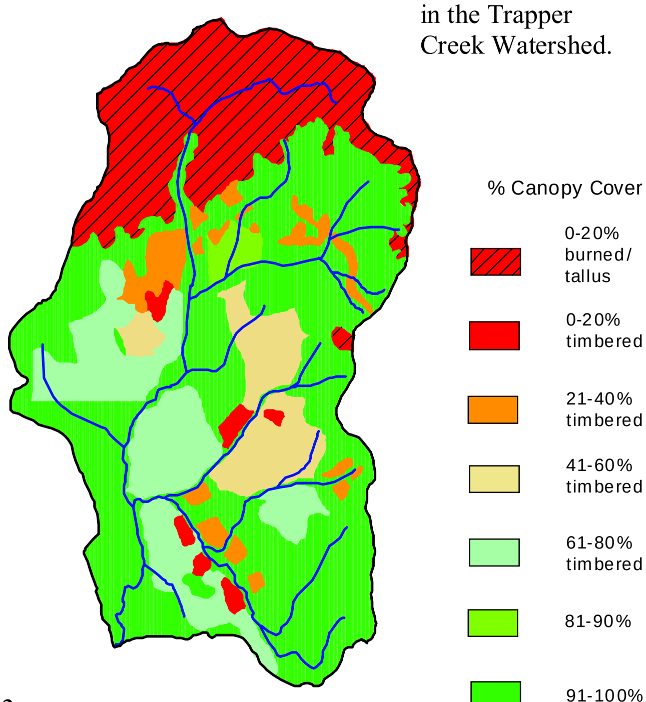


Figure 3-1c. Conifer canopy cover in the Trapper Creek Watershed.



Over 80% of the Trapper Creek main stem is moderate to steep gradient (1.5 - 13%) Rosgen B and A channel type (Figure 3-1a). Some stream segments are bedrock gorges with falls and cascading rapids. There are some stretches of gradual slope (<1.5%) in the lower one-third of the main stem. Several low gradient segments serve as fine sediment depositional zones, including ponds behind beaver dams. There are C channel segments with fairly wide riparian zones, standing water, and vigorous alder growth with a sparse conifer overstory. There are plentiful beds of gravel and cobble suitable for salmonid spawning.

Trapper Creek is a key bull trout watershed. Adfluvial bull trout of Upper Priest Lake spawn in Trapper Creek, and juveniles rear there for 2-3 years before migrating to the lake. The bull trout population is considered a small and "at risk" population (IDFG 2001). There is a barrier waterfall about 2.5 miles from the mouth and bull trout are not found above the barrier (Horner 1999). Brook trout are present but low in numbers. However, probable brook trout/bull trout hybrids have been sampled (Fredericks 1999). There are good densities of cutthroat trout in Trapper Creek, both below and above the waterfall barrier. It is believed that the majority of the cutthroat population is resident.

3.1.A.2 Cultural Characteristics

Trapper Creek watershed is remote, with land use primarily timber harvesting with some recreation use that includes snowmobiling. The majority of watershed acreage is owned and managed as timberland by the State of Idaho (Table 2-5). About 270 acres surrounding the mouth is federal land and managed as part of the Upper Priest Lake Scenic Special Management Area (withdrawn from the timber base).

As reported in 1995, timber had been harvested on 3,880 acres within the 30 previous years (Figure 3-1c). There has been slow vegetative and hydrologic recovery within the 2,000 acres of the 1967 fire due to high elevation and shallow soils (IDL 1997a). Unpaved road density is moderate.

3.1.A.3 Pollutant Source Inventory

Point Source Discharges
No point source discharges exist in the Trapper Creek watershed.

Nonpoint Sediment Sources

Mass Wasting - The 1995 IDL - CWE assessment rated mass failure sediment delivery as "low" (IDL 1997a). Only two instances of mass wasting were observed in the field observations, and both were associated with fillslope failures. Remediation measures have been implemented. No mass wasting was observed in timber harvest units or in undisturbed forested slopes.

Skid Trails - Historic timber harvesting used ground-based tractor skidding, some of this activity occurring in what is now defined as a FPA Stream Protection Zone (SPZ). CWE observations reported recovery of these old skid trails in the Trapper Creek watershed (IDL 1997a). New skid trails are outside the SPZ with vegetation and surface drainage BMPs to control erosion.

Roads and Stream Crossings - The 1995 CWE inventory of roads reported the following statistics: 18.3 miles of open road, 38.1 miles closed road with culverts removed (obliterated), 8 miles of closed road with culverts maintained, and 14.4 miles gated road, for a total of 79 miles of road. Total road density (minus obliterated roads) is 2.1 mi/mi^2, and active road density (including closed and gated) is 1.7 mi/mi^2. There are around 20 crossings of active roads across perennial streams, and an unknown number of crossings from closed and obliterated roads. The CWE field assessments were developed from evaluation of most open roads and some of the closed roads. Most roads near streams or in high risk areas were inspected.

The overall sediment delivery rating of roads was “low”, reflecting minor road surface and inside ditch erosion but little delivery to stream channels (IDL 1997a).

Encroaching and Riparian Roads **-** There are very few road segments within 50 feet of perennial streams, but there are a few miles of road within 300 feet. The primary stretch of riparian road is along both sides of the C channel section of Floss Creek (State Road 49, Figure 3-1b), with a total road distance of about 4 miles. Density of riparian roads within the watershed is estimated at 2.6 mi/mi^2 riparian area (Panhandle Bull Trout TAT 1998a), below the basin average.

Timber Harvesting and Peak Flows **-** The calculated CWE canopy removal index (CRI) for Trapper Creek was 0.29 (see Table 2-9, page 35). Combining the CRI with an average channel stability index of moderate produced a hydrologic risk rating of “low” (IDL 1997a). The channel stability index was low (favorable condition) for a lower stream reach, but only moderate for an upper reach primarily due to a low amount of woody debris. Results of Riffle Armor Stability Indices (see water quality data below) indicate good channel stability. It has been estimated that 55% of the watershed has been logged historically (Panhandle Bull Trout TAT 1998a).

3.1.A.4 Summary of Past and Present Pollution Control Efforts

See Section 2.4.1, page 59.

3.1.A.5 Water Quality Concerns & Status

Refer to Table A-1 for the history of DEQ §305(b) and §303(d) listings for Trapper Creek; Table 2-6 for designated and existing beneficial uses; and Table 2-12 for determined support status of designated and existing beneficial uses.

3.1.A.6 Summary and Analysis of Existing WQ Data

Based on hydrographs developed for Lion Creek and Two Mouth Creek, a peak flow for Trapper Creek in May 1995 (WY 1995 was near the 50 year precipitation mean) is estimated between 250 - 300 cfs (Rothrock and Mosier 1997). Late summer base flow is between 5 - 10 cfs. Water volume for WY 95 was estimated at 36,750 ac-ft, with a surface water yield of around 3 ac-ft/acre.

In the spring of 1994 and 1995, a total of 7 samples during peak flow were taken at the Trapper Creek mouth for water column parameters. One unique feature of all east side streams is the low amount of dissolved minerals coming from the granitic geology. Electrical conductivity ranged from 12 - 20 *u*mhos. Suspended sediment samples had a maximum value of only 2.1 mg/L TSS (1.4 NTU turbidity). A bedload of primarily large grained sand tends to roll along the bottom at high flows as opposed to staying suspended. All measurements of pH and DO were within cold water biota criteria. No samples for bacteria were taken.

The BURP MBIs for Trapper Creek were the highest recorded in the basin: 5.0 for the middle site and 5.1 for the upper site.

Fisheries data for westslope cutthroat trout and bull trout as sampled by IDFG since 1991 (surveys began in 1982) are presented in Table 3-1 with sampling site localities shown in Figure 3-1a. Brook trout are present but in very low densities.

Table 3-1. Results of IDFG Snorkeling and Electro-fishing in Trapper Creek

	Fish densities in fish/100 m²								
	1991	1992	1993	1994	1995	1996	1997	1998	Avg.
Cutthroat densities									
Above waterfall barrier ≈2.5 miles from mouth (F2 on map)	7.3	15.2	--	26.5	14.3	20.9	--	12.8	16.2
Below East Fork confluence (F1 on map))	4.3	3.8	1.3	4.5	3.2	4.8	2.9	6.4	3.9
East Fork Trapper (F3)	21.5	14.6	13.2	20.5	21.0	13.6	11.7	20.5	17.1
Bull trout below barrier									
densities	5.1	3.0	4.5	8.3	3.7	2.1	4.0	2.4	4.1
Total redds	--	--	4	4	2	5	3	2	3.3

Note: Bull trout redd counts in 1999 and 2000 showed 2 and 0 total redds respectively (Corsi *pers comm*).

Table 3-2. Selected Stream Habitat Parameters in SSOC Measurements, Trapper Creek, 1991

Parameter Measured	East Fork Trapper	Mid-Trapper	Upper-Trapper
Rosgen stream type	A3	B2	A3
Percent habitat area			
riffles	25%	36%	20%
glides	47%	36%	31%
pools	28%	28%	26%
shallows	0%	0%	23%
Habitat diversity index (100 is best)	50.0	50.0	86.8
Rearing quality (1:1 is good)	0.4:1	0.5:1	0.5:1
Cobble embeddedness	60%	75%	35%
Pool complexity (range is 0-10)	3.8	3.0	3.0
Residual pool index (filled=0, scoured=1)	0.43	0.33	0.66
Canopy cover	94%	66%	80%

There have been several surveys measuring fish habitat parameters related to the effects of stream sedimentation. In 1991 SSOC surveys (IDEQ 1994), three sites were measured: a middle site to represent a low gradient sediment depositional reach; an upper site to represent a low "impact" condition; and a site on the East Fork of Trapper Creek to represent a smaller 2nd order stream close to harvest and road building activity. Results of selected measured parameters are presented Table 3-2. Based on cobble embeddedness and residual pool index, the East Fork and mid-Trapper site had a higher degree of stream sedimentation, possibly linked to land use activity.

Results of the 1992 DEQ Use Attainability survey at one Trapper Creek site (Hartz 1993), include: overall habitat quality score was rated "good"; an above average (basin wide) pool frequency of 4.8 pools/100 m with a good pool complexity rating of 0.7 (1.0 maximum); but residual pool volume, at 104 m^3/km was well below the average for the wetted width stratified group of 3 - 5 m.

The BURP HI for the middle site was 108, one of the highest recorded in the basin. There were below mid-point scores for percent fines (29%), and a marginal slow/fast ratio of 0.5. At the upper BURP site HI = 96. Percent fines were low at 9%, but the slow/fast ratio was very poor at 0.13. For both BURP sites the wetted width/depth ratio was around 17, below the mid-point in BURP scoring, but a much more favorable ratio than the basin average of w/d = 27.

In 1998 IDL placed three HOBO® temperature sensors in Trapper Creek (Figure 3-1a), all within the lower one-third of the main stem. Hourly readings were tabulated from June 6 - October 5. Mean daily temperature from the middle site 2, as well as daily maximum temperatures, are plotted in Figure 3-2. For sites 1 - 3 mean July temperatures were 14.2, 13.8 and 13.3°C. Highest daily average was 16.8°C at site 1, and highest hourly temperature recorded was 18.9°C at site 1. The moving 7-day mean maximum daily temperature exceeded 10°C in early July (EPA bull trout criteria), and remained above that value until late September.

The CWE, stream canopy closure/temperature assessment, rated all main stem segments between each 200 foot contour as "low" (favorable, Table 2-9), except for the lowest three segments. In these lower segments the ranking was "high", or adverse temperature condition exists, with a 21 - 40% stream canopy cover. It is within this stream reach that the three temperature sensors were placed. The CWE report concluded that the lack of conifer canopy cover in these segments is a natural condition, with fairly wide riparian zones of saturated soils and vigorous alder growth preventing the regeneration of a conifer overstory (IDL 1997a).

3.1.A.7 Status of Beneficial Uses

There have been no documented exceedances of the pH and DO numeric criteria for cold water biota. The BURP MBI results along with the IDFG fish surveys indicate Full Support (FS) of cold water biota beneficial use. The fish sampling shows FS for salmonid spawning. Various stream habitat surveys do indicate less than optimum fish spawning and rearing conditions related to stream sedimentation. There are no bacteria data, so primary contact defers to cold water biota which shows FS.

Stream temperatures show that for at least the lower one-third of Trapper Creek, there are exceedances of both State Standards criteria for cutthroat trout spawning and incubation in July, and the EPA bull trout criteria from July - September.

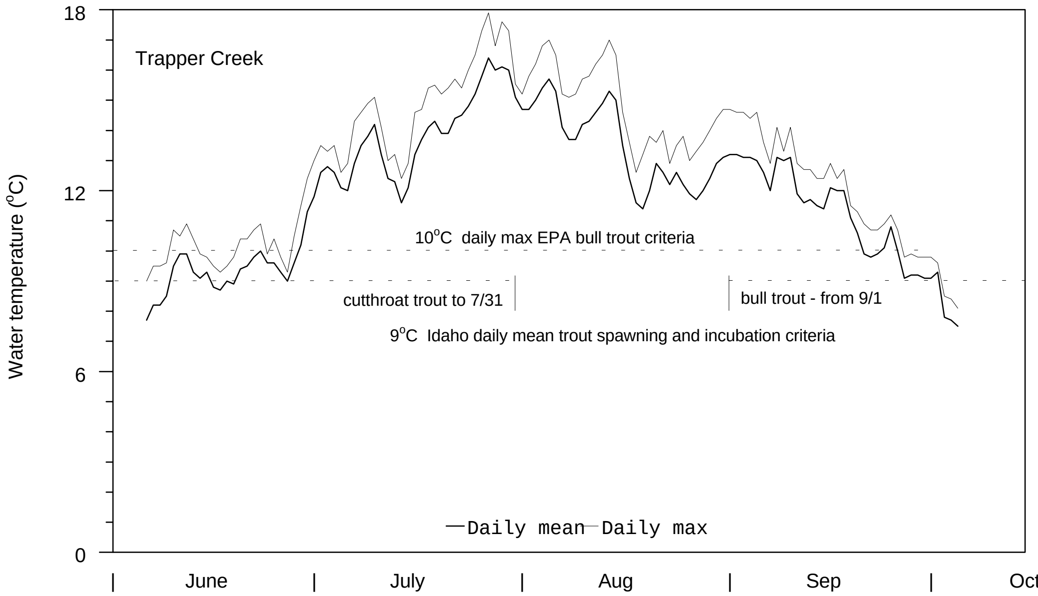


Figure 3-2. Mean daily and daily maximum water temperatures from June 6 - October 5, 1998 at Trapper Creek site 2.

3.1.A.8 Data Gaps

Depending on adoption of new temperature criteria in upcoming revisions of Idaho's Water Quality Standards, and where the new criteria limits are set, it would be useful to place temperature sensors in the middle and upper stretches of Trapper Creek where stream canopy cover is estimated at 91 - 100%. It would be anticipated that because of the significance of Trapper Creek as a key bull trout watershed, that fish sampling surveys, bull trout redd surveys, and habitat assessments would continue on a routine basis.

3.1 §303(d) Listed Streams Proposed for De-listing, with Sediment as the Listed Pollutant of Concern: Includes Streams De-listed in the DEQ 1998 §303(d) List

B. Two Mouth Creek

Summary

Two Mouth Creek was added to the 1994 §303(d) list and retained on the 1996 list, as a result of a Stream Segment of Concern (SSOC) designation in 1990 under Idaho's Antidegradation Agreement with EPA. Listed pollutants are sediment and habitat alteration. In 1990 a SSOC Local Working Committee (LWC) was established. The LWC findings were: "that the beneficial uses cold water biota (i.e. trout rearing) and salmonid spawning, particularly in regard to the adfluvial westslope cutthroat trout, were not fully supported, and that road construction/maintenance problems, wildfire, and logging were all factors contributing to the stream's condition" (IDL 1991). The LWC established Site Specific Best Management Practices (SSBMPs), and these were adopted and have been applied by IDL since 1991.

Two Mouth Creek was retained on the 1998 §303(d) List because DEQ retained all water bodies where water quality was determined by the EPA to be "threatened" in 1994 assessments (IDEQ 1999, see Table A-2). However, this SBA concludes that Two Mouth Creek fully supports all of its designated and existing beneficial uses based on: BURP data collected in 1994; fish population data collected by IDFG from 1991 - 1996, by BURP crews in 1994, and IDL in 1997; stream habitat data collected through SSOC monitoring in 1991 and 1994; and IDL - CWE surveys conducted in 1994. Two Mouth Creek is proposed for §303(d) de-listing with sediment as the listed pollutant of concern.

3.1.B.1 Physical and Biological Characteristics

Two Mouth Creek is a 3rd order tributary to Priest Lake (Figure 2-2), with a watershed size of 15,565 acres and a main stem length of 10.3 miles (Table 2-2). There are approximately 38 miles of perennial streams in the watershed. Two Mouth Creek originates in the Selkirk Mountain crest and flows west to the lake into Huckleberry Bay. Tributaries to the main stem flow north and south. Elevation of the watershed ranges from 2,438 ft at the lake to 7,292 ft at Harrison Peak. The watershed is characterized by steep, highly confined, bedrock, boulder, first order streams that quickly combine into the 3rd order main stem (IDL 1994).

Average annual precipitation increases from 32 inches at the mouth to 50 - 60 inches at high elevations. Precipitation is mostly snow with a snowmelt dominated runoff pattern. Based on hydrographs for WY 1994 and 1995, established by a stream gauge continuous recorder and numerous flow measurements (Rothrock and Mosier 1997), annual high flow occurs between late April to mid-June. The late spring peak flow is associated with daytime air temperatures greater than 80°F (Figure 3-4). Mid and late winter rain-on-snow events occur and can produce moderate rises in the hydrograph.

Higher elevations of the watershed are glacially scoured resulting in thin or absent soils and relatively thin and isolated glacial drift patches (IDL 1997b). Bedrock type is granitic batholith (Figure 2-4). Most rock outcrop is hard, durable, and slightly weathered material. The lower half of the stream course is within a glaciated valley with terraces of till deposited by receding glaciers (IDL 1997b). The area surrounding the mouth is glacial outwash and alluvium. The general soil map of the basin describes four soil groups in the basin (Figure 2-5, Table 2-3). In general, soils of the watershed are considered to have a high inherent hazard for surface erosion (IDL 1997b).

Conifers in lower to mid-elevations include western hemlock, western red cedar, western white pine, Douglas-fir, grand fir, and western larch (IDL 1997b). Higher elevations support primarily Englemann spruce and subalpine fir, interspersed with numerous rock outcrops, scree slopes, and brushy areas. There have not been extensive, stand replacing wildfires in the watershed over the last 100 years.

Only the initial one-half mile of Two Mouth Creek from the mouth is a gradual sloped channel (less than 1.5% gradient, Figure 3-3a). Going upstream, the next 4.5 miles is a mix of B and A channel ranging in gradient from 2.5-10%. The headwater stretch of 5.2 miles is all A channel, ranging from 5-20% gradient. A common reach type is a substrate of bedrock and boulders, including falls and cascading rapids. There are low gradient reaches that are sediment depositional zones, including ponds behind beaver dams. There are reaches of riffles and pool tailouts that have good quality gravel and cobbles for spawning. Broad floodplains are limited.

There are good densities of cutthroat trout, mainly resident populations. Brook trout are low to moderate in abundance. Bull trout are present but very low in numbers. There have been surveys for bull trout redds, but none have been found although spawning and rearing is suspected, and Two Mouth Creek is considered of high importance to bull trout recovery (Panhandle Basin Bull Trout TAT 1998a). In a 1956 survey, adfluvial cutthroat spawners were caught within the first five miles of Two Mouth Creek (Bjornn 1957). A barrier waterfall exists about 5 miles from the mouth.

3.1.B.2 Cultural Characteristics

Two Mouth Creek watershed is mostly State of Idaho Trust Land managed by IDL (91% of the watershed), but 820 acres of the eastern most mountain ridge is IPNF land, and 573 acres surrounding the mouth is privately owned (Figure 2-7 and Table 2-5). The private land is being developed by the Huckleberry Bay Company for single family homes/cabins, and this includes timber harvesting for lot development, construction of access roads, and operation of a sewage lagoon - land application system. A large block of 4,143 acres in the eastern high county is part of the Selkirk Crest Special Management Area, and withdrawn from the timber base (Figure 2-8). Besides timber management by IDL on state lands, there also are a few state lease cabins near the mouth of the stream. Recreation is popular in the watershed, with camping, hiking, hunting and snowmobiling.

Timber harvesting began in the watershed in the 1920s with flumes and skidways built as a means of moving logs down the stream to Priest Lake. Early logging primarily removed old growth white pine and cedar poles. During the late 1950s salvage logging was conducted to capture spruce bark beetle mortality, and this resulted in many low standard, poorly designed roads (IDL 1994). Logging on steeper slopes were jammer logged which required contour roads being constructed from 500 - 800 ft apart on slopes (IDL 1994).

As assessed in 1994 (IDL 1994), timber had been harvested on 4,611 acres within the 30 previous years (Figure 3-3c). The eastern half of the watershed as well as the southeastern mountain ridges have not recently been harvested or roaded. There is, however, a moderate degree of unpaved road density in the western half of the watershed (Figure 3-3b), with density of total roads calculating to 3.2 mi/mi^2 over the entire watershed, and about double that density if only the western half is considered.

3.1.B.3 Pollutant Source Inventory

Point Source Discharges
No point source discharges exist in the Two Mouth Creek watershed.

Nonpoint Sediment Sources

Mass Wasting - The 1994 IDL - CWE assessment rated mass failure sediment delivery as “low” (IDL 1997b). Only one moderate-sized roadfill mass failure was observed in field surveys, with some sediment delivery into a feeder stream.

Figure 3-3a. Two Mouth Creek Watershed: streams, gradients, and sampling sites.

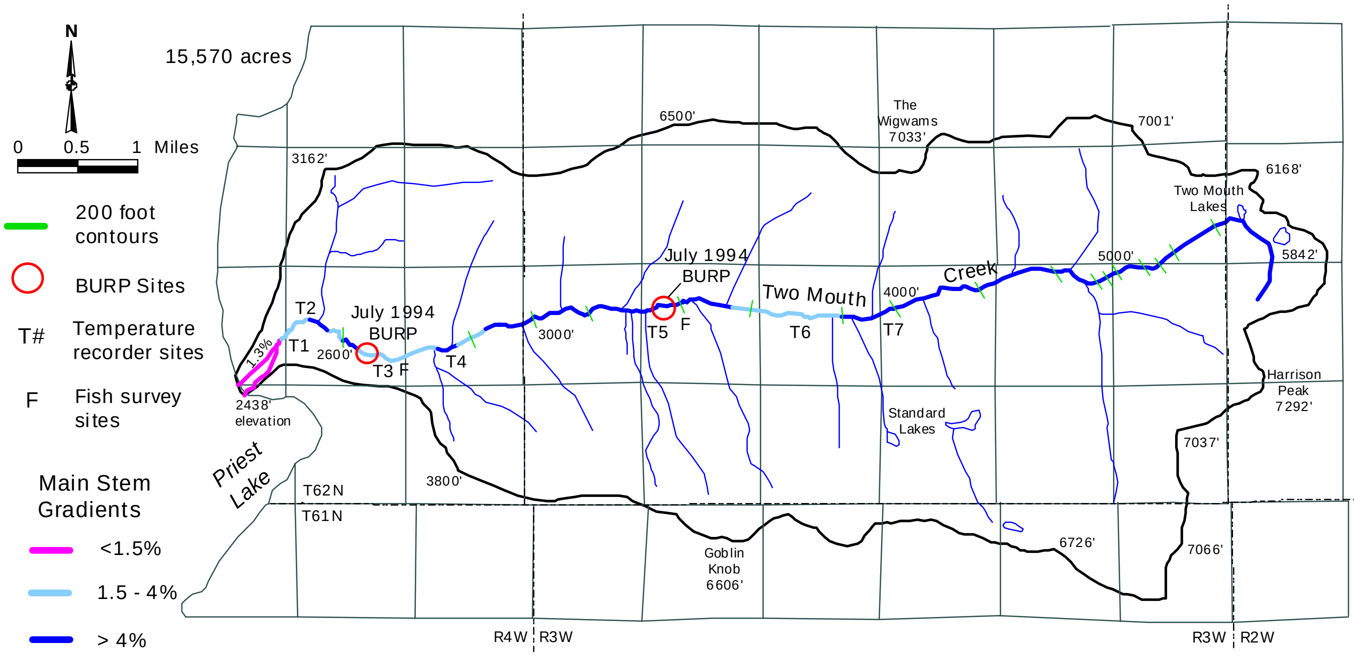


Figure 3-3b. Roads in the Two Mouth Creek Watershed.

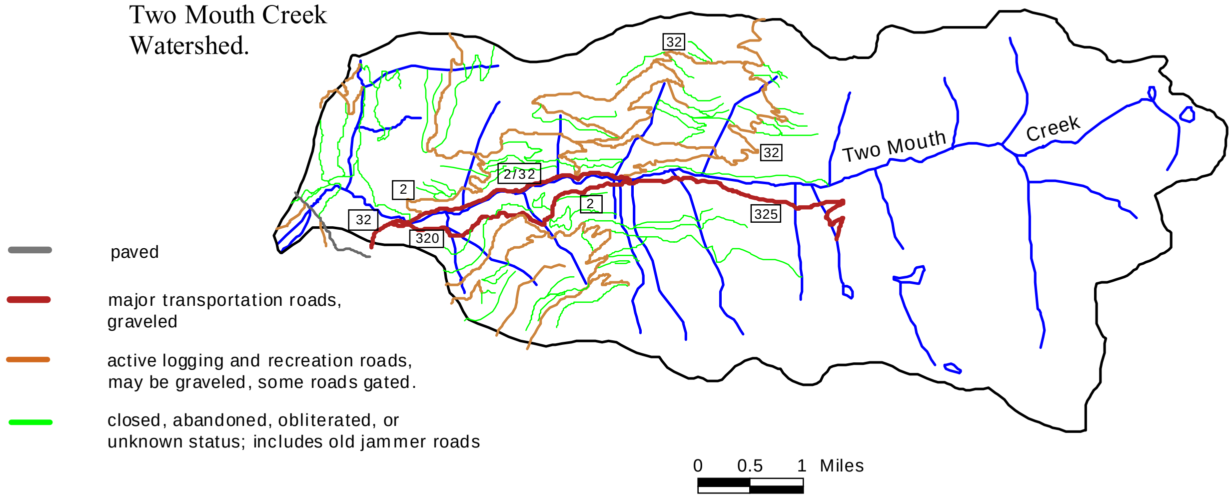
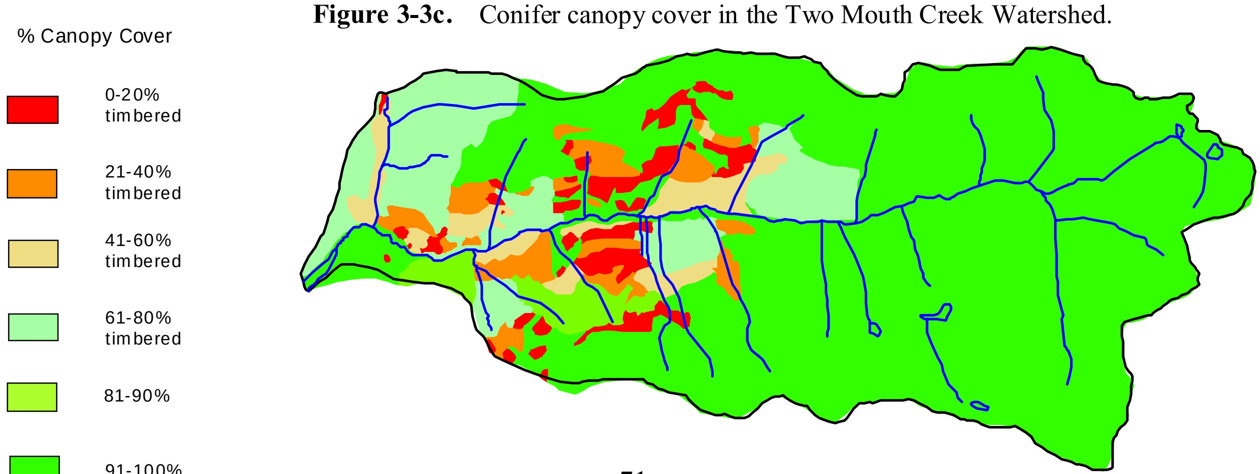


Figure 3-3c. Conifer canopy cover in the Two Mouth Creek Watershed.



Skid Trails **-** Historic timber harvesting used ground-based tractor skidding, some of this activity occurring in what is now defined as a FPA Stream Protection Zone (SPZ). CWE observations reported substantial recovery of these skid trails, and they will not be used in the future (IDL 1997b). New skid trails are outside the SPZ with vegetation and surface drainage BMPs to control erosion. The CWE assessment also reported that old jammer roads were brushed in and for the most part vegetatively recovered (IDL 1994).

Roads and Stream Crossings **-** The 1994 CWE inventory of roads reported the following statistics: 40 miles of open road, 18 miles of roads with other kinds of access controls, 12 miles of closed road with culverts removed, and approximately 20 miles of closed road with culverts still remaining, for a total of 78 miles of road (IDL 1997b). The CWE field assessments were developed from evaluation of most open roads and some of the closed roads. Most roads near streams or in high risk areas were inspected. The overall sediment delivery rating of roads was "low", reflecting minor road surface and inside ditch erosion but little delivery to stream channels.

Again, if only the roaded western portion of the watershed is considered in calculations (9,120 acres), total road density (active and closed with culverts remaining) is high at 5.5 mi/mi^2, and active road density (including roads with access controls) is 4.1 mi/mi^2. There are around 25 crossings of active roads across perennial streams, and an unknown number of crossings from closed and obliterated roads.

Encroaching and Riparian Roads **-** The major transportation road, State Road 2/32, travels 4.4 miles up Two Mouth Creek. About 3 miles of this road is within 300 ft of the main stem and as close as 50 ft in some reaches (Figure 3-3b). There would be some direct sediment delivery to the stream, and this road has likely impaired effective riparian function in some low gradient segments. One estimate of riparian road density in the watershed is quite high, 15.3 mi/mi^2 riparian area (Panhandle Bull Trout TAT 1998a).

Instream Erosion – A lower stream reach assessed during the 1994 CWE survey (about 1 mile from the mouth, C3 channel type), was found to have bank sloughing at a moderate frequency and size, with stream banks being eroded during annual bankfull conditions (IDL 1994). There was only moderate vegetative bank protection, and stream bank cutting was common. Based on other reaches surveyed, main stem segments with this degree of bank erosion is probably not extensive.

Timber Harvesting and Peak Flows **-** The calculated CWE canopy removal index (CRI) for Two Mouth Creek was 0.15 (Figure 3-3c, and see Table 2-9, page 35). IDL estimates that 2,800 acres of the watershed (18%) is in a natural opening condition (rock outcrops and talus slopes). Coupling the CRI with the channel stability index (CSI) produced a hydrologic risk rating of "low" (IDL 1997b). The CSI was moderate for a lower stream reach, and low (favorable condition) for an upper reach. The moderate CSI for the lower reach site (see *instream erosion* above) related to a low amount of woody debris, stream bank erosion and sloughing, and an altered streamside vegetative condition. The overall CSI is rated as moderate. Results of Riffle Armor Stability Indices (see water quality data below) indicate good channel stability. Historically, it has been estimated that 52% of the watershed has been logged (Panhandle Bull Trout TAT 1998a).

Urbanization - There are a few cabins and homes, access roads, and driveways in which stormwater runoff drains into the lower-most 0.6 miles of the stream (below East Shore road where the stream divides into two forks). Also, the sewage lagoon - land application system of Huckleberry Bay development resides within the lower-most watershed. There is routine sampling (four times yearly) for total coliform bacteria and nitrates of five monitoring wells within the land application area, as well as sampling of Two Mouth Creek down gradient of the land application area. Sampling is done by Intermountain Resources of Sandpoint, Idaho.

3.1.B.4 Summary of Past and Present Pollution Control Efforts

See Section 2.4.1, page 59.

3.1.A.5 Water Quality Concerns & Status

Refer to Table A-2 for the history of DEQ §305(b) and §303(d) listings for Two Mouth Creek; Table 2-6 for designated and existing beneficial uses; and Table 2-12 for determined support status of designated and existing beneficial uses.

3.1.A.6 Summary and Analysis of Existing WQ Data

The Two Mouth Creek hydrograph (Figure 3-4) shows that high flow in May 1995 was mostly between 300 - 350 cfs, but a one-day peak of 450 cfs was recorded (Rothrock and Mosier 1997). Late summer base flow is between 10 - 20 cfs. Water volume for WY 1995 was measured at 58,385 ac-ft, with a surface water yield of 3.7 ac-ft/acre.

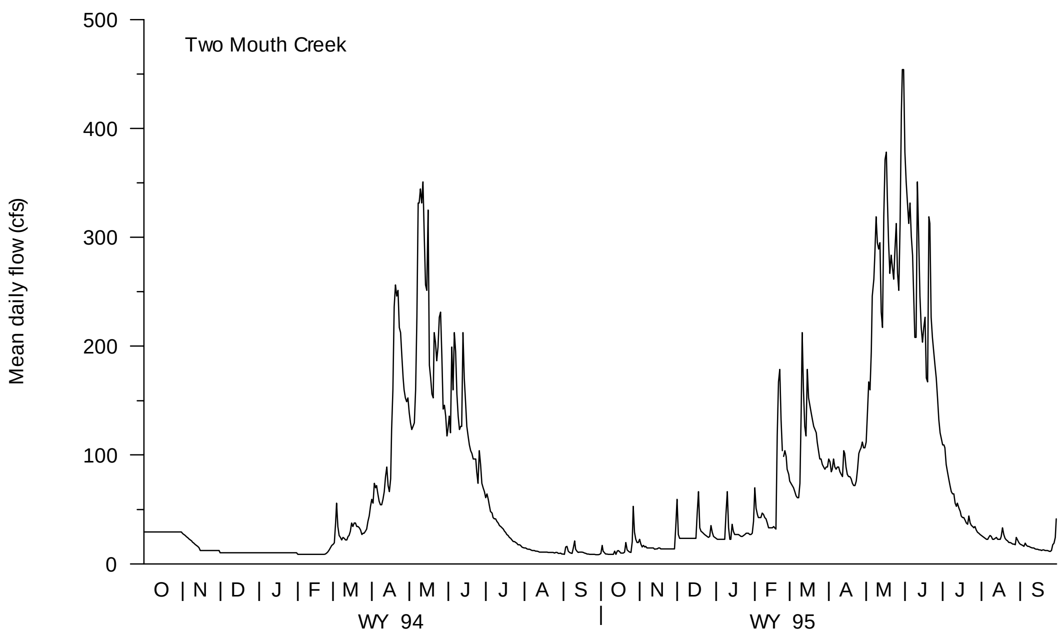


Figure 3-4. Mean daily flow rate for Two Mouth Creek, Water Years 1994 and 1995.

A total of 31 water quality sample runs were conducted between 1993 - 1995, in addition to 31 ISCO samples taken during spring runoff of 1994 and 1995. Dissolved minerals are low with ECs ranging from 10 - 20 *u*mhos. Suspended sediment concentrations were very low. The maximum sampled value was 15 mg/L TSS (7.2 NTU turbidity), and the mean TSS during spring runoff was 2 mg/L. Again, fine bedload is mostly large grained sand that does not readily suspend. Maximum total phosphorus was 50 *u*g/L, but mean TP during runoff was only 6 *u*g/L, about the same as base flow. Total nitrogen is extremely low, averaging between 60 - 100 *u*g/L.

Numerous instream measurements of pH and DO showed no numeric criteria exceedances. Samples for fecal coliform bacteria were not taken on Two Mouth Creek as part of the lake baseline study, but as mentioned earlier, total coliform samples are routinely taken as part of the conditional use permit for the

Huckleberry Bay sewage lagoon - land application system. The majority of results have been less than 50 TC/100 ml, and never above 500 TC/100 ml.

The BURP MBIs for Two Mouth Creek were 4.0 for the lower site, and 4.2 for the middle site (Figure 3-3a), both Full Support.

Fisheries data collected by IDFG, BURP crews, and IDL are presented in Table 3-3. Cutthroat trout densities range from low-moderate to high and show multiple age classes. Bull trout are present but low in numbers, and brook trout were low in abundance. In 1991 the IDFG conducted an additional snorkeling survey within 7 pools of Two Mouth Creek (IDEQ 1994). A total of 45 cutthroat trout and 8 bull trout were observed.

Table 3-3. IDFG and DEQ Snorkeling and Electro-fishing Results in Two Mouth Creek

	Densities in fish/100 m^2						
	IDFG Surveys by Snorkeling or Electro-fishing				BURP Electro-fishing		IDL Electro-fishing
	1987	1988	1989	1994	1994	1997	1997
Cutthroat trout	16.9	12.3	14.0	15.3	4.1	2.9	2.3
Bull trout	0.0	0.2	0.0	0.1	0.1	0.0	0.0
Brook trout	0.02	0.4	0.0	0.4	1.1	0.0	0.0
Sculpin	--	--	--	--	2.8	0.0	0.0

There have been several surveys measuring stream habitat parameters related to the effects of stream sedimentation. In 1991 SSOC surveys (IDEQ 1994), two reaches were measured: one mile above the mouth, and 4.5 miles above the mouth (about in the same vicinity as the BURP sites, Figure 3-3a). Both reaches are within the lower watershed timber harvesting zone. Results of selected measured parameters are presented in Table 3-4. The habitats were described as having a relatively low amount of deposited sand, good quality pools with complex habitat, and banks that were covered and stable (IDEQ 1994).

The 1992 DEQ Use Attainability survey (Hartz 1993) assessed 3 sites in Two Mouth Creek, all within the lower 2 miles of the stream. Results of the survey include:

- overall habitat quality score of “good” for sites 1 and 2, “fair” for site 3,
- pool complexity ratings of 0.7, 0.9, and 0.3 (1.0 maximum),
- pool frequency of 7.5 pools/100 m at site 1, but only 1.6 pools/100 m at sites 2 and 3, and
- residual pool volume of 292 m^3/km at site 1, above average for the wetted width group of 3-5 m, but 160 and 50 m^3/km at sites 2 and 3 which were below average for the wetted width group of 5-7 m.

Table 3-4. Selected Stream Habitat Parameters in SSOC Measurements, Two Mouth Creek, 1991

Parameter Measured	1 mile above mouth	4.5 miles above mouth
Rosgen stream type	B	B
Percent habitat area		
Riffles	47%	51%
Pools	53%	49%
Percent fines	17%	5%
Cobble embeddedness		
Riffles	30%	24%
Runs	33%	17%
Pools	45%	15%
Pool complexity (range is 0-10)	6.5	4.5
Canopy cover	53%	52%

The 1994 BURP survey recorded HI = 96 for the lower site and HI = 98 for the middle site, both above the basin average. Scores well below mid-point were similar for the two sites: a high degree inverse trapezoidal channel shape; a slow/fast ratio around 0.2; and a width/depth ratio of 24 at site 1, and a very poor ratio of 52 at site 2. Bank vegetation protection was also rated below mid-point. Percent fines were low, 16% at site 1 and only 7% at site 2.

In 1996 IDL placed seven HOBO® temperature sensors in Two Mouth Creek (Figure 3-3a for position), ranging from stream mile 0.5 to stream mile 6.2 (about two-thirds up the main stem). Hourly readings were tabulated from July 17 - September 30. Mean daily temperature at site 3, about 1.7 miles from the mouth, as well as daily maximum temperatures, are plotted in Figure 3-5. Note in Figure 3-5 the significant drops in stream temperature in late July and again in early August. All seven recorders showed this phenomenon, but the decreases would seem more than what could be attributed to changes in air temperature.

Averages for mean daily temperature from July 17 to August 31 were 12.3°C for sites 1 - 3, and then steady declines of 11.9, 11.2, 10.7, and 10.1°C for sites 4 - 7 respectively. Highest mean daily temperature was 14.7°C, and highest daily maximum was 16.7°C. The daily maximum temperatures remained above 10°C until mid-September (exceedance of EPA bull trout criteria).

The CWE, stream canopy closure/temperature assessment, rated the first five main stem segments (each 200 ft contour, from 2,400 ft to 3,400 ft elevation) as “high”, i.e. existing canopy cover is less than the target canopy cover needed to maintain stream temperatures. This lower five segment stretch represents about 40% of the main stem length. Canopy cover was estimated at 21 - 40% for the first 3 segments, and 41 - 70% for the last two. SSOC and BURP surveys, all within this lower reach, measured the canopy cover (spherical densiometer) at consistently around 50%. Also, the first 5 temperature sensors were within this reach. In the upper half of the main stem the CWE canopy cover estimates ranged from 71 - 90% with a rating of “low” (favorable cover).

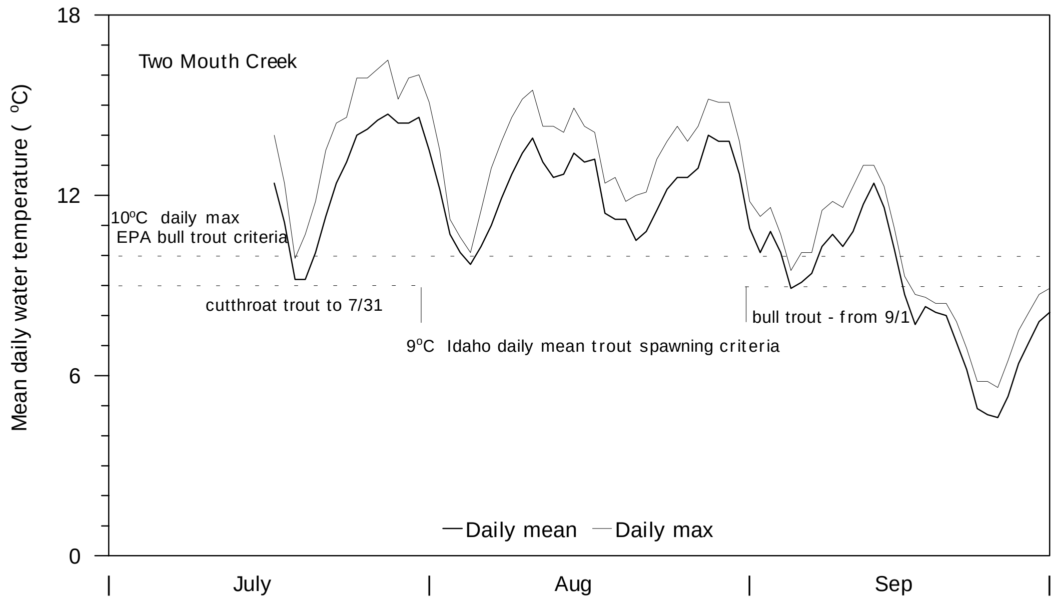


Figure 3-5. Mean daily and daily maximum water temperatures from July 17 - September 30, 1996 at Two Mouth Creek site 3.

The CWE report concludes that the below target stream canopy cover for the first 5 segments is, in part, a natural feature as the stream meanders through glacial outwash and alluvium, but also due to past harvesting that removed large cedar and hemlock adjacent to the stream prior to SPZ zones established by the FPA (IDL 1997b).

3.1.B.7 Status of Beneficial Uses

There have been no documented exceedances of the pH and DO numeric criteria for cold water biota. The BURP MBI results, and the IDFG and BURP fish surveys, indicate Full Support of cold water biota beneficial use. The fish sampling shows Full Support for salmonid spawning. Various stream habitat surveys indicate a range of less than optimum to good fish spawning and rearing conditions related to stream sedimentation. While percent fines appear low to moderate, and pool quality is adequate, there does appear to be a problem associated with channel widening and stream bank erosion. Bacteria data collected by Intermountain Resources shows that primary contact recreation is FS.

Stream temperatures show that for at least two-thirds of the Two Mouth Creek main stem, there are exceedances of both State Standards criteria for cutthroat trout spawning and incubation in July, and the EPA bull trout criteria from July - September.

3.1 §303(d) Listed Streams Proposed for De-listing, with Sediment and Nutrients as the Listed Pollutants of Concern: Includes Streams De-listed in the DEQ 1998 §303(d) List

C. Tango Creek

Summary
Tango Creek was added to the 1994 §303(d) list, and retained on the 1996 list, as a result of EPA analysis of the 1992 Idaho §305(b) report, Appendix D, in which DEQ evaluated cold water biota as supported/threatened and salmonid spawning as partial support. Listed pollutants are sediment and nutrients.

Based on BURP data collected in 1995 at one assessment site, fish population data collected by the USFS in 1996, and limited sampling as part of the 1993 - 1995 Priest Lake baseline study, Tango Creek was found to fully support all of its designated and exiting beneficial uses. In addition, land use activity has been moderate within the watershed and the associated road network is limited. Tango Creek was de-listed from DEQ's 1998 §303(d) List with sediment and nutrients as the listed pollutants of concern (IDEQ 1999), and this SBA supports the de-listing.

3.1.C.1 Physical and Biological Characteristics

Tango Creek is a small 1st order tributary on the west side of Priest Lake (Figure 2-2), flowing due east to the lake. Watershed size is 2,003 acres with a main stem length of 3.3 miles (Table 2-2). Tango Creek watershed is mostly forested and steep sloped, ranging in elevation from 2,438 ft at the lake to 5,400 ft just east of Blacktail Mountain. Average annual precipitation increases from 32 inches at the mouth to approximately 40 inches at high elevations. Precipitation is mostly snow with a snowmelt dominated runoff pattern. Based on numerous flow measurements at Beaver Creek, a nearby watershed to the north, high flow occurs between late March through May. Because of topography rising steeply to higher elevations, winter rain-on-snow runoff events would likely produce only minor spikes in the daily flow pattern, although, USFS rates the watershed as 85% sensitive snowpack (USFS 2000a).

Higher elevation lands surrounding the watershed are granitic batholith, while the valley hillslopes and stream cuts are glacial till and outwash (Figure 3-6b). The general soil map of the basin describes a Jeru glacial till soil that is stony-gravelly sandy loam, and a Hun residual soil that is gravelly silt-sandy loam (Figure 2-5 and Table 2-3). Both soils are rated as high for surface erosion hazard.

Conifers in moist cool slopes are mostly grand fir, hemlock and red cedar; while Douglas-fir, western larch, white pine, and lodgepole pine occupy semi-dry/dry soils. Around 1890 a fire ringed the ridge tops of the watershed (Figure 2-6), but there have been no large scale fires since then. Almost the entire length of Tango Creek is moderate to steep gradient (6 - 16%) Rosgen A channel type (Figure 3-6a). There are no stretches of wide flood plains. Brook trout and cutthroat trout have been collected in recent electro-fishing efforts. Tango Creek is considered low priority in bull trout recovery plans (Panhandle Basin Bull Trout TAT 1998a).

3.1.C.2 Cultural Characteristics

The entire Tango Creek watershed is National Forest land. Fifty acres surrounding the mouth is part of the Priest Lake Recreation SMA, and 230 acres in the north are part of the Bottle Lake and Tepee Creek Research Natural Area (Figure 3-6c). The remaining acreage is managed for timber production. There was only limited early century logging in the watershed, and harvesting in the past 25 years has occurred on approximately 230 acres, primarily within the lower southern portion of the watershed (Figure 3-6e, USFS 1998b). USFS estimates that historically, 11% of the watershed has been logged (USFS 2000a).

3.1.C.3 Pollutant Source Inventory

Point Source Discharges
No point source discharges exist in the Tango Creek watershed.

Nonpoint Sediment Sources

Mass Wasting **-** USFS rates the watershed as low to medium for mass failure hazard (USFS 1998b). There have been no reported mass failures in the watershed.

Roads and Stream Crossings **-** GIS analysis of total unpaved roads in the watershed show a total of 12.7 miles, for a moderate road density of 4.1 mi/mi^2 (Figure 3-6d). More than half of this road network is closed, abandoned and/or obliterated, and the active road network of 5 miles produces a density of 1.6 mi/mi^2. The closed network of roads on hillslopes north of Tango Creek (Figure 3-6d), has been proposed for obliteration under the Douglas-fir beetle project (USFS 1999). There are around 5 road crossings across Tango Creek. Forest Road 638 is a primary road going up the stream, and is widely used for recreation including hunting and huckleberry picking. The first 1.2 miles of this road is within 50 - 300 feet of the stream. The road does not intrude on a floodplain, it is cut into a hillslope above the stream. This road segment could produce and deliver sediment into the stream. This 1.2 mile section is proposed for reconstruction under the Douglas-fir beetle project (USFS 1999).

3.1.C.4 Summary of Past and Present Pollution Control Efforts

See Section 2.4.2, page 60.

3.1.C.5 Water Quality Concerns & Status

Refer to Table A-3 for the history of DEQ §305(b) and §303(d) listings for Tango Creek; Table 2-6 for designated and existing beneficial uses; and Table 2-12 for determined support status of designated and existing beneficial uses.

3.1.C.6 Summary and Analysis of Existing WQ Data

Based on frequent flow measurements taken at Beaver Creek from 1993 - 1995, and two flow measurements taken on Tango Creek during spring high flow, peak flow for Tango Creek is estimated between 25 - 30 cfs (Rothrock and Mosier 1997). Late summer base flow is around 1 - 2 cfs.

Three water quality samples, all at peak flow, were taken at the mouth of Tango Creek in 1994 and 1995. Total phosphorus was low, ranging from <2 - 11 *u*g/L, and total nitrogen was extremely low ranging from 25 - 37 *u*g/L. These values are below TP and TN ranges from Beaver Creek with a sample size of n=15. Visual inspection of the stream bed within lower reaches of Tango Creek show no signs that the Standards Narrative criteria for excess nutrients is being exceeded.

Suspended sediment at Tango Creek had a maximum value of only 3.3 mg/L (1.7 NTU turbidity). There are insufficient measurements of pH, DO, and temperature to judge cold water biota numeric criteria. No samples for bacteria have been taken.

The BURP MBI for Tango Creek was 4.5. In 1996, USFS electro-fished Tango Creek near the mouth. Cutthroat trout were captured at a density of 2.9 fish/100 m^2, with two age classes including juveniles. Only three brook trout were sampled, 0.9 fish/100 m^2, with two age classes. No other species were reported. IDFG conducted a fish survey in 1987, and 38 cutthroat trout were captured (Horner *et at.* 1988).

Figure 3-6a. Tango Creek Watershed: streams, gradients, and sampling sites.

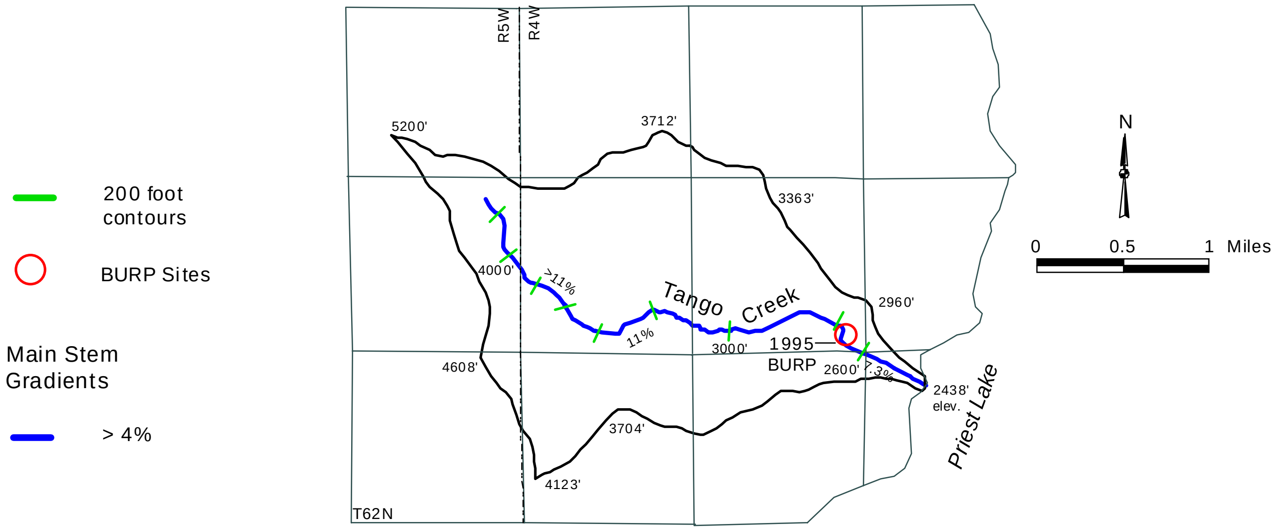


Figure 3-6b. Geology of the Tango Creek watershed.

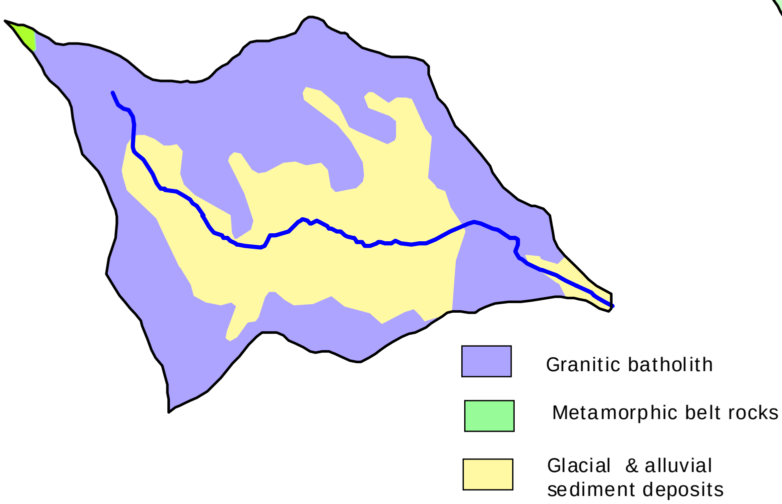


Figure 3-6c. General land use in the Tango Creek watershed.

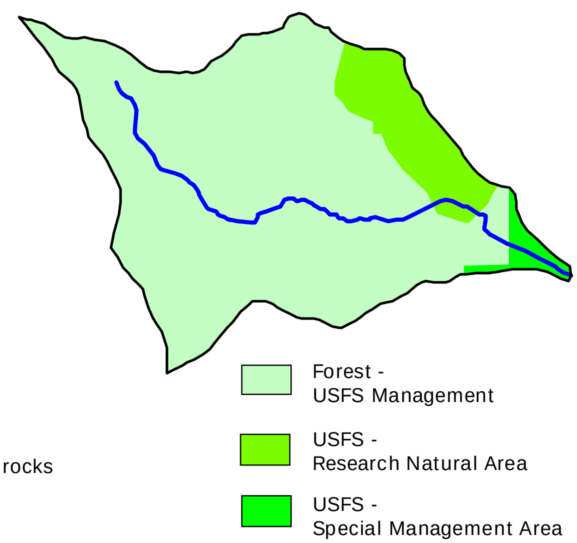


Figure 3-6d. Roads of the Tango Creek watershed.

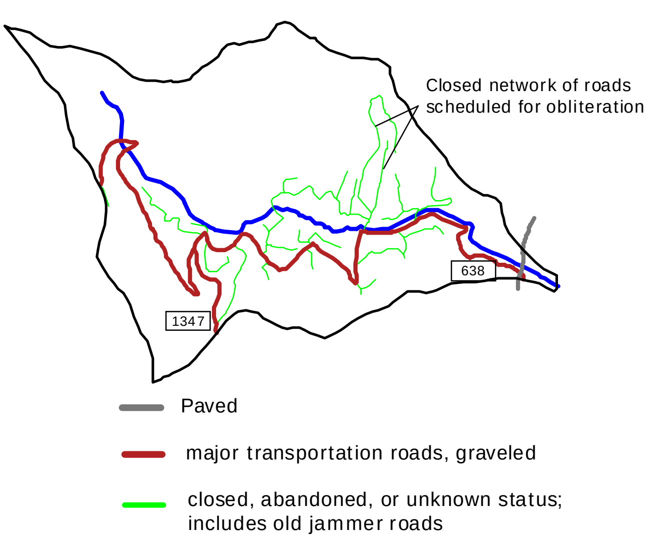
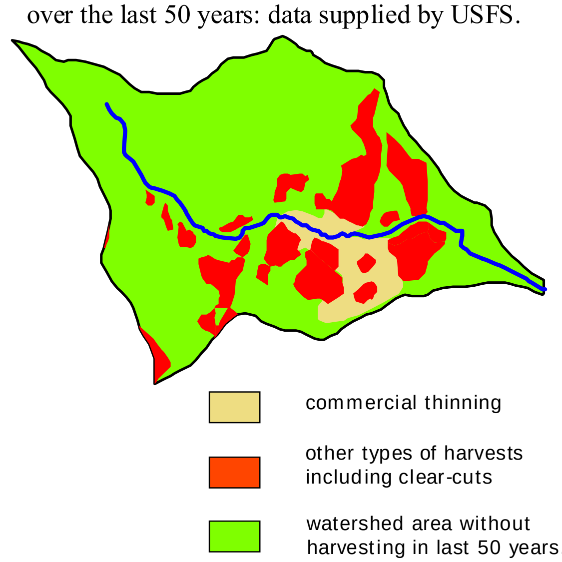


Figure 3-6e. Timber harvests in the Tango Creek Watershed over the last 50 years: data supplied by USFS.



The BURP HI score of 117 was the highest recorded in the basin. The BURP stream reach was in a deep V-shaped valley, good canopy cover of red cedar and grand fir, and stable channel bottom with boulders. Scores below mid-point were 31% fines, a slow/fast ratio of 0.1, and 50% bank vegetation cover.

3.1.C.7 Status of Beneficial Uses

The BURP MBI result is Full Support of cold water biota beneficial use. USFS and IDFG fish surveys, in conjunction with the BURP HI score, result in Full Support for salmonid spawning. The BURP stream habitat survey does indicate less than optimum fish spawning and rearing conditions related to percent fines and pool frequency. Samples for total phosphorus are well below the EPA established 50 *u*g/L instream criteria (EPA 1986), and numerous samples taken in nearby Beaver Creek never exceeded 15 *u*g/L TP. Nutrients are not a pollutant of concern for Tango Creek. There are no bacteria data, so secondary contact recreation defers to cold water biota which shows FS.

3.1.C.8 Data Gaps

Further electro-fishing and stream habitat surveys would be beneficial in further assessing beneficial uses in Tango Creek.

3.1 §303(d) Listed Streams Proposed for De-listing, with Sediment as the Listed Pollutant of Concern: Includes Streams De-listed in the DEQ 1998 §303(d) List

D. Lamb Creek

Summary

Lamb Creek was added to the 1994 §303(d) list, and retained on the 1996 list as a result of EPA analysis of the 1992 §305(b) report, Appendix D, in which IDFG and DEQ evaluated cold water biota as partial support and salmonid spawning as not supported. The listed pollutant is sediment.

Lamb Creek was de-listed in the 1998 §303(d) List (DEQ 1999) based on 1995 BURP data in which MBIs for a lower and upper site were Full Support for cold water biota beneficial use. BURP was repeated in 1997 at nearby lower and upper sites (data analyzed after the 1998 List), and MBI=3.4 at both sites resulted in a Needs Verification status call after following the Determination Flow Chart (Figure 2-10).

At the time of the 1998 §303(d) List, there had only been a single fish sampling within Lamb Creek (by USFS in 1995). In 2000, DEQ conducted electro-fishing at a lower and upper BURP site, and while no cutthroat trout were captured, there was good density of brook trout at both sites, and abundant sculpins at the lower site. Historically, Lamb Creek would have been inhabited by native cutthroat trout and bull trout, but the only fish survey for historic comparison was in 1956, where Lamb Creek was characterized as brook trout dominated with no mention of cutthroat trout observed or captured (Bjornn 1957).

Because both USFS and DEQ electro-fishing show a thriving brook trout population with FS for salmonid spawning, Full Support of cold water biota beneficial use is indicated. This SBA supports the §303(d) de-listing of Lamb Creek with sediment as the listed pollutant of concern.

Stream habitat data from BURP, DEQ Use Attainability, and a USFS R1/R4 survey together show poor to medium habitat values, although three out of four BURP Habitat Indexes were above the basin average (HIs = 97-99). USFS rates the Lamb Creek watershed system as hydrologically destabilized, with 30% Not Properly Functioning condition and 70% Functioning at Risk condition (USFS 1999). This condition in part relates to a stream bedload of sand that exceeds the stream's capacity to transport it.

As common with several of the mid to lower western watersheds, the Lamb Creek drainage has legacy issues with large fire events between 1890 - 1939, intermixed with salvage logging. There is also a natural geologic condition of granitic batholith. In addition, a large wetland - wet meadow floodplain of lower Lamb Creek has had modifications for development of hay cropping and grazing, including cross ditches to facilitate drainage. The historic wetland - wet meadow complex surrounding the lower-most stream reach has also been modified for rural residential/commercial development. These modifications have lessened the wetlands historic function of decreasing stream energy by affording a wide floodplain, and to allow a stream meandering pattern.

Sediment load calculations for the Lamb Creek watershed presented in Section 4 and summarized in this section suggest that the current sediment load represents a moderate increase over background, and possibly could inhibit any future fisheries management effort to restore cutthroat trout within the stream system. The road network has a relative high density, there are some ongoing agriculture impacts, there is hydrologic instability leading to stream bank erosion, and there is ever increasing urbanization impacts at the lower end of the drainage. There are opportunities for reduction of watershed sediment delivery and riparian improvement, from both public and private lands, which may aid in the desired future trend toward a more stabilized stream system.

3.1.D.1 Physical and Biological Characteristics

Lamb Creek is a 3rd order tributary on the west side of Priest Lake (Figure 2-2) flowing southeast to the Priest Lake outlet channel, just upstream of the outlet dam (Figure 3-7a). Main stem length is 12.8 miles, watershed size is 15,615 acres (Table 2-2), and there are approximately 31 miles of perennial streams. The lower half of Lamb Creek flows through a broad flat terrain, and the watershed is flanked on the south, west and northwest by mountains. Elevation ranges from 2,438 ft at the outlet channel to 5,476 ft at Gleason Mountain, but most mountain ridges are between 3,400 - 4,200 ft elevation. Average annual precipitation increases from 32 inches at the mouth to approximately 40 inches at high elevations. Precipitation is 25 - 50% snow with a snowmelt dominated runoff pattern. Peak flow is during mid-March through late April (Figure 3-8). The large area of gradual topography in the lower watershed ranging from 2,440 - 3,000 ft elevation does experience late winter rain-on-snow events with moderate rises in the hydrograph. USFS classifies around 45% of the drainage as having sensitive snowpack (USFS 1999).

Higher elevation lands of the north and west are granitic batholith, valley hillslopes and stream bottom lands are glacial outwash and till, and alluvial deposits, and the southern mountain ridge is belt rock, an extension of the geology of Binarch Creek watershed (Figure 2-4 and Figure 4-2). The general soil map of the west side Priest Lake basin describes the Lamb Creek bottom lands as Bonner soil, and the western higher slopes as Hun - Jeru soils (Figure 2-5, Table 2-3).

Around 1890, the lower and upper drainage of Lamb Creek was burned in a large wildfire (Figure 2-6). Large fires between 1925 - 1939 burned sections of the western and northern hillslopes. Forest types in the watershed are currently dominated by Douglas-fir, grand fir/western hemlock, and western larch (USFS 1999). A portion of forested land currently has Douglas-fir beetle caused mortality.

The lower one-half of Lamb Creek is primarily gradual sloped Rosgen C4 and C5 channel type (Figure 3-7a), with a majority of this section less than 0.5% slope. This lower stream course has floodplains with riparian vegetation a mixture of alders, other shrubs, and a few reaches of dense conifer overstory. The lower watershed has wetlands, wet meadows, and upland meadows, with some of these lands converted to hay cropping, grazing, and residential/business development. Historically, a major area of the lower reach was likely a large contiguous wetland (USFS 1998a).

Depositional zones of the lower reach are often a thick layer of large grained sand. Channel habitat is often runs, glides and scour pools. Some sections have large deep pools of decent quality that provide overwintering habitat (USFS 1999). But often, pool quality is rated poor to moderate due to lack of instream cover. While there are some sections of large woody debris incorporated into the stream banks forming pools, overall there is insufficient LWD because of few recruitable conifer trees in the riparian zones. There are reaches of riffles, runs and pool tailouts with gravel and cobble suitable for spawning. Beaver dams and pools are common. Within the upper B and A channels, granite bedrock and boulders are part of the stream channel and there is often a good canopy cover.

Brook trout are abundant, and possibly the only salmonid in Lamb Creek. USFS believes that remnant cutthroat populations are present in upper headwater portions of Lamb Creek and Skip Creek (USFS 1998a), but no cutthroats were sampled by DEQ electro-fishing within an upper reach. In a 1956 survey, Lamb Creek was described as a typical brook trout stream with little value for cutthroat spawning (Bjornn 1957). It is likely that Priest Lake adfluvial bull trout once migrated into Lamb Creek, but they are probably not present now, and Lamb Creek is considered low priority in bull trout recovery plans (Panhandle Basin Bull Trout TAT 1998a).

Figure 3-7a. Lamb Creek Watershed: streams, BURP sites, and gradients.

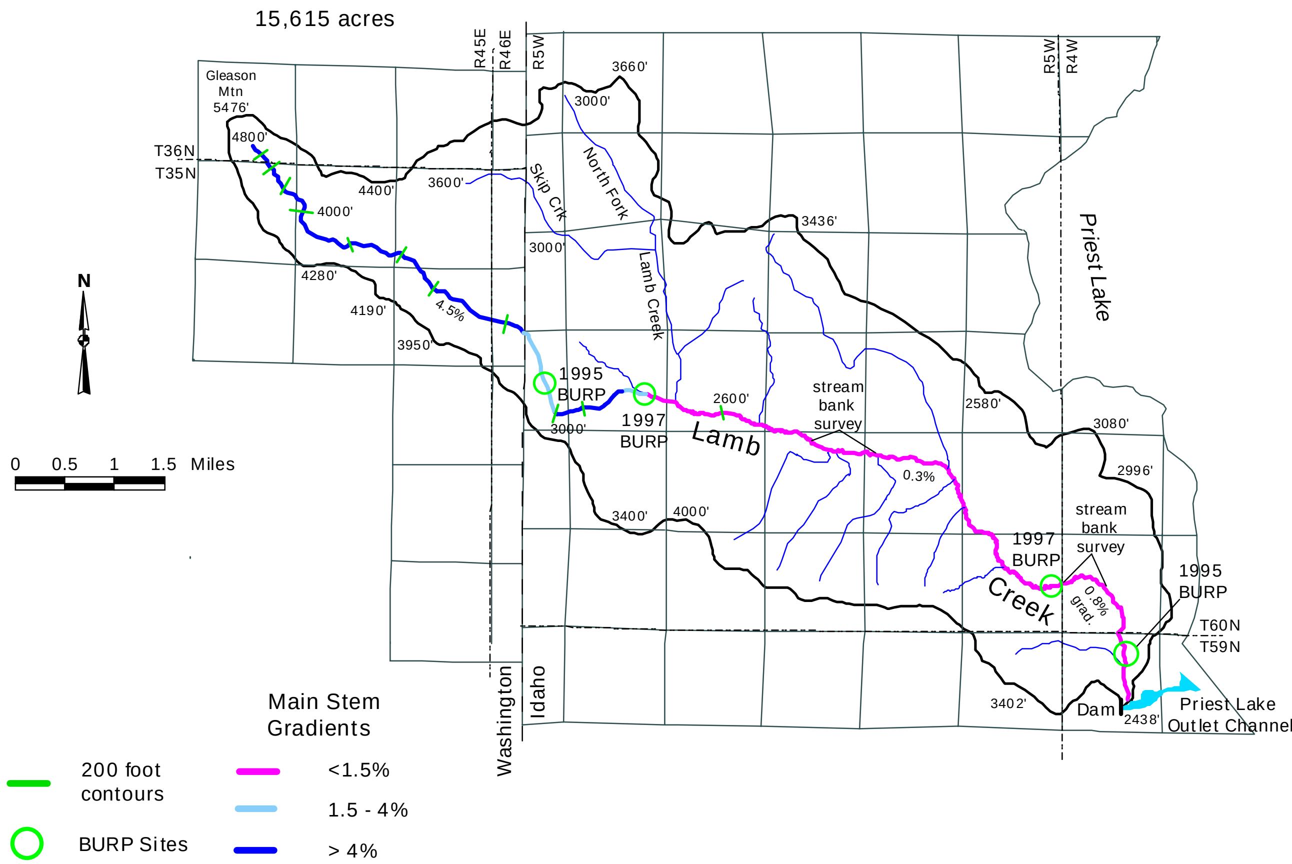


Figure 3-7b. General land use and ownership in the Lamb Creek Watershed.

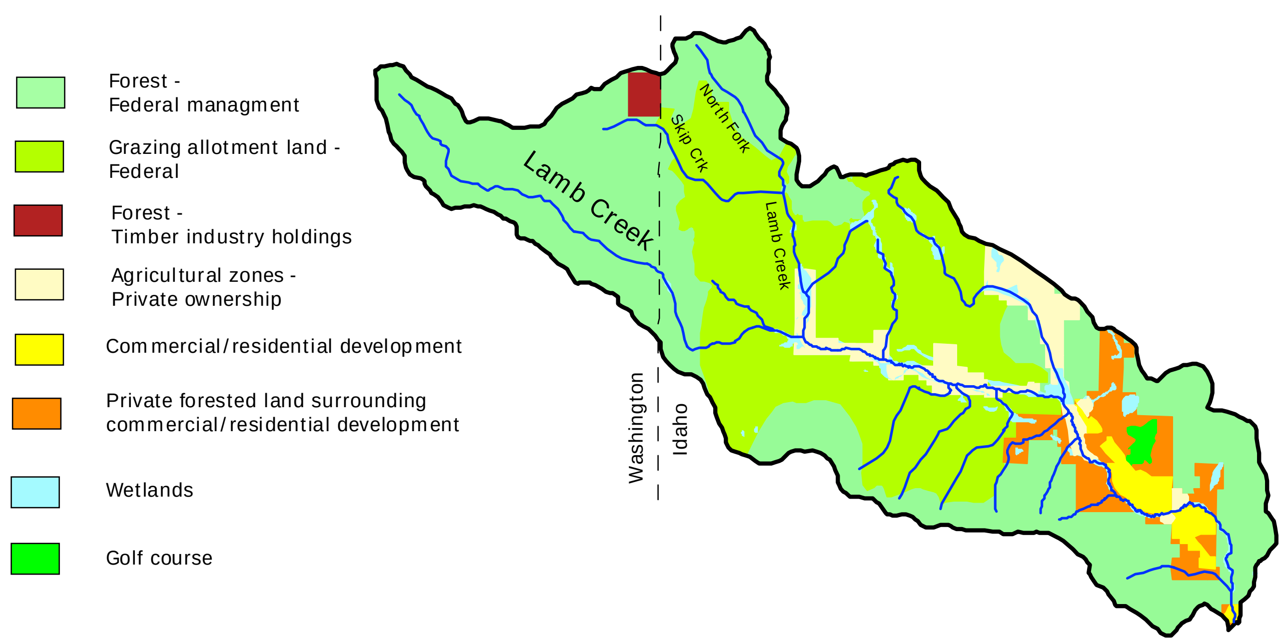


Figure 3-7c. Roads in the Lamb Creek Watershed.

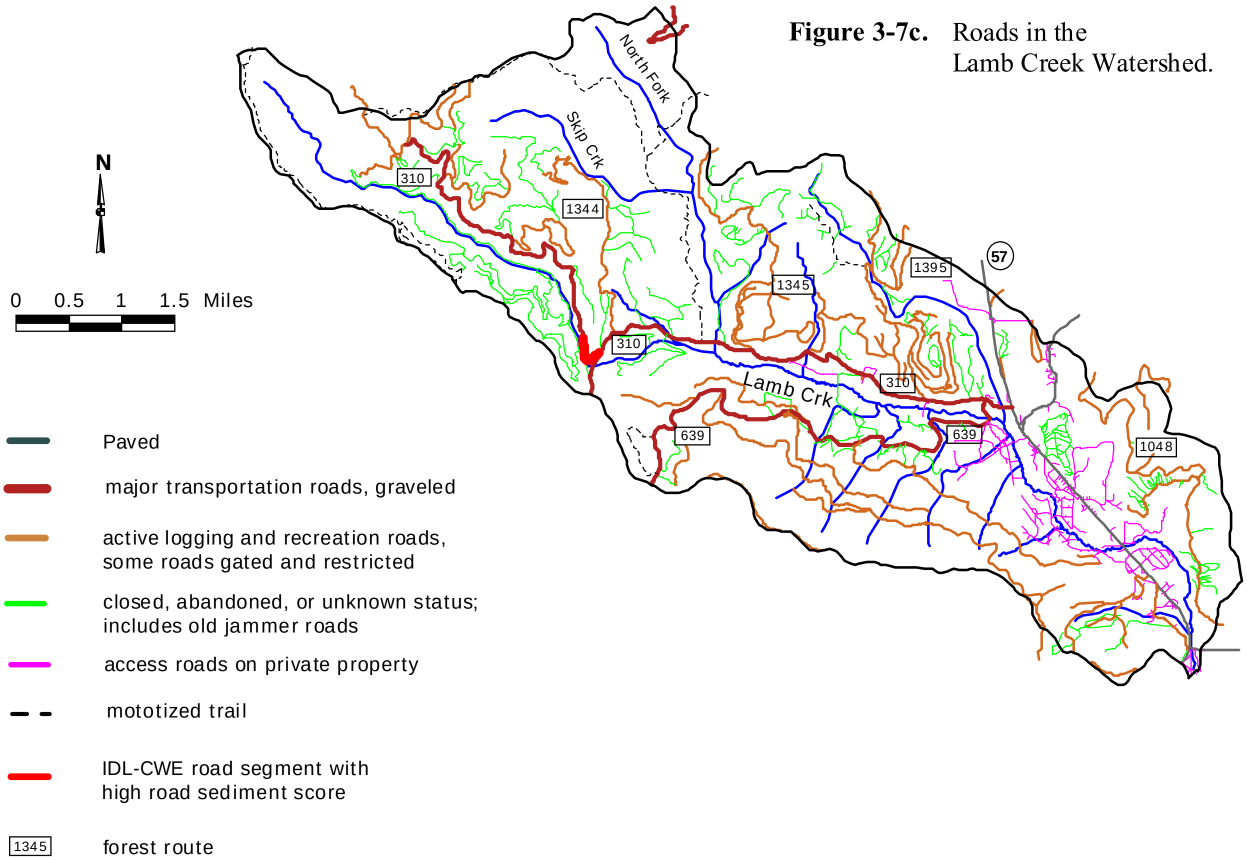
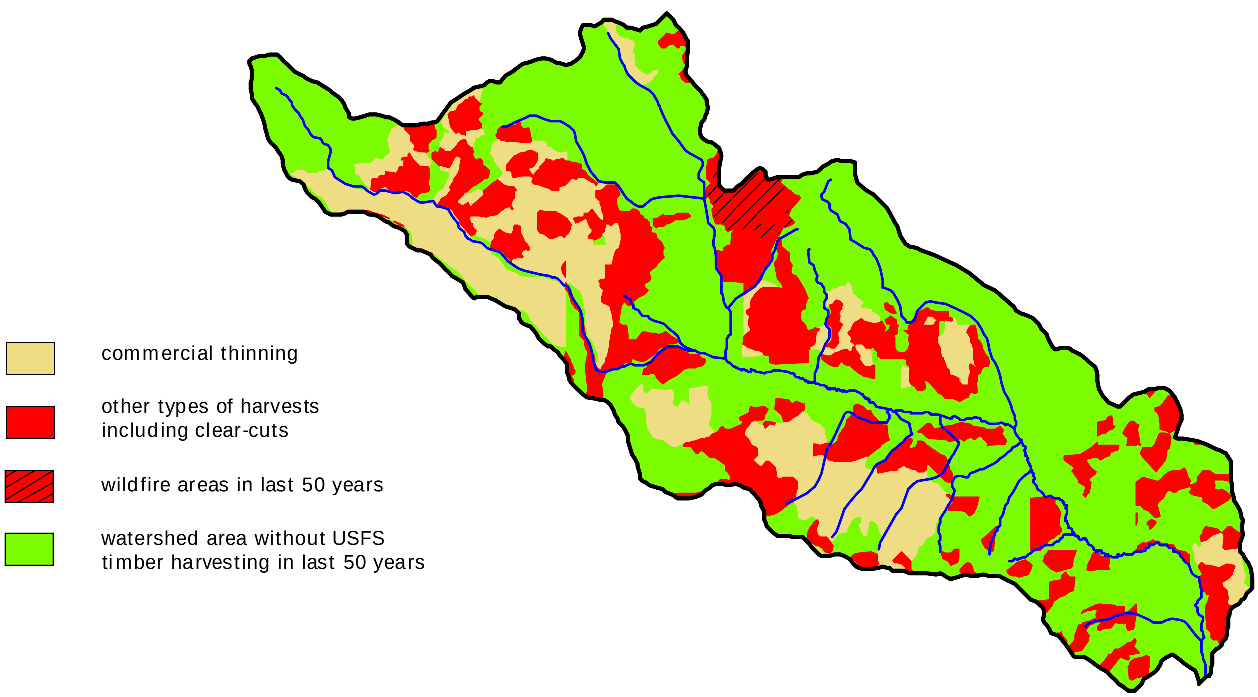


Figure 3-7d. Timber harvests in the Lamb Creek Watershed over the last 50 years; data supplied by the USFS.



3.1.D.2 Cultural Characteristics

Lamb Creek watershed is a mixture of federal lands and private ownership (Figure 3-7b). Within Idaho 2,200 acres are privately owned (14% of the drainage, Table 2-5). Land use on private ownership includes: urbanization within a 1,295 acre zone with development of the Lamb Creek commercial and residential area including subdivisions and a golf course, and also non-industrial timber harvesting which includes conversion of forested land to commercial and residential properties; and 903 acres of an agriculture zone with hay cropping, cattle grazing, and timber harvesting. A 100 acre block owned by industrial timber is located in Washington. The remaining 13,320 acres is under USFS management. Most of this land is managed for timber production, and there is a 6,722 acre grazing allotment.

Because of large fires between 1890 and 1926, historic logging was limited to salvage of fire-killed timber in the Lamb Creek watershed. The majority of timber harvesting has occurred since 1960, and most of this recent logging has been even-aged treatments such as clear-cut, seedtree, and shelterwood silviculture systems (USFS 1998a). It is estimated that around 35% of the drainage has been logged, and watershed road density is moderate to high.

3.1.D.3 Pollutant Source Inventory

Point Source Discharges
No point source discharges exist in the Lamb Creek watershed.

Nonpoint Sediment Sources

Fire and Historical Timber Harvesting **-** The USFS reports that related to large fires in 1925 and 1926, a large debris dam formed in the upper stretch of Lamb Creek during a heavy summer rain, and flood waters broke through the dam washing out bridges and culverts (USFS 1998a). The result was that the narrow upper B channel was scoured 20-40 feet wide with large boulders exposed. Lamb Creek still shows effects of this past flood. Another large fire occurred in 1939 burning western and northern headwater lands. Because of these fires only limited historic logging occurred in Lamb Creek, mainly within isolated parcels for salvage of fire-killed timber (USFS 1999).

Current Timber Harvesting, Roads and Stream Crossings **-** USFS reports timber harvesting activities over the past 50 years as follows (USFS 1998b, Figure 3-7d): in the lower Lamb Creek subwatershed, up to the confluence of North Fork Lamb Creek (7,625 acres), 47% of the subwatershed has been harvested primarily within the southern mountains; the North Fork drainage has had only minor harvesting activity, 16% of the drainage, but fires since 1900 have covered around 70% of the land; and the upper Lamb Creek subwatershed, from North Fork confluence to the headwaters (2,715 acres), has had 54% of the drainage harvested, almost exclusively along hillslopes north of the stream. USFS considers that the headwaters are currently transporting elevated amounts of sediment, and headwater reaches show indications of channel scouring from high water yields (USFS 1999).

DEQ GIS analysis of roads in the watershed produces a total of 150 miles (only 6 miles paved), for a moderate - high road density of 6.2 mi/mi^2 (Figure 3-7c). Density of active roads that are either open or have access controls is 4.1 mi/mi^2, well above the basin-wide average (Table 2-13). Of the 101 miles of active roads, 27 miles are unpaved access roads servicing private commercial and residential areas. An IDL - CWE assessment was conducted in 2000, and 35 miles of road were surveyed. Overall, sediment delivery was rated as “low”, but a 0.4 mile stretch of Forest Road 310, adjacent to Lamb Creek upstream of the North Fork confluence (Figure 3-12c), was given a road sediment score of high.

Stream crossing density of the total road network equals 1.5 crossings/mile of stream (52 stream crossings). This would be in the high end compared basin wide.

Based on the sediment load calculations presented in Section 4, the total road network is estimated to increase sediment load over the natural forested land yield by 56% (assuming 100% delivery to streams). This loading for Lamb Creek seems low given the road and stream crossing density. The reason is that the sediment load calculation is based on IDL - CWE road sediment scores, and the average CWE scores for Lamb Creek were among the lowest of watersheds surveyed. As explored in Section 4, when comparing various methods of load estimates for roads and crossings, the IDL - CWE calculation method may be producing a significant underestimation. When adding in washouts at stream crossings and other mass failures along the road prism from USFS maintenance experiences, sediment load jumps considerably to 183% above background.

Encroaching and Riparian Roads - With the exception of stream crossings, very little of the Lamb Creek road network is within the 50 ft encroaching zone. One exception is an abandoned road along the upper one-third of the main stem. This 3.5 mile historic road, which is vegetating over, literally hugs the stream. Harvesting occurred in the riparian zone throughout this road stretch, along with skid trails. At one time this was likely a major source of sediment to Lamb Creek.

The total road network within a 200 ft zone of watershed streams (including stream crossings), equals 14.9 miles, or 0.4 mi/mi of stream, and active roads in this zone is 0.25 mi/mi of stream. Road density within private lands is ever-increasing which includes stream crossings and roads close to the stream.

Canopy Cover and Peak Flows - An IDL - CWE canopy cover map for Lamb Creek was not available at the time of this report. The USFS considers that due to historic fire, timber harvesting, conversion of wetlands and wet meadows to agriculture and urban growth, and because of floodplain constriction from constructed roads, peak flow and stream energy currently in Lamb Creek is greater than that under which the stream evolved. Effects such as bank cutting and flooding remain a problem (USFS 1998a).

Instream Erosion - A stream bank erosion survey conducted in 2000 (methods described in Section 4), assessed 0.85 miles of mid Lamb Creek, in-between Hwy 57 and the North Fork confluence. This reach was adjacent to a hay field, and had historic cattle access, although the reach is now fenced off from cattle. Of the total stream reach assessed, 15% of the length was found to have either one stream bank or both with evidence of a recent eroded condition. The reach overall was fairly stabilized with shrubs, grass, and a few stretches of conifers, although there were several old cattle access points that were still bare and eroding. A statistical work-up of the survey data leading to an estimate of lateral recession (data analysis by the NRCS, Sampson *pers comm*), produced a moderate erosion rate of 29 tons/stream mile/yr for the 0.85 miles assessed.

A downstream, 0.7 mile segment of Lamb Creek east of Hwy 57 was also assessed for bank erosion, and the length of eroding bank was only 6.3% of the total reach assessed, although the composite bank erosion rating factors were high (significant erosion when found). The estimate of erosion rate was 15 tons/stream mile/yr over the 0.7 miles assessed.

When applying the estimated instream bank erosion rates from the two segments assessed over 7.6 miles of gradual gradient main stem, the load becomes 164 tons/yr.

Agriculture - Around 900 acres of private land has been labeled as an agricultural zone, much of this land used for hay cropping and grazing. Some sections of lower Lamb Creek wetlands and wet meadows were cross ditched to improve land for farming. With ditching, the energy of a stream can increase as spring runoff to the lowlands is accelerated, thereby leading to stream bank cutting. The haylands are not generally a source of sediment, but occasionally the lands are tilled and sediment laden runoff has been observed from these newly tilled lands. There are approximately 100 head of cattle grazing on private land and federal allotments. Many stream reaches are fenced, some are not. There have been observations where direct cattle access has caused stream bank failures and erosion, and riparian vegetation is thin due to trampling and grazing. There is a single agricultural land owner in the watershed, and this owner has been very active in local water quality issues.

Urbanization - About 3 miles of lower Lamb Creek flows through private lands where there has been impact by commercial and residential development. There is impervious and semi-impervious developed land that accelerates stormwater runoff to the stream. Each year new excavations lead to loosened soil which becomes incorporated as suspended sediment in the spring runoff. Some home and business developments have encroached onto the Lamb Creek floodplain and removed riparian vegetation. Observed results have included destabilized and eroding stream banks.

3.1.D.4 Summary of Past and Present Pollution Control Efforts

See Section 2.4.2, page 60, for USFS Forest Plan. Through timber sale receipts obtained from the Douglas-fir beetle project, USFS has scheduled watershed restoration activities within the Lamb Creek drainage including: 9 miles of timber road either reconstructed or obliterated; maintenance procedures over 19 miles of road including addition of relief culverts and rolling dips; and removal of three instream culverts (USFS 2001). Also, there has been a cooperative effort by the rancher in the Lamb Creek watershed to fence off additional stream sections to cattle access. Efforts are ongoing through implementation of the Priest Lake Management Plan to educate property owners on minimizing impact from new residential and commercial developments. In part, this means adherence to the existing Bonner County Stormwater ordinance, and for the lake plan Steering Committee to seek new regulations such as restrictions of vegetation removal within stream riparian zones.

3.1.D.5 Water Quality Concerns & Status

Refer to Table A-5 for the history of DEQ §305(b) and §303(d) listings for Lamb Creek; Table 2-6 for designated and existing beneficial uses; and Table 2-12 for determined support status of designated and existing beneficial uses.

3.1.D.6 Summary and Analysis of Existing WQ Data

A daily hydrograph was established for Lamb Creek for WY 94 and 95 from stream gauging and numerous flow measurements (Rothrock and Mosier 1997). Peak flow for WY 95 was from mid-March to mid-April at 80 - 90 cfs (Figure 3-8). Peak runoff was associated with maximum air temperatures between 40 – 65°F and spring rains. Summer base flow is around 5 - 10 cfs. The annual volume of water delivered from Lamb Creek in WY 95 was estimated at 16,100 ac-ft.

A total of 29 water quality sampling runs were conducted between 1993 - 1995. During peak flow there can be a relatively high (for the lake basin) suspended sediment concentration. Maximum TSS sampled was 64 mg/L (40 NTU turbidity). Associated with this suspended sediment sample was a maximum total phosphorus of 95 *u*g/L. Spring runoff mean TP was 32 *u*g/L. In base flow conditions TP is relatively high for lake basin streams, averaging 21 *u*g/L, and so is total nitrogen, averaging 290 *u*g/L. At the sampling station near the mouth of Lamb Creek, cobbles are covered by attached algal growth and aquatic plants (macrophytes), possibly responding to these nutrient conditions. Again, west side lake basin streams show higher nutrient concentrations in part related to substantial acreage of wetlands, wet meadows, and pasture converted from wetlands and wet meadows. The degree of algal and macrophyte growth observed at the sampling site is not considered an exceedance of the Standards Narrative criteria for excess nutrients.

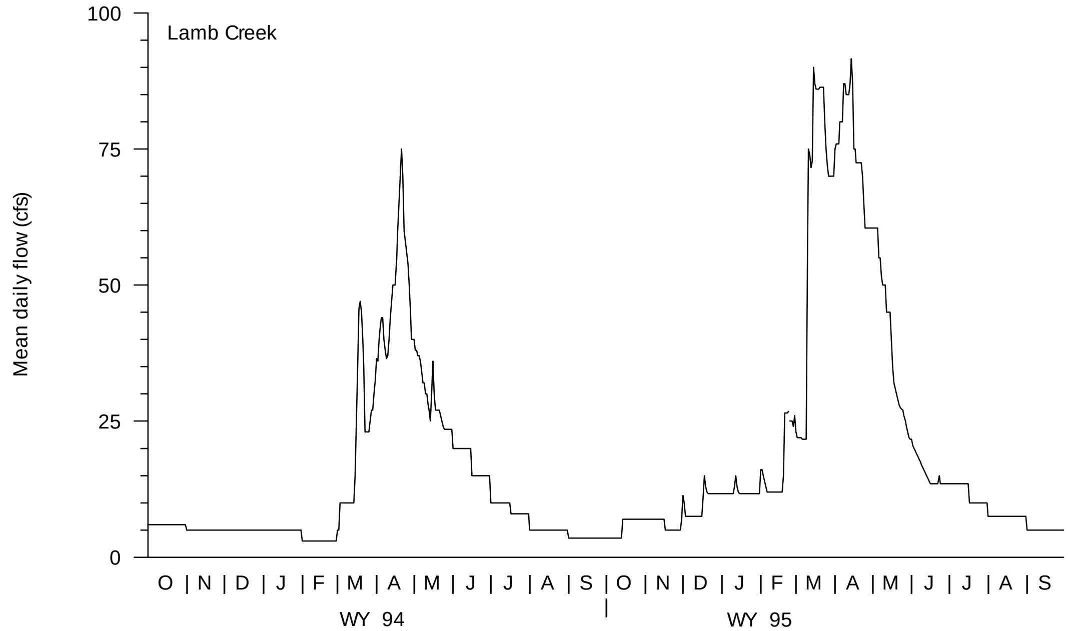


Figure 3-8. Mean daily flow rate for Lamb Creek, water years 1994 and 1995.

Numerous instream measurements were taken of pH and DO with no numeric criteria exceedances. Only instantaneous temperature readings were taken in Lamb Creek, and maximum temperature recorded was 16°C.

Thirteen samples were taken for fecal coliform bacteria. The maximum bacteria count was 270 FC colonies/100 ml, and all other results ranged between <1 - 50 FC/100 ml.

The 1995 BURP MBIs were 3.7 for a lower site and 4.2 for an upper site (Figure 3-7a). In 1997 at nearby lower and upper sites, MBIs were both 3.4.

The electro-fishing effort by USFS in 1995 was near the mouth. There were 19 brook trout sampled for a density of 9.5 fish/100 m^2, with three age classes including juveniles. Dace and sculpin were also sampled. No cutthroat trout were captured. DEQ electro-fishing in 2000 at the BURP 1997 lower site resulted in 12 brook trout/100 m^2 with 3-4 age classes, no cutthroat trout captured, and abundant sculpins. Electro-fishing at the BURP 1995 upper site produced 20 brook trout/100 m^2, with no cutthroat or sculpins. Lamb Creek is under general IDFG fishing regulations unlike the restricted fishing regulations from Kalispell Creek north.

The BURP Habitat Index scores from the two lower sites were HI=72 for 1995 (C channel), and HI=97 for 1997 (B channel). In the C channel section, scores below mid-point included 60% fines, marginal instream cover, high embeddedness, a poor slow/fast ratio of 0.1, and poor lower bank stability. In the lower B channel reach there was a decent slow/fast ratio of 0.8, fair instream cover, moderate embeddedness, but a high 51% fines.

BURP HI scores in the upper two reaches, both B channels, were HI=97 and HI=99. Below mid-point scores were percent fines of 32% and 46%, poor slow/fast ratios of 0.04 for 1995 and 0.3 for 1997, and high embeddedness for the 1997 reach.

The 1992 DEQ Use Attainability survey documented overall, poor - medium habitat conditions. The lower site near the mouth was rated "just fair" for habitat score, with below mid-point scores including marginal instream cover, and high sand deposition and channel alteration. Bank condition, canopy cover, and

Table 3-5. Selected Measurements of USFS R1/R4 Habitat Procedure on Lamb Creek.

	Reach Identifiers and Mean Values						
Measured parameters	**1&2**	**3&4**	**5**	**6&7**	**8**	**9**	**Weighted Mean**
Reach length (m)	524	3191	1816	3336	1115	3307	--
Channel type	B5	B5	C5	C5	C5	C5	--
Slow/fast ratio	0.3	0.4	0.6	0.2	0.3	0.1	0.3
Wetted riffle+run width (m)	5.0	4.8	4.8	3.8	3.8	3.6	4.2
Residual Pool Volume (m^3/km)	142	236	294	72	88	20	133
Number of pools/100 m	1.9	1.7	2.6	1.7	2.2	0.8	1.6
Percent fines	50	53	68	27	80	38	53

riparian condition were rated good. Residual Pool Volume was 122 m^3/km, below average for the 3-5 m wetted width basin wide group. A middle reach site rated "poor" in habitat score, with poor instream cover, bank stability, pool complexity, and high sand deposition and riparian disruptive pressures (grazing). RPV was very poor at 2 m^3/km.

In October 1997 the USFS conducted a R1/R4 Fish Habitat Inventory Procedure on 8.3 miles of Lamb Creek. Stream habitat measurements were developed into slow/fast ratios, RPV, pool frequency, and percent fines by Wolman Pebble Count. The R1/R4 Inventory was conducted in 9 reaches, and a summary of the data is presented in Table 3-5.

Data and field notes from the R1/R4 Inventory presents a wide variety of conditions, ranging from: good habitat with quality pools, abundant LWD and canopy cover, and good gravels for spawning, to the other extreme of wide sandy bottoms with poor spawning habitat, poor frequency and quality of pools, low LWD, and stream banks eroding due to home lot development, cattle crossings, and stream energy. Overall, for the 3-5 m wetted width basin data set, a weighted mean average of 1.6 pools/100 m and RPV of 133 m^3/km are well below the basin average. Pool formers were 57% meanders (lateral scour), and 35% LWD. Percent fines in riffles, runs and pools averaged a high 53%. Throughout the R1/R4 notes there is mention of abundant brook trout with large fish size encountered.

3.1.D.7 Status of Beneficial Uses

The BURP MBI results for 1995 are Full Support for cold water biota beneficial use. The BURP MBI results for 1997 are Needs Verification. Examining the DEQ RIBI fish assemblage questions (IDEQ 1996), the 1997 results for Lamb Creek would be NV due to the dominance of the introduced brook trout and absence of cutthroat trout. Continuing with the Determination Flow Chart (Figure 2-10), the 1997 HIs were just less than 100, so the status call remains NV.

Based on the USFS and DEQ electro-fishing surveys, the good densities of brook trout along with sculpins in the lower reach suggest that cold water biota is not impaired, or shows Full Support. While it may be argued that the absence of cutthroat trout is a clear sign of an impaired condition, there simply is no historic data available to judge what cutthroat population numbers may have been in Lamb Creek. There is no doubt however, that overall, Lamb Creek has poor to medium stream habitat conditions, due in part to an excess of sand bedload, along with other factors identified in this section such as insufficient instream Large Woody Debris along with a reduction of stream-side LWD recruitment. Current opportunities do exist to reduce the current sediment load into the stream.

The USFS and DEQ fish data shows Full Support for salmonid spawning beneficial use using brook trout for juveniles and two older age classes.

Sufficient fecal coliform bacteria samples were collected to assign FS to primary contact recreation. Domestic water supply use of Lamb Creek is isolated to single family residences, so the turbidity criteria does not apply. The toxic substance criteria was Not Assessed. There is insufficient water temperature data to judge exceedances of the various criteria.

3.2 §303(d) Listed Streams Proposed for Partial De-listing, with Sediment as the Listed Pollutant of Concern: Stream Segment Retained Needs Further Evaluation

A. Reeder Creek

Summary

Reeder Creek was added to the 1994 §303(d) list, and retained on the 1996 list, as a result of EPA analysis of the 1992 §305(b) report, Appendix D, in which IDFG and DEQ evaluated cold water biota as partial support and salmonid spawning as not supported. The listed pollutant is sediment. Reeder Creek was retained on the 1998 §303(d) List (IDEQ 1999).

BURP data were collected at two sites on Reeder Creek in 1995. The lower site MBI was 3.9, Full Support, and the Habitat Index of 105 is a good score. However, this site was near the mouth on an A channel gradient (Figure 3-19a), representing a 0.6 mile A and B channel reach. This BURP site is not representative of the primary, 5 mile mid-section that is a low gradient channel type flowing through wet meadow habitat. The MBI at an upper BURP site was also FS, but this site was in a B channel reach representative of the headwaters, above the main middle section. Up to 2000, there had been no fish sampling efforts documented for Reeder Creek. It was known that at least brook trout inhabit the stream.

In 2000 a BURP site was established within the middle section, just west of the Hwy 57 crossing (Figure 3-9a). Electro-fishing at this site produced a low-moderate density of brook trout with only 2 age classes represented. No cutthroat were captured, and the dominant species was speckled dace.

DEQ electro-fishing at the upper 1995 BURP site (in 2000), produced an extremely abundant brook trout density of 76 fish/100 m^2, with 3 age classes including juveniles. No other species were captured.

This SBA concludes that upper Reeder Creek, from the headwaters down to elevation 2680 ft, is Full Support of cold water biota and salmonid spawning beneficial uses, and should be de-listed with sediment as the pollutant of concern. This is based on MBI = 4.1, a thriving brook trout population, HI = 103, and minor land use disturbance in the upper watershed.

This SBA retains the portion of Reeder Creek from elevation 2680 ft to the mouth on the §303(d) list until the MBI results are completed for the middle section, as well as tabulation of the Habitat Index score. A beneficial use status call will be presented in the 2002 DEQ §303(d) List.

3.2.A.1 Physical and Biological Characteristics

Reeder Creek is a 2nd order tributary on the west side of Priest Lake (Figure 2-2), flowing south and then due east to the lake. Main stem length is 7.7 miles and watershed size is 8,454 acres (Table 2-2). The watershed can be divided into three sections. Within the lower one-half, east of Hwy 57, Reeder Creek is mainly a low gradient channel, 0.4 - 1% slope, flowing through a broad floodplain of wetlands and wet meadows. Riparian vegetation is alders and willows with some conifer overstory, and the stream bottom is sandy-silt. The last one-half mile gets steeper with B and A channel type as the stream cascades down to the lake through Elkins Resort. The south side of this watershed section is mountainous, reaching an elevation of 4,074 ft at Lakeview Mountain.

The middle watershed section is west of Hwy 57, and Reeder Creek flows through the broad floodplain of Bismark Meadows. While once a contiguous wetland and wet meadows, a portion of this lowland has been converted to hay cropping and grazing. Reeder Creek gradient is less than 0.5% in this section, and portions of the stream have been straightened. The riparian zone is primarily shrub overstory with abundant grasses and forbs, and channel type is D, G, and E (USFS 1994 file notes). The stream bottom is sand-silt-muck.

The 2.3 mile reach of B and A channel of the headwaters flows due south through conifer canopy. The upper watershed reaches an elevation of 4,729 ft at Reeder Mountain. Northeast of the headwaters is a chain of the small Reeder Lakes. It seems that only the lower-most lakes have a hydrologic connectivity to Reeder Creek (USFS 1994). To the west of the headwaters is Indian Creek, a small stream that flows into Reeder Creek. Throughout Reeder Creek, beaver dams and ponds are common.

Average annual precipitation increases from 32 inches at the mouth to approximately 35 inches at high elevations. Precipitation is 25-50% snow with a snowmelt dominated runoff pattern. Peak flow is during the period of mid-March through late April (Figure 3-10). The large area of gradual topography in the lower watershed ranging from 2,440 - 3,000 ft, experiences mid to late winter rain-on-snow events with moderate rises in the hydrograph.

High elevation lands of the northwest are metamorphic belt rocks; a large mid section from the headwaters to the mouth is glacial till and outwash, alluvial deposits, and lacustrine laid sediment; and hillslopes to the southeast are granitic batholith (Figure 2-4). The general soil map of the west side Priest Lake basin (Figure 2-5) describes the Reeder Creek bottom lands as Bonner soil, the southeast mountain soils as Hun-Jeru, and the northwest mountain soils as Priestlake-Treble (Table 2-3).

Around 1890 almost the entire Reeder Creek drainage was burned in a large wildfire (Figure 2-6). Large fires between 1905 - 1939 burned sections of the southeast and northeast hillslopes.

DEQ electro-fishing in 2000 showed brook trout to be abundant in an upper reach, but low in density within a middle reach. From USFS field observations, and from accounts of local fishermen, it would seem that brook trout are abundant throughout the stream. Local residents have stated that a few cutthroat trout have been caught in Reeder Creek, but not in recent years. DEQ sampling did not capture any resident cutthroats, but some may reside in headwater habitat. It is uncertain if bull trout inhabited Reeder Creek historically, but they are probably not present now, and Reeder Creek is considered low priority in bull trout recovery plans (Panhandle Basin Bull Trout TAT 1998a).

IDFG file records show that there was a Rotenone treatment of Reeder Creek in August 1960 for brook trout removal, followed by a plant of cutthroat fry (Fredericks *pers comm*).

3.2.A.2 Cultural Characteristics

Reeder Creek watershed is a mixture of federal lands and private ownership (Figure 3-9b). A substantial area of land is private (2,253 acres, 27% of the watershed). Land use on private ownership includes: a minor amount of urbanization with scattered single family residences, and a single small subdivision near the mouth of Reeder Creek; some non-industrial private timber harvesting; and a 900 acre brush/agricultural zone with hay cropping and minor grazing. Two blocks of industrial timber lands (552 acres, Stimson Lumber Company) are located in the southeast hillslopes. The remaining 6,038 acres is under USFS management with most land managed for timber production, but federal land also includes flat brush fields and meadows. Federal land at the mouth of Reeder Creek is leased to Elkins Resort, with cabins and driveways immediately adjacent to the stream.

There has been a light - moderate level of timber harvesting in the watershed with an estimated 17% of the watershed being logged (USFS 2000a). Road density is moderate.

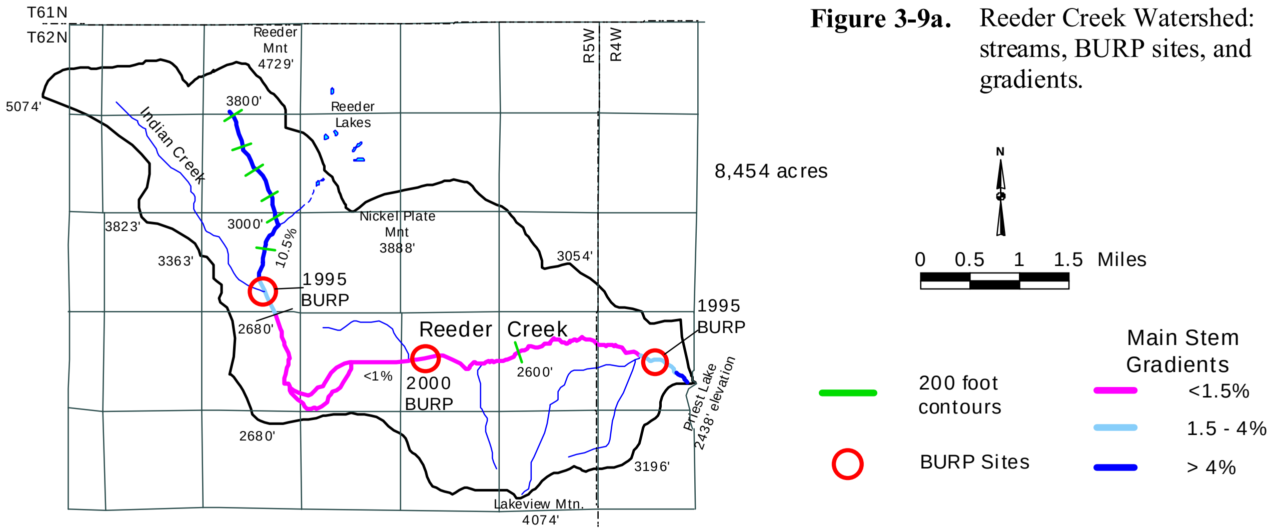


Figure 3-9a. Reeder Creek Watershed: streams, BURP sites, and gradients.

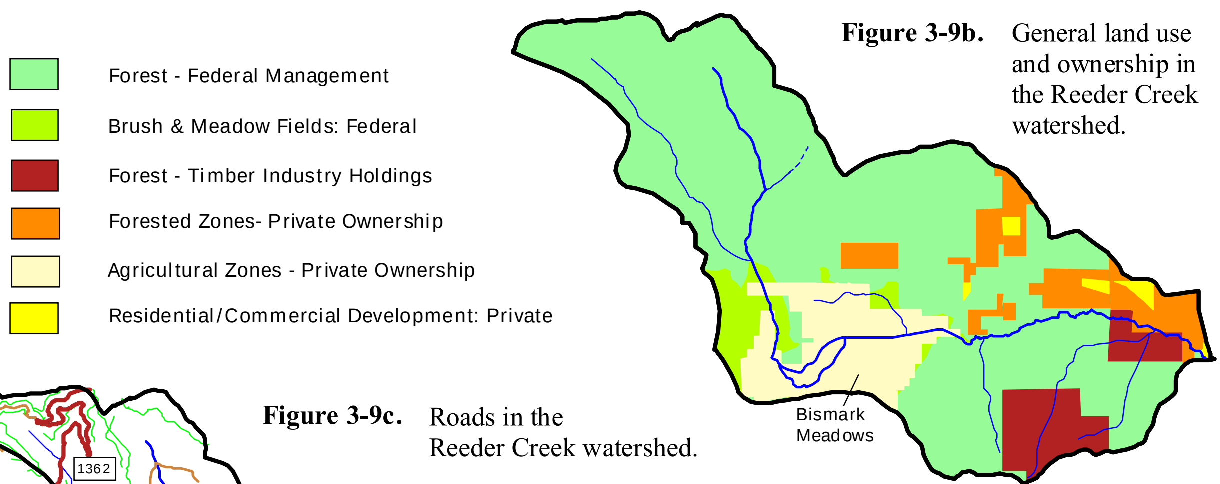


Figure 3-9b. General land use and ownership in the Reeder Creek watershed.

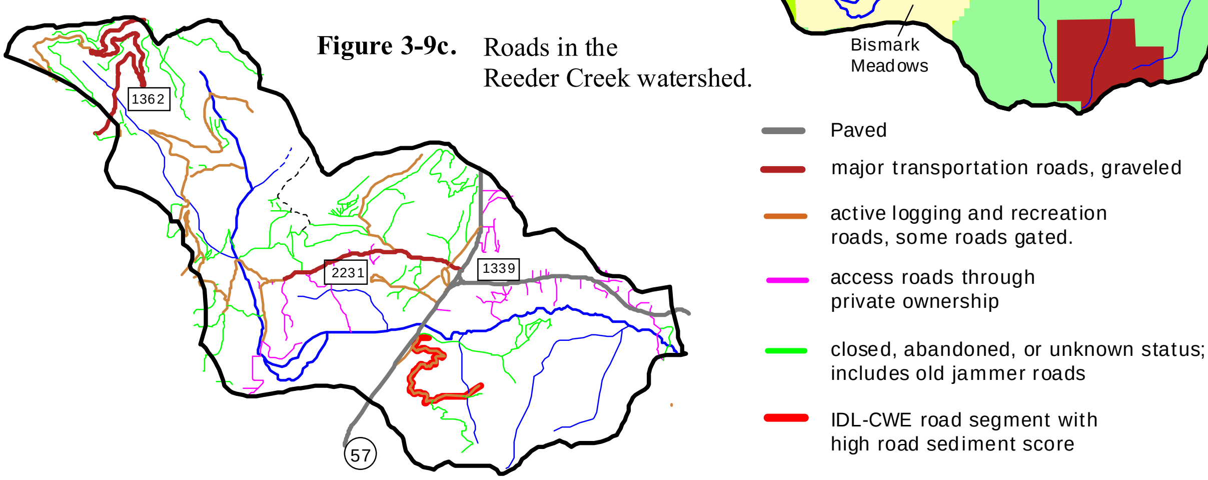


Figure 3-9c. Roads in the Reeder Creek watershed.

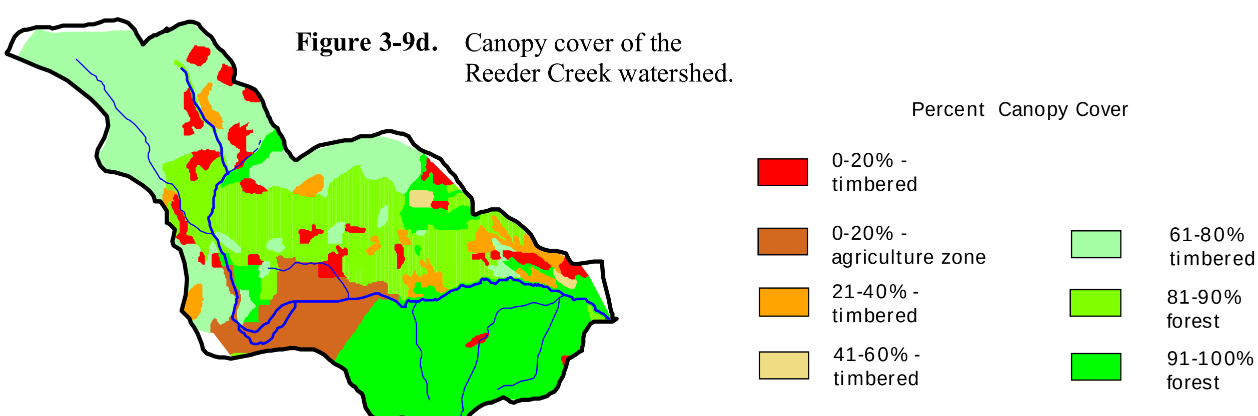


Figure 3-9d. Canopy cover of the Reeder Creek watershed.

3.2.A.3 Pollutant Source Inventory

Point Source Discharges
No point source discharges exist in the Reeder Creek watershed.

Nonpoint Sediment Sources

Mass Wasting - The 1999 IDL - CWE assessment assigned a "moderate" mass failure hazard rating to the watershed. A single mass failure was recorded during the CWE inventory.

Roads and Stream Crossings - DEQ GIS analysis of the road network shows 65 miles of total roads for a density of 4.9 miles/mi^2 (Figure 3-9c). Density of active roads that are either open or have access controls (including 5.7 miles of paved road) is a moderate 2.8 mi/mi^2. In the lower half of the watershed there are road miles which service resort and residential areas.

There are 16 stream crossings from the total road network for a density of 0.9 crossings/mile of stream. Riparian road length is low - moderate, estimated at 2.9 mi/mi^2 riparian area (USFS 2000a), below the basin average.

CWE assessments covered 11.5 miles of roads within the watershed. Most road segments inventoried rated "low" in sediment scores, but a 2 mile road stretch, southeast off Hwy 57, was given high erosion scores for cut and fill slopes, road surface, and sediment delivery (Figure 3-9c). Road scores from this segment resulted in an overall weighted CWE road score of 28, near the high range of "low".

Timber Harvesting and Peak Flows - There has been timber harvesting on federal land within the headwaters of Reeder Creek, and within private tracts of land along the northeast section of the watershed (Figure 3-9d). There has been some limited harvesting within Stimson Lumber Co. lands along the southeast mountains.

CWE assessments produced a 0.2 Canopy Removal Index on forested lands (Figure 3-9d). This would not include the large opening of Bismark Meadows. The Channel Stability Index was rated as "low" (favorable), and the Hydrologic Risk Rating was within the "low" range. Reeder Creek however does reach spring peak flow very rapidly (Figure 3-10).

Agriculture - About 700 acres of private land are classified as land for hay cropping and grazing. Animal units are estimated at about 100 head of cattle and 30 head of sheep, but some of this livestock grazing occurs in lands of the Kalispell Creek drainage. Historically, about 1.5 miles of Reeder Creek was straightened, and adjacent wetlands and wet meadows have had substantial cross-ditching for improvement of hay cropping. With loss of meander and floodplain function, stream energy has likely increased. Some stream reaches are fenced from cattle, some are not. USFS has noted some stream sections that have severe bank damage due to cattle access (USFS 1994).

Urbanization - There has only been minor impact to Reeder Creek associated with urbanization. There have been documented problems with sediment runoff into the stream from roads and excavation around Elkins Resort near the mouth, and also from a subdivision just upstream from the resort.

3.2.A.4 Summary of Past and Present Pollution Control Efforts

See Section 2.4.2, page 60, for Forest Plan of the Idaho Panhandle National Forests. There is a current effort underway, led by the IDFG, to establish the 1,200 acre Bismark Meadows under a federal Wetland Reserve Program (WRP). Land owner signatures have been obtained for WRP easement purchases. This effort is still in a preliminary stage with grant funding not secured, but if a WRP is established this will help restore wetland functions to the 3.5 miles of middle Reeder Creek that flows through Bismark Meadows. There would be elimination of the cross-drain ditches, allowance for meander to be restored, and riparian shrub plantings. For middle Reeder Creek, these are far more significant factors for improving stream health than impacts from the current sediment load.

3.2.A.5 Water Quality Concerns & Status

Refer to Table A-9 for the history of DEQ §305(b) and §303(d) listings for Reeder Creek; Table 2-6 for designated and beneficial uses; and Table 2-12 for determined support status of designated and existing beneficial uses.

3.2.A.6 Summary and Analysis of Existing WQ Data

A daily hydrograph was established for Reeder Creek for WY 94 and 95 from stream gauging and numerous flow measurements near the mouth (Rothrock and Mosier 1997). Peak flow for WY 95 was from mid-March to late April at 55 - 65 cfs (Figure 3-10). Peak runoff was associated with maximum air temperatures between 40 - 65 °F and spring rains. Summer base flow is around 3 - 5 cfs. The annual volume of water delivered from Reeder Creek in WY 95 was estimated at 14,270 ac-ft.

A total of 30 water quality sampling runs were conducted between 1993 - 1995. During peak flow suspended sediment concentrations were moderate, with a maximum TSS of 21 mg/L (10 NTU turbidity). Associated with this suspended sediment sample was a maximum total phosphorus of 45 *u*g/L. Mean TP during spring flow was 20 *u*g/L. In base flow conditions TP is somewhat above average for lake basin streams, with an mean of 14 *u*g/L, and so is total nitrogen averaging 265 *u*g/L. Like other lake basin west side streams, Reeder Creek has substantial acreage of wetlands, wet meadows, and pasture converted from wetlands and wet meadows. Vegetative decay and soil characteristics of these lowlands produce surface water and groundwater with above average phosphorus, and relative high dissolved inorganic and organic nitrogen, iron, and tea colored to reddish brown colored water from iron and organics.

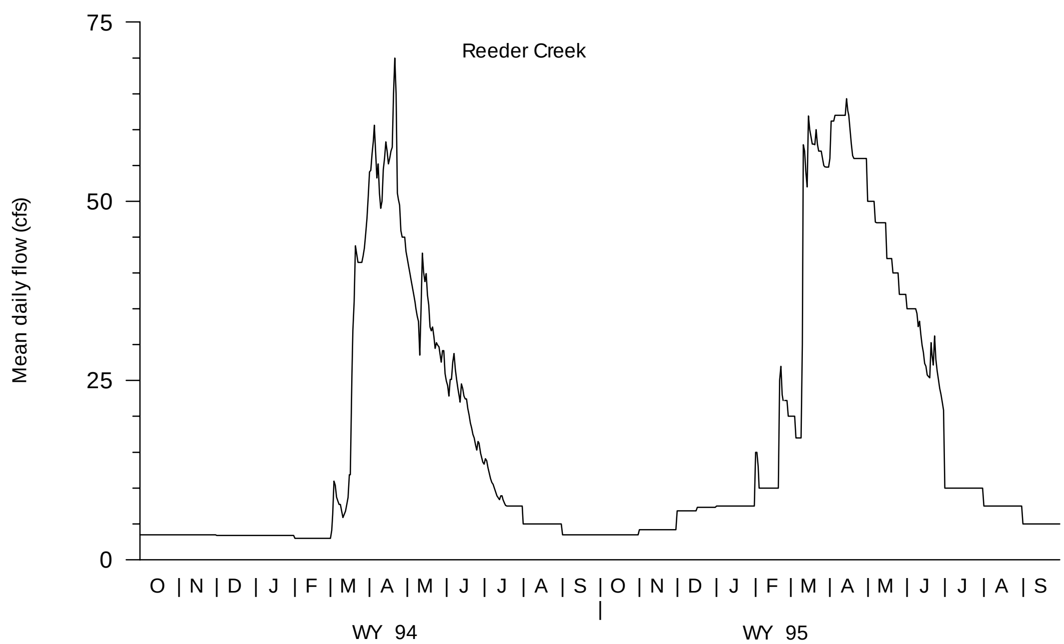


Figure 3-10. Mean daily flow rate for Reeder Creek, water years 1994 and 1995.

Numerous instream measurements were taken of pH and DO with no numeric criteria exceedances. Only instantaneous temperature readings were taken in Reeder Creek. Maximum temperature recorded was 15.6 °C. CWE stream canopy closure assessments did assign a temperature adverse condition to segments of Reeder Creek between the 2,440 - 2,800 ft contours, or the lower two-thirds of the stream.

During 1993 - 1995, thirteen samples were taken for fecal coliform bacteria near the mouth, as the stream enters Priest Lake. Reeder Creek is considered as primary contact recreation beneficial use near the mouth, since there may be swimming or wading activity from guests of Elkins Resort. The maximum bacteria count was 80 FC colonies/100 ml, and all other results ranged between <1 - 17 FC/100 ml.

As part of the revised BURP protocol, samples for *E. Coli* bacteria were taken in 2000 near the middle BURP site. Four samples taken from July 21 - August 16 ranged from 66 - 250 *E. Coli*/100 ml with a geometric mean of 113 *E. coli*/100 ml. This sample data is very near the Standards criteria of 126 *E. coli*/100 ml geometric mean of five samples over 30 days (Table 2-10). Mid summer *E. Coli* sampling near the lake should be conducted in 2001 to test against the 5 sample geometric mean criteria.

The BURP MBI for the lower site was 3.9, and for the upper site MBI = 4.1. The MBI for the 2000 BURP site is not available for this report.

DEQ electro-fished Reeder Creek in 2000; one reach at the middle BURP site and another survey at the 1995 upper BURP site. The middle site had a brook trout density of 4.1 fish/100 m^2 with two age classes including juveniles, no cutthroat or sculpins sampled, and abundant speckled dace. The upper site had an extremely abundant brook trout population of 76 fish/100 m^2, but no cutthroat or sculpins captured.

The BURP HI score for the 1995 lower BURP site was 105. Below mid-point scores were 24% fines, a slow/fast ratio of 0.1, and 50% bank vegetation. For the upper site, HI = 103. The only below mid-point scores were 46% fines and a slow/fast ratio of 0.1. The HI score for the 2000 BURP site has not yet been tabulated. The stream reach was within flat gradient, wet meadow - hay crop land, and characterized by: numerous drainage ditches coming into the stream; predominately a silty muck bottom; undercut banks; a riparian edge of mainly grasses and forbs with just a few shrubs; a habitat distribution of pools and runs with a pool/run ratio 0.24; and a good pool quality index because of undercut banks and instream cover. The 1992 DEQ Use Attainability survey assessed one site near the mouth. The overall habitat score rated "fair". Pool frequency was good at 6.2 pools/100 m, but the RPV of 178 m^3/km was below average for the 3 - 5 m wetted width group.

3.2.A.7 Status of Beneficial Uses

The BURP MBIs representing 0.6 miles near the mouth, and the headwaters section down to elevation 2680 ft, are Full Support for cold water biota beneficial use. Electro-fishing at the upper site showed a thriving brook trout fishery, supporting the FS for cold water biota, but no cutthroat trout were captured. Salmonid spawning for the upper BURP site is Full Support. Support status calls for the primary, middle low gradient reach will have to wait until MBI and HI scores are completed.

Sufficient fecal coliform bacteria samples were collected near the mouth in 1993 - 1995 to assign FS to primary contact recreation. However, *E. coli* sampling in 2000 at the middle BURP site was very near the Standards criteria. Domestic water supply use of Reeder Creek is isolated to single family residences, so the turbidity criteria does not apply. The toxic substance criteria was Not Assessed.

There is insufficient water temperature data to judge exceedances of the various criteria.

3.2.A.8 Data Gaps

A continuous temperature sensor should be placed within the lower half of Reeder Creek.

3.2 §303(d) Listed Streams Proposed for Partial De-listing, with Sediment as the Listed Pollutant of Concern: Stream Segment Retained Needs Further Evaluation

B. East River

Summary

East River was added to the 1994 §303(d) list, and retained on the 1996 list, as a result of EPA analysis of the 1992 Idaho §305(b) report, Appendix D, in which IDFG evaluated cold water biota as partial support and salmonid spawning as not supported. The listed pollutants are sediment, DO, temperature, and flow. The 1998 §303(d) List changed the boundaries of the East River listing to the North Fork (headwaters to Priest River), retained the North Fork on the list, and de-listed the Middle Fork from its headwaters to the confluence with the North Fork (IDEQ 1999).

There have been three BURP sites on the Middle Fork East River, and one BURP site on Keokee Creek, a tributary to Middle Fork. MBIs range from 4.0 - 4.4. This data along with Full Support for salmonid spawning beneficial use were the basis for §303(d) de-listing of the Middle Fork. There have been numerous fish surveys within the Middle Fork, and some if its tributaries, conducted by IDFG, DEQ, and IDL. Collectively these surveys show: cutthroat trout with density ranging from absent to low in lower reaches, and good to abundant in middle and upper reaches; the presence of bull trout throughout the Middle Fork main stem, mostly at low density but in a couple of tributaries density was adequate; and some brook trout and brown trout.

There was one BURP site in the East River main stem, and two on the North Fork. MBIs range from 4.0 - 4.4. There have been far less fish surveys within the main stem and North Fork. There was a very low salmonid density within the main stem from a single electro-fishing effort; and salmonid populations for the North Fork range from an absence of cutthroat and a dominance of brook trout in lower reaches, to adequate density of cutthroat in mid and upper reaches. No bull trout were captured.

There are data and observations which indicate poor to mediocre habitat conditions within the lower reaches of the Middle Fork, North Fork, and within the main stem, and the sediment load calculations suggest a moderate increase above background. Habitat and land use information includes: 1) DEQ instream habitat measurements and IDFG habitat observations indicating widened channels, low pool frequency and poor pool quality, along with poor stream bank conditions in the lower reaches, 2) stream bank damage within the main stem by large animal access, 3) fish data showing low or absent populations of cutthroat trout within lower reaches, 4) a moderate - high timber road density producing a current sediment load calculation of moderate over background, 5) an IDL - CWE analysis showing a moderate canopy removal index for the Middle Fork, and coupled with a channel stability index, resulted in a hydrologic risk rating on the high end of moderate, and 6) an IDL - CWE result of a temperature adverse condition for the lower reaches of both forks and the main stem.

Complicating the analysis for East River is a legacy issue of historic timber harvests within riparian zones where shade and LWD recruitment were effected, and sediment input from a road network constructed prior to the Idaho FPA. Also complicating an analysis is that comparing East River salmonid populations with eastern Priest Lake streams is difficult since East River is under only general angling regulations, while Priest Lake streams are under the more Restrictive Special Rules aimed at cutthroat preservation.

It is the conclusion of this SBA that the upper one-half of the Middle Fork East River is clearly in Full Support of cold water biota and salmonid spawning beneficial uses, and based on less data, this is also true of upper North Fork. It is determined that the lower reach of the Middle Fork is also Full Support based on adequate densities of brook trout, the presence of bull trout, and abundant sculpins. The lower reach of the North Fork has exhibited adequate densities of brook trout and brown trout to warrant Full Support.

This SBA supports the 1998 §303(d) de-listing of the Middle Fork for sediment. The North Fork East River, from its headwaters to the confluence with the Middle Fork, is also proposed for §303(d) de-listing with sediment as the listed pollutant of concern.

The 2.5-mile main stem, based solely on a single MBI would be Full Support under WBAG. But based on a single IDFG electro-fishing effort in 1986, the status is considered either NV or NFS for both cold water biota and salmonid spawning beneficial use. The main stem needs a current, more extensive fish survey, and DEQ BURP crews will do this during the summer of 2001. This SBA retains the main stem East River on the §303(d) list until analysis of the 2001 electro-fishing results. A beneficial use status call will be presented in the 2002 DEQ §303(d) List.

There is evidence to suggest that the lower reaches of the two Forks and the main stem are reflecting a Cumulative Effects within the entire watershed resulting from excess sediment, hyrdologic disequilibrium, historic riparian harvests, and possibly elevated water temperatures. Also, there is an elevated status for East River since apparently, this is the only known drainage of bull trout spawning and early rearing within the Lower Priest River subbasin. There are current opportunities for reduction of watershed sediment delivery and riparian improvement, from both public and private lands. Thus in Section 4, sediment source load calculations are presented for the East River drainage as an informational resource for any future interagency fisheries management efforts to strengthen both the cutthroat trout and bull trout populations.

In comment packages received to the draft SBA and TMDL, the IDL assessments concluded that the Middle and North Fork East River displayed Full Support of its beneficial uses and should be de-listed (IDL 2001). EPA analysis on the other hand recommended TMDL development for the North Fork (EPA 2001).

The East River is also listed for dissolved oxygen. The history of the DO listing is unknown. There have been no known measurements of DO taken within streams of this drainage. DEQ will measure DO at selected locations during the summer of 2001. The Middle Fork, North Fork, and main stem will thus remain on the §303(d) with DO as the listed concern. The status of the DO listing will be addressed in the 2002 DEQ §303(d) List.

3.2.B.1 Physical and Biological Characteristics

The entire East River drainage is 43,165 acres (Figure 2-2), and there are approximately 86 miles of perennial streams. The Middle Fork is a 3rd order stream, and watershed size is 21,788 acres (Table 2-2). The stream flows 9 miles almost due west until the confluence with the North Fork. Tributaries flow north and south except for Canyon Creek which flows west and comes into the Middle Fork just prior to the confluence. The North Fork is a 3rd order stream with a watershed size of 19,494 acres. The stream flows 10 miles southwest to its confluence. Tributaries mainly flow north and south. Lost Creek is a major tributary which appears to contribute only a minor amount of surface water, or none at all, to the North Fork. Observations indicate that the mountainous flow of Lost Creek goes subsurface just southeast of Chase Lake as it enters the large, glacial outwash and till, flat terrain of Jack Pine Flats. Lost Creek may contribute subsurface volume to the North Fork. Figure 3-11a depicts a subdivision line for the North Fork which separates Lost Creek as a 6th order HUC. This subdivision results in a 6,308 acre Lost Creek subwatershed, and a 13,188 acre North Fork subwatershed. At the confluence of the North and Middle forks, the 4th order main stem flows 2.5 miles to the mouth at Lower Priest River. Subwatershed size of the main stem is 1,881 acres.

The Middle and North Forks originate in the Selkirk Mountain crest. Elevation ranges from 2,280 ft at the confluence of the two forks to 6,706 ft at Mount Casey. The mouth of the main stem is at 2,230 ft.

Figure 3-11a. East River Watershed: streams, BURP sites, and gradients.

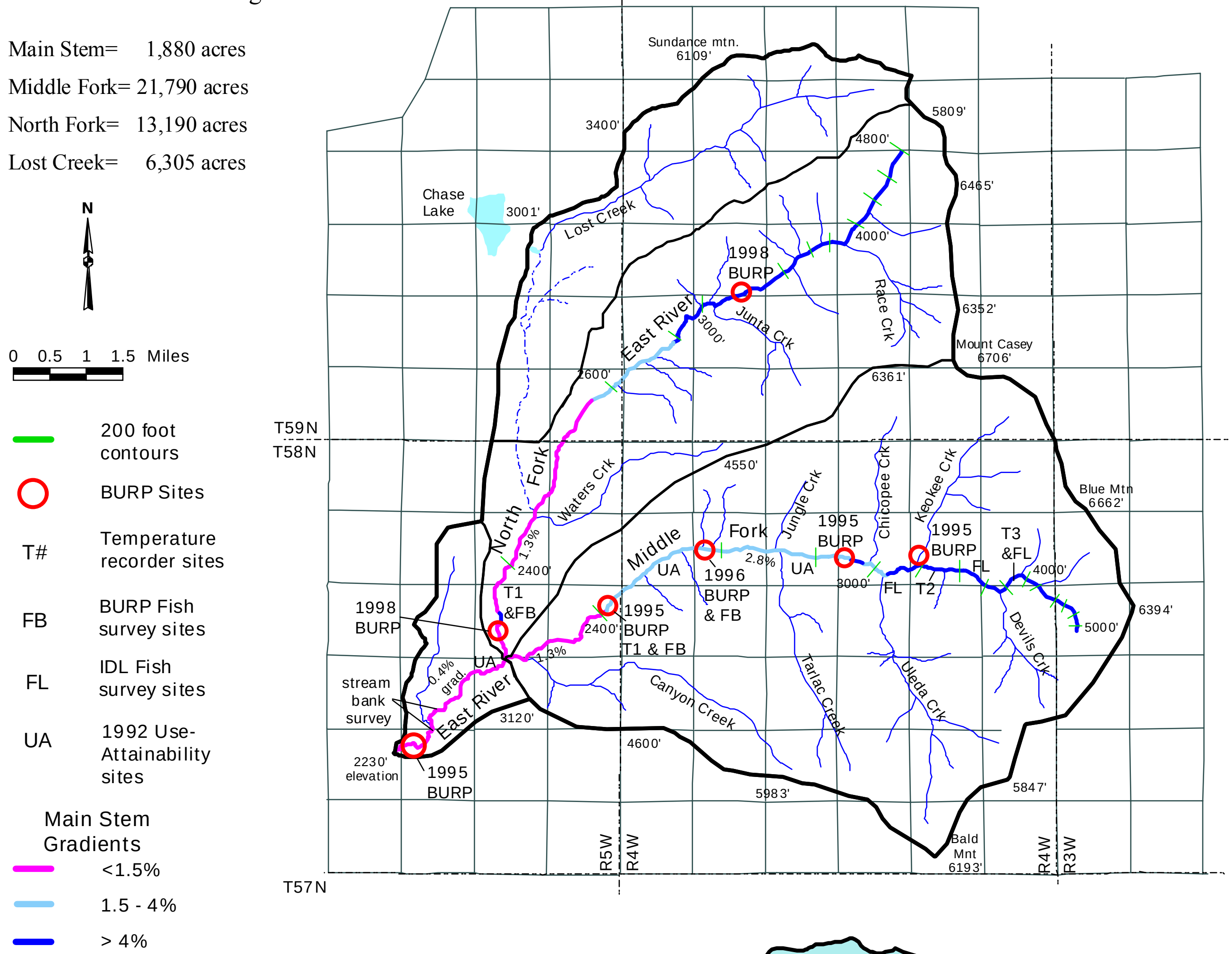


Figure 3-11b. General land use in the East River Watershed.

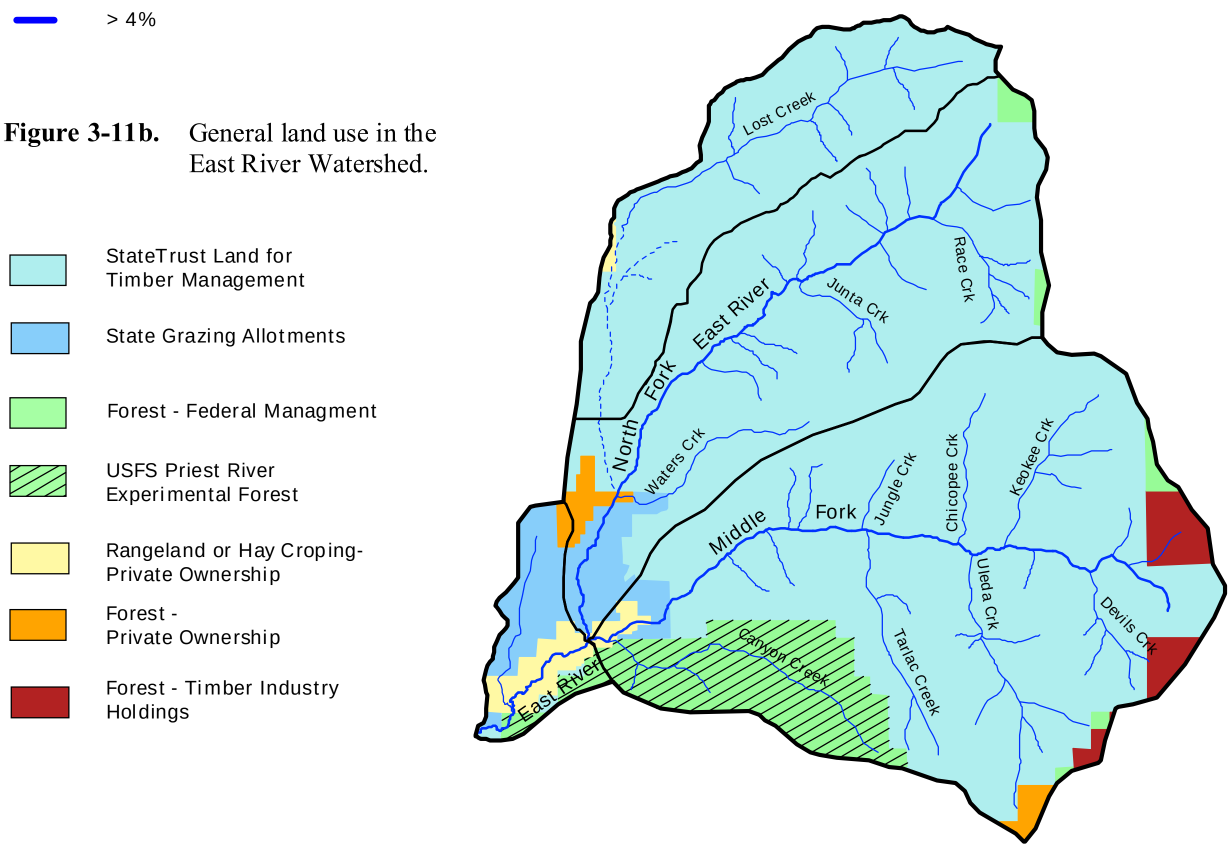


Figure 3-11c. Roads in the East River watershed.

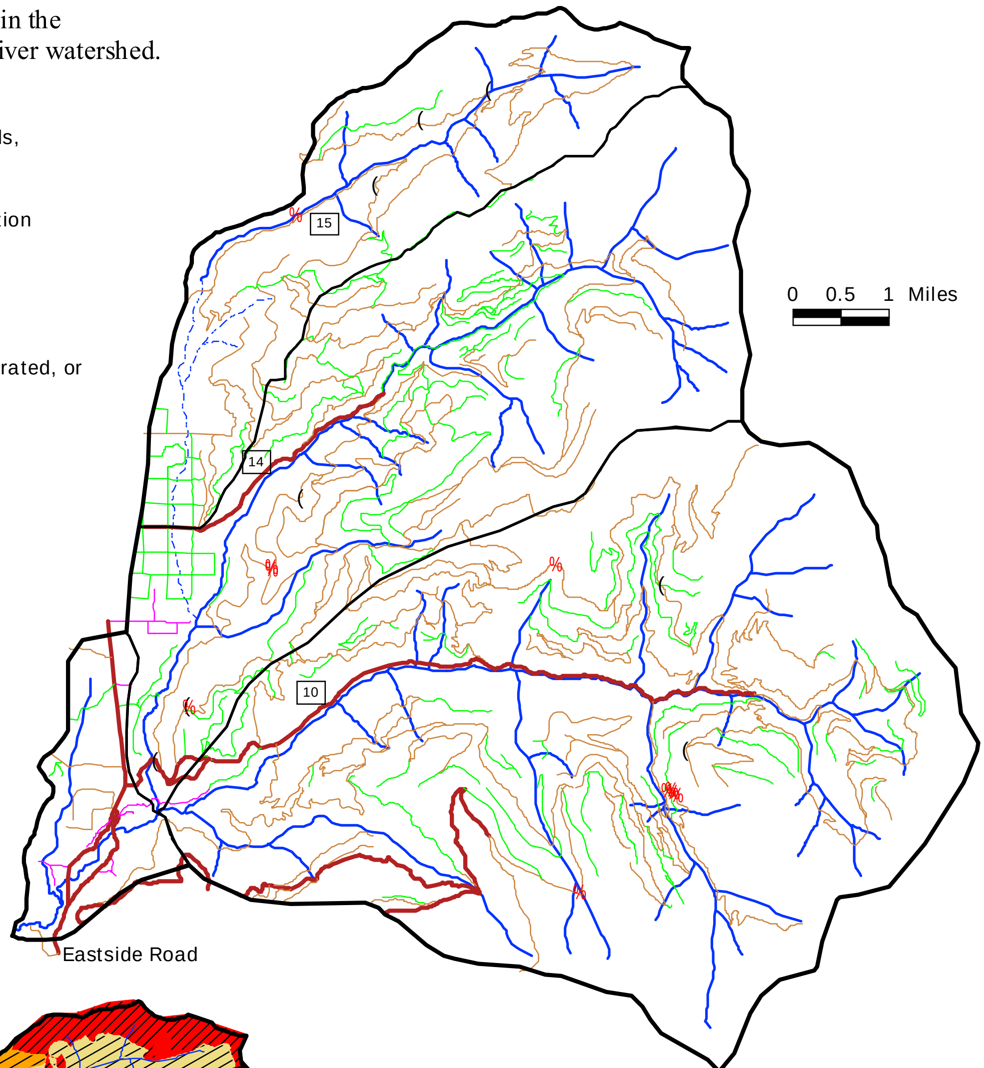
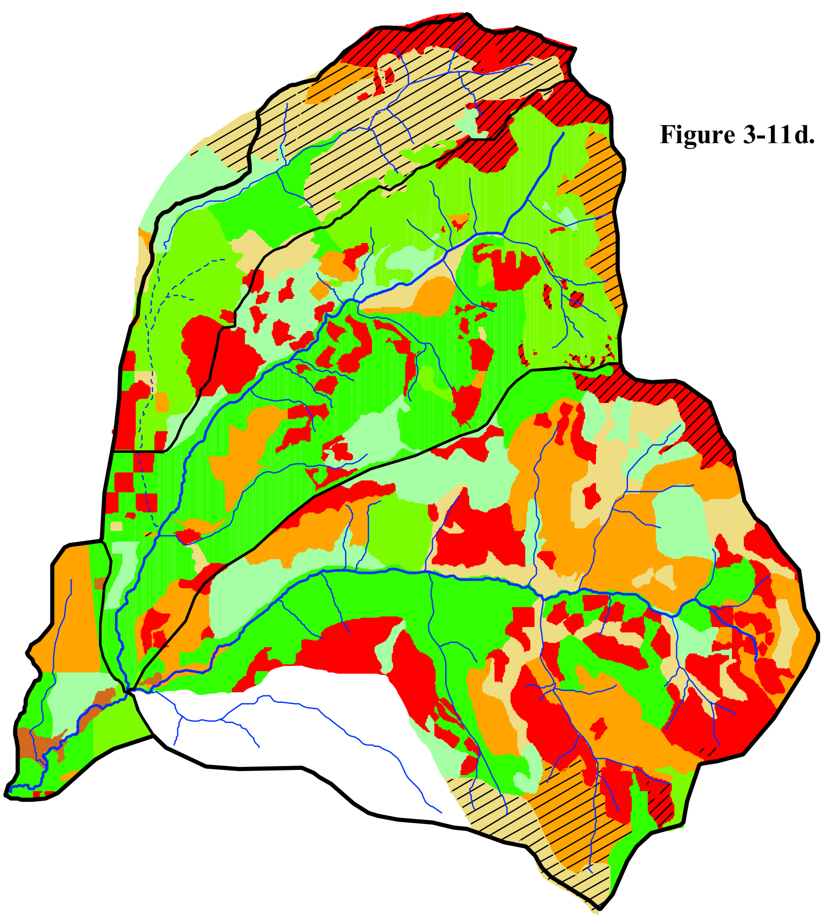


Figure 3-11d. Canopy cover in the East River Watershed.



Like east side streams tributary to Priest Lake, the upper watersheds are characterized by steep, highly confined, bedrock, boulder, first and second order streams that quickly combine into the 3rd order Middle and North Forks.

Average annual precipitation increases from 32 inches at the mouth to 40 - 50 inches at high elevations. Precipitation is mostly snow with a snowmelt dominated runoff pattern. A hydrograph has not been established for East River. Based on hydrographs for WY 1994 and 1995 established by stream gauging and numerous flow measurements on Soldier Creek, the watershed just above Lost Creek (Rothrock and Mosier 1997), high flow occurs between mid-April to late May. Soldier Creek peaks earlier than more northerly east side streams, in part because of a higher percentage of lower elevation, rain-on-snow sensitive acreage. Late winter rain-on-snow runoff events did produce moderate rises in the hydrograph at Soldier Creek. Caution must be taken on extrapolating East River flows from Soldier Creek because of the large stand-replacing Sundance fire that occurred over much of the upper Soldier Creek watershed in 1967.

Parent geology of the eastern two-thirds of East River watershed is granitic batholith (Figure 2-4). The general soil map depicts the higher eastern slopes to be Rock Outcrop - Prouty Jeru, while the mid-watershed slopes are Vay-Ardtoo-Lenz (Figure 2-5, Table 2-3). The lower-most stream valley of the Middle Fork, the lower one-half of the North Fork stream valley, and the main stem, is glacial till and outwash, and alluvial deposits, Bonner general soil type. There is a discrepancy between the USGS geology map of Figure 2-4, and the USFS land type map of Figure 4-2. In the USFS map there is a wide ban of residual belt rock spanning the lower one-third of the Middle and North Fork drainages.

The large Sundance fire of 1967 encompassed the higher elevations of the Lost Creek watershed (Figure 2-6). An early 1900s large fire also occurred in upper Lost Creek. There have been no other extensive stand-replacing wildfires in the East River drainage over the last 100 years.

The entire 2.5 miles of the main stem is very gradual sloped, ≤0.5% (Figure 3-11a). Historically the main stem course was likely a large floodplain with a high degree of meander. However, except for the lower-most 0.5 miles, the main stem now runs through private property where wetlands and wet meadows have been converted to pasture lands. The initial 1.8 miles of the Middle Fork averages 1.3% gradient, then 4.4 miles of 1.6 - 4.5% B channel, and then 5 - 10% A channel headwaters. The North Fork has a long 4.1 mile stretch of mostly 1 - 1.4% gradient, followed by a short B channel section, and then a 4 - 12% A channel upper reach.

A common reach type in upper segments is a substrate of bedrock and boulders, including falls and cascading rapids. There are substantial reaches of gradual sloped channel that are sediment depositional zones, including ponds behind beaver dams. There are reaches of riffles and pool tailouts that have good quality gravel for spawning. There are C channel floodplain sections along the main stem, lower-most Middle Fork, and lower one-half North Fork.

Fish surveys within the Middle Fork show varying results, with cutthroat trout as the dominant salmonid in some samples, brook trout as dominant in others. Cutthroat density has generally been low within lower reaches, and have ranged from low to abundant in middle and upper reaches. Brook trout are mostly sampled at low population numbers. The introduced brown trout are present, and bull trout have been sampled in the Middle Fork. In the North Fork brook trout are dominant, cutthroats have low density, and no bull trout have been captured. The Middle Fork is considered to support spawning and early rearing of bull trout, and is considered of high importance to bull trout recovery (Panhandle Basin Bull Trout TAT 1998a). Within the North Fork there is suspected spawning and early rearing of bull trout, and the North Fork is also considered of high importance to bull trout recovery.

3.2.B.2 Cultural Characteristics

The East River watershed is mostly State of Idaho Trust Land managed by IDL (87% of the watershed); 3,200 acres is part of the USFS Priest River Experimental Forest with Canyon Creek running through this land; another 516 acres, mainly on the eastern edge, is USFS and BLM land; and 1,926 acres is privately owned (Figure 3-11b). A total of 730 acres of private holdings is labeled as agriculture zones with hay cropping and grazing. An agricultural zone surrounds most of the main stem East River and lower-most Middle Fork. Residential development is mainly large acre rural lots, including hobby farms with grazing animals. There are 788 acres of private industrial timber lands, all on the eastern portion of Middle Fork. Most of the state owned land is managed for timber. There are 2,030 acres as State grazing allotment on the northern end of the main stem watershed, and surrounding the lower 1.5 miles of the North Fork. Recreation is popular in the watershed, with fishing, camping, hiking, hunting and snowmobiling.

The watershed has had considerable timber harvesting and road building since the early 1900s. Conifer canopy removal has been moderate to heavy within the Middle Fork, and low to moderate in the North Fork. Total road density is moderate.

3.2.B.3 Pollutant Source Inventory

Point Source Discharges
No point source discharges exist in the East River watershed.

Nonpoint Sediment Sources

Mass Wasting **-** The 1998 IDL - CWE assessment gives an overall mass failure hazard rating of moderate to the east river drainage. The mass failure sediment delivery scores to stream channels rated “low” for both the Middle and North Forks. During the CWE inventory, 11 mass failures were recorded, all from cut and fill slopes (Figure 3-11c). Several failures were rated as 90% delivery to streams.

Skid Trails **-** Nearly 100 skid trails in the East River watershed were examined and rated in the CWE assessments. Overall, skid trail sediment delivery scores rated “low” for both the Middle and North Forks.

Roads and Stream Crossings **-** GIS analysis of the road network provided by IDL produces a total of 147 miles of roads within the Middle Fork drainage, for a density of 4.3 mi/mi^2 (Figure 3-11c). This total likely includes some road mileage that has been obliterated but not recorded on the GIS files. Active roads that are either open or have access controls have a moderate density of 3.2 mi/mi^2. Frequency of stream crossings of the Middle Fork total road network is 1.4 crossings/mile of stream (60 crossings), above the basin-wide average (Table 2-13). The 1998 IDL - CWE inventory assessed 26 miles of road within the Middle Fork drainage. The mean weighted CWE road sediment score was 14, or “low”.

Based on the sediment load calculations for the Middle Fork presented in Section 4, the total road network is estimated to increase sediment load over the natural forested land yield by 67% (assuming 100% delivery to streams, and not including road prism failures).

The CWE inventory recorded 7 mass failures within the Middle Fork and 2 Significant Management Problems (SMPs), and these were road segments with severe erosion or structural failures. When using the CWE mass failure occurrences at stream crossings and other sections of the road prism, including estimates of delivery to streams, sediment load increases to 145% above background.

GIS analysis of the North Fork road network (excluding the Lost Creek subwatershed but including the main stem drainage), produces a total of 120 miles of roads for a density of 5.1 mi/mi^2 (Figure 3-11c).

Active roads that are either open or have access controls have a moderate density of 3.1 mi/mi^2. Frequency of stream crossings of the total road network is 1.4 crossings/mile of stream (49 crossings). The 1998 IDL-CWE inventory assessed 35 miles of road within the North Fork+main stem drainage. The mean weighted CWE road sediment score was 14, or "low".

Based on sediment load calculations the total road network of the North Fork+main stem is estimated to increase sediment load over the natural forested land yield by 73%.

The CWE inventory recorded 3 mass failures within the North Fork, and 3 SMPs associated with road segments with severe erosion or structural failures. When using the CWE mass failure occurrences at stream crossings and other sections of the road prism, including estimates of delivery to streams, sediment load increases to 120% above background.

Encroaching and Riparian Roads - Existing transportation roads travel up the main stem channels within the watershed (Figure 3-11c). State Road 10 follows the Middle Fork up to the headwaters; State Road 14 follows the North Fork in its middle segment; and State Road 15 goes up Lost Creek. There is an older, closed road that hugged North Fork along its upper reach. There are also roads paralleling Uleda Creek and Waters Creek.

With the exception of stream crossings, very little of the East River road network is within the 50 ft encroaching zone. For the Middle Fork drainage, the total road network within a 200 ft zone of watershed streams (including stream crossings), equals 14.6 miles, or 0.34 mi/mi of stream, and active roads in this zone is 0.3 mi/mi of stream. For the North Fork+main stem drainage, the total road network within a 200 ft zone of watershed streams equals 10.2 miles, and density calculations are similar to the Middle Fork. Based on the USFS draft Geographic Assessment for the basin (USFS 2000a), the estimated riparian road density for the Middle and North Forks is around 6 mi/mi^2 riparian area, well above the basin-wide average (Table 2-13).

Timber Harvesting and Peak Flows - The calculated CWE canopy removal index (CRI) for the Middle Fork is 0.49 (Figure 3-11d). The CWE assessment did not include the Canyon Creek subwatershed (USFS Priest River Experimental Forest). The average channel stability index (CSI) was 47, or a moderate rating. Coupling the CRI with the CSI for the Middle Fork produces a hydrologic risk rating (HRR) at the borderline of "moderate" and "high". A high HRR rates a watershed as having a hydrologic adverse condition. The HRR rating, along with habitat data presented in the next section, may indicate stream channel impairment due to increases in peak flow discharge and sediment delivery.

The calculated CRI for the North Fork is 0.16 (excluding the Lost Creek drainage, and a CRI was not calculated for the main stem watershed). The average CSI was 50, or a moderate rating. Coupling the CRI with the CSI produces a HRR of "low".

Instream Erosion - A stream bank erosion survey was conducted in 2000, and surveyed 0.34 miles of the main stem just west of the Eastside Road stream crossing (Figure 3-11c). Of the total stream reach assessed, 89% of the length was found to have either one stream bank or both with evidence of a recent eroded condition. This reach as well as other segments of the main stem are known to have severe bank erosion due in part to damage by large animal access, but also by known problems of flow constriction by the Eastside Road bridge stream crossing, and as suggested above, possibly excess peak flow from the Middle Fork. The composite of bank erosion rating factors was high. A statistical work-up of the survey data leading to an estimate of lateral recession (data analysis by the NRCS, Sampson *pers comm*), produced a substantial erosion rate of 193 tons/stream mile/yr for the 0.34 miles assessed.

Agriculture - The primary stream segment impacted by commercial grazing is along the main stem, west of the Eastside Road bridge. Here, direct cattle access to about 0.3 miles of stream have lead to damaged stream banks that are sloughing and eroding, and very little shrub riparian vegetation.

Urbanization - East of the Eastside Road bridge is 1.4 miles of main stem, and 1 mile of the lower-most Middle Fork, that runs through private property where there has been development of several rural homesteads. Observations show access to the stream channel by cows and horses, conversion of wetlands and wet meadows by drainage channels, and substandard private roads and driveways.

3.2.B.4 Summary of Past and Present Pollution Control Efforts

See Section 2.4.1, page 59. In the IDL comment package to the draft SBA (IDL 2000), the following statement was included: "IDL has been very proactive in recognizing and correcting water quality problems that occur on its ownership in the East River drainage. We have been very active in improving the transportation systems within the tributaries of the East River. Main access roads have been surfaced with crushed rock, and rolling dips have been constructed to control surface runoff. Culvert sizes have been upgraded to prevent catastrophic failure. We have replaced several bridges using a spill through design that provides for a more natural stream flow than an abutment design. Non-surfaced roads have been heavily cross-ditched to prevent surface erosion. Gates or tank traps have been installed to control access on many of the non-surfaced roads. Many miles of old roads have been permanently abandoned, with culverts removed, and appropriate erosion control measures applied. Timber sales have been carefully planned to protect water quality and to ensure adequate shade and large woody debris is maintained within Stream Protection Zones. We will continue our efforts to maintain and improve water quality in the East River drainage whether or not a TMDL is developed."

3.2.B.5 Water Quality Concerns & Status

Refer to Table A-7 for the history of DEQ §305(b) and §303(d) listings for East River; Table 2-6 for designated and beneficial uses; and Table 2-12 for determined support status of designated and existing beneficial uses.

3.2.B.6 Summary and Analysis of Existing WQ Data

Hydrographs based on gauging stations and flow measurements have not been developed for the East River. Based solely on an acreage proportional basis with Soldier Creek, a peak flow for WY 95 for the Middle Fork calculates to 340 cfs, and the North Fork estimate is 200 cfs excluding Lost Creek. Again, based solely on the data from Soldier Creek, WY 95 annual flow volume into the Lower Priest River from East River calculates to a substantial 80,170 ac-ft (excluding Lost Creek). Summer base flow measured by BURP crews was 55 cfs in the main stem, 24 cfs on the Middle Fork, and 13 cfs on the North Fork.

There has been no water column sampling for suspended sediments and nutrients, and no known measurements for pH and DO. No samples have been collected for fecal coliform bacteria.

The BURP MBIs for East River sites have all been greater than 3.5 (Full Support). The results are as follows:

lower Middle Fork 1995	MBI = 4.4
mid-Middle Fork 1996	MBI = 4.2
upper Middle Fork 1995	MBI = 4.4
Keokee Creek 1995	MBI = 4.0
lower North Fork 1998	MBI = 4.4
upper North Fork 1998	MBI = 4.3
Main Stem 1995	MBI = 4.0

Table 3-6 presents data from electro-fishing and angling by IDFG in 1986 (Horner *et al*. 1987); electro-fishing by BURP crews in 1997 and 1998; and electro-fishing by IDL in 1998.

Cutthroat density in the Middle Fork from IDFG surveys had a decent average of 8 fish/100 m^2, but this was due to one upper reach with an excellent density of 24 cutthroat/100 m^2, averaged with two lower reaches of 0 and 0.3 fish/100 m^2. Cutthroats were not captured in the BURP survey at a lower Middle Fork site (Figure 3-11a), and density was only 0.4 cutthroat/100 m^2 within a middle reach. IDL surveys within upper Middle Fork sites and within Keokee creek, overall showed good cutthroat densities, on par with some east side tributaries to Priest Lake such as Two Mouth Creek and Indian Creek, and Big Creek just south of East River (Table 2-10)

Bull trout have been captured throughout the Middle Fork main stem, at low densities. A few larger fish captured were believed to be fluvial adult bull trout. Bull trout densities were decent in IDFG sampling within Uleda and Tarlac Creeks.

Brook trout density within the Middle Fork has been low to moderate. Sufficient age classes of brook trout were captured in the lower Middle Fork BURP survey to give Full Support for salmonid spawning beneficial use in that reach. BURP surveys also showed abundant sculpins in lower and middle reaches.

Within the North Fork, IDFG surveys found no cutthroat trout within four lower to middle reaches, but density averaged 3.2 cutthroat/100 m^2 in two upper reaches. Brook trout were dominant with a moderate average density, and brown trout were present. A single BURP electro-fishing within the North Fork at a lower reach, showed no cutthroat trout, a moderate density of brook trout assuming the unidentified salmonid young-of-the-year were brook trout, and a few sculpins. No bull trout were captured in either the IDFG or BURP surveys. The survey results would classify the North Fork as Full Support of salmonid spawning using the brook trout results.

Only a single fish survey has been conducted within the main stem, by IDFG. No cutthroat trout or bull trout were captured. Brook trout and brown trout were sampled at a very low density.

The BURP HI for the main stem site was 80, below the basin average. At this site, about 0.5 miles up from the mouth, below mid-point scores were instream cover, channel shape, slow/fast ratio, and a very poor wetted width/depth ratio of 45. Lower bank stability was poor and given a mark of 0, and there was significant land use impact on the banks and within the riparian zone. Percent fines were low at 10%.

Middle Fork HIs were 89, 95 and 94 for lower, mid and upper sites (Figure 3-11a). At all three BURP sites the slow/fast ratios were extremely poor at <0.1. The lower site had a poor width/depth ratio of 33. Percent fines were low to moderate, 11%, 28% (below mid-point), and 15% respectively.

The habitat score at the North Fork lower site was well below the basin average at HI=78. This reach had a poor width/depth ratio of 42, no pools encountered, poor instream cover, moderate percent fines (35%), and high cobble embeddedness. The upper North Fork site had a good habitat score of HI=110, but the slow/fast ratio was also very poor at <0.1.

The 1992 DEQ Use Attainability survey (Hartz 1993) assessed 1 site on the main stem, 2 sites on the Middle Fork, and no sites on the North Fork. The main stem site, just upstream of the Eastside Road bridge (Figure 3-11a), was rated "poor" for overall habitat quality. Low scores related to sand deposition, stream bank instability and erosion, and lack of riparian vegetation. There were six large pools, half created by large woody debris, the other half by lateral scour. Residual pool volume was 2,308 m^3/km, which was the highest volume of its wetted width group of 7.5 - 10 m.

Table 3-6. Results of Electro-fishing within East River: IDFG 1986 (Horner *et al.* 1987); DEQ BURP in 1997 and 1998; and IDL in 1998.

All Densities in fish/100 m^2

IDFG 1986 Species	Main stem	Middle Fork mean density	Middle Fork Range of 3 reaches	Tarlac Creek	Uleda Creek	North Fork mean density	North Fork Range of 6 reaches
Cutthroat trout	0	8.1	0-24.0	0	4.4	1.1	0-4.4
Bull trout	0	0.7	0-1.8	4.4	6.6	0	0
Brook trout	0.2	1.1	0-3.3	2.1	0	4.3	1.4-12.4
Brown trout	0.5	0.9	0-1.8	0	0	1.3	0-3.9

DEQ BURP[a]	lower Middle Fork - 8/97			mid- Middle Fork - 8/97			lower North Fork - 8/98		
Species	Trout No. <100 mm	Total No.	density	Trout No. <100 mm	Total No.	density	Trout No. <100 mm	Total No.	density
Cutthroat trout	0	0	0	1	4 (3 ages)	0.4	0	0	0
Bull trout	0	5	0.7	2	2	0.2	0	0	0
Brook trout	6	21 (4 ages)	2.9	5	17 (3 ages)	1.7	2	9	1.3
Brown trout	0	1	0.1	0	0	0	0	0	0
unidentified salmonid YOY	--	--	--	--	--	--	27	--	3.8
Slimy sculpin and *cotus* sp.	--	146	20.3	--	99	10.1	--	13	1.8
Dace	--	2	0.3	--	0	0	--	0	0

IDL 1998[a]	Upper Middle Fork - 3 Reaches			Keokee Creek - 2 Reaches		
	Mean No. of 0 yr.	Mean total density	Range of density	Mean No. of 0 yr.	Mean total density	Range of density
Cutthroat trout	2	11.6	3.6 - 17.5	1.5	18.0	17.5 & 18.9
Bull trout	0	0.4	0 - 1.2	0	0	0
Brook trout	0	0.4	0 - 1.2	0	0	0

a = DEQ BURP and IDL electro-fishing was one-pass only.

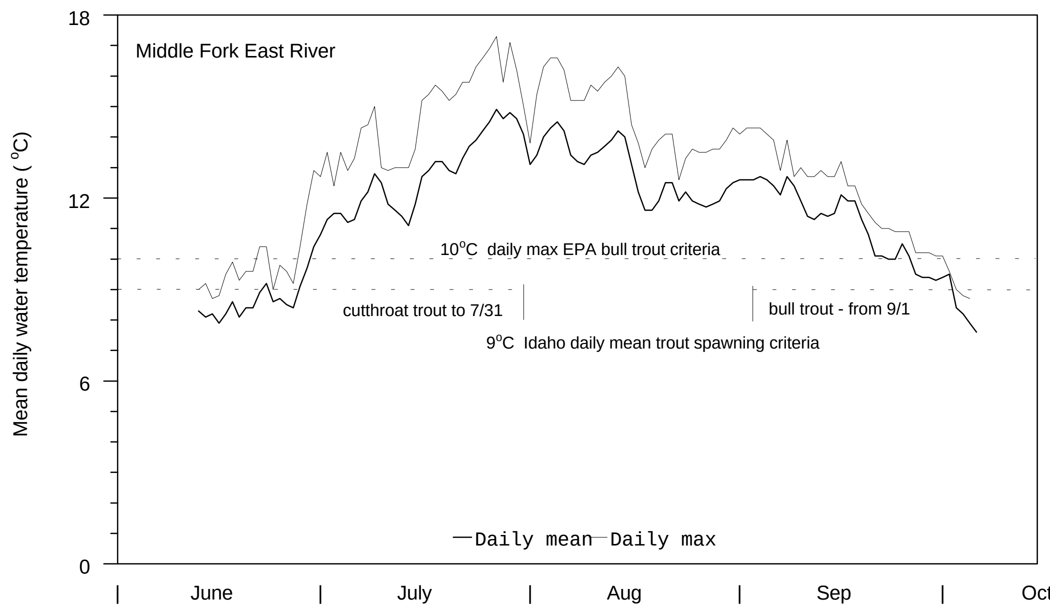


Figure 3-12. Mean daily and daily maximum water temperatures from June 13 - October 6, 1998 at Middle Fork East River, site #1.

A mid-Middle Fork UA site was rated as "fair" for overall habitat quality. Only one pool was encountered and thus a low RPV of 132 m^3/km. An upper Middle Fork site was rated as "good". Here there were four decent quality pools (4.7 pools/100 m), and RPV = 710 m^3/km was well above the average for the wetted width group of 5 - 7 m.

In IDFG general observations of stream habitat during electro-fishing surveys (Horner *et al*. 1987), it was noted that the main stem and lower Middle Fork lacked good quality riparian vegetation, that bank sloughing and erosion were common, and that there was a reduced quality of spawning gravels. Observations for lower East River also noted a low frequency of pools, and poor pool quality.

The overall condition of low pool frequency and low pool quality noted in all of the above habitat surveys may relate to insufficient recruitment of riparian large woody debris, which in turn may reflect historic logging practices of clear-cutting hemlock and cedar within riparian zones.

In 1998 IDL placed three HOBO® temperature sensors in the Middle Fork (Figure 3-11a for locations); one sensor in a lower reach, and the other two in headwater segments. Another sensor was placed in lower Keokee Creek. Hourly readings were tabulated from June 13 - October 6. Mean daily temperature at site 1 Middle Fork (lower reach), as well as daily maximum temperatures, are plotted in Figure 3-12. The Standards cutthroat spawning and incubation temperature criterion was exceeded on most days in July at sites 1, 2, and Keokee Creek, but only exceeded on 2 days at site 3 of Middle Fork. The EPA bull trout criterion was exceeded on most days from July - September at sites 1, 2, and Keokee Creek, but not at site 3. Mean temperatures for the period of record were 11.5, 9.1, 7.1, and 9.6°C at sites 1, 2, 3, and Keokee Creek respectively. Maximum hourly temperature recorded was 17.3°C at site 1.

In 1999 IDL again placed a sensor at lower Middle Fork site 1, and also a sensor within the lower section of the North Fork. Period of record was August 1 - September 20. Mean temperature for this period was 11.3°C for the North Fork and 10.5°C for the Middle Fork. Maximum hourly temperature was greater in the North Fork, 16.8°C compared to 14.6°C for the Middle Fork. The EPA bull trout criterion was exceeded on most days for the period of record.

DEQ placed a temperature sensor within the main stem from August 8 - October 23, 1997. Mean temperature was 13.5°C for August with a maximum hourly temperature of 18.1°C recorded. The EPA bull trout criterion was exceeded on all days for August and September.

The IDL – CWE, stream canopy closure/temperature assessment, evaluated the entire length of the Middle Fork and several of its tributaries. Of the thirty-two, 200 ft contour segments evaluated through aerial photography, 18 were given a high temperature rating. High temperature rating was assigned to the lower one-half of the Middle Fork, the entirety of Tarlac Creek, the lower one-half of Uleda Creek, and most of Devils Creek, Keokee Creek, and Chicopee Creek.

The CWE canopy closure/stream temperature assessment evaluated the entire length of the North Fork, and Waters Creek. Of the thirty-six, 200 ft contour segments evaluated, 11 were given a high temperature rating. High temperature ratings were assigned to about two-thirds of the North Fork length.

While not evaluated by CWE, the main stem would also have a high temperature rating due to agricultural and urban clearing of riparian vegetation.

BURP and Use Attainability surveys within lower and mid Middle Fork, and lower North Fork, recorded canopy closures ranging from 40 - 55% as measured by a spherical densiometer.

3.2.B.7 Status of Beneficial Uses

There have been no documented measurements of pH and DO for assessment of numeric criteria exceedances for cold water biota. Based on numerous measurements of pH and DO obtained within Priest Lake east side streams during the 1993 - 1995 lake baseline study (Rothrock and Mosier 1997), there is no reason to suspect exceedances of pH and DO within the East River drainage. However, the East River drainage will remain on the §303(d) list until DO measurements are obtained by DEQ.

The BURP MBI results score Full Support of cold water biota beneficial use for all segments of the East River drainage. IDFG, DEQ, and IDL fish surveys show Full Support of salmonid spawning beneficial use for the entirety of the Middle and North Forks. Based on a single IDFG electro-fishing within the main stem in 1986, the status call for salmonid spawning is Not Full Support. However, a more current and thorough fish evaluation is needed within the main stem to make a status call. Thus, salmonid spawning for the main stem is considered as Needs Verification.

When examining cold water biota beneficial use by WBAG+, using additional information of fish survey results, habitat evaluations, and various sediment load calculations from land use data, a conclusion might be drawn that the lower reaches of the Middle Fork and North Fork, and the main stem, have impaired cold water biota through Cumulative Watershed Effects including excess sediment. It appears that cutthroat populations are far less in density compared to upper reaches of the two Forks. There is an impairment to stream channels, and poor instream cover and pool frequency/quality in lower reaches. Habitat impairment might be a combined function of: sediment load; acceleration of peak flow within the Middle Fork due to canopy removal; reduction of riparian conifer vegetation related to legacy timber harvesting practices; and stream bank damage due to large animal access. Based on temperature sensors and the IDL - CWE Temperature Adverse Condition ratings, elevated stream temperatures may also be a factor if there is impairment.

However, the average of brook trout densities within lower and middle reaches of the two Forks appear adequate given the observed angling pressure. And, some bull trout continue to be captured in electro-fishing surveys within the lower reaches of the Middle Fork. Therefore, this SBA assigns Full Support to the entirety of the Middle and North Forks. The main stem is assigned Needs Verification until further fish surveys are conducted, and remains on the §303(d) List.

Stream temperature is §303(d) listed for East River. Temperature recording sensors show that for the main stem, and most of the Middle and North Fork reaches there are exceedances of the Standards temperature criteria for cutthroat spawning and incubation in July, and of the EPA bull trout criteria for July - September. However, judgement on criteria exceedances are to be delayed until negotiations with DEQ and EPA are finalized on temperature issues and Standards for Idaho streams (IDEQ 1999).

There has been no collection of bacteria samples to assess primary contact recreation beneficial use. Primary contact would default to Full Support based on the support status of cold water biota. Domestic water supply is an existing use of East River waters, but the use is isolated to single family residences so the turbidity criteria does not apply. The toxic substance criteria was Not Assessed.

3.3.B.8 Data Gaps

Instream measurements of pH and DO levels within East River need to be obtained, as well as collection of bacteria samples. An electro-fishing survey within the main stem is needed and will be conducted by DEQ in 2001.

3.3 §303(d) Listed Streams Evaluated as Impaired for Cold Water Biota Beneficial Use, and Recommended for Sediment TMDL Development

A. Lower West Branch Priest River

Summary

Lower West Branch Priest River was added to the 1996 §303(d) list as a result of Idaho Panhandle National Forest analysis. A pollutant of concern was not listed, but sediment became listed in the 1998 DEQ §303(d) List (IDEQ 1999), and Lower West Branch was retained on the 1998 List.

There were four BURP sites on the main stem of Lower West Branch, and all MBI scores gave Full Support to cold water biota beneficial use. However, based on the analysis of additional information required with WBAG+, the main stem appears to have impaired cold water biota, in part due to an excess of current sediment load. Main stem fish surveys by IDFG and DEQ show an absence of cutthroat trout, and brook trout densities, overall, exhibit a low density. Habitat measurements and observations indicate a high percent fines which have limited gravel and cobble aquatic insect habitat and salmonid spawning habitat. Instream cover and pool quality are often rated as poor. Also, the USFS rates the watershed system at 64% Not Properly Functioning and 36% Functioning at Risk, and attributes poor channel conditions in part to historic and ongoing sediment delivery to streams (USFS 1999).

Sediment load calculations presented in Section 4 and summarized in this section suggest that the current sediment load represents at least a moderate increase over background. Currently, there is an array of land use practices which are contributing sediment and these include: high density Forest Roads and stream crossings; an influx of substandard private roads and driveways; questionable maintenance procedures on County roads; documented departures from BMPs by Non-industrial Private Forest (NIPF) timber harvesting operations; and direct cattle access to streams on private property and Forest Service grazing allotments. There are ample opportunities for better BMP implementation to reduce the watershed sediment delivery to streams.

3.3.A.1 Physical and Biological Characteristics

Lower West Branch is a 4th order tributary on the west side of Lower Priest River (Figure 2-2), flowing southeast to the river. Main stem length is 25.3 miles. The watershed is complex and large, 56,835 acres (Table 2-2). There are numerous 1st order to 3rd order streams flowing into the main stem, and total length of watershed perennial streams is approximately 192 miles. For the IDL - CWE analysis that is presented in this section, the watershed was divided into eight 6th order HUCs as delineated with acreages shown in Figure 3-13a.

Most of the main stem flows through flat terrain, and tributaries to the west, north and east originate in hillslopes and mountains. Elevation ranges from 2,100 ft at the confluence with the river to 5,600 ft at South Baldy Mountain, creating the headwaters of the main stem. Most tributaries have mountain crests between 3,500 - 4,800 ft elevation. Average annual precipitation increases from 32 inches at the mouth to approximately 40 inches at high elevations. Precipitation is 25 - 50% snow with a snowmelt dominated runoff pattern. Peak flow is during mid-March through late April. A large area of gradual topography surrounding the main stem, ranging from 2,100 - 3,000 ft elevation does experience mid to late winter rain on snow events.

Higher elevation lands of the northern mountain range are residual granitic batholith; the western and southeastern mountain ridges are residual belt rock; and the valley hillslopes and stream bottom lands of the main stem are lacustrine deposits (Figure 4-2). Only the very lower main stem valley has been typed in the SCS general soil map, and this valley is Mission - Cabinet - Odenson soil group (Table 2-3).

Figure 3-13a. Lower West Branch Priest River Watershed: streams, BURP sites, and gradients.

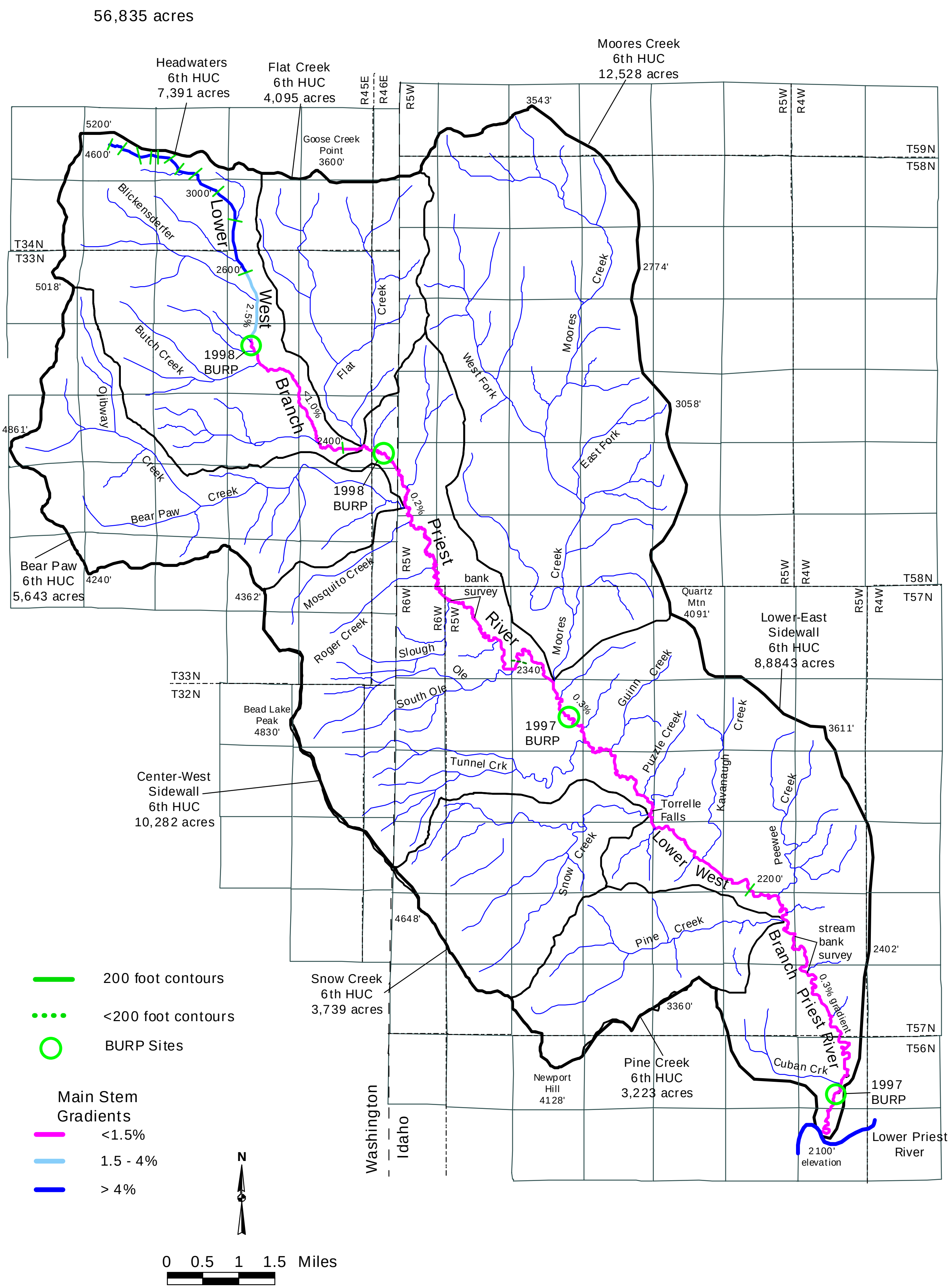
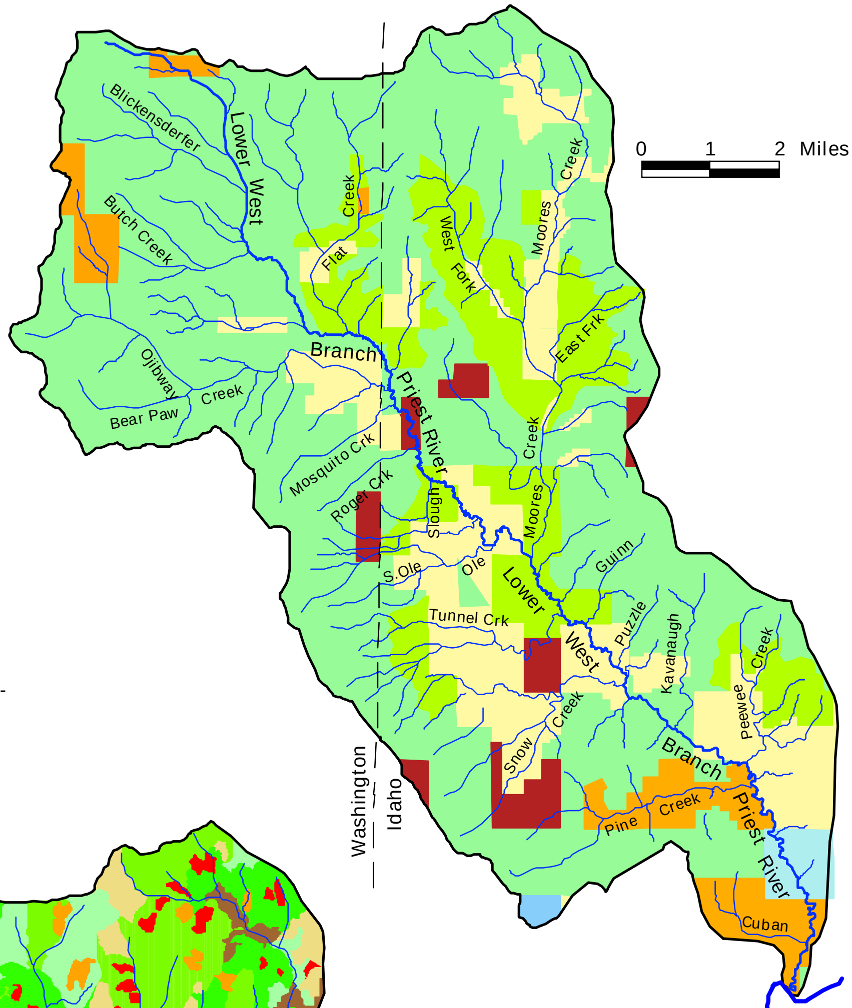


Figure 3-13b. General land use and ownership in the Lower West Branch watershed.



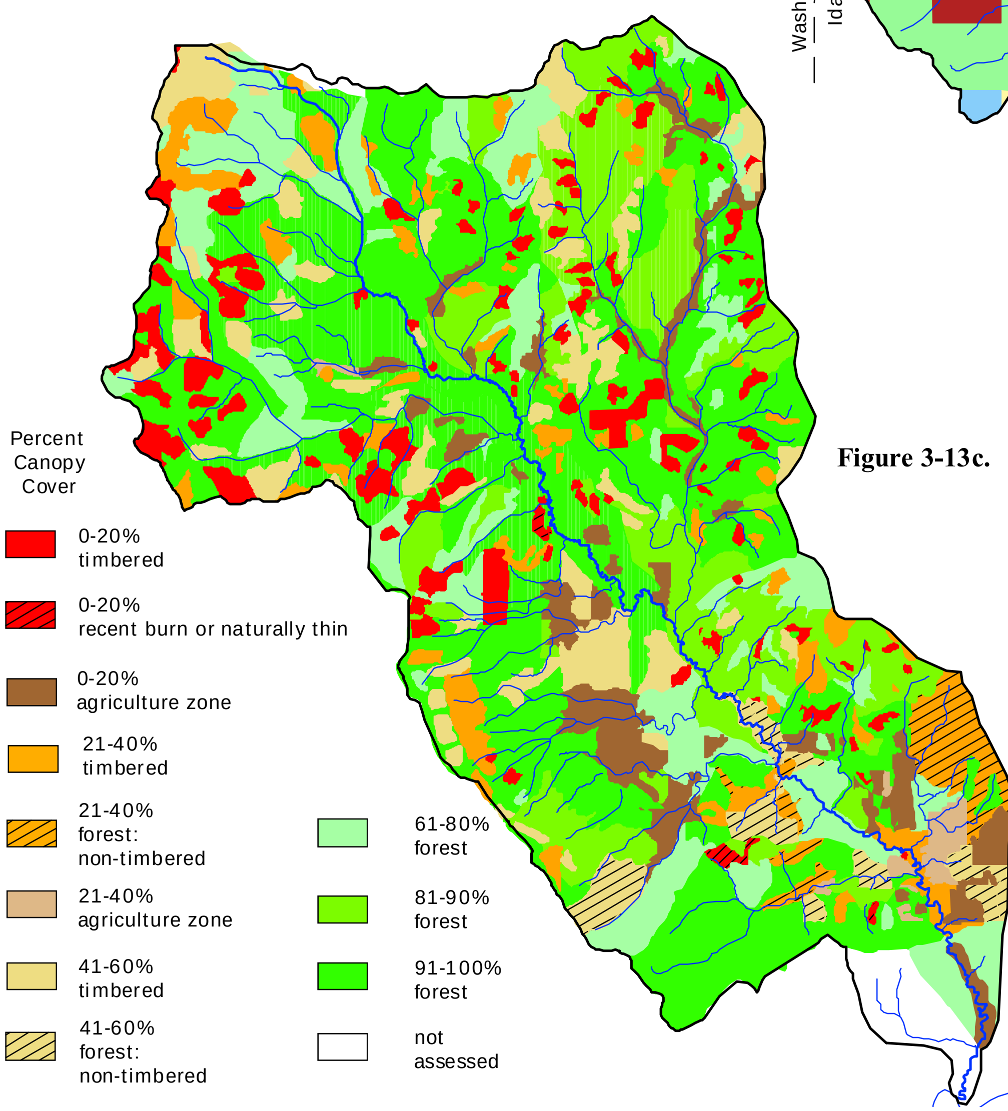
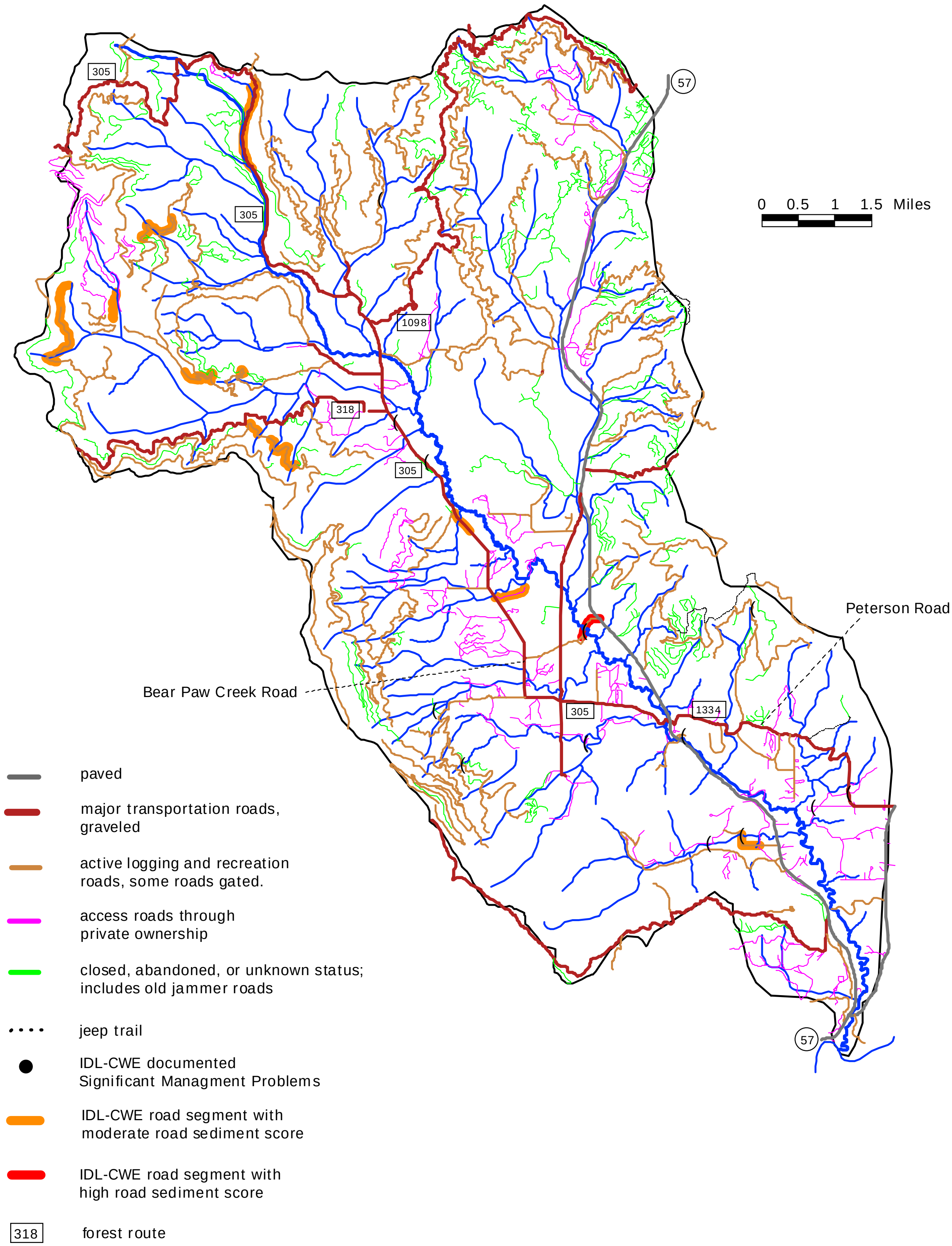


Figure 3-13c. Canopy cover of the Lower West Branch watershed.

Figure 3-13d. Roads in the Lower West Branch watershed.



Historic wildfires between the years 1900 - 1937 occurred within the southern one-fourth of the watershed (Figure 2-6, USFS 1999). The larger remaining portion of the watershed has received only scattered and isolated fires. There have been no large fires since 1950. Current conifer forest types are dominated by Douglas-fir, grand fir, and western red cedar (USFS 1999). The USFS estimates 3,330 acres of National Forest Lands in the watershed have some level of Douglas-fir beetle caused mortality. Harvesting of some of the affected trees began in 2000.

Around 85% of the main stem length is gradual sloped with a majority of the gradient less than 0.5% (Figure 3-13a). The predominant channel type is F4/F5 with confined banks (USFS 1998b), but there are long stretches of C and D channel types with broad floodplains. Riparian vegetation is a mix of alder/willow and sparse to dense conifer overstory. Along the stream course are many wetland areas. Most tributaries have a higher percentage of B and A Channel type than the main stem. The exception is Moores Creek, one of the larger tributaries, which is almost entirely gradual slope. Significant areas of flatlands surrounding Lower West Branch and lower sections of tributaries have been converted to hay cropping and grazing. Approximately 62 miles of the watershed perennial streams flow through private land, or around 32% of the total, and another 25 stream miles flow through federal land with allotments for grazing.

Substrate type throughout most of the main stem is a thick layer of sand and silt, with scattered gravel and cobble beds. Compared to other west side streams of the Priest Lake basin, there are considerable deposits of silt and clay related to the belt rock parent geology of the western and southeastern hillsides, and a lacustrine stream valley. Meander pools and glides/runs are the predominant habitat type (USFS 1998b). There are a few sections of riffles, shallow runs, and pool tailouts with gravel and cobble suitable for spawning. Beaver dams and pools are common. There are reaches with a good amount of woody debris of alder and conifers incorporated into the channels and forming pools. Pool quality has mostly been rated as poor to adequate, and instream cover is generally rated as poor.

In 1987 IDFG conducted an electro-fishing survey within the main stem from the mouth to the Idaho - Washington border, and within Moores Creek (Horner *et al* 1988). The USFS conducted snorkeling and electro-fishing surveys in several tributaries in 1992 and 1998 (USFS file notes). DEQ electro-fished two lower main stem sites in 2000. Historically, the Lower West Branch drainage was considered as supporting populations of westslope cutthroat trout. In the IDFG surveys no cutthroat were sampled. Fish species captured were brook trout, redside shiner, longnose dace, largescale sucker, pumpkinseed, brown bullhead and channel catfish (the latter two species are presumed migrants from Blue Lake). It is known from local fishermen that an occasional brown trout and rainbow trout is caught. Brook trout density was low in the Lower West Branch. Moores Creek on the other hand had high densities of brook trout and was considered to have good quality brook trout habitat.

The USFS surveys of tributaries showed mainly a dominance of brook trout with occasional cutthroat sampled. DEQ surveys found low brook trout density within the lower half of the main stem, and no cutthroats were captured.

It is uncertain if bull trout inhabited Lower West Branch historically, but they are probably not present now, and the stream is considered low priority in bull trout recovery plans (Panhandle Basin Bull Trout TAT 1998a). A complete fish migration barrier exists on the main stem at Torrelle falls, 8.2 miles from the mouth. There also is a fish migration barrier about one mile from the mouth of Bear Paw Creek, a major tributary, due to twin culverts under Forest Service Road 305 (Figure 3-13d).

3.3.A.2 Cultural Characteristics

Lower West Branch is a mixture of federal lands and private ownership with a small acreage of State ownership (Table 2-5 and Figure 3-13b). Land use activities in this watershed is considered high relative to the rest of the basin. Industrial timber holdings total 1,468 acres in the watershed. Within the State of Idaho there are 9,978 private acres which are not industry owned. Most land use on these private holdings has been given a general designation of agriculture zone with hay cropping and grazing. Small scale NIPF timber operations occur on this private land, and there have been several observations of departures from Idaho Forest Practices Act (FPA) - BMPs. As more rural homesteads are being built there also has been an increase in substandard private roads and stream crossings. In the State of Washington there is another 1,919 acres of private non-industrial land where there is hay cropping, grazing, and NIPF timber operations. Land under USFS management totals 42,743 acres, around 32% in Washington. Most of this land is managed for timber production and there is a substantial 7,895 acres in grazing allotments.

The Lower West Branch has had a long history of logging beginning in the late 1890s (USFS 1999). A large timber sale occurred between 1912 and 1930, conducted by Dalkena Lumber Company, and mainly was selective logging of large and more valuable trees. There has been a succession of timber sales on federal lands since then. During early settlement days a good deal of the homesteaded land was logged with acreage converted for agriculture, which included drainage ditches and wetland conversion, and stream channel straightening. An estimated 25% of the drainage has been logged (Figure 3-13c). The watershed is moderate to heavily roaded.

3.3.A.3 Pollutant Source Inventory

Point Source Discharges
No point source discharges exist in the Lower West Branch watershed.

Nonpoint Sediment Sources

Timber Harvesting - USFS cites that a portion of current poor stream habitat relates to the legacy of early and mid century harvesting (USFS 1998b). For example, in the late 1930s a major logging operation transported logs down the stream channel by cordoroys and flumes. An extensive road system was built throughout the drainage, adjacent to streams in some areas. Another example comes from USFS field notes that reported a damaging clear-cut operation in the upper stretches of Mosquito Creek watershed (USFS 1998b). The riparian zone had been harvested and no apparent buffer zone exists. The stream is choked with slash along the clear-cut borders, and silt has filled in the pools and covered the riffles. This timber sale was within legal guidelines at the time of harvesting (USFS 2000c).

NIPF Timber Harvesting - Departures from forest practice BMPs have been observed by NIPF operations in the Lower West Branch watershed. In one case along the lower main stem, a clear-cut harvest was conducted on a steep bank of the stream, and shortly thereafter a rain storm caused a mud slide into the stream. Several NIPF operations have been observed along the flatlands of Bear Paw Creek Road, a major road that is county maintained. In a few cases the logging road approach to the county road was not armored, and produced sediment to the road ditches during rain storms. In turn, this sediment was delivered to streams crossing under the county road. In a couple of cases the initial logging road construction filled in the county road drainage ditch (no culvert), with the temporary blockage causing sediment runoff and road wash.

Roads and Stream Crossings - DEQ GIS analysis of roads in the watershed produces a total of 472 miles (18.5 miles paved), for a moderate - high road density of 5.3 mi/mi^2 (Figure 3-13d, and this excludes roads obliterated by USFS). Density of active roads that are either open or have access controls is 4.0 mi/mi^2, well above the basin-wide average (Table 2-13). Of the 352 miles of active roads, 87 miles are unpaved access roads servicing private timber, agricultural, and rural residential areas.

Stream crossing density of the total road network equals 1.3 crossings/mile of stream (238 stream crossings), just above the basin-wide average. During IDL - CWE inventories in September 1999, several culverts were found to have down-stream drops (bottom lip of culvert to surface water) in excess of 1 foot and at times 2-3 feet. This degree of drop may prevent upstream fish migration. Also, a few culverts were found to be causing extensive down-stream bank cutting and erosion.

The IDL - CWE inventory covered 85 miles of forest roads that were recorded on the GPS unit (other miles were driven that were not recorded because of GPS malfunction). The weighted average road sediment score among the eight, 6th order HUCs assessed was 17, or "low". There were 14 Significant Management Problems recorded (Figure 3-13d), and these were road segments with severe erosion or structural failures.

The USFS also recorded road problems in the 1998 assessments for the Douglas-fir beetle EIS (USFS 1998b). On Flat Creek for example, two old logging roads run parallel to the stream and the road closest to Flat Creek had been washed out in two places, contributing sediment. In areas where the road bed is still intact, water has carved a channel down the middle of the road which eventually drains into the stream.

Based on the sediment load calculations for Lower West Branch in Section 4, the total road network is estimated to increase sediment load over the natural forested land yield by 79% (assuming 100% delivery to streams). This loading includes an estimate of road washout problems at stream crossings based on USFS maintenance experiences (Janecek Cobb *pers comm*).

Urbanization and Private Roads - Increasingly there seems to be development of 5-20 acre home lots and ranchettes in the watershed. Development was observed to the west along Bear Paw Creek Road (Forest Road 305, Figure 3-13d), to the east off Peterson Road (Forest Road 1334), and along Pine Creek. Several miles of private roads and driveways in these areas were assessed during the CWE inventory. In general, these unpaved roads do not meet the standards established by FPA roads. Often, there is no gravel base and there is rutting and channelization of flow. Drainage ditches are often inadequate and not stabilized, and there were occasions when loose dirt spoils of newly dug ditches were very close to streams and clearly eroding into the streams. Some culvert road crossings were observed as not having proper gravel armoring, and there were raw cut and fill banks at the crossings. Private roads and driveways built on steep slopes often do not have adequate runoff management structures such as water bars and dips, or cross drain culverts. Examples of subwatersheds where sediment producing private roads were observed include Pine Creek, Snow Creek, and Pee Wee Creek.

County Roads - Bear Paw Creek Road is a major transportation road maintained by Bonner County. Beginning at Hwy 57, the road runs west and then northwest following the general course of Lower West Branch (Figure 3-13d). The road eventually becomes Forest Road 305 which runs parallel to the headwaters of the main stem. There also is a major north - south cross road at the Four Corners Grange. The significance of this road system (about 10 miles), is that numerous tributaries cross perpendicular under the roads as they head toward the main stem. Tributaries crossing under this road system include Snow Creek, Tunnel Creek, Moores Creek, Ole Creek, Slough Creek, Roger Creek, Mosquito Creek, Bear Paw Creek, and the main stem itself.

The road does have a good gravel base, and is a flat-rolling grade until it parallels and heads up the main stem headwaters. But, from observations it is obvious that fine sediment does flow off the road into the drainage ditches, and then is deposited into streams at the road crossings. Possibly producing a greater amount of sediment is the ditch maintenance practices of Bonner County. Each fall the ditches are scraped clean and the spoils are piled on top of the ditches. This produces significant loose soil, and during fall rain storms the loose dirt sloughs and is incorporated into the ditch runoff reaching streams. The ditches are not given the opportunity to develop a vegetative base for soil stabilization. The county states that this practice is necessary to maintain sufficient carrying-capacity in the ditches to prevent overflow and road wash. The county has placed some straw bales and filter fencing at ditch terminals of stream crossings, but overall these are inadequately preventing sediment discharge to streams.

Encroaching and Riparian Roads - With the exception of stream crossings, only a minor amount of the Lower West Branch road network is within the 50 ft encroaching zone. The total road network within a 200 ft zone of watershed streams (including stream crossings), equals 49 miles, or 0.26 mi/mi of stream, and active roads in this zone is 0.20 mi/mi of stream. Based on the USFS draft Geographic Assessment for the basin (USFS 2000a), the estimated riparian road density for the Lower West Branch is 4.3 mi/mi^2 riparian area (Table 2-13). The above data for riparian roads is around the basin-wide average.

Mass Wasting - The IDL - CWE mass failure hazard rating for the eight, 6th order HUCs ranged from moderate to high, except for a low rating for Pine Creek. Only one mass failure was recorded in the CWE assessments, and the mass failure sediment delivery score for the watershed was "low". From USFS maintenance experiences however, there are, on the average, around 6 failures per year on the federal road prism other than stream crossing washouts (Janecek Cobb *pers comm*). Average soil volume delivered to streams per failure was estimated around 55 cubic yards. There are also atypical (averaging once every 10 years or so), large mass failures, such as a 1997 road-bed fill failure on Bear Paw Creek Road near the Ole Creek stream crossing. This failure delivered an estimated 2,220 cubic yards near the vicinity of the stream crossing. Including an estimate of the above two types of failures into sediment load calculations for the road prism, increases sediment load over the natural forested land yield by 156%.

There have also been large mass failures along Lower West Branch main stem within a lower reach canyon of about 5.5 stream miles. This canyon reach begins around the Cuban Creek inflow (T56N R5W S1), and continues upstream past the Pine Creek inflow terminating near the southwest corner of T57N R5W S23 (just past elevation 2200 ft on the main stem, Figure 3-13a). Here, the canyon walls are steep and about 200 feet high, and apparently susceptible to failure because of the high sediment hazard landtype Lacustrine Stream Channels. A layer of gravelly silt or sandy loam overlays a clay layer, allowing slippage (Niehoff *pers comm*). During the stream bank erosion survey in 2000, a 1.0 mile reach was assessed within this area. Four mass failure scars were observed, at least one in recent times since a barbed wire cattle fence and steel fence post were hanging in the air at one failure scar. This failure was estimated at 200 ft wide, 200 ft long, an average 7 ft deep, and with 100% delivery to the stream the volume was around 10,370 cubic yards and 22,000 tons. It is uncertain as to what degree these failures are natural as compared to relating to land use activity. One failure in this stretch has been attributed to a private clear-cut followed by a landslide during a thunderstorm. Also, a sediment deposition plug or debris dam, along with peak high flows, may concentrate stream energy toward the toe of a cliff segment, precipitating a mass failure (Janecek Cobb *pers comm*).

Agriculture - Related to the agricultural acreage and federal grazing allotments, there has been some stream bank damage done by direct cattle access and crossings, as documented by USFS surveys (USFS 1992 and 1998b), and by DEQ observations. Stream reaches exist where there is little in the way of riparian shrubs offering shading vegetation, and banks are sloughing. Stream segments affected by grazing include Snow Creek, Tunnel Creek, Bear Paw Creek, Moores Creek, Flat Creek, and isolated sections of the main stem. There are historic wetlands, wet meadows, and floodplains that have drainage ditches and stream channels that have been straightened.

Canopy Cover and Peak Flows - Unfortunately there have been no documented stream flow measurements and gauging efforts to form a daily hydrograph on Lower West Branch. IDL - CWE assessments were able to compose a canopy cover map (Figure 3-13c), although there were several zones of estimation due to an incomplete set of available aerial photographs and orthophoto quads. Canopy Removal Indexes (on forested lands only) for the eight, 6th order HUCs ranged from 0.10 to 0.40, with a weighted average watershed CRI of 0.27. The Channel Stability Indexes all ranged on the high end of moderate (trending toward an unstable condition), 51 - 56 CSI. The overall watershed Hydrologic Risk Rating was within mid-point of the moderate range. USFS estimates that 16% of the watershed has hydrologic openings (USFS 2000a).

USFS cites that, "the Lower West Branch is a channel out of hydrologic equilibrium as evidenced by extremely poor channel conditions and numerous sources of ongoing sediment delivery to streams" (USFS 1999).

Instream Erosion - It is believed that stream bank erosion is a significant direct sediment contributor to the main stem and tributaries. There are many reaches along the main stem of C and F channel types with one or two confining banks that are at times high and steep. Areas have been documented where super saturated clay banks are eroding and sloughing. At times this is a natural condition related to insufficient root stabilizing vegetation. But there are observations where the condition has been obviously exacerbated by historic riparian logging, adjacent road fills, cattle access, and 4x4 access. Within the bankfull width, there is documentation of high amounts of down cutting, bank slumping and undercutting (USFS 1998b). This condition can be exacerbated by excess stream energy related to hydrologic openings and decreased floodplain function. USFS field surveys estimate that in some reaches as high as 50 - 75% of the stream banks were affected by bank slumping (USFS 1998b).

As mentioned previously, a stream bank survey was conducted along 1.0 mile of the lower main stem within a canyon. Portions of this reach likely had historic cattle access, but there was little sign of recent access. Of the total stream reach assessed, 24% of the length was found to have either one stream bank or both with evidence of a recent eroded condition. A statistical work-up of the survey data leading to an estimate of lateral recession (data analysis by the NRCS, Sampson *pers comm*), produced a moderate - high erosion rate of 51 tons/stream mile/yr for the one mile assessed.

A middle reach on the main stem, from the confluence of Slough Creek and downstream (Figure 3-13a), was also surveyed for bank erosion. Stream length assessed was 0.5 miles. This reach was within a federal grazing allotment and private agricultural land where there is current cattle access to the stream. Of the total stream reach assessed, 18% of the length was found to have either one stream bank or both with evidence of a recent eroded condition. The calculated erosion rate was 33 tons/stream mile/yr over the 0.5 miles assessed.

When extrapolating the calculated instream bank erosion rates from the two segments assessed over 21.3 miles of gradual gradient main stem, the load becomes 851 tons/yr.

3.3.A.4 Summary of Past and Present Pollution Control Efforts

See Section 2.4.2, page 60 for Forest Plan of the Idaho Panhandle National Forests. In their comment package to the draft SBA, USFS states that as a result of the Douglas-fir beetle EIS the agency identified improvements to include road obliterations, improved road surfacing, improved culvert sizing, and increased frequency of cross drains (USFS 2000b). Through timber sale receipts obtained from the Douglas-fir beetle project, USFS has scheduled restoration activities within the Lower West Branch drainage including: 12 miles of timber road obliteration; 22 miles of road reconstruction; maintenance procedures over 34 miles of road; an addition of 39 relief culverts and 132 rolling dips; and removal of 24 instream culverts (USFS 2001).

3.3.A.5 Water Quality Concerns & Status

Refer to Table A-5 for the history of DEQ §305(b) and §303(d) listings for Lower West Branch; Table 2-6 for designated and beneficial uses; and Table 2-12 for determined support status of designated and existing beneficial uses.

3.3.A.6 Summary and Analysis of Existing WQ Data

A daily hydrograph has never been established for Lower West Branch, and the only flow measurements on record are from the summer BURP crews. USFS does estimate a mean annual discharge of 178 cfs.

Peak flow would be from mid-March to late April. From visual observations this stream is very flashy as stream flow responds quickly to winter and early spring rain-on-snow events. USFS, though, labels the acreage of sensitive snowpack at 30% of the drainage, a percentage less than most other western watersheds (USFS 2000a). Summer base flow in the lower main stem measures from 20 - 35 cfs. Based solely on a watershed proportion basis applied to the annual gain in water in Lower Priest River between the upper and lower USGS gauging stations (Figure 2-1), annual flow into the river from Lower West Branch would average 80,140 ac-ft.

Only a very few water samples have been taken in Lower West Branch. Visually, the lower half of the stream runs extremely turbid during spring runoff. In one DEQ sampling (late spring 1998), seven sites along the main stem were sampled for turbidity and suspended sediment. At the two lowest downstream sites, turbidity reached 36 NTU and maximum TSS was 48 mg/L. If sampling were to occur during the spring rising limb of the hydrograph, it is estimated that turbidity and TSS values would be substantially higher than these values.

There have been no recorded measurements of pH and DO. DEQ placed a temperature sensor within the lower main stem, downstream of Torrelle falls, from June 24 - October 2, 2000. During the warmest period of early July to mid August mean daily temperatures ranged from 15.0 - 16.8°C, and daily maximum temperatures ranged from 15 - 19.0°C (Figure 3-14). The IDL – CWE, stream canopy closure assessments, rates the main stem from mouth to beginning of headwaters as 5 - 20% canopy cover, or high salmonid temperature rating (adverse condition).

Only one bacteria sample has been taken, in September 1999. The count was 100 FC colonies/100 ml, and 130 *E. coli*/100 ml.

The BURP MBI scores for the four Lower West Branch sites (Figure 3-13a), are:

Lower 1997 = 3.7 Mid-Lower 1997 = 4.3 Mid-Upper 1998 = 4.0 Upper 1998 = 3.6

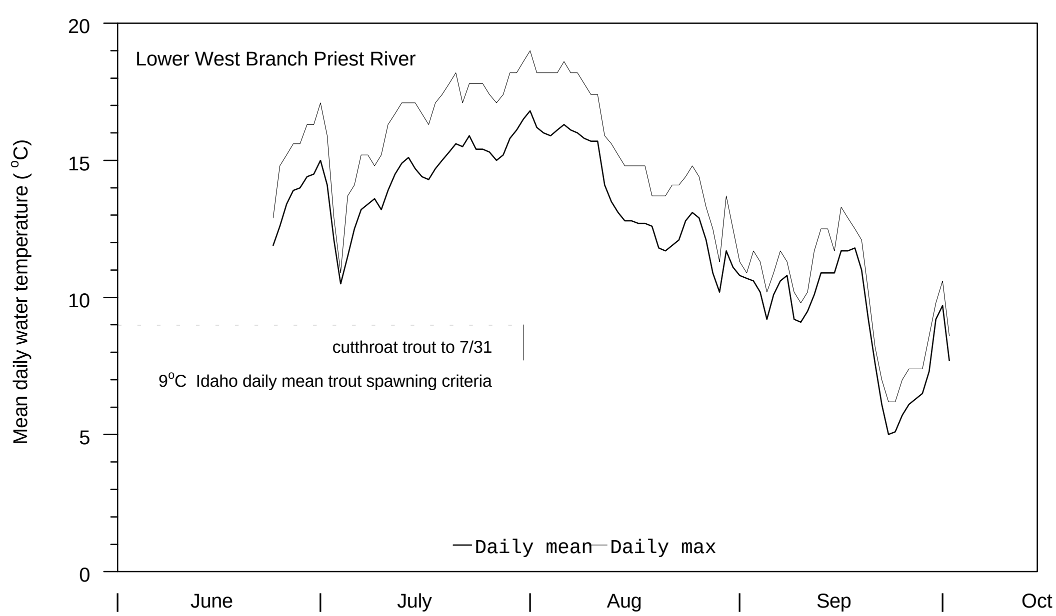


Figure 3-14. Mean daily and daily maximum water temperatures from June 24 - October 2, 2000 within a lower segment of Lower West Branch Priest River.

Table 3-7. Summary of Salmonid Fish Surveys in Lower West Branch and Tributaries, and Adjacent Streams

Study	Stream	Brook trout	Cutthroat
IDFG 1987 electro-fishing	Lower West Branch - mouth to ID-WA line 7 reaches sampled	range = 0.0 - 5.4/100 m^2 mean = 1.8/100 m^2	0
	Moores Creek 3 reaches sampled	range = 2.1 - 29.9/100 m^2 mean = 19.3/100 m^2	0
	Quartz Creek[a] 3 reaches sampled	range = 4.3 - 56.8/100 m^2 mean = 28.0/100 m^2	present in 1 reach, 1.5/100 m^2
	Upper West Branch 3 reaches sampled[a]	range = 0.7 - 3.3/100 m^2 mean = 2.0/100 m^2	0
USFS & Washington Dept. Of Wildlife 1992 electro-fishing	Hickman Creek	2 fish	none captured
	Butch Creek	numerous brook trout	none captured
	Mosquito Creek	present	present in headwaters
	Lower West Branch	1 fish	none captured
USFS 1998 & 1999 snorkeling and electro-fishing	Bear Paw Creek 3 reaches sampled	3, 6, and 23 fish sampled in 3 reaches	15, 4, and 0 fish sampled in 3 reaches
	Ojibway Creek 4 reaches sampled	2, 4, 13, and 7 fish sampled in 4 reaches. Est. mean density= 4.7/100 m^2	0, 0, 1, and 3 fish sampled in 4 reaches. Est. mean density= 0.5/100 m^2
	Moores Creek 1 reach	177 fish, est. density= 44/100 m^2	none captured
	Kavanaugh Creek	3 fish	2 fish
DEQ 2000 electro-fishing	1997 Lower BURP Site	0.3/100 m^2	0
	1997 Mid-Lower BURP Site	1.1/100 m^2	0

a = Quartz Creek is an adjacent stream to the east; Upper West Branch is an adjacent stream to the north.

Table 3-7 summarizes electro-fishing results from 1987 IDFG surveys (Horner *et al* 1988); narrative notes from 1992 and 1998 USFS snorkeling and electro-fishing (USFS file notes); and DEQ electro-fishing in 2000 at the lower and mid-lower 1997 BURP sites. The USFS surveys were intended for presence/absence indications, and the data is mostly total fish captured without estimates of density.

IDFG surveys showed overall, low density of brook trout in the main stem, although 2 of the 7 reaches surveyed did have moderate densities of around 5 fish/100 m^2. No cutthroat trout were captured. Low salmonid productivity was in part attributed to a pool quality that rated poor - fair, lack of instream cover, and sparse habitat for spawning and aquatic insects (Horner *et al*. 1988). The absence of brown trout in main stem sampling indicated limited success of a 1976 introduction of this species in the Lower Priest

River. Sampling in Upper West Branch immediately to the north, which is almost the same dimension and flow, also had low densities of brook trout. The tributary Moores Creek showed high density of brook trout, as well as Quartz Creek, another small stream immediately to the east.

USFS surveys show the presence of cutthroat trout in some of the tributaries, mostly at low numbers except for decent numbers in Bear Paw Creek. DEQ sampling within the lower main stem site showed very low density of brook trout, and no cutthroat captured. Northern pikeminnow and redside shiner were abundant. Eleven brook trout were captured at the lower-middle BURP site (2 age classes including juveniles), but density calculated as low. Numerous sculpin were sampled at the mid-lower site.

The BURP HI scores for the four Lower West Branch sites are:

Lower 1997 = 65 Mid-Lower 1997 = 68 Mid-Upper 1998 = 48 Upper 1998 = 83

The first 3 scores are some of the lowest recorded in the basin, and the score at the mid-upper site falls within the Not Full Support category. Habitat parameters that had below mid-point scores were common among all sites, and included: 40 - 100% fines, poor instream cover, high embeddedness, slow/fast ratios from 0 - 0.2, and lack of habitat type diversity. The low slow/fast ratios resulted from most of the BURP reach lengths being classified as a “run”. This habitat typing is contrary to that estimated from USFS habitat surveys where pool/riffle ratios as high as 44:1 were cited (USFS 1992). The difficulty in Lower West Branch is a deep depth and uniformity of channel dimensions, so it is often a subjective interpretation to distinguish between a pool, run or glide. Regardless, recognizable riffles are rare; in the first 3 BURP sites there were no habitats typed as riffles.

The 1992 DEQ Use Attainability survey of 2 sites within the lower to middle main stem gives a similar picture of marginal habitat conditions. Overall habitat score for both sites rated as “poor”, with low scores relating to lack of instream cover, sand deposition, and embeddedness. Pool complexity was rated as poor. At one site most of the 480 m reach was classified as a glide with only 1 pool. At the other site a single large pool yielded a moderate Residual Pool Volume of 351 m^3/km.

USFS field surveys within reaches of federal ownership were conducted in 1998 on Lower West Branch and the tributaries Flat Creek, Roger Creek, Mosquito Creek, and Moores Creek (USFS 1998b). Surveys included notes on habitat type, substrate type, instream cover, stream bank condition, channel type, and also Wolman Pebble Counts in low gradient riffles, pool tail-outs, and within pools.

USFS main stem surveys ranged from the confluence of Guinn Creek upstream to the headwaters near Blickensderfer Creek (Figure 3-13a). Several segments were omitted due to private property access. Percent fines (0 - 8 mm) within riffles and pool tail-outs averaged a high 64%. Fines included a clay and silt component. Percent fines were high within many pools. Many stream banks were found to be eroding with poor bank stability, and in some cases this was attributed to adjacent land use practices. Most pools were meander formed, but there were areas where most pools were formed by woody debris. In some reaches, high concentrations of woody debris embedded in the stream banks were attributed to past riparian logging operations.

Average percent fines in Flat Creek was 85%. Bank alterations caused by cattle were found in some sections, and some sediment was entering the stream from old logging roads. In Roger Creek, entirely B and A channel type, average percent fines was lower at 33%. Pool density and quality were rated overall as low within the two reaches surveyed. Percent fines were not measured in Mosquito Creek. Pool quality and density were rate overall as low. Mosquito Creek was considered impacted due to historic logging within a portion of the riparian zone.

Moores Creek runs primarily through flatlands of wet meadows, hay fields, and areas with direct cattle access from both private lands and federal grazing allotments (Figure 3-13b). Some sections through private property have been channelized. Moores Creek is of interest because of high density brook trout, and what USFS considers as good brook trout habitat (USFS 1992). Riparian vegetation is mostly shrubs and grasses. Instream cover is aided by aquatic vegetation. The lower-most 1 mile did have 41% pool habitat formed by meander, alder debris, and beaver dams, with pool quality rated fair to good. Riffles comprised 17% of the habitat. However, the next 1.4 mile reach, up to the confluence with West Moores Creek, has stream banks impacted by cattle grazing, and a habitat of 86% run, 10% pool, and only 3% riffle, and overall low quality due to poor instream cover.

3.3.A.7 Status of Beneficial Uses

The BURP MBI results for the main stem are all Full Support for cold water biota beneficial use. The IDFG fish sampling indicates Full Support for salmonid spawning beneficial use using brook trout as the species present, and USFS data shows limited cutthroat spawning in the tributaries. The DEQ fish surveys, when using WBAG guidelines (IDEQ 1999), results in Not Full Support for salmonid spawning for the lower main stem site, and also NFS for the mid-lower site with the combination of only 2 age classes and HI <73. There is little doubt however that there are self-propagating populations of brook trout throughout the main stem.

When examining cold water biota beneficial use by WBAG+, using additional information of fish survey results, habitat evaluations, and various sediment load calculations from land use data, the conclusion is drawn that for Lower West Branch, cold water biota beneficial use is impaired in part due to excess sediment. Within the main stem, run, riffle and pool tail-out habitat with gravels and cobbles are sparse, and IDFG cites low overall abundance of aquatic insects as a possible reason for the low productivity of brook trout (Horner *et al* 1988). Sparse habitat to support aquatic insects is also noted in USFS field notes (USFS 1998b). The various stream habitat surveys all show significant stream reaches of impaired fish spawning and rearing conditions related to sedimentation.

The judgment of Not Full Support seems in line with a summary of Lower West Branch conditions cited by USFS, that "the main stem of the Lower West Branch has been adversely impacted by frequent introductions of large volumes of bedload, historic ditching of channels, past filling of wetlands, and the altering of natural drainage patterns with road construction. The Lower West Branch is a channel out of hydrologic equilibrium as evidenced by extremely poor channel conditions and numerous point sources of ongoing sediment delivery to the streams. The channel will not likely move towards stability until large scale rehabilitation projects are implemented" (USFS 1999).

Stream temperatures show that there are exceedances of the State Standards criteria for cutthroat trout spawning and incubation in late June and July.

The fecal coliform and *E. coli* bacteria sample was below criteria levels, so FS is assigned to primary contact recreation. Domestic water supply is an existing use of some tributaries to Lower West Branch, and possibly of the main stem itself, but the use is isolated to single family residences so the turbidity criteria does not apply. The toxic substance criteria was Not Assessed.

3.3.A.8 Data Gaps

Turbidity/TSS sample runs should be made during the spring rising limb of the hydrograph to document the extent of suspended material.

3.3 §303(d) Listed Streams Evaluated as Impaired for Cold Water Biota Beneficial Use, and Recommended for Sediment TMDL Development

B. Kalispell Creek

Summary
Kalispell Creek was added to the 1996 §303(d) list as a result of Idaho Panhandle National Forest analysis. The listed pollutant is sediment. Kalispell Creek was retained on the 1998 §303(d) List (DEQ 1999).

Kalispell Creek has been assessed by 5 BURP sites. MBI results at a lower and middle site in 1995 resulted in Needs Verification for cold water biota beneficial use. MBI results at nearby lower and middle sites in 1997 produced Full Support, and an upper site in 1998 was FS. There have been numerous fish surveys throughout the Kalispell drainage in the last eight years, and while there are resident populations of cutthroat trout primarily in headwater reaches, densities are low, and very few cutthroats have been captured within the main stem. Brook trout are the dominant salmonid species, but even their population numbers appear low in relation to other comparable streams. BURP, DEQ Use Attainability, and USFS stream surveys show mostly poor to medium habitat values. Also, USFS rates the watershed system overall as a Not Properly Functioning Condition (USFS 1999).

The conclusion of this SBA is that the fish sampling data suggests an impaired salmonid fishery, or Not Full Support of the cold water biota beneficial use. USFS attributes an impaired fishery, in part, to a stream bedload of sand that exceeds the stream's capacity to transport it, with a result of filling in of pools and covering of spawning gravels, and also other habitat features such as sparse instream cover and insufficient recruitment of large woody debris which form pools (USFS 2000c). There is also the factor of significantly suppressed adfluvial cutthroat populations within Priest Lake that historically spawned in Kalispell Creek, and the competition factor of the introduced brook trout over the native cutthroat.

In the USFS comment package to the draft Subbasin Assessment (July 2000), USFS stated that there has been extensive surveys of the streams, road networks and timbered units, and with a few exceptions, identified sediment sources have been addressed (USFS 2000b). The DEQ sediment calculations presented in Section 4 and summarized in this section seem to show that the current sediment load from the road network is relatively low. One road impact is Forest Road 308 which for about 4 miles parallels closely Kalispell Creek within its floodplain. A large scale proposed project, detailed in an upcoming Kalispell timber regeneration/watershed restoration draft EIS, includes a plan to relocate this road to higher ground and restore riparian characteristics along this channel stretch (USFS 2000b).

The conclusion of the USFS watershed assessment is that the current habitat conditions seem largely a reflection of historic fire and legacy land use rather than recent sediment loading, and to some degree a reflection of the predominant granitic geology. Large stand replacing fires in the late 1800s and early to mid 1900s, intermixed with salvage logging and green timber logging, with related construction of a transportation network, clearly led to a historically high sediment delivery and water yield.

The draft SBA and TMDL (December 2000), agreed with the USFS in that the current level of watershed sediment load to Kalispell Creek has not likely impaired cold water biota beneficial use below Full Support, or prohibits recovery to Full Support. Kalispell Creek was thus proposed for §303(d) de-listing with sediment as the listed pollutant of concern. However, the Priest Lake Watershed Advisory Group (WAG) in their consideration of the draft SBA and TMDL, recommended that the current status call of Not Full Support for cold water biota warrants that Kalispell Creek not be de-listed, and that a sediment TMDL be prepared. This is the same conclusion and recommendation stated in the EPA comment package (EPA 2001). This final SBA and TMDL adopts the recommendation of the WAG and EPA and presents a TMDL for Kalispell Creek in Section 4.

3.3.B.1 Physical and Biological Characteristics

Kalispell Creek is a 4th order tributary on the west side of Priest Lake (Figure 2-2), flowing east from the headwaters and then southeast to the lake. Main stem length is 14.6 miles and watershed size is 25,210 acres (Table 2-2). There are approximately 64 miles of perennial streams.

For descriptive purposes the watershed is divided into 3 sections. East of Highway 57 the low gradient channel meanders 4.4 miles south then southeast to the lake (Figure 3-15a). This lower stream course has floodplains with riparian vegetation a mixture of alders, other shrubs, and sometimes a dense conifer overstory. Mountains to the north create tributary streams to Kalispell Creek, including Hazard Creek. Elevation reaches 4,057 at Lakeview Mountain.

The middle main stem section is between the confluence of Hungry Creek downstream to Hwy 57. Kalispell Creek in this segment is mostly low gradient C channel, but there are two lengthy B channel sections, 1.5 - 3.5% gradient. Mountains to the south produce several perennial tributaries (Pable, Rapids, Virgin, and Bath Creeks), and Nuisance Creek flows from the north. Elevation reaches 5,476 at Gleason Mountain. From a sediment management standpoint for Kalispell Creek, the subwatershed section to the north needs to be considered. The mountains and streams in the surrounding area of Diamond Creek, north of Nuisance Creek (Figure 3-15a), are mostly disconnected (surface water) from Kalispell Creek's main stem. They either go subsurface or flow into the Potholes Research Natural Area. There are two small streams flowing from the Potholes wetlands to Kalispell Creek, but it is believed that the majority of surface runoff and sediment produced from this northern subwatershed is not delivered to Kalispell Creek. An approximate dividing line (Figure 3-15b) gives an upper subwatershed size of 5,366 acres, and the size of the Kalispell Creek drainage reduces to 19,844 acres.

The third watershed section is the headwaters of Kalispell Creek, with 2.5 miles of B and A channel, and tributaries flowing in from the western mountains (Mush, Hungry, Chute and Deerhorn Creeks). Elevation reaches 5,552 ft at Hungry Mountain.

Average annual precipitation increases from 32 inches at the mouth to approximately 40 inches at high elevations. Precipitation is about 25 - 50% snow with a snowmelt dominated runoff pattern. Peak flow is during the period of mid-March through early May (Figure 3-16). Rain-on-snow events in mid to late winter produce only minor hydrograph spikes.

Higher elevation lands surrounding the watershed are granitic batholith, and valley hillslopes and stream bottom lands are glacial outwash, till and alluvial deposits (Figure 2-4 and Figure 4-2). There are some areas of belt rock along the northern slopes. The upper half of the drainage was glaciated, the lower half was unglaciated (USFS 1998a). The general soil map of west side Priest Lake basin only extends to the Idaho - Washington line (Figure 2-5). Lower bottom lands are Bonner soil, and granitic mountainsides are Hun - Jeru soils (Table 2-3). Valley terraces and hillslopes of glacial till are likely Priestlake-Treble soils. The IDL - CWE rating of overall surface erosion hazard is high, and the mass failure hazard rating is moderate.

The lower-most reach of Kalispell Creek east of Hwy 57 is described by the USFS as primarily C channel type with habitat composed of pools, runs and glides (USFS 1998c). The overall habitat quality is considered low - marginal because of the lack of adequate cover, habitat complexity, and depth to support large numbers of fish. Major sections have thick sandy bottoms. Alder/shrub bottoms are a very common riparian type, along with associated beaver influenced areas. There are some sections of conifer forest immediately adjacent to the stream. Recruitment of large woody debris is low, in part because of historic fire and timber removal. There are sections of riffles, glides and pool tailouts with gravel and cobble suitable for spawning, but percent fines and cobble embeddedness is high. West of Hwy 57 there are

Figure 3-15a. Kalispell Creek Watershed: streams, BURP sites, and gradients.

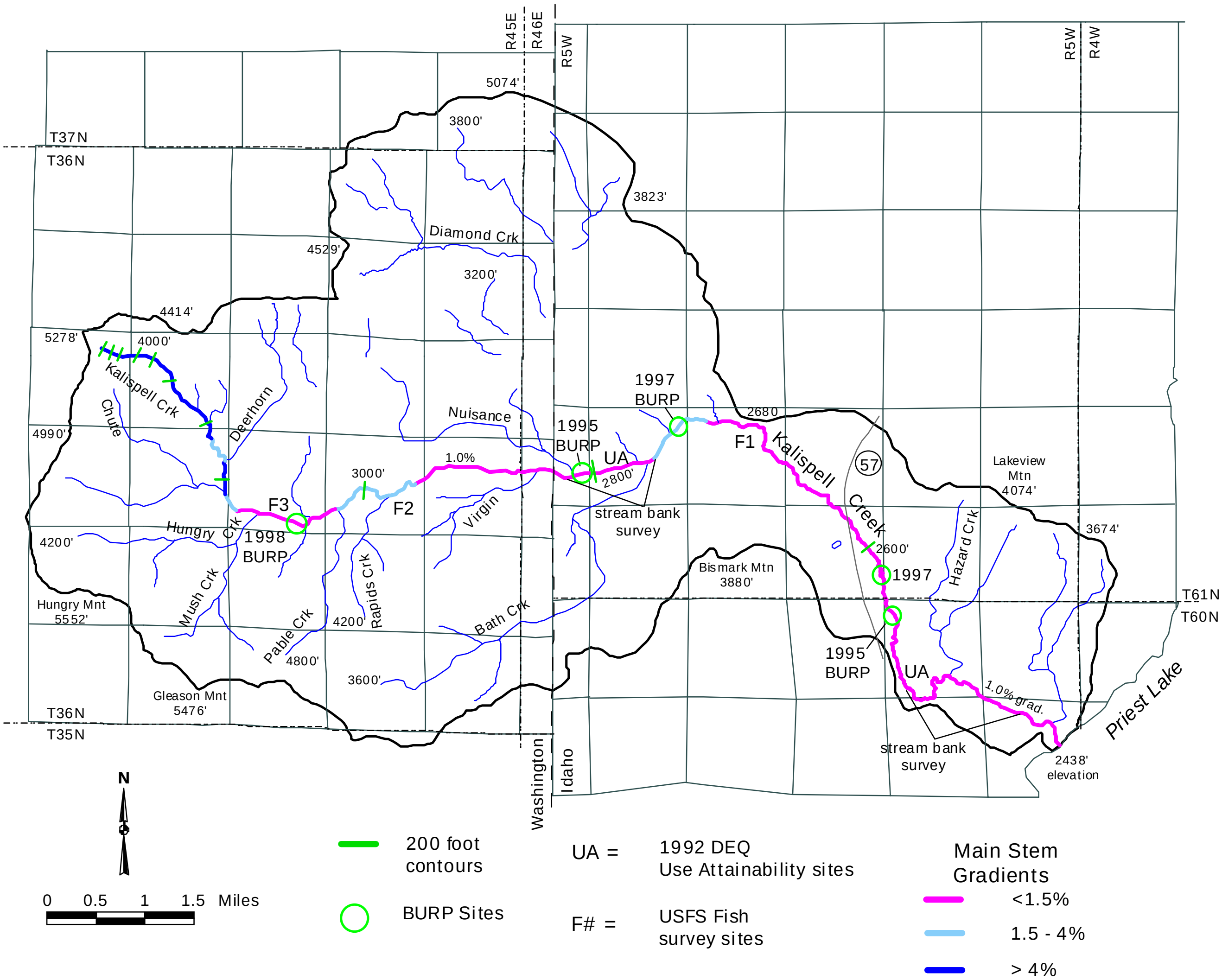


Figure 3-15b. General land use and ownership in the Kalispell Creek watershed.

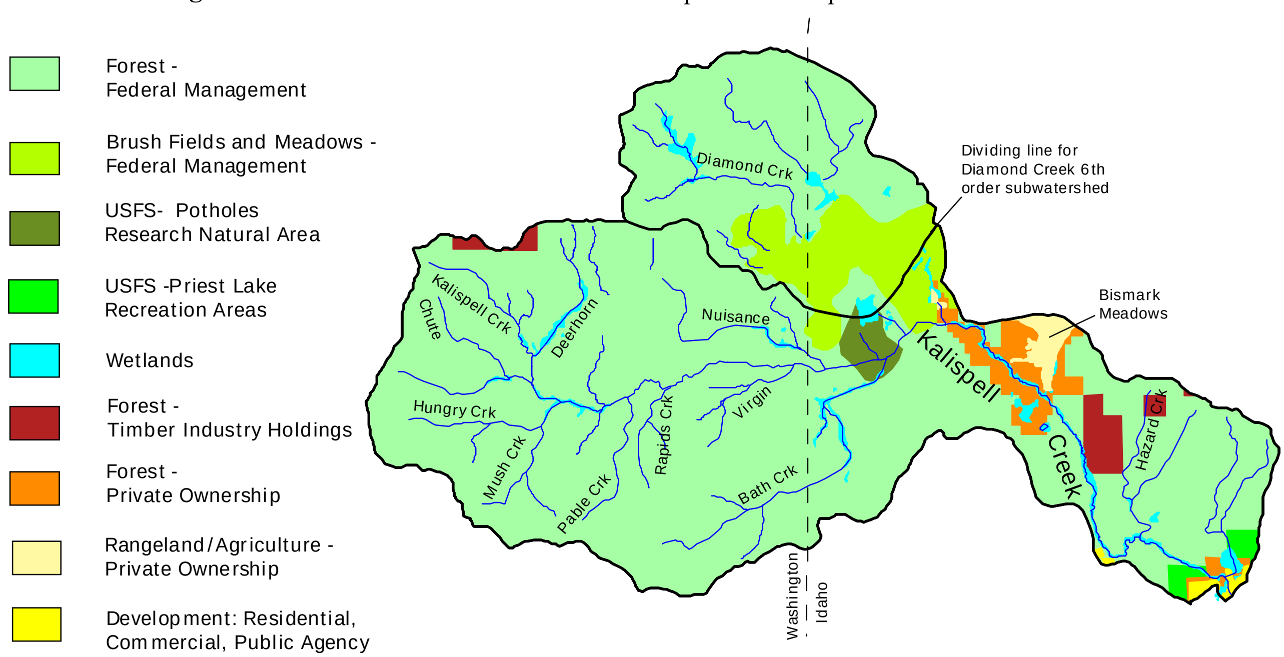
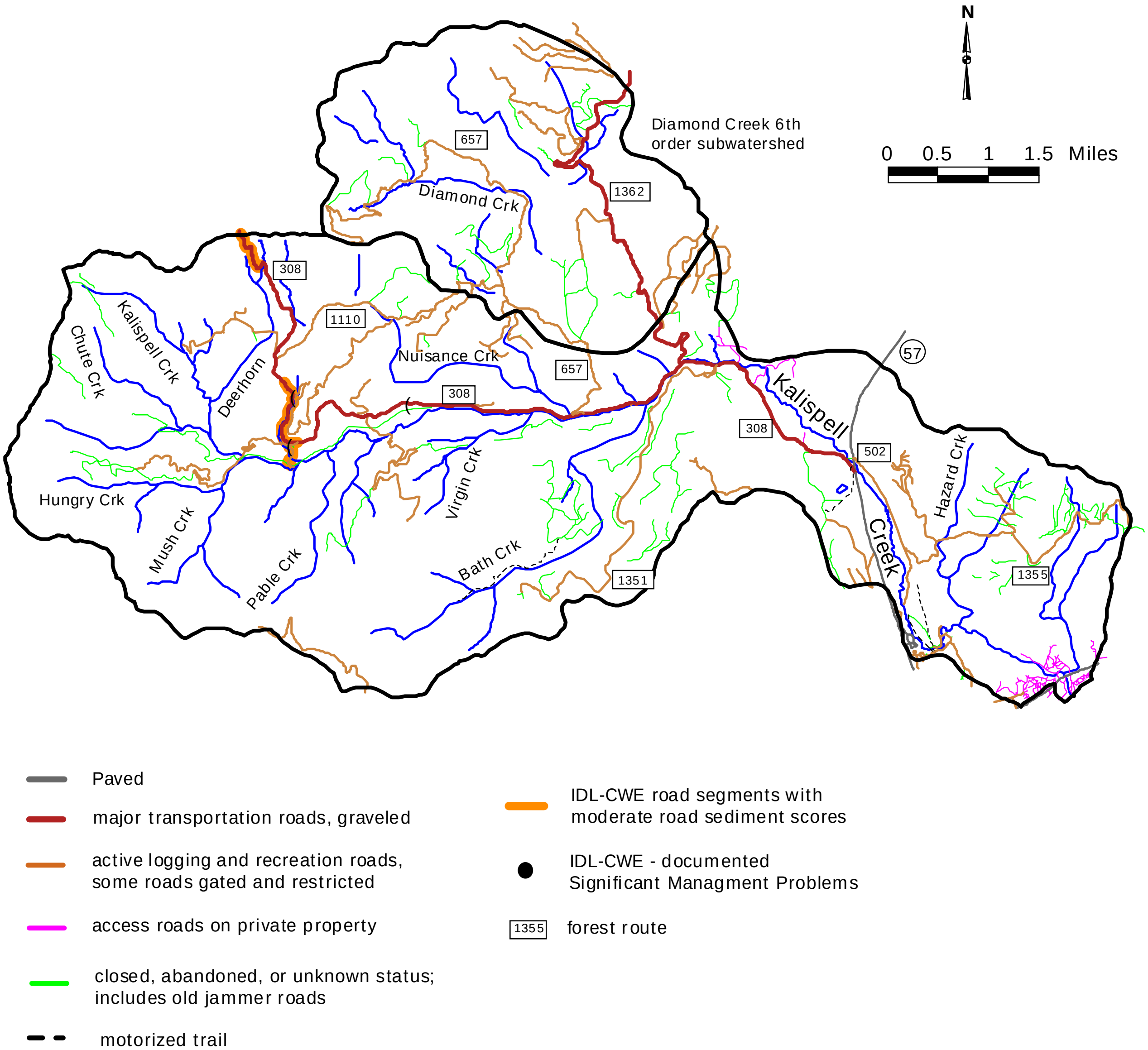


Figure 3-15c. Roads in the Kalispell Creek watershed.



major reaches that meet the above general description, but there are also B channels with decent pool quality and dense hemlock and cedar overstory. Beaver dams and pools are common throughout the stream.

Overall, the headwaters of Kalispell Creek and tributaries to the main stem offer better rearing and spawning habitat, in part because of a higher percentage of B channel type with fewer sand depositional zones, a greater percentage of pools formed by large woody debris, and more abundant gravels and cobbles (USFS 1998c). Still, much of this spawning habitat was found to be highly embedded (USFS 1998c).

There has been a history of large stand replacing fires in the Kalispell drainage over the past 100 years or so. An 1890 fire burnt the western and northern mountains, as well as the eastern lands near the lake (Figure 2-6). Another major fire occurred in 1926, and then a subsequent reburn in 1939. Following the fires and salvage logging, a large area of approximately 9,000 acres was planted with ponderosa pine and white pine, with also some Douglas-fir and spruce. The ponderosa pine seedlings were from a seed source not suited to the area, and the white pine seedlings were not from blister rust-resistant stock. These plantations have suffered high mortality due to insects and diseases, and the USFS is proposing a major timber rehabilitation/watershed restoration project in the drainage (USFS 1998c).

Several electro-fishing efforts by USFS have been conducted in Kalispell Creek since 1990, along with DEQ electro-fishing in 2000. In upper reaches of the main stem and within tributaries, there are brook trout, cutthroat trout, and sculpin, with brook trout dominating the numbers. In mid to lower reaches of the main stem only brook trout and sculpin were sampled by USFS, but DEQ electro-fishing did capture two cutthroats in a middle main stem reach. Historically, cutthroat trout displayed two life histories in the Kalispell drainage, adfluvial below fish barriers, and resident above barriers (USFS 1998c). Bull trout once inhabited Kalispell Creek, but the last reported observation of a bull trout was in 1984 (USFS 1998c). In the Priest Lake Bull Trout Assessment, Kalispell Creek is considered as supporting sub-adult and adult rearing and is considered of high importance to bull trout (Panhandle Basin Bull Trout TAT 1998a).

In a 1956 Priest Lake basin fish survey (Bjornn 1957), a significant proportion of the stream beds west of Hwy 57 were reported to have high amounts of sand covering the spawning beds, and this was in part attributed to the 1926 and 1939 fires. The 3 mile reach beginning at the mouth was found to have several sections of suitable gravel and cobble beds to support spawning, and numerous small cutthroat trout (up to 9 inches) were found in this stretch, as well as a few adfluvial spawners. A few bull trout were also reported.

At the public meeting for the draft SBA and TMDL (January 31, 2001), a long-time resident of the Kalispell Creek area gave an account of IDFG Rotenone treatments conducted in the 1950s and 1960s. This would have been done to eliminate brook trout. According to IDFG file memorandums, a Rotenone treatment within the main stem was conducted in August 1960, and IDFG subsequently planted 135,000 cutthroat fry (Fredericks *pers comm*). Another citizen's account was given of USFS chemical treatments on vegetation (Silvisar) along stream courses in the 1970s. There was speculation that the chemical might have leeched into streams leading to fish toxicity. These public comments were given as factors that might partially relate to the current low salmonid densities within Kalispell Creek.

3.3.B.2 Cultural Characteristics

Kalispell Creek watershed is a mixture of federal lands and private ownership (Figure 3-15b). Private lands total 1,360 acres (5.3% of the watershed), and private land uses include: residential areas surrounding the mouth, and increasingly, home lots developed along the stream corridor west of Hwy 57; Non-industrial Private Forest timber harvesting which includes conversion of forested land to commercial and residential properties; and a 200 acre agriculture zone within Bismark Meadows for primarily hay cropping, but also a minor amount of cattle grazing. Private timber industry owns 370 acres total, the biggest block located west of Hazard Creek.

USFS manages 23,850 acres and much of this land is managed for timber production. But federal land also includes: non-forested brush fields and wet meadows; the Potholes Research Natural Area; a portion of the Priest Lake Recreation SMA near the mouth; and a Grizzly Bear Management Unit.

The Kalispell Creek watershed has had a significant disturbance history over the past 100 years. Besides the multiple major fires from 1890 - 1939, there was major salvage and green timber logging. Railroad lines were constructed up the main stem and its many tributaries, and chutes were built to transport logs down the stream. Large stretches of riparian area were encroached upon and conifers removed. Various levels of road building and harvesting has continued in the watershed.

3.3.B.3 Pollutant Source Inventory

Point Source Discharges
No point source discharges exist in the Kalispell Creek watershed.

Nonpoint Sediment Sources

Fire and Historical Timber Harvesting **-** The 1926 wildfire burned within the headwater lands of the southern and western streams (Figure 2-6). The fire did not completely consume conifers and downed woody debris within floodplains and over stream channels, thus there was material in place to help maintain channel stability and fish habitat (USFS 1998c). The Diamond Match timber company, aided by the CCC, followed the fire by salvage logging, and logging of unburnt white pine, spruce and hemlock. This post-1926 harvesting was done by building a narrow gage railroad, plus chutes, trestles, tow paths, and some roads. Some of the transportation structure was built in riparian zones and adjacent to streams. Also, there was logging within the riparian zones.

Another major fire occurred in 1939 throughout the upper one-third of the watershed as well as near the lake, reburning much of the 1926 fire area. The 1939 fire covered 9,300 acres (USFS 1998c). This was a heat intensive fire with most trees consumed along with downed woody debris, including trees and debris within riparian zones. After this fire another round of salvage logging began, along with construction of a road network.

Based on the degree of hydrologic openings created by fire and logging, the likely erosion and failures of cut and fill slopes upon which the railroad was built, and erosion from the early road network, there undoubtedly was a tremendous sediment yield to watershed streams, and the sediment load exceeded the streams capacity to transport it (USFS 1998c). Many of the low quality habitat parameters measured today, such as high width to depth ratios, and high percent fines and embeddedness, are thought to in part reflect this early to mid century history. Additionally, there was significant fire and human disturbance within the riparian zone which affected stream canopy closure, stream bank stability, and recruitment of woody debris to aid in channel stabilization and pool formation.

Current Timber Harvesting, Roads, and Stream Crossings - Since the 1950s about 19% of the Kalispell Creek drainage has been harvested (USFS 1998c). Data presented here from the GIS analysis of the road network is for the Kalispell Creek 6th order subwatershed (19,844 acres), excluding the Diamond Creek upper subwatershed. There are 93.4 miles of total roads (Figure 3-15c), for a moderate density of 3.0 mi/mi^2. This includes closed roads and spurs in which some are vegetatively stabilized, and it excludes documented obliterated roads. Active roads that are either open or have access controls total 59 miles, or 1.9 mi/mi^2, well below the basin-wide average. An IDL - CWE assessment was conducted in 1998, and

21 miles of road were surveyed. Overall sediment delivery was rated as "low", but 3 localities of Significant Management Problems were recorded along the upper Forest Road 308, and 1.5 miles of upper Road 308 received moderate CWE road sediment scores (Figure 3-15c).

Stream crossing density of the total road network is 0.8 crossings/mile of stream (43 total crossings), which is below average compared basin-wide. The majority of crossings are over perennial streams.

Based on the sediment load calculations presented in Section 4, the total road network including failures along the road prism, is estimated to increase sediment load over the natural forested land yield by 47% (assuming 100% delivery to streams).

***Encroaching and Riparian Roads, and Instream Erosion* -** Forest Road 308 (Kalispell Creek Road) travels up the valley floor of the middle segment of Kalispell Creek, west of Hwy 57, and 3.3 miles of this road is within a 200 ft zone from the stream, and 0.9 miles is within the 50 ft encroaching zone (Figure 3-15c). Historically this was the rail route for salvage logging. Road 308 is a well traveled and maintained transportation road with a surface of compacted aggregate. Undoubtedly, there is sediment produced from the road surface, cut banks, and ditches delivered to the stream, but more importantly, the road constricts the stream and reduces the effective floodplain and riparian area of the reach. USFS is considering obliterating this road stretch and relocating it along a more northerly route (USFS 1998c). For the Kalispell Creek subwatershed, the length of total road network within a 200 ft zone of watershed streams equals 13.8 miles, or 0.3 mi/mi of stream, and density of active roads is 0.2 mi/mi of stream.

Sediment load calculations may take into account instream erosion related to the length of floodplain encroaching roads (within 50 ft of the stream), as the road can interfere with the stream's natural tendency to seek a steady state gradient (Harvey 2000a). During high discharge periods the stream may erode at the road bed or fill slope, or if the road is sufficiently armored, the confined stream energy may erode the stream banks and the stream bed. Using the calculation method presented in Section 4 from the Coeur d'Alene basin TMDL (Harvey 2000a), produces 165 tons/yr for the 0.9 mile stretch of encroaching Road 308 (erosion from two stream banks and the streambed).

The stream bank erosion survey conducted in 2000 (methods described in Section 4), assessed 1.1 miles of mid Kalispell Creek along Road 308, in which a portion of the assessment reach was adjacent to the 50 ft encroaching road segment. Of the total stream reach assessed, 14% of the length was found to have either one stream bank or both with evidence of a recent eroded condition. A statistical work-up of the survey data leading to an estimate of lateral recession (data analysis by the NRCS, Sampson *pers comm*), produced a moderate erosion rate of 18 tons/stream mile/yr for the 1.1 mile assessed.

A downstream, 1.7 mile segment of Kalispell Creek east of Hwy 57 was also assessed for bank erosion, and the length of eroding bank was 8% of the total reach assessed. Data analysis produced a stream bank erosion rate of 20 tons/stream mile/yr (a greater composite score of erosion rating factors than the upper segment).

It is uncertain how the estimates of current instream erosion relates in degree to factors such as incoming watershed sediment load, peak flows, hydrologic disequilibrium, riparian condition, or the historic stream bed load of sand deposits.

***Canopy Cover and Peak Flows* -** The IDL - CWE assessment was unable to produce a canopy cover map and canopy removal index due to an incomplete set of available aerial photographs and ortho-photoquads. Current estimates by USFS is that 38% of the watershed is still not reforested.

***Mass Wasting* -** The IDL - CWE inventory did not report any occurrences of mass failures. While mass failures have occurred in the watershed, their frequency rate appears very low.

Agriculture - Impact of agriculture is minor in this watershed. Conversion of the lower section of Bismark Meadows to hay cropping, through cross drainages, eliminated some historic meandering and floodplain effectiveness. There are only a few head of cattle that have direct access to the stream. Sediment delivery has been observed when drainage channels are mechanically re-deepened, and the spoils are piled on top of the ditch bank. Rain storms wash the loose soil back into the ditch where it is then delivered to the stream.

Urbanization - There is residential development surrounding the mouth of Kalispell Creek. There have been observations of sediment laden stormwater runoff from access roads, driveways, and home lot development being delivered into the stream. West of Hwy 57 there is development of rural homesteads off Kalispell Creek Road. The IDL - CWE inventory reported several driveways in this stretch that were in poor condition and eroding badly. Near the corner of Hwy 57 and Road 308, a gravel mining operation has recently begun, very close to Kalispell Creek. Erosion control measures have been mandated as part of the mining permit, but compliance will have to be closely monitored.

Watershed Sediment Load Calculations - As developed in Section 4, the natural or background sediment load into Kalispell Creek has been estimated at 722 tons/year (assuming 100% delivery). When calculating current sediment load from forested acres, the total road network, stream crossing failures, road prism mass failures, and hay land, the estimated load of 1,070 tons/year is 48% above background, the lowest increase of the five watersheds calculated for sediment load in these categories (Table 4-1). Keeping the sediment yield at a relative low level for Kalispell Creek drainage was a moderate road density and stream crossing frequency, and minor occurrences of road failures based on USFS road maintenance experiences of the past 10 years (Janecek Cobb *pers comm*). When adding an instream bank erosion estimate of 225 tons/yr over 12 miles of gradual gradient main stem, the percent increase over background jumps to 84% (with no estimate of natural stream bank erosion).

3.3.B.4 Summary of Past and Present Pollution Control Efforts

See Section 2.4.2, page 60 for Forest Plan of the Idaho Panhandle National Forests.

3.3.B.5 Water Quality Concerns & Status

Refer to Table A-4 for the history of DEQ §305(b) and §303(d) listings for Kalispell Creek; Table 2-6 for designated and existing beneficial uses; and Table 2-12 for determined support status of designated and existing beneficial uses.

3.3.B.6 Summary and Analysis of Existing WQ Data

A daily hydrograph was established for Kalispell Creek for WY 94 and 95 from stream gauging and numerous flow measurements (Rothrock and Mosier 1997). Peak flow for WY 95 was from early April to early May at 130 - 150 cfs (Figure 3-16). Peak runoff was associated with maximum air temperatures between 60 - 75 °F and spring rains. A late winter peak of around 100 cfs occurred in March associated with initial warming and rains. Summer base flow is around 15 - 20 cfs. The annual volume of water delivered from Kalispell Creek in WY 95 was estimated at 27,460 ac-ft.

A total of 32 water quality sampling runs were conducted between 1993 - 1995, in addition to 15 ISCO samples taken during spring runoff of 1995. During peak flow there can be relatively high (for the lake basin) suspended sediment concentrations. Maximum TSS sampled was 65 mg/L (25 NTU turbidity) with an associated maximum total phosphorus of 120 *u*g/L. Mean TP for spring runoff was 35 *u*g/L, highest in the lake basin. In base flow conditions with low suspended material, TP is also relatively high for lake basin streams, averaging 17 *u*g/L. Total nitrogen is moderate, averaging 120 *u*g/L.

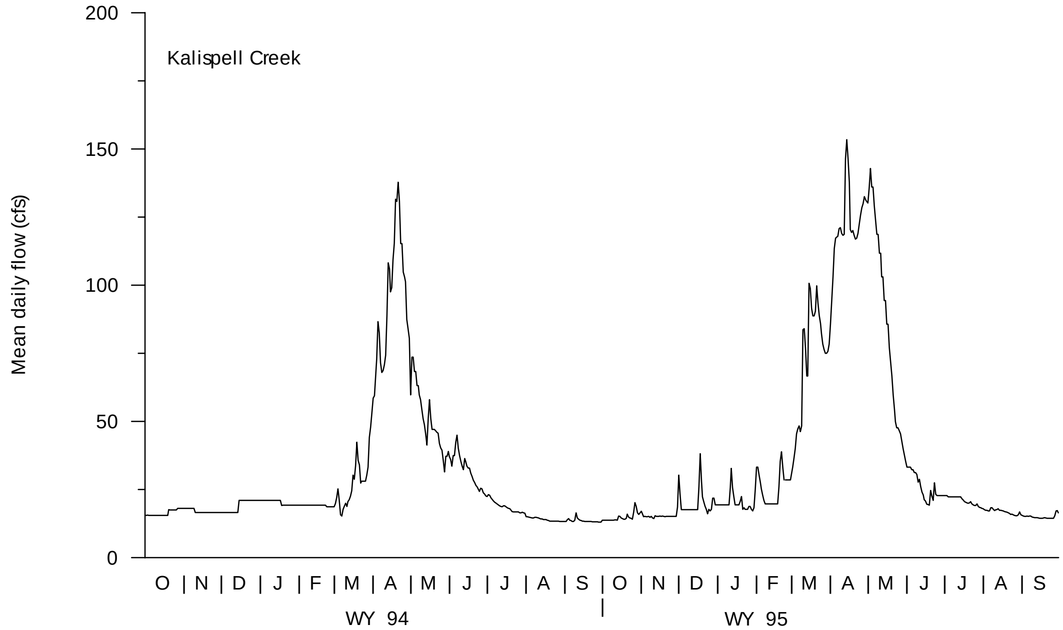


Figure 3-16. Mean daily flow rate for Kalispell Creek, water years 1994 and 1995.

Numerous instream measurements were taken of pH and DO with no numeric criteria exceedances. Highest instantaneous temperature recorded was 12.3°C. DEQ placed a temperature sensor near the mouth of Kalispell Creek from August 8 - October 25, 1997. Mean daily temperature over this period was 10.3°C, highest daily mean was 12.5°C, and maximum hourly temperature was 14.8°C. For the entire period of August through the end of September, the EPA bull trout criteria was exceeded.

Fourteen samples were taken for fecal coliform bacteria. The maximum bacteria count was 90 FC colonies/100 ml, and all other results ranged between <1 - 28 FC/100 ml.

The BURP MBIs for 1995 were 3.1 at a lower site and 3.3 at a middle site (Needs Verification, see Figure 3-15a for localities). BURP was repeated in 1997 with MBI=4.4 at a lower site, and MBI=4.0 at a middle site (Full Support). Averaged together the MBIs are 3.7 (FS) at both lower and middle reaches. For a single upper BURP site sampled in 1998, MBI=4.0.

Results of USFS electro-fishing in 1996 at three sites in Kalispell Creek, and 1998 surveys in selected tributaries, are presented in Table 3-8. As cautioned before, these surveys were primarily meant as presence/absence sampling, but with stream length and width recorded the data could be converted to fish densities. Also presented are DEQ BURP results from electro-fishing in 2000 at 2 main stem sites.

Brook trout captured included young-of-the-year and older age classes. Brook trout density within the main stem is considered low. Cutthroat trout were absent or extremely low in numbers. The densities from Kalispell Creek USFS sites F2 and F3 represent only 1 cutthroat at each site, and only 2 cutthroat were captured by DEQ at the 1997 BURP site. USFS field notes also mention 1996 electro-fishing surveys in other tributaries besides those listed in Table 3-8 (inventory sheets could not be found). Cutthroat trout distribution was found restricted to steeper gradient headwater reaches, or reaches above natural and man made barriers, in Chute, Kalispell, Deerhorn, Bath, and Nuisance Creeks (USFS 1998c).

Table 3-8. Electro-Fishing Results by USFS within Kalispell Creek and Tributaries, 1996 and 1998; and by DEQ BURP in 2000.

Data in fish/100 m²									
	USFS 1996 Kalispell Creek[a]			**USFS 1998 Tributaries**				**DEQ 2000 - Main Stem BURP Sites[b]**	
	Site F1	**Site F2**	**Site F3**	**Rapid Creek**	**Virgin Creek**	**Bath Creek**	**Hungry Creek**	**1995 Lower Site**	**1997 Middle Site**
Cutthroat trout	0	0.1	0.1	0	0	0	0	0	0.3
Brook trout	3.7	2.1	3.3	0	0	11.4	5.3	0.9	1.4
Sculpin	2.0	0.6	0.6	0	0	0	0	5.5	0.6

a = Refer to Figure 3-15a for locations of 1996 electro-fishing sites
b = Refer to Figure 3-15a for locations of 2000 electro-fishing sites

In 1992 another USFS electro-fishing survey was documented by narrative notes, in the vicinity of Hungry Creek confluence with Kalispell Creek. Shocking downstream of the confluence, mainly in pools, brook trout were present and numerous, ranging from fry to 10 inches. Cutthroat trout distribution was spotty, mostly found only in high quality pools. Cutthroats were in the 4-6 inch range, with no fry sampled. Sampling was also conducted in Hungry Creek, with a dominance of brook trout and a few cutthroat sampled.

The 1992 - 2000 fish sampling results have been compared to USFS sampling in 1983 and 1984, and the conclusion is that cutthroat trout have diminished in both numbers and distribution (USFS 1998c). In earlier sampling, cutthroats were found in moderate density in main Kalispell Creek above Rapids Creek confluence.

The BURP Habitat Index scores from the two lower sites were: a poor HI=70 for 1995, and an adequate HI=95 for 1997 (both C channel). Parameters with below mid-point scores included: percent fines (44 - 52%), instream cover, embeddedness, and for the 1995 site, a very poor slow/fast ratio of 0.07.

BURP scores for the two middle sites were HI=74 for 1995 (C channel), and HI=92 for 1997 (B channel). The C channel site had a high 93% fines, high embeddedness, and poor lower bank stability. The B channel site had far less fines and degree of embeddedness. The right stream bank was impacted by the adjacent Forest Road 308. At both sites the slow/fast ratio was poor at 0.2. At all four BURP sites the wetted width/depth ratios were at or below the basin average, ranging from 16 - 27.

At the 1998 upper site, HI=77 (B channel). Below mid-point scores included: percent fines (53%), instream cover, embeddedness, a slow/fast ratio of 0.2, and a poor width/depth ratio of 37.

The 1992 DEQ Use Attainability survey gave a similar picture of below average habitat conditions. A lower reach site east of Hwy 57 was rated overall as “fair” for habitat score, with poor instream cover and pool complexity. While pool frequency was low at 1.3 pools/100 m, volume was above average for the 3 - 5 m wetted width group, with RPV = 695 m^3/km. A middle reach site, downstream of the 1997 middle BURP site, was rated overall as “poor-fair” for habitat score, with similar characteristics as above. Here though, pool frequency was good with 6.4 pools/100 m (lateral scour pools), and volume was just below average at RPV = 220 m^3/km.

Habitat surveys were conducted by USFS in 1992 and 1993 within Kalispell Creek and several tributaries. A selected set of parameters is presented in Table 3-9 (USFS 1998c). Individual residual pool volume (IRPV) for Kalispell main stem averaged 30.4 m^3, excluding beaver created pools, and this seems to be well above average compared to other west side streams of similar wetted width. Beavers create the largest pools in the Kalispell watershed averaging between 67 - 217 m^3 IRPV. These large beaver pools offer good over-wintering and rearing habitat for fish (USFS 1998c). While the main stem IRPV may be good, BURP data shows a very low frequency of pools, so when extrapolated to Residual Pool Volume/km, available volume per length drops substantially. Note that in some the of tributaries such as Kalispell headwaters, Chute, Nuisance, and Bath Creeks, IRPV is less than 2 m^3, substantially less than measured within Hungry Creek and Mush Creek.

Various factors were used by USFS to rate pool quality, and qualitative ratings showed overall a very low percentage of high quality pools except for Hungry and Mush Creeks (Table 3-9). USFS evaluation of the Kalispell Creek data is that a stream the size of Kalispell Creek should have more high quality pools (USFS 1998c). Percent fines data for Kalispell Creek C and B channel type again indicates that spawning habitat is not of high quality, with highly covered or embedded gravel and cobble. Percent fines in tributary, B channel spawning habitat was low - moderate ranging from 17 - 38%, but note an embeddedness around 50% for Chute, Hungry, and Rapids Creek.

Table 3-9. Summary of Selected Habit Parameters from USFS Surveys within Kalispell Creek and Tributaries, 1992 and 1993.

	Individual Residual Pool Volume in cubic meters		Pool Quality Rating in Percent			Percent Fines in Pools, Tailouts, Runs, and Glides		
Stream	Mean w/o beaver ponds	Range of all Pools	Low	Moderate	High	C Channel	B Channel	%Embed-dedness
Kalispell Main stem	30.4	16-119	33	54	13	54	40	--
Kalispell Headwaters	1.5	1-2	80	20	--	--	--	--
Nuisance Crk	1.7	1-3	96	2	2	--	--	--
Chute Creek	1.8	1-3	97	--	3	--	31	53
Bath Creek	5.7	2-153	80	12	8	--	--	--
Hungry Creek	116.3	63-217	8	39	53	--	17	50
Virgin Creek	1.4	1-72	98	1	1	--	38	29
Rapids Creek	0.6	0.1-3	100	--	--	--	26	47
Mush Creek	88.5	55-122	9	33	58	--	--	--

3.3.B.7 Status of Beneficial Uses

The 1995 BURP MBI results for the lower and middle sites are Needs Verification. Examining the DEQ - RIBI fish assemblage questions (IDEQ 1996), the RIBI result for Kalispell Creek is NV due to the dominance of the introduced brook trout and reduced numbers of native cutthroat trout. Continuing with the Determination Flow Chart (Figure 2-10), the 1995 HIs were <100, so the status call remains NV. The 1997 MBIs for the lower and middle sites were Full Support, as well as the 1998 upper site.

Based on the USFS and DEQ electro-fishing surveys, along with the array of habitat evaluations, the data strongly suggests that cold water biota beneficial use is impaired as reflected by the continued decline of cutthroat populations along with a relative low density of brook trout. This condition is in part due to an excess of sand bedload, along with other factors identified in this section. The status call becomes Not Full Support.

The USFS and DEQ fish data shows Full Support for salmonid spawning beneficial use using brook trout for juveniles and two older age classes, and the assumption that the minor presence of 4-6 inch cutthroat trout equates to spawning of the resident population.

Sufficient fecal coliform bacteria samples were collected to assign FS to primary contact recreation. Domestic water supply use of Kalispell Creek is isolated to single family residences, so the turbidity criteria does not apply. The toxic substance criteria was Not Assessed.

There is insufficient temperature data in July to judge the Standards cutthroat spawning and incubation criteria. Temperature data for August and September shows exceedance of the EPA bull trout criteria.

3.3.B.8 Data Gaps

A continuous recording temperature sensor needs to be placed within the main stem of Kalispell Creek beginning in spring to evaluate the Standards cutthroat spawning and incubation criteria.

3.4 §303(d) Listed Streams: Currently, Insufficient Information to Completely Assess Beneficial Use Status, and Recommended for Deferral until Evaluated by the 2002 §303(d) List

A. Reeder Creek from Elevation 2680 ft to the Mouth

Refer to Section 3.2.A, page 91.

B. East River Main Stem

Refer to Section 3.2.B, page 97

C. Binarch Creek

Summary

Binarch Creek was added to the 1994 §303(d) list, and retained on the 1996 list, as a result of EPA analysis of the 1992 §305(b) report, Appendix D, in which IDFG evaluated cold water biota and salmonid spawning as partial support. The listed pollutant is sediment. Binarch Creek was retained on the 1998 §303(d) List (DEQ 1999).

Binarch Creek is a small stream system that has been difficult to assess because a major length of the stream is low to moderate gradient and has extensive senescent and active beaver complexes which have created large pools, glides, and marshes, and has also resulted in several reaches where the stream goes subsurface, or becomes intermittent. Two BURP sites within beaver complexes resulted in one MBI score of 3.6 (Full Support), and one score of 2.6, the lowest MBI in the basin (although still above Not Full Support). The macroinvertebrate community structure in these slow water, sediment laden environments might be expected to be different than the ecoregion reference of fast moving water over riffles. A BURP site in the lowest stream reach, B channel type, did show FS (MBI=4.5).

The entire watershed is Idaho Panhandle National Forest land, and a major area of the middle stream reach has been designated by the USFS as a Research Natural Area (RNA). The RNA designation was made in part, because of an unusually diverse assemblage of aquatic plants and animals including a pure strain of westslope cutthroat trout. However, DEQ electro-fishing in 2000 at a single site below the RNA boundary resulted in just four fish captured, all cutthroat trout, for a low density of 0.8 cutthroat/100 m^2. This electro-fishing result did not meet the WBAG Full Support criteria for salmonid spawning. IDFG electro-fishing (1987) within the lower-most B channel reach showed a moderate brook trout density.

Based only on the single DEQ electro-fishing effort, the middle segment of Binarch Creek appears to have a salmonid density less than what might be expected as Full Support of cold water biota beneficial use. Habitat surveys show significant stretches of high sediment deposition, but in many cases this has been attributed to settling behind beaver dams, and then movement of sediment when dams fail. USFS habitat surveys do conclude that several B channel reaches have poor pool habitat due to aggradation of sediment, and a part of this sediment build-up can be attributed to fairly extensive historic timber harvest activity and associated road network (USFS 1998b). For salmonid spawning beneficial use, it is known from USFS field observations that there are self-propagating populations of both brook trout and cutthroat trout, and in reality salmonid spawning beneficial use is probably Full Support.

In their comment package to the draft Subbasin Assessment, USFS stated that there has been extensive surveys of the streams, road networks, and timbered units, and current sources of sediment that may reach Binarch Creek are considered to be minimal (USFS 2000b). The USFS documented plans for remediation of inventoried sediment sources. In addition, there are numerous land use restrictions within the boundaries of the Binarch RNA. The DEQ sediment calculations presented in Section 4 and summarized in this section suggest a low – moderate current sediment load.

This SBA concludes that the low gradient middle reach of Binarch Creek is Not Full Support of cold water biota beneficial use based on the average MBI of 3.1 from two BURP sites, and low trout densities at a single electro-fishing reach. However, the available current fish data is considered insufficient to make an informed status call. It is recommended that Binarch Creek remain on the §303(d) list, and that a beneficial use status call is deferred until a more thorough fish survey can be conducted during the summer of 2001, preferably within the boundaries of the RNA. USFS has verbally committed to conduct this survey.

In the draft SBA and TMDL (December 2000), Binarch Creek was recommended for de-listing from the §303(d) list with sediment as the listed pollutant of concern. This recommendation was based on the sediment calculation results which suggested that the current sediment yield to Binarch Creek is insufficient to impair or prohibit recovery of a Full Support cold water biota beneficial use. However, the Priest Lake WAG in their consideration of the draft SBA and TMDL, recommended that the current status call of Not Full Support warrants that a stream not be de-listed. This is the same conclusion and recommendation stated in the EPA comment package (EPA 2001)

3.4.C.1 Physical and Biological Characteristics

Binarch Creek is a 2nd order tributary on the west side of Lower Priest River (Figure 2-2), flowing southeast to the river. Main stem length is 8.5 miles, and watershed size is 7,232 acres (Table 2-2). The watershed is mostly forested and steep sloped, ranging in elevation from 2,420 ft at the river to 4,170 ft at Binarch Mountain. The stream is mostly low to moderate gradient meandering through an uncontained floodplain in a wide valley bottom. Annual average precipitation increases from 32 inches at the mouth to approximately 35 inches at high elevations. Precipitation is 25 - 50% snow with a snowmelt dominated runoff pattern. Based on the daily hydrograph established at Lamb Creek immediately to the north (Figure 3-8), peak flow is during mid-March through late April.

The lower two-thirds of the watershed is primarily residual metamorphic belt rock, while the upper headwater lands are residual granitic batholith (Figure 2-4 and Figure 4-2). The lower valley is outwash and alluvial sediment deposits.

Around 1890 almost the entire drainage of Binarch Creek was burned in a large wildfire (Figure 2-6, USFS 1999). No other large fires have occurred in the drainage since then. An area left unburnt in the 1890 fire is presently included in the Binarch RNA.

From the confluence with Lower Priest River, the first 1 mile upstream is B channel with an average 3% gradient (Figure 3-17a). Then there is a 5.7 mile middle stretch that is mainly E4/E5 channel with a 0.5 - 1.4% gradient, but includes a 1.2 mile reach that is 2% gradient B channel. Beyond this middle section is B channel turning to A channel headwaters.

USFS reports that beaver dams are abundant and play an important role in the ecology of Binarch Creek (USFS 1999). Historically, the stream was a series of beaver dams and ponds, but the beaver population was largely trapped out. As older dams failed, there was no replacement by new ones. Subsequently, large volumes of sediment began moving through the lower reaches of the stream. It appears that the beaver populations are recovering, and with creation of new dams the USFS anticipates an improvement in the overall condition of Binarch Creek over time as the stream trends toward stability (USFS 1999).

Ecological roles of beaver dams and ponds in Binarch Creek, both active and senescent dams (abandoned dams as food supply of alders, cottonwoods and willows are used up), include: 1) raised water levels expanding wetlands and wet meadows, 2) settling of watershed sediment which may lead to pond filling and formation of vegetated land forms, 3) promotes abundant stream side vegetation providing excellent

Figure 3-17a. Binarch Creek Watersheds: streams, BURP sites, and gradients.

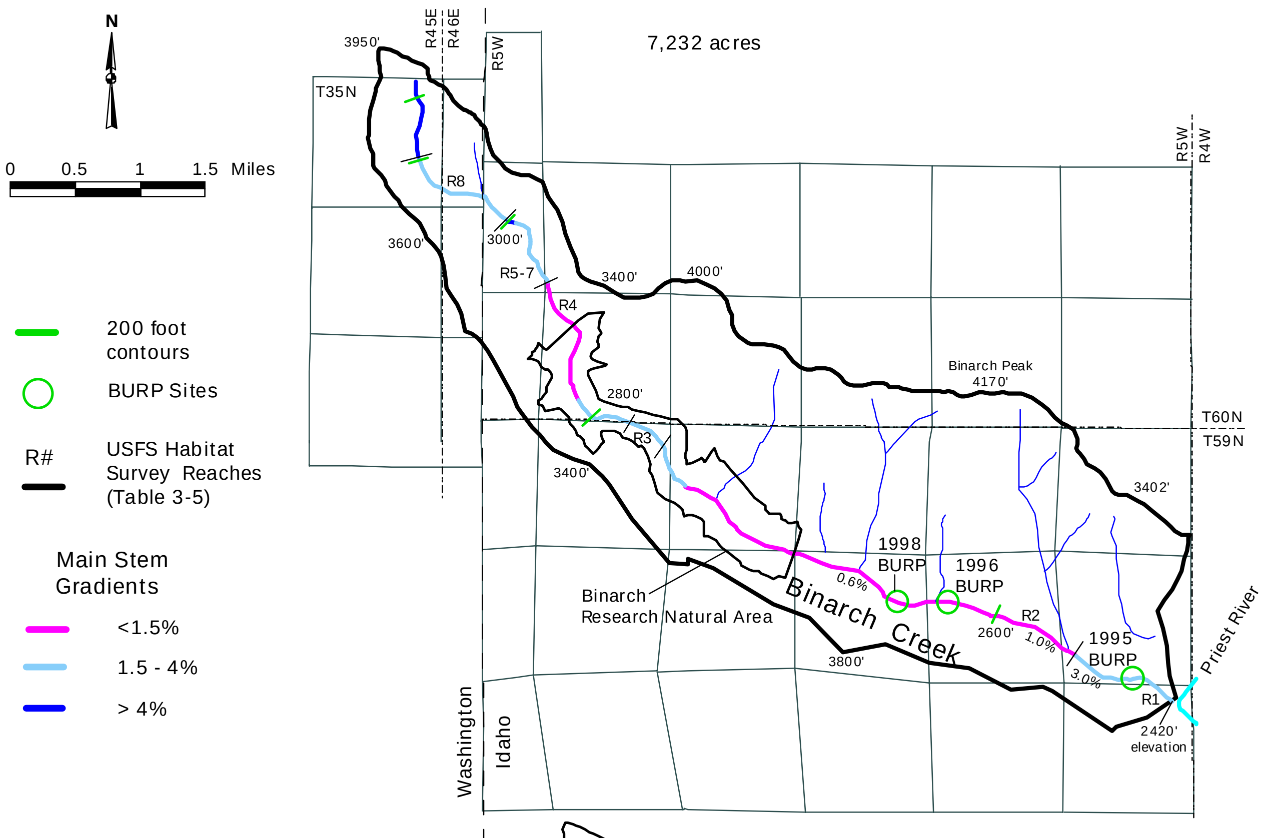


Figure 3-17b. Roads in the Binarch Creek Watershed.

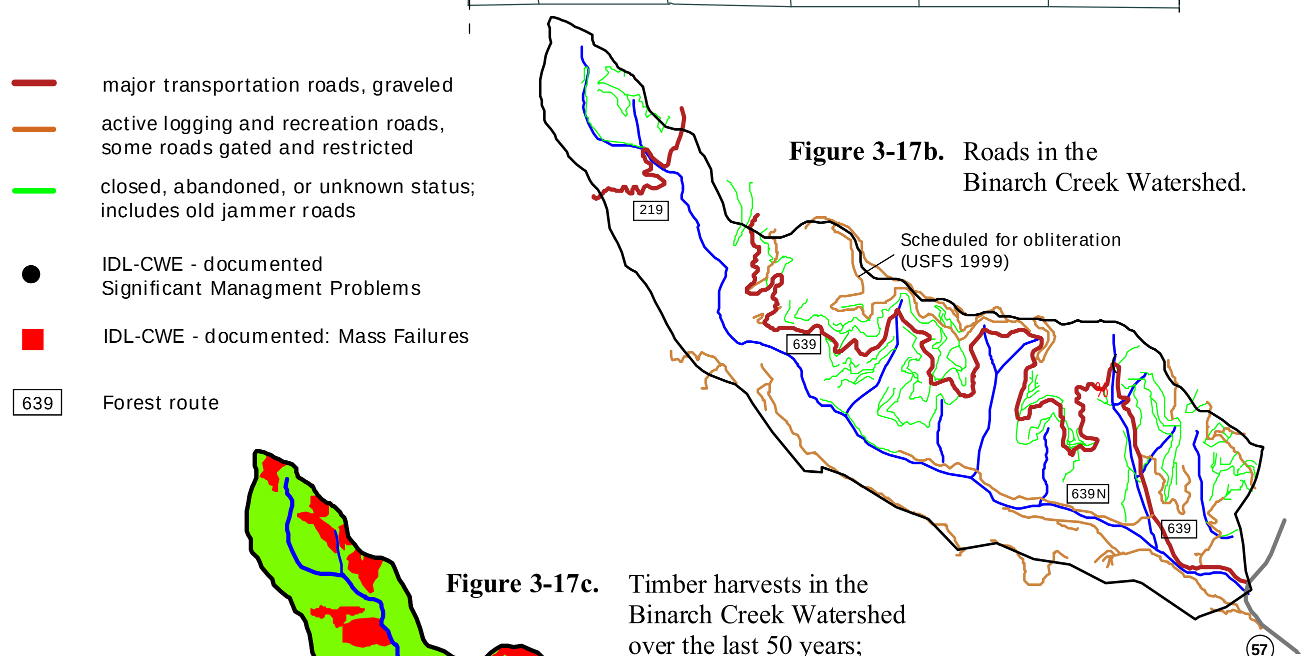
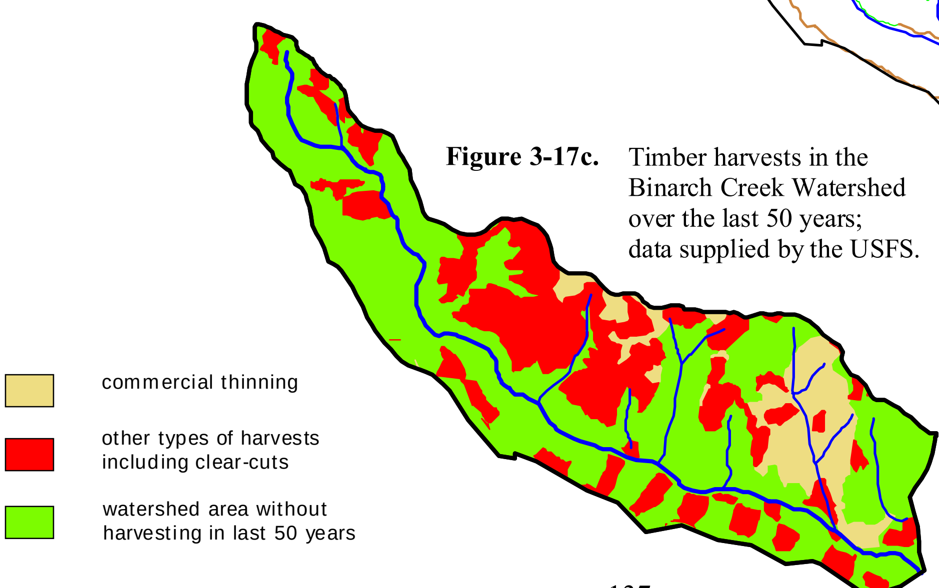


Figure 3-17c. Timber harvests in the Binarch Creek Watershed over the last 50 years; data supplied by the USFS.



cover for fish, 4) pond filling may force stream segments to go subsurface, 5) increases stream stability by decreasing flow velocity, and 6) in general offers excellent over-wintering and rearing habitat for fish. However, a dynamic stream equilibrium would also provide complex habitat, such that in segments not impounded by beavers there would be high quality pools formed by LWD and scour, and low gradient riffles with suitable gravels and cobbles for spawning. It appears that the middle reach of Binarch Creek has a low quality and quantity of this latter habitat type.

In 1989 the 660 acre Binarch RNA was established (Figure 3-17a). RNA status was justified on principle distinguishing features (USFS 1989), including: 1) a low-gradient, meandering stream representative of glaciated northern Idaho, 2) senescent and active beaver dams and ponds, 3) marshes and wet meadows, 4) diverse assemblage of aquatic plants and animals (greatest diversity among 32 streams examined in northern Idaho, Rabe and Savage 1977), and 5) presence of a pure strain of westslope cutthroat trout.

A 1975 sampling by University of Idaho collected 15 cutthroat trout from mid Binarch Creek for analysis of species purity (USFS file notes). These fish were found to be a pure strain of westslope cutthroat trout, *Salmo clarki lewisii* (USFS 1989). This native species hybridizes readily with both introduced hatchery bred cutthroat and rainbow trout (both introduced at one time in the Lower Priest River system). There are only a few populations of pure westslope that remain in Idaho. A prevailing theory for the pure strain is their isolation within the RNA from other migrating fish due to beaver dams and segments of subsurface flow (dry channels).

Electro-fishing surveys by IDFG and DEQ within lower to mid-lower reaches below the RNA, showed low cutthroat density and low - moderate brook trout density. USFS field observations would indicate that brook trout are abundant throughout the stream. In the past, the stream had been stocked with brown trout and rainbow trout (USFS 1999). It is unknown if bull trout inhabited Binarch Creek historically, but they are suspected to be not present now, and the stream is considered low priority in bull trout recovery plans (Panhandle Basin Bull Trout TAT 1998a).

3.4.C.2 Cultural Characteristics

The entire Binarch Creek watershed is National Forest land. The RNA is 660 acres, and the remaining 6,572 acres is managed by the USFS for timber production. Because of the large fire around 1890, little historic logging occurred in the drainage, and the majority of harvesting has occurred since the 1960s. Around 43% of the watershed has been harvested (USFS 2000a), and road density is moderate.

3.4.C.3 Pollutant Source Inventory

Point Source Discharges
No point source discharges exist in the Binarch Creek watershed.

Nonpoint Sediment Sources

Mass Wasting - An 1999 IDL - CWE assessment gave an inherent mass failure hazard rating of “high” to the drainage (a predominance of step slopes and unstable parent geology). During the CWE assessment however, only a single mass failure was reported (Figure 3-17b), associated with a cut slope, and sediment delivery was rated as minor.

Roads and Stream Crossings - GIS analysis of the road network provided by IDL produces 61 miles of total roads (Figure 3-17b), for a density of 5.4 mi/mi^2. This includes closed roads and spurs in which some are vegetatively stabilized, and it excludes documented obliterated roads. Active roads that are either open or have access controls total 25 miles, or a moderate 2.2 mi/mi^2. The 1999 CWE inventory assessed

15.6 miles of road. All road miles surveyed were given a road sediment delivery score of "low", and the scoring reflected minor to moderate road system erosion, and minor delivery to stream channels. The CWE inventory documented a single Significant Management Problem (Figure 3-17b), associated with a combination of road problems. Stream crossing density of the total road network is 1.2 crossings/mile of stream (20 total crossings), which is below average compared basin-wide. The majority of crossings are over intermittent channels. USFS reports that the stream crossing and encroaching sections of Road 219 in the headwaters (Figure 3-17b) is leading to some sedimentation and stream damage (USFS 1998b). Based on the sediment load calculations presented in Section 4, the total road network including failures along the road prism, is estimated to increase sediment load over the natural forested land yield by 73% (assuming 100% delivery to streams).

Encroaching and Riparian Roads - Forest road 639N travels up the valley floor of Binarch Creek for 3.6 miles (Figure 3-17b), and the majority of its length is within a 200 ft buffer zone from the stream, but very little of its length is within the 50 ft encroaching zone. The length of the total road network within a 200 ft buffer zone of watershed streams equals 6.8 miles, or 0.4 mi/mi of stream; but density of active roads within the buffer drops to one-half of this value.

Timber Harvesting and Peak Flows - USFS reports that 43% of the Binarch Creek watershed has had timber harvesting activity since 1950 (USFS 1998b, Figure 3-17c). The IDL - CWE estimated canopy removal index (CRI) was 0.14, seemingly underestimating timber removal. The average channel stability index (CSI) was 47, or a moderate rating. Coupling the CRI with the CSI produced a hydrologic risk rating (HRR) of "low".

3.4.C.4 Summary of Past and Present Pollution Control Efforts

See Section 2.4.2, page 60, for Forest Plan of the Idaho Panhandle National Forest. In addition, the Binarch Creek RNA status prohibits timber harvesting and cattle grazing within its boundaries, and also there is to be no construction of instream habitat improvement structures since one objective of an RNA is study of an undisturbed ecosystem. In their comment package to the draft SBA, USFS states that as a result of the Douglas-fir beetle EIS the agency identified opportunities to reduce runoff and improve exiting conditions in the drainage (USFS 2000b). Through timber sale receipts obtained from the Douglas-fir beetle project, USFS has scheduled restoration activities within the Binarch Creek drainage including: 1.5 miles of timber road obliteration; 1.2 miles of road reconstruction; and maintenance procedures over 14 miles of road (USFS 2001). The planned obliteration is a network of roads on the northern face of the Binarch drainage (see Figure 3-17b), to improve slope hydrology and reduce the risk of slope failure.

3.4.C.5 Water Quality Concerns & Status

Refer to Table A-8 for the history of DEQ §305(b) and §303(d) listings for Binarch Creek; Table 2-6 for designated and existing beneficial uses; and Table 2-12 for determined support status of designated and existing beneficial uses.

3.4.C.6 Summary and Analysis of Existing WQ Data

Peak flow for Binarch Creek is estimated between 55 - 60 cfs (Rothrock and Mosier 1997). Late summer base flow is around 2 - 3.5 cfs.

There have been no documented water quality samples taken from Binarch Creek, and no measurements of pH and DO. No samples for bacteria have been taken.

DEQ placed a temperature sensor within mid-lower Binarch Creek near the 1996 BURP site (Figure 3-17a), from June 24 - October 2, 2000. Upon visitation to extract the sensor, the stream segment was found dry. The last reliable data appears to be August 9. During the period of June 24 to August 9, mean daily temperatures ranged from 10.8 - 14.9°C, and daily maximum temperatures ranged from 10.9 - 17.1°C. The Standards cutthroat spawning and incubation temperature criterion was exceeded on all days from June 24 to July 31.

The BURP MBIs for Binarch Creek were: 4.5 for the 1995 lower site (Figure 3-17a); 2.6 for the 1996 mid-lower site (Needs Verification); and 3.6 for the 1998 mid-lower site. The 1998 sample was within a beaver complex, the BURP habitat reach was glide/pool, and the macroinvertebrate samples were collected in glides with silty substrate. The 1996 mid-lower site was also within a beaver complex, and the low MBI in part related to below average EPT representation with a dominance by Diptera in number of individuals.

Electro-fishing was conducted by IDFG in 1987 within a single reach in the lower-most B channel (Horner *et al*. 1988). Brook trout density was 3.2 fish/100 m^2, and cutthroat density was low at 0.2 fish/100 m^2. DEQ electro-fished in 2000 at the 1996 mid-lower BURP site. Cutthroat density was low at 0.8 fish/100 m^2 (4 fish captured), and no brook trout or sculpins were sampled. The length range of the 4 cutthroats was 100 - 179 mm (no juvenile cutthroats <100 mm).

The BURP HI for the 1995 lower site was good at HI=115. For the 1996 mid-lower site, the score was low at HI=77. This middle reach primarily consisted of runs and glides, sandy substrate, and a good deal of still water due to beaver dams. Scores below mid-point included 100% fines, poor instream cover, and high embeddedness. BURP notes stated that this reach was representative of a large section of stream surrounding the sampling site. The 1998 mid-lower site was also within a beaver complex with slow flow and sandy substrate. BURP notes describe the predominant habit as "bog". An HI is not available as the habitat assessment sheet was incompletely scored. Field notes recorded 5 salmonids observed, 100 – 140 mm in length.

The 1992 DEQ Use Attainability survey was conducted at one site, in the same vicinity as the B channel BURP lower site. This habitat assessment, like the BURP HI score, gives a favorable habitat characteristic. The habitat score was rated overall as "good", with a slow/fast ratio of 0.7, excellent instream cover, good bank vegetation and stability, and good pool complexity. Residual pool volume was good for the 3 - 5 m wetted width group, 291 m^3/km.

A fairly comprehensive habitat survey was conducted by USFS over much of Binarch Creek in October 1998 (USFS 1998b). The stream was divided into 8 reaches as shown in Figure 3-17a. A summary of USFS notations and measurements, including averages of percent fines within channels and pool tailouts as measured by Wolman pebble counts, are presented in Table 3-10.

3.4.C.7 Status of Beneficial Uses

The BURP MBI, fish data and habitat results show Full Support of cold water biota and salmonid spawning beneficial uses for the lower-most 1 mile of B channel. The average MBI for the two lower-middle sites (MBI=3.1) results in Needs Verification, but again these were samples taken within marshy beaver complexes. The DEQ electro-fishing result would indicate Not Full Support of cold water biota and salmonid spawning beneficial uses because of the few salmonids captured. USFS field observations and the 1975 University of Idaho sampling would indicate cutthroat and brook trout spawning within the middle reach.

There are insufficient pH and DO data to assess criteria exceedances. Likewise, there are no fecal coliform bacteria data to assess contact recreation. This stream would be considered secondary contact recreation.

Because cold water biota criteria does not equal FS, secondary contact recreation beneficial use is assigned Not Assessed. Domestic water supply of Binarch Creek is not an existing use.

Stream temperatures show that there are exceedances of the State Standards criteria for cutthroat trout spawning and incubation in late June and July.

3.3.D.8 Data Gaps

It is essential for USFS and/or DEQ to conduct an update survey of the salmonid populations within the middle and upper reaches of Binarch Creek to assess the current status of cutthroat trout within the RNA, and to clarify the support status of cold water biota and salmonid spawning beneficial uses.

Table 3-10. Habitat Survey Notes and Measurements of Binarch Creek from USFS Survey in October 1998.

Reach Number - Elevation	Channel Type	Reach Length (miles)	Average Substrate % Fines (0-8 mm)	Average Pool Tail-out % Fines	General Reach Features, Going Upstream
1 2400' - 2560'	B3	0.9	15	11	Found 10 artificial check dams, creating overall, adequate sized pools. Channel appears fairly stable. Riparian zone mostly conifers. W/D=15, low sinuosity.
2 2560' - 2720'	E5	3.8	93	88	Dry for first mile, then intermittent for remaining reach. Uncontained floodplain in wide valley bottom. 3 large abandoned beaver ponds. Directly below dams stream goes subsurface, and surfaces again upstream of the next dam. Most LWD located in dams, little LWD observed in channels. Riparian zone mostly shrubs and grasses. W/D=9, high sinuosity.
3 2720' - 2760	B3	0.4	--	--	Dry channel, no measurements taken. Riparian zone shrubs and grasses in flat gradients, conifers where there are steep forested walls.
4 2760' - 2880'	E4	1.4	61	75	Beginning of reach is tight valley, then opens up. Two large beaver ponds, and stream fluctuates between surface and subsurface between ponds. Last ¾ of reach, stream stays on surface. Riparian zone mostly shrubs and grasses. W/D=4, high sinuosity.
5, 6, 7 2880' - 3000	B4, E4, and B3	0.6	19, 73, 34	56, 72, 27	B channel drainage, highly confined with riparian conifers. Only a few pools, and pools that exist are poor quality and mostly filled with sand. W/D in B channels =11. E channel riparian mostly grasses, and banks are stable and healthy. Pools mostly meander formed.
8 3000' - 3200'	E4	0.9	33	39	Section of stream below Road 219 crossing is being influenced by road. Bank failures, channel migration, and stream divergence are common. Pool quality is poor. Above road crossing stream seems more stable. Pools are mainly meander formed, with little LWD incorporation. Riparian zone a mixture of shrubs and conifers. W/D=5, high sinuosity.

3.4 §303(d) Listed Streams: Currently, Insufficient Information to Completely Assess Beneficial Use Status, and Recommended for Deferral until Evaluated by the 2002 §303(d) List

D. Lower Priest River

Summary

Lower Priest River was added to the 1994 §303(d) list, and retained on the 1996 list, as a result of EPA analysis of the 1992 §305(b) report, Appendix D, in which DEQ evaluated domestic water supply and primary contact recreation as supported/threatened, and cold water biota and salmonid spawning as partial support. The listed pollutant is sediment. Lower Priest River was retained on the 1998 §303(d) List (IDEQ 1999).

There has been one BURP site on Lower Priest River (assessed in 1998) just above river mile 16 (Figure 3-18a). Data collected that can be used for judgement of aquatic life beneficial use status, using the Idaho River Ecological Assessment Framework (IREAF, IDEQ 2001) includes: 1) macroinvertebrate samples in which five metrics are calculated into a River Macroinvertebrate Index; 2) samples of periphyton collected on rocks in which ten selected diatom metrics are calculated into the River Diatom Index, and 3) water column physical and chemical parameters in which eight parameters are calculated into a River Physicochemical Index using the methods of the Oregon Water Quality Index (Cude 1998). Data from category 3 comes from the lower USGS station, at river mile 3.8. A fourth index is used in the IREAF, the River Fish Index, which is a composite of 10 fish metrics from electro-fishing surveys. IDFG has not conducted quantitative fish sampling within the river for at least 25 years. In 1998 the USGS conducted, for the first time, backpack and boat electro-fishing near the lower river USGS gauging station (Brennan *et al.* 2000). This data can be used to calculate the River Fish Index.

As of the writing of this SBA and TMDL, the Idaho River Ecological Assessment Framework is in draft form, and is undergoing peer review and has been distributed for public comment. Aquatic life beneficial use status for Lower Priest River can not yet be judged using this methodology. In addition, this author feels that a complete evaluation of beneficial use status cannot be made without a current fish population survey by IDFG. A written request by DEQ has been made to the Coeur d'Alene Regional Office of IDFG to conduct electro-fishing during the summer of 2001 at the minimum in the vicinity of the 1998 BURP site, and hopefully at additional river reaches.

For salmonid spawning beneficial use, the IREAF calls for support determination by the IDFG. Of the salmonid species that exist in Lower Priest River, the species that will primarily utilize river habitat for spawning is the mountain whitefish, *Prosopium williamsoni* (Horner *pers comm*). Brown trout and rainbow trout are frequently main stem spawners as well (Corsi *pers comm*). Bull trout, cutthroat trout, and brook trout will primarily migrate to tributary habitat for spawning. It is believed that mountain whitefish have maintained a viable population in the river (Horner *pers comm*). The USGS electro-fishing did capture 21 mountain whitefish (15% of total catch), ranging in length from 84 - 236 mm. This data suggests Full Support for salmonid spawning beneficial use.

Lastly, there are temperature exceedances of the Standards cold water biota criteria as the 1998 mean daily temperature exceeded 19°C from July through mid-August (Figure 3-19). Maximum mean daily temperature neared 24°C. Perhaps Lower Priest River is a candidate for the year 2000 Standards revision that added Seasonal Cold Water as an aquatic life use designation (IDAPA 58.01.02.250.03).

3.4.D.1 Physical and Biological Characteristics

Lower Priest River originates as outlet from Priest Lake and flows south to the confluence with Pend Oreille River. By the time it reaches its mouth, it is a 5th order river. The distance from Priest Lake outlet to the mouth is 45.5 river miles. The §303(d) listed segment of Lower Priest River begins at the tributary

Figure 3-18a. Drainage of 303(d) Listed Lower Priest River.

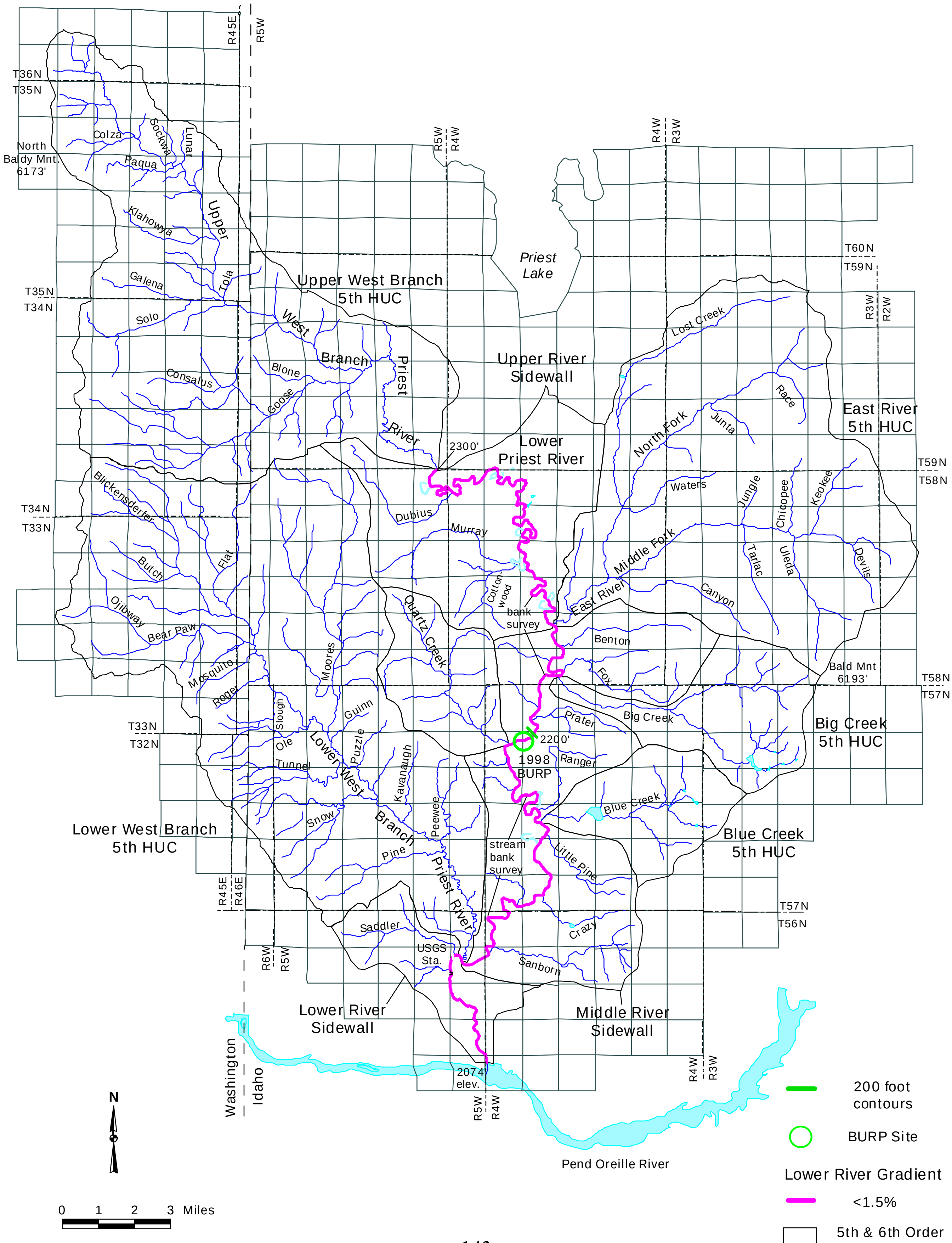
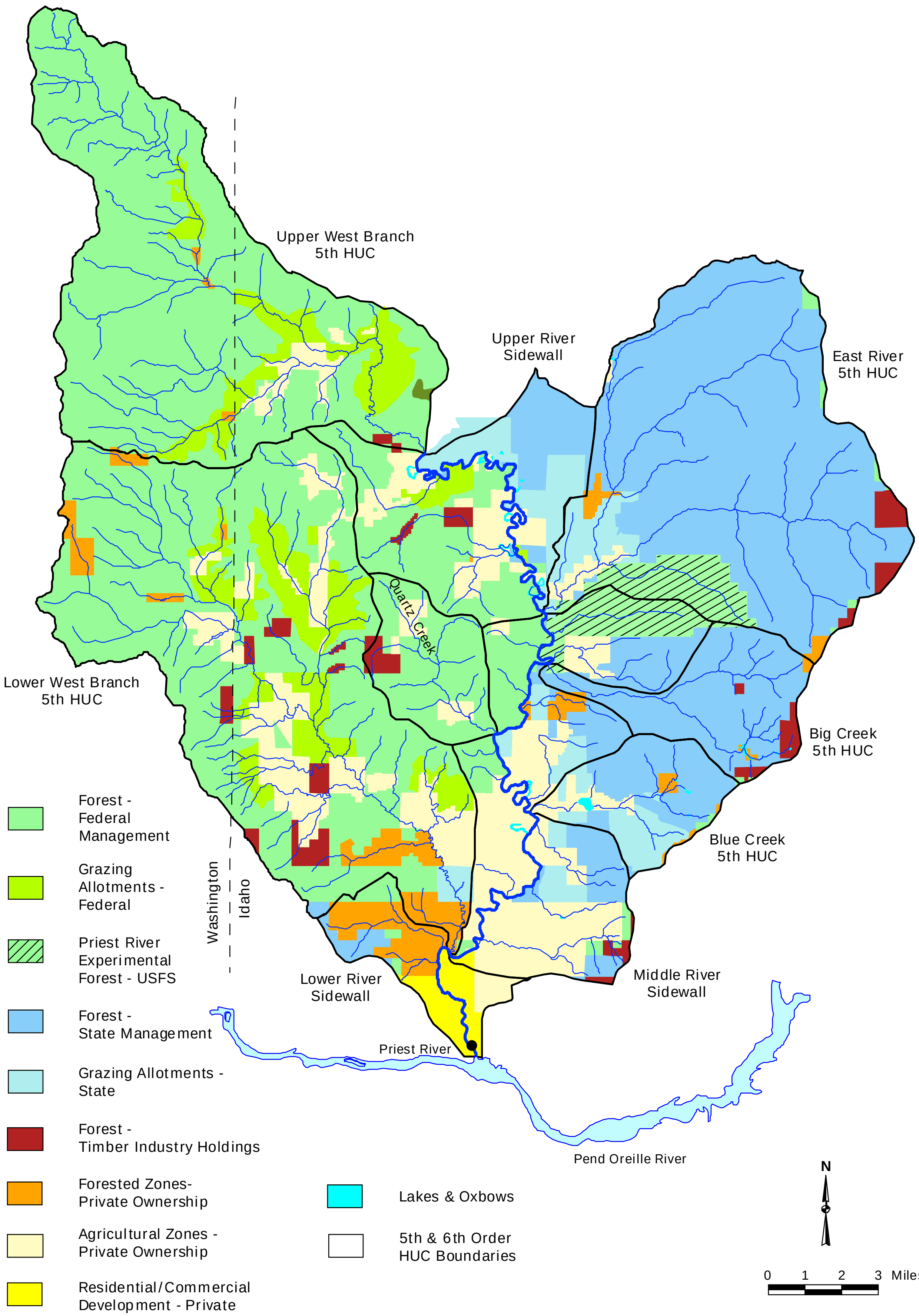


Figure 3-18b. General land use and ownership in the 303(d) listed Lower Priest River drainage.



inflow point of Upper West Branch Priest River. From this point to the mouth the distance is 35.3 river miles. Watershed size draining into the listed segment is large, 219,980 acres, with approximately 475 miles of perennial streams. Watershed size draining into the river between the lake outlet dam and the Upper West Branch confluence is 13,300 acres (Binarch Creek and any drainage from the upper portion of Jack Pine Flats). The §303(d) listed Lower Priest River drainage has been separated into nine, 5th or 6th order subwatersheds (Table 3-11 and Figure 3-18a). The 3 sidewall subwatersheds include numerous small 1st and 2nd order perennial streams. Two of the subwatersheds are §303(d) listed, Lower West Branch and East River, as well as Binarch Creek and Lamb Creek which flow into the river upstream of the listed segment.

Table 3-11. 5th & 6th Order Watersheds Draining into the §303(d) Listed Segment of Lower Priest River

Subwatershed	Acreage	Percent of Basin
Upper West Branch Priest River	45,201	20.5
Upper River Sidewall Dubius, Murray & Cottonwood Creeks	18,704	8.5
East River	43,165	19.6
Lower West Branch Priest River	56,835	25.8
Quartz Creek	7,081	3.2
Middle River Sidewall Benton, Fox, Prater, Ranger, Little Pine, Crazy, & Sanborn Creeks	26,989	11.8
Big Creek	9,354	4.3
Blue Creek	7,435	3.4
Lower River Sidewall Saddler Creek	6,217	2.8
Total	219,980	100

Elevation of the river at the lake outlet is 2,438 ft and drops to 2,074 ft at the mouth. The average gradient over this river length is 0.15%. The numerous 1st to 4th order tributaries flow mainly westerly or easterly into the river. Elevation on the eastern Selkirk mountains reaches 6,706 ft at Mount Casey, and along the western mountain range elevation tops out at 6,173 ft at North Baldy.

Precipitation increases from the average of 32 inches along the river valley to approximately 50 inches at the highest Selkirk peaks of the East River watershed. Precipitation is 25-50% snow with a snowmelt dominated runoff pattern. Peak flow is typically during early May through early June, and this represents high elevation snow melt with warm temperatures (see Figure 2-3 in section 2.1.1.2, page 11). There also is a substantial sub-peak between early March and late April and this represents late winter and early spring rain-on-snow events within the substantial acreage of flat, low elevation lands within the drainage.

Regarding parent geology, the valley floor and lowlands of tributaries are glacial till and outwash, alluvial, and lacustrine deposits; the majority of the surrounding eastern and northwestern hillslopes and mountains are granitic batholith; and there are substantial areas in the middle and southwestern sections of metamorphic belt rocks (Figure 2-4 and Figure 4-2). Only the valley floor and eastern slopes have been typed on the SCS general soil map (Figure 2-5 and Table 2-3).

Large stand-replacing wildfires occurred between 1880 - 1937 within: the upper one-half of the Upper West Branch watershed; the Quartz Creek watershed; adjacent to the middle of the river course; and the lower one-third of the Lower West Branch (Figure 2-6). The remaining portions of the drainage have received only scattered and isolated fires. There have been no large fires since 1950 with the exception of the Lost Creek subwatershed (East River), burnt as part of the 1967 Sundance fire. Currently there is considerable Douglas-fir beetle caused mortality.

High banks including fill banks from adjacent road construction confine a good deal of the river course. There are a few floodplains and adjacent wetlands, and some oxbows connected to the river with flowing water. Some banks of the river are lined with tall conifers, cottonwood, and shrubs; other banks have hay cropping and grazing down to the river's edge. Along six BURP transects, wetted width ranged 31 - 47 m, and bankfull width ranged 42 - 59 m. The river channel is a combination of riffles, runs and pools. There are significant areas of stream bed with cobbles and gravels.

Over the last 25 years there has been very little in the way of fisheries evaluation within the river. In 1998 the USGS conducted, for the first time, backpack and boat electro-fishing near the lower river station (Brennan *et al.* 2000). The only salmonid captured was mountain whitefish. Co-dominants in the sampling were largescale sucker and northern pikeminnow. Warm water game fish sampled were bluegill, largemouth bass, and yellow perch.

Summaries of fish sampling within many tributary drainages can be found in Table 2-10 and the watershed sections of East River (Section 3.2.B), and Lower West Branch (Section 3.3.A). Based on these tributary evaluations and stocking records, other salmonid fish species in the river would be brook trout, westslope cutthroat trout, rainbow trout, and brown trout. From conversations with long time local residents, it is known that the river was once a viable adfluvial cutthroat fishery (Broun *pers comm*), and adfluvial cutthroat are still caught. Based on electro-fishing within the Middle Fork East River, there may be a small fluvial subadult and adult bull trout population within the river. The river is considered of high importance in bull trout recovery plans (Panhandle Basin Bull Trout TAT 1998a).

3.4.D.2 Cultural Characteristics

Watersheds of the §303(d) listed segment of Lower Priest River are a mixture of federal, state, and private ownership (Figure 3-18b). Land use activities have been described for two of the large subwatersheds, Lower West Branch and East River. Upper West Branch, another large 5th order subwatershed, has a similar land use pattern as described for Lower West Branch, except there is more National Forest land and less private agricultural land. The lower one-third of Priest River is surrounded by private land mostly labeled as an agricultural zone, but the last 3 river miles are in the urbanization zone of the city of Priest River. The upper one-third of the listed river segment flows through federal and state grazing allotment land and private agricultural lands.

Total private acreage in the drainage is 40,337 acres (18% of total, Table 2-5). Industrial timber holdings total 4,021 acres. Other private forested lands total 6,589 acres, about 20% of this in the State of Washington. Private lands that have been given an agricultural zone designation total a substantial 27,706 acres, most in Idaho. The defined residential zone around Priest River is 2,020 acres. Throughout the non-industrial private lands there are small scale NIPF timber operations.

The large private holdings in the lower one-third of the drainage were homesteaded beginning in the 1890s where settlers cleared the flatter lands for agriculture purposes and filed for the timber rights (USFS 1999). Land use activities included cross drains and wetland - wet meadow conversion, and there has been some minor channel modification of the river within the lower one-third of its course. Today, there is hay cropping and some cattle grazing along the river and tributaries. As more rural homesteads are being built there has been an increase in private roads and stream crossings, and hobby farm grazing by horses and cattle.

Land under USFS management totals 110,938 acres. Of this there is 16,309 acres in grazing allotments, and 6,256 acres as the Priest River Experimental Forest. Idaho State lands total 67,855 acres with 8,898 acres in grazing allotments.

The Lower Priest River drainage has had a long history of logging beginning in the late 1800s when valuable white pine was harvested (USFS 1999). A large timber sale occurred between 1912 and 1930 conducted by Dalkena Lumber Company, and mainly was selective logging of large and more valuable trees in the Lower West Branch and lower sections of Upper West Branch. Rail lines were built, paralleling streams to access timber areas, and logs were hauled to the river and floated to mills at the city of Priest River. Prior to construction of the first outlet dam at Priest Lake in 1950, the river was also used to transport logs cut within the Priest Lake basin. There has been a succession of timber sales on federal and state lands since the 1950s. The lower river basin is moderately to heavily roaded with total road density ranging from 5.0 - 7.1 mi/mi^2 within the main 5th order HUC watersheds (USFS 2000a).

3.4.D.3 Pollutant Source Inventory

Point Source Discharges

No point source discharges exist in the Lower Priest River drainage.

Nonpoint Sediment Sources

Discussion and examples of general sediment sources that are applicable within the lower river basin have been previously discussed in Section 2.3 (page 55), and more specifically for East River (Section 3.2.B) and Lower West Branch (Section 3.3.A). A brief description of Upper West Branch and Quartz Creek is presented the next Section (3.5.10 and 11). If it is determined that Lower Priest River has beneficial uses significantly impaired by sediment, then TMDL development will require a detailed analysis of all 5th order HUCs draining into the river similar in detail to what has been presented for East River and Lower West Branch. IDL - CWE assessments and inventories were conducted on the non-listed Upper West Branch and Quartz Creek drainages, and with CWE assessments on Lower West Branch and East River, these four subwatersheds account for around 80% of the drainage. In addition, USFS has conducted surveys on all lower west side watersheds in association with the Douglas-fir beetle EIS (USFS 1999).

One sediment source mentioned here is stream bank erosion along the river course. A bank erosion survey was conducted in September 2000 within two subsample reaches of the river: a 4.7 mile middle reach from river mile 23 down to mile 18; and 3.4 miles of a lower reach beginning at McAbee Falls down to river mile 7 (Figure 3-18a). Of the total middle river reach assessed, 45% of the length was found to have either one stream bank or both with evidence of a recent eroded condition; and percent bank with an eroded condition was 89% of the lower reach assessed. The average of the composite scores of erosion rating factors for both reaches were on the high end compared to wadable stream sections surveyed within the basin. A statistical work-up of the survey data leading to an estimate of lateral recession rate has not been completed at the time of this report.

Based on qualitative observations from the river bank survey, there were several segments of raw banks with signs of recent erosion and even chunks of upper bank broken off and slumped into the high water mark zone. Some segments had high raw banks, 20 ft high or so, with a thick layer of gravelly sand and silt loam overlaying a dense clay layer. This is a condition susceptible to slippage and mass failure. In a few cases bank slumping was associated with fill slopes of adjacent roads, such as just upstream of McAbee Falls.

One stream bank legacy issue of interest is related to the historic log drives down the river. Old photographs show a dense mat of logs bank to bank, and it is believed that the log drives did considerable damage to the banks.

3.4.D.4 Summary of Past and Present Pollution Control Efforts

See Section 2.4, page 59.

3.4.D.5 Water Quality Concerns & Status

Refer to Table A-10 for the history of DEQ §305(b) and §303(d) listings for Lower Priest River; Table 2-6 for designated and beneficial uses; and Table 2-12 for determined support status of designated and existing beneficial uses.

3.4.D.6 Summary and Analysis of Existing WQ Data

Hydrology for the lower river basin has previously been presented in Section 2.1.1.2 (page 11), including a WY 95 daily hydrograph of the river at the two USGS gauging stations (Figure 2-3). The two USGS stations closely bracket the drainage into the §303(d) listed segment. There is only minor flow from flatlands between the upper gauging station and the inflow point of Upper West Branch (Figure 3-18a), and there is also only minor flatland inflow between the lower station and the mouth.

Minimum river flow rate and water temperatures from mid summer through early fall in relation to rearing requirements for adult and juvenile cutthroat trout and adult rainbow trout, has been an issue of concern voiced by the Idaho Water Resource Board and the IDFG (IWRB 1995). These issues have previously been presented in Section 2.1.2.2 (page 24).

The River Physicochemical Index (PI) used with the Idaho River Ecological Assessment Framework (IDEQ 2001), as one component to judge aquatic life beneficial use, incorporates these parameters: dissolved oxygen (DO), pH, biochemical oxygen demand (BOD), total solids, ammonia+nitrate nitrogen, total phosphorus, fecal coliform, and water temperature. While the PI is not calculated in this SBA for reasons already stated in the Priest River Summary, available data are summarized below.

The USGS conducts routine water quality sampling at the lower gauging station every other year. Water sampling frequency for 1994 - 1998 has been 6 times per year, and for 1990 and 1992 frequency was around 20 times per year for phosphorus and nitrogen. BOD has not been measured. Total solids is an addition of total dissolved solids (TDS) and total suspended sediment (TSS). A summary of the USGS data from 1990 - 1998 which can be used in the PI is as follows:

DO	mean = 10.5 mg/L	range = 7.7 - 13.4 mg/L	n = 30
pH	mean = 7.6	range = 6.8 - 8.8	n = 30
total solids	mean = 58 mg/L	range = 20 - 178 mg/L	n = 24
fecal coliform	mean = 36 FC/100 ml	range = 2 - 120 FC/100 m	n = 30
total phosphorus	mean = 0.012 mg/L	range = 0.004 - 0.052 mg/L	n = 62
NO_2+NO_3+ammonia	mean = 0.044 mg/L	range = <0.005 - 0.136 mg/L	n = 62

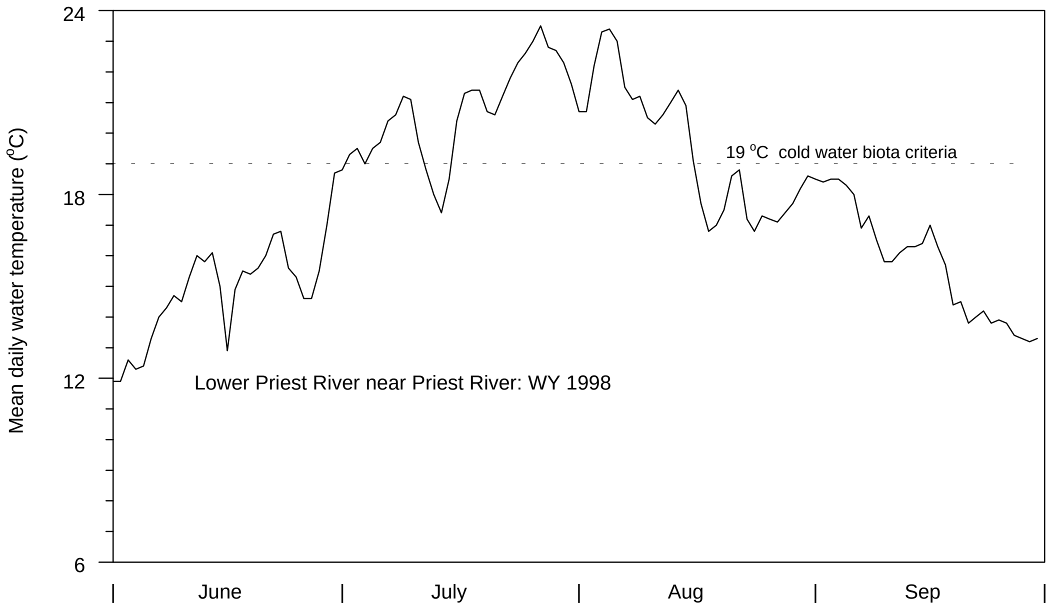


Figure 3-19. Mean daily water temperature of Lower Priest River measured at USGS gauging station, 3.8 river miles from the mouth, June - September 1998 (from Brennan *et al* 1999).

In 1998 USGS installed a temperature recording data logger for the months of June - September. Mean daily temperature is plotted in Figure 3-19. Daily average exceeded the Standards cold water biota criteria of 19°C by early July and remained above the criteria until August 17. Highest daily mean was in early August at 23.4°C, with the highest instantaneous temperature at 25.3°C. In earlier years USGS reports a maximum instantaneous temperature of 29°C. In summer months Lower Priest River begins as cool water, not cold water, as its source is the epilimnetic waters of Priest Lake. Upper layer waters of southern Priest Lake measured in July and August of 1998 ranged from 20 – 25°C.

See Summary of Basin Water Quality, Section 2.2.3.2 (page 36) for further discussion of measured parameters on Lower Priest River including estimates of the water quality from the lower basin stream composite draining into the river.

The 1998 BURP site (Figure 3-18a), a 620 m reach, was below the inflow of Upper West Branch, East River, and Big Creek, and above the inflow of Quartz Creek, Blue Creek, and Lower West Branch. The BURP site was above the main hay cropping and grazing region along the river course itself (Figure 3-18b).

Composite samples of periphyton from the BURP site were collected on four occasions as part of a state-wide sampling effort to develop a River Diatom Index (RDI). Periphyton samples were collected in September 1998 as part of the BURP assessment, collected twice on the same day in September 1999, and sampled again in October 1999. A host of diatom metrics from the state-wide samples were tested statistically for metric response against human disturbance categories, macroinvertebrate EPT taxa richness, and various chemical and physical water column parameters (Fore 2000).

A final set of 10 periphyton metrics were selected as RDI response indicators to degree of human disturbance. These included percent siltation sensitive diatoms, percent siltation tolerant diatoms, percent motile diatoms (siltation tolerant), eutrophic species richness, and percent adnate diatoms (attachment to rocks apically). For periphyton data of Idaho Northern Mountain sites with no history of silver mining, six diatom metrics were significantly different at sites with moderate to heavy human disturbance upstream of the site compared to sites with minimal to moderate human disturbance upstream. The Priest River data was placed in the latter, or undisturbed category on a relative basis state-wide. The degree of statistical discrimination of diatom metrics versus human disturbance was less for Northern Mountain data compared to southern and eastern Idaho data likely because human disturbance is less intense in the northern region (Fore 2000).

The mean RDI of the four composite Priest River samples was RDI = 38 (28, 40, 42, 42). The preliminary indication from ranking RDI scores is that the Priest River data falls within the range of "good" biological condition (Fore 2000).

One composite sample for macroinvertebrate data has been taken at the BURP site. Preliminary analysis of the data shows: good taxa richness (40 total taxa) and EPT richness (22 EPT taxa); good community balance in the way of low dominance by the numerically dominant taxa; a presence of elmid beetles (4% elmidae); and an upper score for percent predators (7%). Once developed, it appears that the River Macroinvertebrate Index score from this data will indicate a good, clean water community.

The 1998 USGS electro-fishing effort netted 138 total fish (Brennan *et al.* 2000). Fish in number per square area was not reported. Largescale sucker and northern pikeminnow each comprised around 30% of the sample. Percent composition for mountain whitefish was 15%, and 12% of the sample was redside shiner.

Measurements and results of habitat parameters within the 620 m BURP reach include: good bank stability and cover with little evidence of erosion; a channel distribution of 93% run and 7% riffle; and 7% fines in riffle habitat.

3.4.D.7 Status of Beneficial Uses

USGS data show that there are not exceedances of the cold water biota criteria for pH and DO at the lower river site. Water temperatures exceeded the Standards cold water biota criteria on most days from early July to mid August 1998. The aquatic life beneficial use cannot be judged at this time using the Idaho Rivers Ecological Assessment Framework. Salmonid spawning beneficial use is Full Support with mountain whitefish as the spawning species. This is based on IDFG assumptions and supported by USGS electro-fishing. Fecal coliform bacteria data collected at the USGS station shows that primary contact recreation is Full Support. Domestic water supply use of Lower Priest River is isolated to single family residences, so the turbidity criteria does not apply. The toxic substance criteria was Not Assessed.

3.4.D.8 Data Gaps

A comprehensive fish survey by IDFG within the river is needed for use with the River Fish Index as part of the large river bioassessment process to assess aquatic life beneficial use. In addition, a single BURP site is insufficient to properly assess a water body segment 35 miles in length. An additional BURP site should be established and evaluated further downstream, below the inflow of Lower West Branch and Quartz Creek.

Section 3.5. Summary Evaluations of Non §03(d) Listed 5th Order HUCs

Almost all major 5th order HUCs in the Priest River basin which are not §303(d) listed have had BURP assessment sites, and also were included in the 1992 DEQ Use Attainable (UA) survey. Many of these watersheds have had quantitative fish sampling by DEQ - BURP crews, IDFG or USFS. A few of the non-listed watersheds have had IDL - CWE assessments, and all of the western watersheds have various surveys conducted by the USFS.

Below is an information summary of eleven 5th order watersheds. Refer to Figure 2-2 (page 9) for location of the watersheds, Table 2-10 (page 40) for a summary of macroinvertebrate and fish sampling results, and Table 2-11 for habitat measurements. Like these tables, the watershed summaries are ordered geographically by northern streams draining into Upper Priest Lake, eastern streams draining into Priest Lake or Lower Priest River, and western streams.

3.5.A Northern Streams

3.5.A.1 Hughes Fork

Hughes Fork is a 4th order stream that flows into Upper Priest River about 0.5 miles north of Upper Priest Lake. Watershed size is 38,647 acres, main stem length is 14 miles, and there are approximately 67 miles of perennial streams. About 7 miles from the Hughes Fork mouth, the stream flows through Hughes Meadows, a large wetland - wet meadows complex. The USFS considers the watershed above Hughes Meadows as a "reference watershed". The main stem is mostly gradual gradient for the first one-half of its length, and the stream is considered to have abundant spawning habitat (Bjornn 1957). The watershed is considered of high importance in bull trout recovery plans (Panhandle Basin Bull Trout TAT 1998a).

The entire watershed is National Forest land, and the western mountain range is part of the Salmo-Priest Wilderness SMA. Land use is primarily timber harvesting, and the USFS reports moderate land use disturbance with 18% of the watershed logged, a total road density of 3.1 mi/mi^2, a stream crossing frequency of 0.6 crossings/mile of stream, and a riparian road density of 2.5 mi/mi^2 riparian area (Table 2-13, USFS 2000a). These statistics are below the basin-wide averages.

Based on a USFS gauging station on Upper Priest River, the estimated WY 95 mean daily spring high flow for lower Hughes Fork ranged from 400 - 650 cfs, and summer base flow is 40 - 90 cfs.

There were two BURP sites on Hughes Fork, both below Hughes Meadows. MBIs were good at 4.9 and 4.1. Electro-fishing in 1998 by IDFG showed decent cutthroat density and occasional presence of bull trout (Table 2-10). BURP habitat measurements showed a mediocre condition with HIs of 82 and 89. Below mid-point scores included percent fines, embeddedness, and at one site an absence of pools. The DEQ UA assessment at three sites (all below Hughes Meadows) also showed mediocre conditions with one habitat rating of "good" and two ratings of "poor". One of the poor ratings was related to beaver activity, but the other site was labeled as a very silty reach with high percent fines. Overall, pool complexity and Residual Pool Volume (RPV) were above average.

There were also two BURP sites on Gold Creek, a major tributary to Hughes Fork. MBIs were good at 4.7 and 5.1, and on a basin-wide relative basis the HIs were good at 112 and 113. BURP electro-fishing showed cutthroat trout with three age classes, and presence of bull trout. DEQ placed a temperature sensor in Gold Creek from August 8 - September 30, 1997. The maximum mean daily temperature was 12.2°C and maximum hourly 14.1°C. On most days the EPA bull trout criteria was exceeded.

3.5.A.2 Upper Priest River

Upper Priest River is a 4th order stream that flows into the northern end of Upper Priest Lake. Watershed size is 50,984 acres, main stem length is 25 miles, and there are approximately 98 miles of perennial streams. The headwaters originate from the Nelson Mountain Range of British Columbia with 15,354 acres of the drainage in Canada. The main stem for its lower-most 2 miles is a meandering gradual gradient stream flowing through a broad floodplain. Beyond the floodplain to the Canadian border the stream flows through a steep sided canyon. At stream mile 16 there is a major fish migration barrier, Upper Priest Falls. The watershed is considered of high importance in bull trout recovery plans (Panhandle Basin Bull Trout TAT 1998a).

The entire U.S. watershed is National Forest land. The delta from the confluence with Hughes Fork to the mouth, with wetlands and oxbows, is part of the Upper Priest Lake Scenic Area. Land use disturbance has been low, and the USFS reports (not including Canada), 5% of the watershed logged, a total road density of 1.2 mi/mi^2, a stream crossing frequency of 0.6 crossings/mile of stream, and a riparian road density of 1.4 mi/mi^2 riparian area (USFS 2000a). These statistics are well below the basin-wide averages. The USFS considers the watershed and stream system as a Properly Functioning Condition, and DEQ considers portions of the stream as "reference".

A USFS stream gauging station exits on Upper Priest River above the confluence of Hughes Fork. For WY 95 mean daily spring flow averaged 460 cfs with a peak of 925 cfs. Summer base flow is high, ranging 50 - 100 cfs. At the mouth, below the confluence of Hughes Fork, the estimated WY 95 annual volume of water delivered to Upper Priest Lake from the river was a substantial 255,417 ac-ft.

There were two BURP sites on Upper Priest River, mid-lower and middle reaches, and MBIs were good at 4.8 and 4.6. In 1998 there was extensive electro-fishing by IDFG and USFS within the main stem and several tributaries below Upper Priest Falls (Table 2-10). Cutthroat densities varied widely from poor to excellent; bull trout are present but mostly at low densities; and brook trout densities range from absent to extremely abundant.

BURP habitat scores were mediocre with HIs of 85 and 78, but that might be expected in a large and wide wadable stream (10 - 12 m base flow wetted width in the mid-lower section). Below mid-point habitat scores included high percent fines and embeddedness at the middle reach, and poor slow/fast ratios at both sites. The DEQ UA assessment at four sites, from lower to middle reaches, rated habitat at 3 sites as "good" and 1 site as "excellent". Overall, pool frequency was low but pool complexity and RPV were well above average.

3.5.B Eastern Streams

3.5.B.1 Caribou Creek

Caribou Creek is a 3rd order stream that flows into The Thorofare, a 2.7 mile channel that carries Upper Priest Lake outflow and Caribou Creek inflow into the northwestern tip of Priest Lake. Watershed size is 20,830 acres, main stem length is 11.5 miles, and there are approximately 37 miles of perennial streams. For the lower 5.5 miles of Caribou Creek the main stem is mostly low to moderate gradient, less than 1.7%. The stream gradient then steepens within the Selkirk mountains. Bull trout were historically present, and currently there is suspected spawning and rearing. The watershed is considered of high importance in bull trout recovery plans (Panhandle Basin Bull Trout TAT 1998a).

The majority of the watershed is State Endowment Trust land, with a few blocks owned by timber industry and minor acreage of National Forest land in the northeastern mountain range. A portion of the northeastern range is part of the Selkirk Crest SMA. Land use is primarily timber harvest and disturbance has been low - moderate with an estimated 23% of the watershed logged, a total road density of 2.1 mi/mi^2, and a riparian road density of 0.5 mi/mi^2 riparian area (Panhandle Basin Bull Trout TAT 1998a).

Stream flow for WY 95 was estimated from a gauging station established on Lion Creek, the adjacent watershed to the south. Estimated mean daily spring high flow ranged between 400 - 600 cfs, and summer base flow between 20 - 50 cfs.

There were two BURP sites on Caribou Creek, mid-lower and middle reaches, and MBIs were good at 4.4 and 5.3. Electro-fishing by IDFG in 1998 was conducted within three upper reaches. Results were very poor with no cutthroat or bull trout sampled and only two brook trout captured (Horner *et al*. 1999). DEQ electro-fished BURP sites in 2000, and results at the lower site were poor with brook trout the only salmonid captured at a low density of 0.3 fish/m^2. Sampling at the BURP middle site had slightly better brook trout density, but again no cutthroat. Cutthroat trout were sampled in a 1982 IDFG survey, and bull trout have been observed in the past. In a 1956 survey, salmonids were also very scarce (Bjornn 1957), and Bjornn reported that local residents had recalled a good size run of cutthroat trout in the past (pre-1950s). Based on the IDFG and DEQ electro-fishing results, Caribou Creek will be more thoroughly evaluated as DEQ prepares for the 2002 §303(d) List.

BURP habitat scores were HI = 88 at the mid-lower site and a good HI = 108 at the middle site. Both sites had poor slow/fast and width/depth ratios. The DEQ UA assessments were at four sites within middle to upper reaches. Three sites had habitat ratings of "good", one site as "fair". Overall, pool complexity was only fair, pool frequency below the basin-wide average, and RPV was below average at three sites but at one site RPV was one of the highest recorded.

3.5.B.2 Lion Creek

Lion Creek is a 3rd order stream that flows west into the northeastern tip of Priest Lake. Watershed size is 18,440 acres, main stem length is 11 miles, and there are approximately 34 miles of perennial streams. The lower one-half mile of Lion Creek cascades into the lake with falls and rapids, and there are numerous log jams (Bjornn 1957). This reach flows through Lion Head State Park. The next 3 - 4 miles is B channel with 1.5 - 3.5% gradient, and then the stream gradient steepens within the Selkirk mountains. Bull trout are present with spawning and early rearing. The watershed is considered of high importance in bull trout recovery plans (Panhandle Basin Bull Trout TAT 1998a). In a 1956 survey, the B channel lower reach above the lower-most falls and rapids, was considered to have good spawning beds and abundant cutthroat (Bjornn 1957).

The majority of the watershed is State Endowment Trust land, with a single one-quarter section block owned by timber industry, and some acreage of National Forest land in the eastern mountain range. A large section of the eastern range, 7,284 acres, is part of the Selkirk Crest SMA. Land use is primarily timber harvest and disturbance has been moderate with an estimated 35% of the watershed logged, a low road density of 1.6 mi/mi^2, but a substantial riparian road density of 6.1 mi/mi^2 riparian area (Panhandle Basin Bull Trout TAT 1998a). The high estimate of riparian road density relates to State Roads 41 and 42 which closely parallel Lion Creek on both sides for about the first half of its length, and State Road 41 which parallels a portion of South Fork Lion Creek.

An IDL - CWE assessment was conducted within Lion Creek watershed in 1999. The Canopy Removal Index was rated at 0.22, the Channel Stability Index = 54 (moderate), and the resulting Hydrologic Risk Rating was at the high end of "low". The road sediment delivery rating was "low", but only a small section of State Roads 41 and 42 along the main stem were assessed.

A stream gauging and water quality sampling station was established on lower Lion Creek as part of the Priest Lake baseline study (Rothrock and Mosier 1997). For WY 95 mean daily spring flow averaged 220 cfs with a peak of 550 cfs, and summer base flow ranged 20 - 50 cfs. Annual volume of water delivered to the lake was 65,870 ac-ft.

There were two BURP sites on Lion Creek, lower and lower-middle reaches. MBIs were good at 5.2 and 4.9. Between 1983 and 1994 there were four fish sampling surveys by IDFG (IWRB 1995). Averaged over the four sampling years cutthroat trout density was good at 8.6 fish/100 m^2, bull trout were present but at very low density, and no brook trout were observed (Table 2-10). DEQ electro-fished the BURP sites in 2000, and at the lower site cutthroat and brook trout were captured, both at low densities. At the lower-middle site cutthroat was sampled at low density. IDL electro-fished a middle Lion Creek reach in 1997 and no fish were captured. Based on the most current fish sampling efforts by IDL and DEQ that resulted in very low numbers of salmonids captured, further fish population surveys are needed in Lion Creek.

BURP habitat scores were decent with HI = 93 at the lower site and HI = 107 at the lower-middle site. Both sites had poor slow/fast ratios and the middle site had a high width/depth ratio. The DEQ UA assessments were at lower, middle and upper sites. The middle site was not rated. This reach was entirely a series of descending cascades and runs with small “pool” pockets. Habitat rating at the lower site was “fair”, and at the upper site “excellent” where pool frequency and RPV were well above basin-wide averages.

DEQ placed a temperature sensor in lower Lion Creek from August 8 - September 30, 1997. The maximum mean daily temperature was 14.1°C and maximum hourly 15.6°C. On most days the EPA bull trout criterion was exceeded.

3.5.B.3 Indian Creek

Indian Creek is a 3rd order stream that flows west into Priest Lake. Watershed size is 14,978 acres, main stem length is 10 miles, and there are approximately 25 miles of perennial streams. The lower 1.5 miles of Indian Creek is gradual gradient as it flows through Indian Creek State Park, and the remaining length is steep gradient B and A channel within the Selkirk mountains. Bull trout are present with spawning and early rearing. The watershed is considered of high importance in bull trout recovery plans (Panhandle Basin Bull Trout TAT 1998a). In a 1956 survey the lower reaches were considered to have adequate spawning beds and abundant cutthroat (Bjornn 1957).

The majority of the watershed is State Endowment Trust land with some acreage of National Forest land in the eastern mountain range. A large section of the eastern range, 5,160 acres, is part of the Selkirk Crest SMA. Land use is primarily timber harvest and disturbance has been moderate with an estimated 36% of the watershed logged, a low road density of 1.9 mi/mi^2, but an above average riparian road density of 4.3 mi/mi^2 riparian area (Panhandle Basin Bull Trout TAT 1998a). State Road 2/27 closely parallels Indian Creek and North Fork Indian Creek for a substantial portion of stream length.

An IDL - CWE assessment was conducted within Indian Creek watershed in 1999. The Canopy Removal Index was rated at 0.10, the Channel Stability Index = 51 (moderate), and the resulting Hydrologic Risk Rating was “low”. A substantial 23 miles of road were inventoried, including long stretches of road parallel to the main stem, North Fork, and South Fork. The overall average road sediment score was “moderate”, one of the few watersheds assessed that had a score above “low”, but the total sediment delivery rating was low (roads + skid trails + mass failure scores).

A stream gauging and water quality sampling station was established on lower Indian Creek as part of the Priest Lake baseline study. For WY 95 mean daily spring flow averaged 150 cfs with a peak of 360 cfs, and summer base flow ranged 10 - 30 cfs. Annual volume of water delivered to the lake was 42,620 ac-ft.

There was a single BURP site on Indian Creek, a middle reach just below the confluence of the North and South Forks. The MBI was good at 4.9. Between 1983 and 1994 there were five fish sampling surveys by IDFG (IWRB 1995). Averaged over the five sampling years: cutthroat trout density was good at 13.4 fish/100 m^2; bull trout were present with generally low density, but the 1987 density was decent at 4.9 fish/100 m^2; and brook trout were present with low - moderate densities (Table 2-10). In 1994 there was BURP electro-fishing at two sites, with a mean cutthroat density of 7 fish/100 m^2 and multiple age classes, and very low brook trout density.

The BURP habitat score was good at HI = 107. The reach had poor slow/fast and width/depth ratios. The DEQ UA assessments were at two sites, a lower reach near the mouth and a reach on the North Fork. Habitat rating at both sites was "good". Both sites had above average pool frequency and RPV.

IDL placed a temperature sensor within the headwaters of North Fork Indian Creek from July 16 - September 22, 1999. This data shows that upper stream reaches can be cold enough to have only minor exceedances of various temperature criteria. The maximum mean daily temperature was 11.1°C (in late August) and maximum hourly 13.1°C. The Standards criteria for cutthroat spawning in July was never exceeded, and the EPA bull trout criteria was exceeded on only 24% of the days compared to nearly 100% on most lower reaches throughout the basin.

3.5.B.4 Hunt Creek

Hunt Creek is a 3rd order stream that flows west into Priest Lake. About 1.5 miles from the mouth the stream is bifurcated into a North and South Fork. The stream also bifurcates near the mouth. Watershed size is 11,906 acres, main stem plus North Fork length is 7 miles, South Fork length is 5.3 miles, and there are approximately 13 miles of perennial streams. The lower 1.5 miles is mostly moderate gradient B channel, and the Forks are steep gradient B and A channel within the Selkirk mountains. It is unknown if bull trout were historically present in Hunt Creek; they are suspected to be not present now. The watershed is considered of moderate importance in bull trout recovery plans (Panhandle Basin Bull Trout TAT 1998a). In a 1956 survey, an impassable falls was identified one mile from the mouth and the stream was considered to only have resident cutthroat trout (Bjornn 1957).

The majority of the watershed is State Endowment Trust land with some acreage of National Forest land in the eastern mountain range. A section of the eastern range of the North Fork subwatershed is part of the Selkirk Crest SMA. Land use is primarily timber harvest and disturbance has been moderate with an estimated 53% of the watershed logged, a total road density of 2.5 mi/mi^2, and a high riparian road density of 8.9 mi/mi^2 riparian area (Panhandle Basin Bull Trout TAT 1998a). An IDL - CWE assessment has not been conducted.

A stream gauging and water quality sampling station was established on lower Hunt Creek as part of the Priest Lake baseline study. For WY 95 mean daily spring flow averaged 94 cfs with a peak of 220 cfs, and summer base flow ranged 20 - 40 cfs. Annual volume of water delivered to the lake was 32,585 ac-ft.

There was a lower BURP site, and a middle site on the North Fork. MBIs were good at 4.7 and 4.1. DEQ electro-fished the middle North Fork site in 2000, and cutthroat trout were captured at an adequate density of 5.3 fish/100 m^2. No other salmonids were sampled.

BURP habitat scores were HI = 89 at the lower site and a good HI = 108 at the North Fork site. The lower site had high embeddedness, a poor width/depth ratio, and no pools. The North Fork site had high embeddedness and a poor slow/fast ratio. The DEQ UA assessments were at two sites in the same vicinity as the BURP reaches. Both sites had habitat ratings of "good". Pool frequency and RPV were well below average at the lower site, and RPV was below average on the North Fork reach.

3.5.B.5 Soldier Creek

Soldier Creek is a 3rd order stream that flows west into the southeastern edge of Priest Lake. Watershed size is 15,815 acres, main stem length is 10 miles, and there are approximately 27 miles of perennial streams. The lower 3 miles is mostly gradual gradient E and C channel flowing through a large wetlands - wet meadows complex. The lower end of the tributary Lee Creek also flows through this floodplain area. Above the lower flat gradient, Soldier Creek quickly steepens to B and A channel within the Selkirk mountains. Bull trout are suspected to be present with spawning and early rearing, and the watershed is considered of moderate importance in bull trout recovery plans (Panhandle Basin Bull Trout TAT 1998a). In the 1956 survey, Soldier Creek was considered as supporting a large population of brook trout in the lower reach, and moderate populations of bull trout and cutthroat in upper reaches (Bjornn 1957). At the time of the 1956 survey there were numerous log jams which may have impeded migration to middle and upper reach spawning beds.

The majority of the watershed is State Endowment Trust land with some acreage of National Forest land in the eastern mountain range. The lower meadows area is private ownership as well as the area surrounding the mouth. Land use is primarily timber harvest and disturbance has been moderate - high with an estimated 75% of the watershed logged, a total road density of 2.4 mi/mi^2, and a high riparian road density of 12.7 mi/mi^2 riparian area (Panhandle Basin Bull Trout TAT 1998a). A large area of the headwaters land was burnt in the 1967 Sundance fire (Figure 2- 6). An IDL - CWE assessment has not been conducted within the watershed.

A stream gauging and water quality sampling station was established on lower Soldier Creek as part of the Priest Lake baseline study. For WY 95 mean daily spring flow averaged 111 cfs with a peak of 246 cfs, and summer base flow ranged 10 - 20 cfs. Annual volume of water delivered to the lake was 34,400 ac-ft.

There were two BURP sites on Soldier Creek, lower and middle reaches. The lower reach was within the flat gradient meadows with a very sandy-silty substrate and few graveled riffles. The MBI = 3.3 at this lower site is below the Full Support score. The middle reach MBI was good at 4.8. There was BURP electro-fishing at the middle reach, with brook trout at a low density of 2 fish/100 m^2, no cutthroat or bull trout captured, and sculpin were present.

The BURP habitat score at the lower site was very poor at HI = 52, reflecting high percent fines and embeddedness, poor instream cover, and no pools. To a degree, this low habitat score may be reflecting deposition of sediment sources related to the extensive 1967 Sundance fire. At the middle site HI = 100, with poor slow/fast and width/depth ratios. The DEQ UA assessments were at three sites, all three within a 1 mile middle stretch above the meadows. All sites had habitat ratings of “excellent”. Overall, pool frequency and RPV were below average, but pool complexity and instream cover were rated high.

DEQ placed a temperature sensor in lower Soldier Creek from August 8 - September 30, 1997. The maximum mean daily temperature was 15.4°C, and maximum hourly 18.2°C. On all days the EPA bull trout criterion was exceeded.

Based on low salmonid density at a single DEQ electro-fishing site, an MBI and HI at the lower site which were below FS, and moderate – high land use statistics, Soldier Creek will be more thoroughly evaluated as DEQ prepares for the 2002 §303(d) List. Additional BURP electro-fishing will be scheduled for the summer of 2001.

3.5.B.6 Big Creek

Big Creek is a small 3rd order stream system south of East River, flowing west into Lower Priest River. Watershed size is 9,354 acres, main stem length is 3.6 miles, and then there is a bifurcation into a 4.4 mile North Fork, and a 4.9 mile southeastern Happy Fork. There are approximately 20 miles of perennial streams. The main stem is gradual to moderate gradient averaging 2.8% over its length, and then the two forks steepen within the southern most portion of the Selkirk mountains. The North Fork subwatershed reaches an elevation of 6,193 ft at Bald Mountain, but Happy Fork tops out at 4,257 ft. It is unknown if bull trout were historically present in Big Creek; they are suspected to be not present now. The watershed is considered of low importance in bull trout recovery plans (Panhandle Basin Bull Trout TAT 1998a).

The majority of the watershed is State Endowment Trust land with some blocks of industrial timber land in the eastern mountain range. Land use is primarily timber harvest. Percentage of the watershed logged has not been determined, but estimates of the road system statistics are high with total road density at 7.1 mi/mi^2, a stream crossing frequency of 1.8 crossings/mile of stream, and a riparian road density of 6.6 mi/mi^2 riparian area (Panhandle Basin Bull Trout TAT 1998a). An IDL - CWE assessment has not been conducted within the watershed.

There has been no stream gauging efforts on Big Creek. One estimate of flow is a mean annual discharge of 35 cfs (Panhandle Basin Bull Trout TAT 1998a). Summer base flow at BURP sites has been around 8 cfs in the main stem.

There were two BURP sites on Big Creek, both on the main stem at a middle and upper reach. MBIs were both 3.9. IDFG conducted an electro-fishing survey in 1986 at 3 reaches in the main stem, 2 reaches in Happy Fork, and 1 reach in North Fork. Sampling results showed a good fishery throughout (Table 2-10), with good to excellent numbers of cutthroat, and an especially abundant population of brook trout in Happy Fork. BURP electro-fishing in 1997 within the main stem, using a 2 pass method, produced brook trout at 11 fish/100 m^2, cutthroat at 1.2 fish/100 m^2 with multiple age classes, and numerous sculpin.

The BURP habitat score at the middle site was HI = 92, with high percent fines (44%) and embeddedness, and a poor slow/fast ratio. At the upper main stem site the score was mediocre at HI = 75 with high percent fines and embeddedness, poor slow/fast and width/depth ratios, and poor lower bank stability. DEQ UA assessments were not conducted on Big Creek.

3.5.C Western Streams

3.5.C.1 Granite Creek

Granite Creek is a major 4th order stream that flows east into Priest Lake. Watershed size is 64,024 acres, the single largest 5th order subwatershed in the Priest River basin. Main stem length is 10.7 miles and mostly gradual sloped, and then there is bifurcation into two major 3rd order forks; the North Fork with a main stem length of 11.7 miles and the South Fork with a main stem length of 14 miles. The headwaters of the two forks originate in high mountainous areas from 5,700 - 6,500 ft elevation, with steep B and A channel type. There also are reaches of gradual gradient with wide floodplains and wet meadows, such as the large Sema meadows of the South Fork drainage. All together there are approximately 129 miles of perennial streams within the watershed. Bull trout are present in the stream system with suspected spawning and subadult and adult rearing, and the watershed is considered of high importance in bull trout recovery plans (Panhandle Basin Bull Trout TAT 1998a).

In the 1956 fish survey, Granite Creek was considered the best Priest Lake tributary for adfluvial cutthroat trout spawning (Bjornn 1957). The main stem gradient is mostly low and free of serious obstacles for migration, and allowed for extensive gravel areas suitable for spawning. In the 1940s a fish trap for cutthroat spawners was in operation on the main stem. Numbers of cutthroat spawners had dramatically declined by the 1956 survey. North Fork Granite Creek was considered to have large areas of good spawning gravels, and the initial 2 miles of the South Fork was also considered as having good spawning habitat.

The watershed is primarily National Forest land. There are blocks of industrial timber land within the South Fork drainage, and there are private residential and timber lands adjacent to the lower main stem channel and surrounding the mouth at Priest Lake. Land use is mostly timber harvesting and the USFS reports low - moderate land use disturbance with 9% of the watershed logged, a total road density of 3.0 mi/mi^2, a stream crossing frequency of 0.6 crossings/mile of stream, and a riparian road density of 3.1 mi/mi^2 riparian area (USFS 2000a). These statistics are just below the basin-wide averages. There were extensive wildfires and multiple reburns over much of the Granite Creek drainage between 1890 and 1940 (Figure 2-6). USFS considers South Fork Granite Creek watershed as a "reference watershed". An IDL - CWE assessment has not been conducted within the watershed.

A stream gauging and water quality sampling station was established on lower Granite Creek as part of the Priest Lake baseline study. For WY 95 mean daily spring flow averaged 463 cfs with a peak of 970 cfs, and summer base flow ranged 55 - 125 cfs. Annual volume of water delivered to the lake was a substantial 148,170 ac-ft. Fecal coliform bacteria samples were taken and no value exceeded 10 FC/100 ml. Total suspended sediment concentrations during spring high flow was considered above the lake basin average, with a mean 4.5 mg/L TSS and a maximum 37 mg/L.

There were two BURP sites on main stem Granite Creek, one near the mouth and the other just below the confluence of the two forks. MBIs were good at 4.4 and 4.5. There were also two BURP sites on South Fork, a lower and upper reach. MBIs were 4.6 and 5.0.

Between 1983 - 1994 IDFG conducted four fish sampling surveys on the main stem and seven surveys on the South Fork (IWRB 1995). Averaged over the four sampling years on the main stem, cutthroat and brook trout density were low, and bull trout were present at a low density (Table 2-10). On the South Fork, cutthroat density averaged over seven years was somewhat better at 2 fish/100 m^2. Bull trout were present. In 1997 there was BURP electro-fishing at the upper main stem site. Cutthroat density was very low and no bull trout were captured (Table 2-10). BURP sampling on the South Fork produced a low cutthroat density and only one bull trout captured. The Kalispel Natural Resource Department conducted a snorkeling survey within six - 30 m reaches of the South Fork in 1997 (KNRD 1997). Mean cutthroat density was decent at 8 fish/100 m^2, but no bull trout were observed.

BURP habitat measurements on Granite Creek main stem resulted in mediocre scores with HIs of 85 and 88, but like Upper Priest River this is a very wide wadable stream. Below mid-point scores included percent fines (54% at the lower site), and very low slow/fast ratios. BURP habitat scores on the South Fork were HI = 94 at the lower site, and a basin high HI = 118 at the upper site. The DEQ UA assessment at three main stem sites of lower, middle and upper reaches rated habitat as "fair", "good", and "excellent" going upstream. Pool frequency and RPV were well below basin-wide averages at all sites.

The KNRD habitat assessment at 433 transects within 11 reaches on the South Fork produced an average habitat composition of 51% riffle, 30% run, 9% pool, 5% glide, and 5% pocket water (KNRD 1997). Average measured embeddedness was moderate at 38%, and stream banks were generally stable. The frequency of primary pools was 6.1/km. Occurrence of spawning gravels were common.

DEQ placed a temperature sensor in lower Granite Creek from August 8 - September 30, 1997. The highest mean daily temperature was 12.1°C and maximum hourly 13.8°C. On 70% of the days, the EPA bull trout criterion was exceeded.

3.5.C.2 Upper West Branch Priest River

Upper West Branch is a major 4th order stream that flows southeast into Lower Priest River. Watershed size is 44,623 acres, main stem length is 22.3 miles, and there are approximately 112 miles of perennial streams within the watershed. Goose Creek is a major tributary at the south end of the drainage, and main stem length of Goose Creek is 8.3 miles with a subwatershed size of 13,283 acres. The lower one-half of Upper West Branch is mainly gradual gradient channel through areas of floodplains, but there are some steep reaches near the mouth. The headwaters originate from steep mountains reaching 5,552 ft elevation at Hungry Mountain. Like other mid to lower west side streams, there are considerable main stem reaches with a stream bed substrate of thick sand. Most of Goose Creek is flat gradient flowing through a large wet meadows complex called Big Meadows which has been converted to hay cropping and grazing. The headwaters of Goose Creek is steep reaching nearly 6,000 ft at South Baldy Mountain.

Local ranchers state that bull trout were historically present in Upper West Branch and Goose Creek, but they are suspected to be not present now. The watershed is considered of low importance in bull trout recovery plans (Panhandle Basin Bull Trout TAT 1998a).

The watershed is primarily National Forest land, and there is 1,627 acres of private land which is mostly labeled as an agriculture zone with hay cropping and grazing. Around 8,000 acres of federal land is designated as grazing allotment. USFS reports timber harvesting land use disturbance as moderate with 23% of the watershed logged, a total road density of 5.9 mi/mi^2, a stream crossing frequency of 1.0 crossings/mile of stream, and a riparian road density of 5.5 mi/mi^2 riparian area (USFS 2000a). These statistics are above the basin-wide averages. Overall, the USFS rates the watershed as 66% Not Properly Functioning, 18% Functioning at Risk, and 16% Properly Functioning (USFS 1999). USFS considers the roadless, upper-most headwaters above Colza Creek as a “reference watershed”. The upper one-half of the drainage burned over in wildfires between 1880 - 1890, and there were large fires between 1925 - 1939 in the headwater lands of Upper West Branch (Figure 2-6).

An IDL - CWE assessment was conducted within the watershed in 1999. A substantial 88 miles of road were inventoried, including long stretches of Forest Road 312 which parallels the main stem. The overall road rating and sediment delivery scores were “low”. There were 19 Significant Management Problems recorded associated with roads. Instream assessments of channel stability produced scores from moderate to high (trending toward unstable).

There has been no stream gauging efforts on Upper West Branch. One estimate of flow is a mean annual discharge of 158 cfs (USFS 2000a). Summer base flow at the lower BURP site was 35 cfs.

There were three BURP sites on Upper West Branch (1999); lower, middle and upper. MBIs were good at 4.3, 4.8, and 4.6 going upstream. IDFG conducted an electro-fishing survey in 1986 at 3 reaches within the main stem. Sampling results showed a low density of brook trout, no cutthroat trout, and a single rainbow trout captured (Table 2-10). BURP electro-fishing in 1999 at the lower site produced low brook trout density but with multiple age classes, and sculpin. Results at the middle site were low brook trout numbers, a single cutthroat captured, and sculpin. USFS reports electro-fishing at three reaches within the tributary Solo Creek, and results were low brook trout numbers and a cutthroat density of 1.6 fish/100 m^2 at one reach, but no cutthroats captured at the other 2 reaches.

BURP habitat scores at all three sites were good (on a basin-wide relative basis), with HIs of 101, 108, and 101 going from lower to upper sites. Percent fines were high at all 3 sites ranging from 41 - 87%. DEQ

UA assessments were conducted on three reaches. At the lower reach near the mouth the overall habitat rating was "excellent". This was a mix of B and A channel type with very good pool complexity and pool frequency, and high RPV. The other two UA sites were within middle, gradual gradient reaches above the confluence of Goose Creek, and results conflict with BURP habitat scoring. At both UA sites the habitat rating was "poor". This related to very sandy substrate, poor instream cover and pool complexity, and some stream banks damaged by cattle grazing and other riparian zone disturbances. Pool frequency and RPV however were good and well above the basin-wide averages.

No temperature sensors have been placed within Upper West Branch. In 1999 there were bacteria samples taken in the main stem and at the mouth of Goose Creek. Results which were presented in Section 2.2.3.2 (page 38) showed relative high values for fecal coliform and *E. coli*.

Based on low salmonid density from electro-fishing efforts, a high percent fines in stream channels, and bacteria results that were near or exceeded State standards, the Upper West Branch watershed will be more thoroughly evaluated as DEQ prepares for the 2002 §303(d) List. Goose Creek will be evaluated for 303(d) listing with bacteria as the pollutant of concern.

3.5.C.3 Quartz Creek

Quartz Creek is a 2nd order stream flowing southeast into Lower Priest River. Watershed size is 7,081 acres, main stem length is 6.3 miles, and there are approximately 18 miles of perennial streams within the watershed. The main stem is B channel for the lower-most 0.7 miles, and then for 4.5 miles the average gradient is <1.0%. The headwater lands are relative low elevation topping out around 3,100 ft. It is unknown if bull trout were historically present in Quartz Creek; they are suspected to be not present now. The watershed is considered of low importance in bull trout recovery plans (Panhandle Basin Bull Trout TAT 1998a).

The watershed is primarily National Forest land, and there are 1,334 acres of private land that is mostly labeled as an agriculture zone with hay cropping and grazing. There is one block of industrial timber land. USFS reports timber harvesting land use disturbance as moderate with 20% of the watershed logged, a total road density of 5.0 mi/mi^2, a stream crossing frequency of 1.3 crossings/mile of stream, and a riparian road density of 5.2 mi/mi^2 riparian area (USFS 2000a). These statistics are above the basin-wide averages. Overall, the USFS rates the watershed as Functioning at Risk (USFS 1999). Most of the Quartz Creek drainage experienced stand replacement fires between 1926 - 1931 (Figure 2-6).

An IDL - CWE assessment was conducted within the watershed in 1999. A total of 11.4 miles of road were inventoried, including most of Forest Road 416 which parallels the main stem. The overall road rating and sediment delivery scores were "low". There were 5 Significant Management Problems recorded along Road 416. Instream assessments of channel stability produced an average score of moderate (trending toward unstable).

There has been no stream gauging efforts on Quartz Creek. One estimate of flow is a mean annual discharge of 23 cfs (USFS 2000a).

Two BURP sites were established in 2000, a lower and upper site. MBI and HI scores are not yet available from the BURP assessments. IDFG conducted an electro-fishing survey in 1987 at 3 reaches in the main stem (Table 2-10). Brook trout were very abundant, cutthroat were present at 1.5 fish/100 m^2, and brown trout were also sampled. DEQ electro-fishing at the lower BURP site resulted in moderate brook trout density and a few cutthroat captured. At the upper BURP site brook trout and cutthroat were sampled at low density, and sculpins were abundant.

SECTION 4. TMDL - SEDIMENT LOADING ANALYSIS AND ALLOCATION

4.1 Estimates of Natural and Existing Sediment Loads for Five §303(d) Listed Watersheds

4.1.1 Introduction

An attempt to calculate sediment yield from watersheds, and delivery to streams, will provide relative rather than exact sediment yields (Harvey 2000a). The calculations presented in this section attempt to account for all significant sources of sediment separately. This approach is used to identify the primary sources of sediment in a watershed. This identification of primary sources for TMDL streams will be useful as implementation plans are designed and developed to remedy these sources.

Two sediment loading rates were calculated for selected watersheds; an estimated natural or background loading rate prior to Euroamerican settlement and land use activities within the basin, and the current sediment loading rate. The sediment loading points were calculated for five of the §303(d) watersheds (Table 4-1): Kalispell Creek, Lamb Creek, Binarch Creek, East River, and Lower West Branch Priest River. Sediment load calculations were initially chosen for these selected watersheds as part of the WBAG+ body of additional information to aid in beneficial use determinations. Sediment load information is carried further into sediment Load Allocations and Percent Reductions for the Lower West Branch and Kalispell Creek TMDLs.

Figure 4-1 presents a conceptual diagram of the relationship between the increase of a current sediment load over natural load as it relates to an impact on cold water biota (CWB) beneficial use. Current sediment load in all Priest River basin watersheds will be higher than natural conditions simply because of the timber road system. The measurements of stream biology may suggest Full Support at the estimated current sediment load, or the stream biology may suggest Not Full Support of CWB. In the latter case an

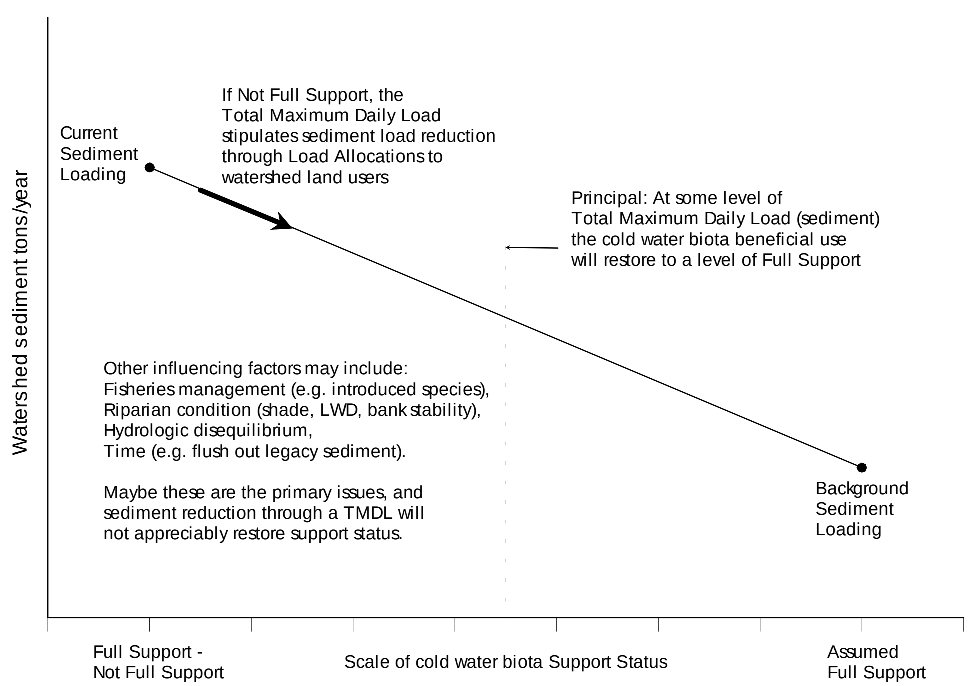


Figure 4-1. Conceptual diagram of sediment TMDL in association with cold water biota beneficial use.

Table 4-1. Sediment Load Calculations for Selected Priest River Basin Watersheds

Categories of Sediment Loading	Kalispell Creek[a]	Lamb Creek	Binarch Creek	East River[b]	Lower W. Branch	LWB w/ slides[c]
Watershed area: square miles	31.0	24.4	11.3	57.6	88.8	
Natural Sediment Load						
Tons/year – 100% delivery	**722**	**544**	**266**	**1,032**	**1,878**	**+800**
Weighted mean tons/mi^2	23.3	22.3	23.5	17.9	21.1	
WATSED routing coefficient	0.54	0.56	0.65	0.48	0.45	
Current Sediment Load						
Forested area (minus roads & crops) (mi^2)	30.0	22.4	10.8	55.3	78.3	
Tons/yr with 100% delivery	**698**	**501**	**254**	**991**	**1,649**	**+800**
Unpaved Roads						
Number of unpaved road stream crossings	41	49	19	109	220	
Mean CWE score at stream crossings	28.0	11.5	12.0	16.3	19.0	
Tons/yr from stream crossings - 100% delivery	**29**	**9**	**4**	**29**	**87**	
Miles of total road network within 200 ft of streams	14	15	7	25	49	
Miles of the total road network in the entire watershed	90	144	61	268	454	
Weighted mean CWE total road sediment score	19.8	11.5	12.0	14.2	16.8	
Tons/yr from total road network (minus crossings)	**322**	**339**	**142**	**732**	**1,489**	
Failures at roads						
Annual number of washouts at stream crossings	0.5	3	0	6	6	
Tons/yr from stream crossing washouts	**11**	**65**	**0**	**130**	**130**	
Annual number of typical road prism failures	0	4	0.5	8	8	
Tons/yr from typical road prism mass failures	**0**	**480**	**60**	**545**	**961**	
Tons/yr from atypical failures	**0**	**144**	**0**	**0**	**480**	**+800**
Hay land and Grazing						
Acres of improved hay land and pasture	190	547	0	12	4,143	
Tons/yr from hay, alfalfa and grazing improved land	**8**	**24**	**0**	**9**	**167**	
Other						
Tons/yr from residential stormwater	**0**	**4**	**0**	**0**	**0**	
Mean bank erosion in surveyed reaches (tons/mile/yr)	19	22	NA	193	45	
Extrapolated tons/yr from stream bank erosion	**225**	**164**	**NA**	**442**	**851**	
Summary						
Total current tons/yr	**1,294**	**1,731**	**460**	**2,877**	**5,816**	**+1,600**
Percent increase over natural sediment load	79%	218%	73%	179%	210%	

a = Kalispell Creek watershed calculations without Diamond Creek 6th order subwatershed
b = East River combines calculations from Middle Fork, North Fork, and the main stem
c = Mass failure slides along a 5.5 mile canyon within a lower main stem reach have been kept separate from other LWB calculations.

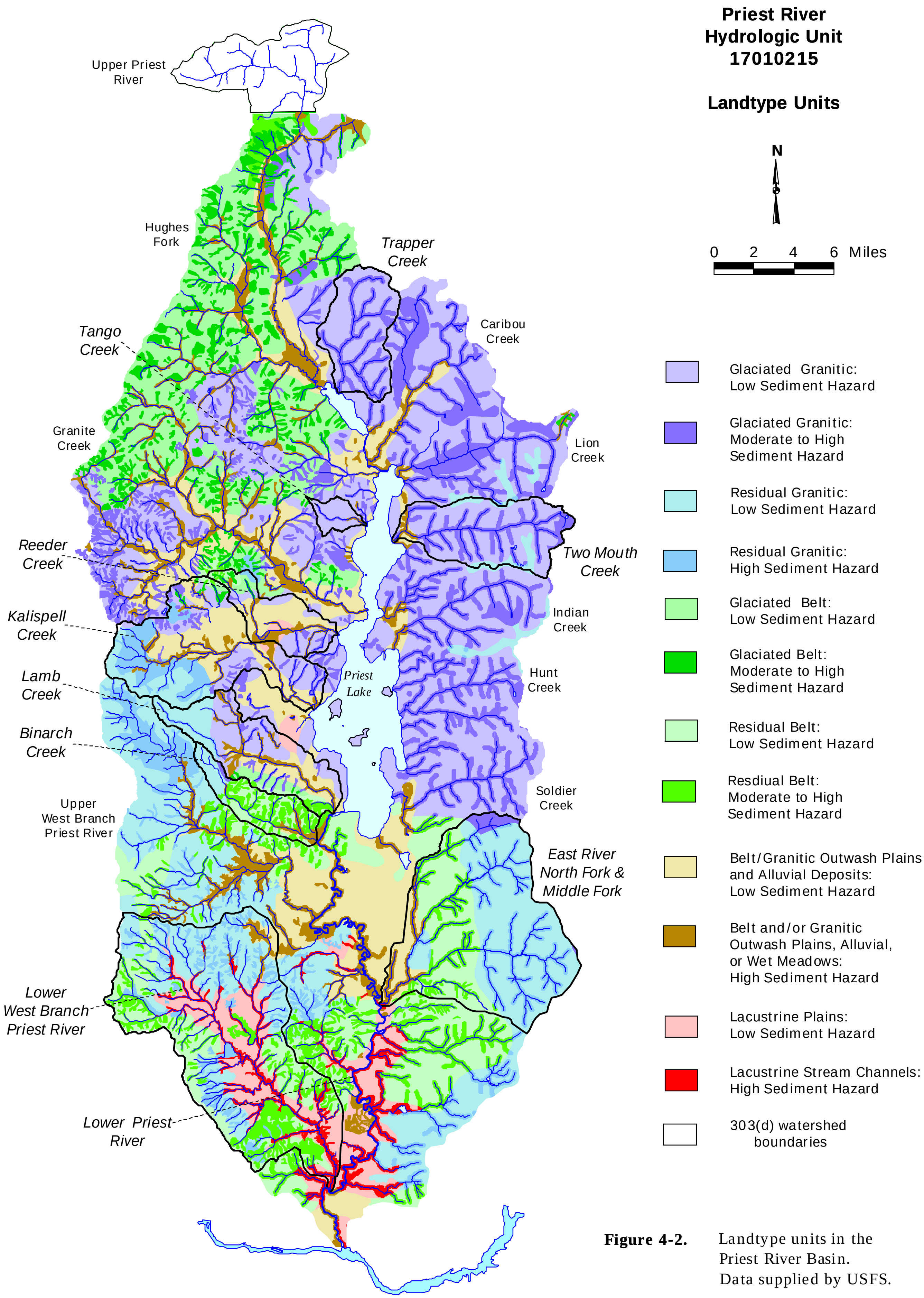


Figure 4-2. Landtype units in the Priest River Basin. Data supplied by USFS.

estimation is made as to whether the current sediment load has played a significant part in the CWB impairment. There may be other reasons for impairment such as poor instream cover and lack of quality pools associated with low, large woody debris recruitment (linked perhaps to historic riparian harvests). Other factors may be water temperature and fishery management issues such as introduction of non-native species. For a sediment TMDL, the goal is to reduce the current watershed load to a point where the CWB will exhibit full support. Questions may arise as to whether sediment load reduction in itself will lead to restoration of full support without other management actions, or if other management actions should take priority over sediment load reduction as a means to achieve full support.

4.1.2 Natural or Background Sediment Load

4.1.2.1 Forest Land

The USFS supplied to DEQ a GIS base geology and landtype map of the Priest River basin in order to calculate background sediment load (Figure 4-2, Niehoff *pers comm*). Landtypes are units of classification based on local geomorphology, hydrology, and soils characteristics. Each landtype is assigned a sediment yield in tons/square mile area/year. These yield rates are used in the Forest Service WATSED Model for planning land management activities.

A point or emphasis is made here on the use of WATSED landtype coefficients to calculate Forest Land sediment load for the Priest River TMDL. The WATSED model provides useful information to identify sources of sediment and compare management alternatives (EPA 2001). The model design was not intended to predict specific quantities of sediment yield for applications such as a TMDL. In the EPA comment package to the draft SBA and TMDL (EPA 2001), it was cited that the development origin of WATSED and related R1/R4 models was for the Idaho Batholith and that extrapolation outside of the Idaho Batholith should be made with extreme caution, and that calibration and validation does not exist for Kaniksu granitic and Belt series metamorphic geology's (USFS 1981, Ketcheson *et al*. 1999). However, the use of WATSED coefficients for sediment yield estimates from Forest Land is clearly the best of options available for TMDL development in northern Idaho, and there has been some field trials of sediment yield from various landtypes within the Idaho Panhandle National Forests (Niehoff *pers comm)*.

The GIS coverage supplied by the USFS was a base map of low sediment hazard landtypes, including these examples common within the Priest River basin: Belt/Granitic Outwash Plain and Alluvial Deposits (typically gentle sloped, Bonner soils) with 11 tons/mi^2/yr; High Elevation, Residual Belt Mt. Slopes and Ridges with 13 tons/mi^2/yr; and High Elevation, Glaciated Granitic Mt. Slopes and Ridges with 23 tons/mi^2/yr (Figure 4-2). The base map was overlaid with sensitive landtypes ranging from moderate to high sediment hazard. Some common examples in the basin include: Highly Weathered, Dissected, Residual Granitic Bottoms and Toeslopes with 32 tons/mi^2/yr; Dissected, Residual Belt Mt. Slopes at 36 tons/mi^2/yr; Lacustrine Stream Channels with 41 tons/mi^2/yr; and Non-Dissected, Belt Stream Breaklands with 59 tons/mi^2/yr. Landtype units take into account historical, non-forested lands such as wet meadows.

Acreage within each watershed was partitioned to each base or sensitive landtype. Within landtype partitions the watershed acreage was further separated into ownership groups, and sub-ownership groups such as improved hay land within broader agricultural zones. The ownership and land use partitions were for the purpose of sediment yield estimates in the calculations of TMDL Load Allocations.

The WATSED sediment yield coefficients were applied to square miles of each partition resulting in tons/yr for each partition. Adding up the partitions resulted in watershed tons/yr as background sediment load. Dividing total watershed tons/yr by watershed area results in a weighted mean tons/mi^2/yr sediment yield for the watershed.

The WATSED model does not assume that sediment yield means 100% delivery to watershed streams. WATSED uses a "routing coefficient" applied to yield to reduce the estimated amount of sediment delivered to streams. The routing coefficient equation is based on watershed size. The larger the watershed the smaller the routing coefficient applied to yield, and less relative sediment delivery to streams. Table 4-1 presents a summary of sediment load for five watersheds. The first category is background sediment yield. While routing coefficients are shown, the sediment load calculations for most DEQ - TMDL documents have used the assumption of 100% delivery to streams. The Priest River basin TMDL will take the same approach.

4.1.2.2 Fire

The historic cycle of wildland fires was the prevailing disturbance in the natural setting of the basin. Estimates and records of fires between 1880 - 1940 were presented in Section 2 and 3, including large areas of western watersheds with intense multiple burns. As explored in Section 2.3.2.1 (page 55), it is felt by some USFS scientists that because of the widespread volcanic ash cap, intense multiple fires would not have led to an appreciable increase in sediment yield. Instead, a hydrophobic condition may have developed with very intense fires, and this may have led to excess water yields and flooding which caused stream channel damage. Such conditions are speculated for damage in upper reaches of Lamb Creek and Upper West Branch during the early 1900s.

4.1.2.3 Mass Failures

The basin wide IDL Cumulative Watershed Effects (CWE) analysis produced mass failure hazard ratings mostly averaging from moderate to high, based on GIS maps related to a matrix table of slope categories and predominant bedrock/parent material (Table 2-9, page 35). But, CWE mass failure scores within watershed sections observed in field surveys were generally "low", and from observations by USFS and IDL personnel the natural or historic occurrence of landslides would appear to have been minor. Due to the methods used to develop sediment coefficients for use in the WATSED model, landslides are not calculated separately. The WATSED coefficient includes landslide estimates therefore a separate landslide calculation is not needed. A separate estimate for slides would result in an overestimation of sediment load by counting landslides twice. For example, the high sediment hazard landtype Lacustrine Stream Channels at 41 tons/mi^2/yr, common along the lower channel sections of lower basin streams, reflects a layer of gravelly silt or sandy loam overlaying a clay layer, a condition with a propensity toward slides (Niehoff *pers comm)*. Another example is the moderate sediment hazard landtype Dissected, Glaciated Granitic Mt. Slopes at 39 tons/mi^2/yr, common along east side stream channels draining into Priest Lake, which in part reflects granitic soil movement on steep slopes.

One exception of having WATSED landtype coefficients alone account for natural mass failures is a 5.5 stream mile segment of Lower West Branch between Cuban Creek inflow upstream past Pine Creek inflow (Figure 3-13a and Section 3.3.A.3, page 117). Here, the canyon walls are steep, about 200 feet high, and apparently susceptible to failure related to the high sediment hazard landtype Lacustrine Stream Channels. During the stream bank erosion survey in 2000, a 1.0 mile reach was assessed within this area. Four mass failure scars were observed, at least one in recent times since a barbed wire cattle fence and steel fence post were hanging in the air at one failure scar. This large failure was estimated at 200 ft wide, 200 ft long, an average 7ft deep, and with 100% delivery to the stream the volume calculates to 10,370 cubic yards or 22,400 tons. Another large slide occurred around 1970 at Shingle Mill hill, uphill of the Peninsula Road bridge, where the slide blocked Lower West Branch and caused some local flooding and property damage (Booth *pers comm*).

It is assumed that there is a natural occurrence of mass failures along the canyon reach of Lower West Branch in part related to steep slopes and the predominate landtype. Also, a sediment deposition plug or debris dam, along with peak high flows, may concentrate stream energy toward the toe of a cliff segment, precipitating a mass failure (Janecek Cobb *pers comm*). A rough estimate of an average slide was developed at 5,560 yrd^3 or 12,000 tons with 100% stream delivery. An estimated average landslide frequency of every 15 years equates to 800 tons/yr. This value was added separately to the Lower West Branch sediment load estimates (Table 4-1) for reasons explained in the TMDL, Section 4.3.1.

4.1.3 Current Sediment Load

Summary
Several methods of calculation went into the estimates of current sediment yield to streams given various land use conditions. As a composite, these individual calculation methods might be called a model for watershed sediment load within the Priest River basin. The series of sediment calculation methods presented here are similar to those used in other northern Idaho TMDLs, including those for the Coeur d'Alene basin (Harvey 2000a and 2000b), and the Pend Oreille basin (Bergquist 2000). Areas where methods for the Priest River basin are different or modified from other northern Idaho TMDLs are noted. A summary listing of sediment sources considered and methods of yield calculations for Priest River basin are as follows:

- *Forested acres (watershed area minus roads and agricultural land*): WATSED landtype sediment yield coefficients.

- *Unpaved road stream crossings*: IDL – CWE road sediment scores at stream crossings converted to tons delivered to streams based on research in LeClerc Creek, Washington.

- *Unpaved road segments other than stream crossings*: CWE road sediment scores converted to delivered tons of sediment.

- *Road prism mass failures*: based either on USFS road maintenance experiences and observations of failures and estimated sediment yield, or based on CWE mass failure observations and estimate of sediment yield.

- *Canyon wall mass failure in Lower West Branch main stem*: based on observations and measurements during the stream bank erosion survey of 2000, and from aerial photographs.

- *Agricultural land*: Revised Universal Soil Loss Equation (RUSLE).

- *Stream bank erosion*: data from bank erosion survey converted to estimate of lateral recession rate by analysis from National Resources Conservation Service.

- *Residential stormwater*: calculation methods followed Minnesota Pollution Control Agency.

4.1.3.1 Forested Acres

From the total acreage of each watershed analyzed, acreage was subtracted for land developed as hay cropping/grazing, and the total road system prism (GIS road length determinations times width estimates of various road categories for cut slope, ditches, road surface, and fill slope). The remaining forested acreage was then given the same landtype sediment yield coefficients as natural background. Again, the calculations of Table 4-1 assume 100% delivery to streams.

Within the forested acreage are activities related to timber harvesting. Activities with a potential to increase hillslope erosion over background include: excavated skid trails and landings; tractor and cable yarding; soil compaction by heavy machinery; Cat scarification for site preparation on steep slopes; high intensity burns continuous over a large area; and damage by off-road vehicles after access afforded by canopy opening. Experience and forest practice audits have indicated that if timber harvesting follows the rules of the Idaho Forest Practices Act, or Washington Forest Practices, that forest activities do not generally result in widespread increased surface erosion (Washington Forest Practices Board 1995). One exception in the Priest River basin would be tractor excavated skid trails where the tractor blade removes the volcanic ash cap. The WATSED model incorporates a high sediment yield for a newly excavated skid trail, and the model scales down the yield for five years at which time the skid trail is assumed healed to background levels (Niehoff *pers comm*). In recent years, the USFS in their timber sale contracts have required a reduction in deep excavated skid trails.

The sediment calculation for forested acreage in Table 4-1 does not take into account the above mentioned forest activities. Thus, there is an underestimation, particularly for Non-industrial Private Timber harvests which through personal observations in the basin, will at times have inadequate BMPs. IDL - CWE inventories did examine numerous skid trails and, overall, skid trail sediment scores were rated as "low". The acknowledged underestimation is in part offset by including the entire road network mileage in sediment yield calculations, as explained below. The problem of developing a reasonable estimate of a sediment yield coefficient for forest activities is that the degree of hillslope erosion is extremely site specific, and there is an incomplete inventory of features such as tractor excavated skid trails, particularly on private land. An attempt at developing sediment yield estimates would take considerable in-the-field assessments, which was not available for this TMDL. These in-the-field assessments should be incorporated into TMDL Implementation Plans to assure appropriate priorities for sediment reduction efforts.

4.1.3.2 Unpaved Road Surface Sediment

Forest road fine sediment loading was estimated using a relationship between CWE score and the road sediment delivered per mile of road (Figure 4-3), developed for roads on a Kaniksu granitic geology in the LeClerc Creek (Washington) watershed (McGreer *et al.* 1997). Its application to roads on Belt geology's likely overestimates sediment yields from these systems. However, as described later, sediment loading developed from Priest River basin CWE scores may be representing an underestimation. It is important to emphasize that the CWE score given by IDL survey crews incorporates a stream delivery multiplier. The equation of Figure 4-3 predicts delivered road sediment to streams in tons/mile/yr. Other methods first predict sediment yield followed by various estimates of delivery.

The first unpaved road sediment calculation in Table 4-1 is at each stream crossing, including closed roads but excluding obliterated roads where known. For stream crossings where there was a corresponding recorded IDL - CWE score, that score was converted to tons/mile/yr by the CWE equation. This value was reduced by the fraction of 400 ft/5,280 ft, with stream crossing load calculated as 200 ft on each side of a crossing (Harvey 2000a). Again, this value is 100% delivered to streams. For stream crossings without a CWE score, the calculations used the average CWE score at crossings which were rated within each watershed.

There are other road sediment calculation methods that suggest an underestimation of load using the CWE method. The highest average CWE score at stream crossings for watersheds assessed in Table 4-1 was CWE = 28 for the Kalispell Creek watershed (which is the high end of a "low" road sediment score). This equates to 9.0 tons/mile/yr, or 0.7 tons/400 ft crossing/yr. The WATSED model uses a road surface erosion of 20,000 tons/mi^2/yr for a road 5 years or older after initial construction on weathered granitics (Niehoff *pers comm*). Using a 40 ft width typical for an active timber road prism (10 ft wide cut slope, 2 ft wide ditch, 14 ft wide road tread, and 14 ft wide fill slope), the yield per 400 ft stream crossing equals 11 tons/yr. Even using a low estimate of 25% delivery to streams within 200 ft on each side of a crossing, this value is 3 - 4 times higher than the delivery at CWE score = 28.

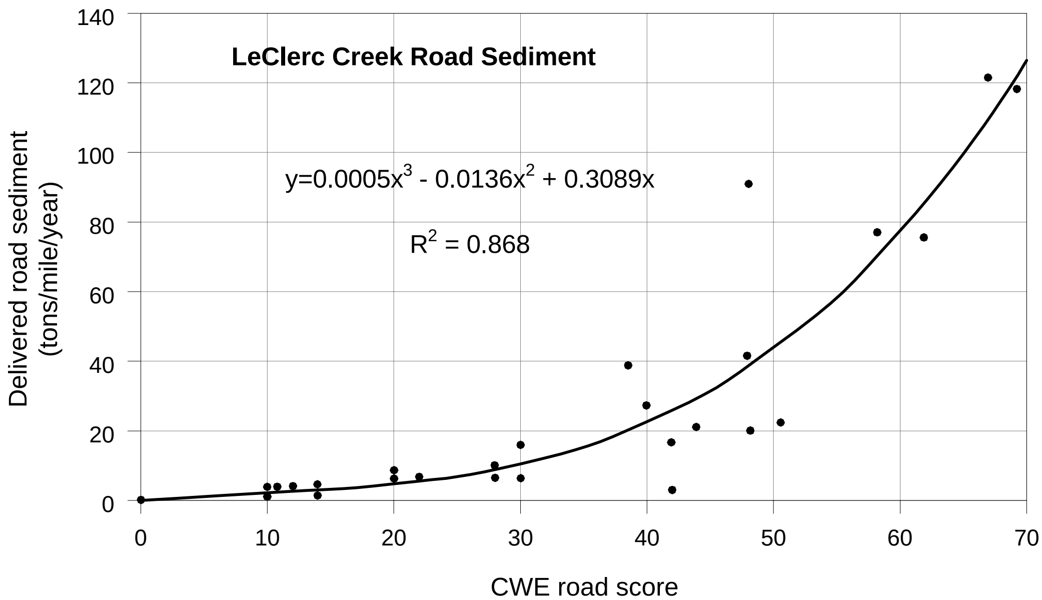


Figure 4.3 Sediment export of roads based on Cumulative Watershed Effects scores in the LeClerc Creek watershed, Washington (McGreer *et al*. 1997).

Another example comes through a worksheet presented in the Washington Forest Practices Board Manual (WFPB 1995). With road statistics of: a road older than 2 years built on course to fined-grained granite; 30% vegetative cover on cut and fill slopes; a 2" - 6" deep gravel surfacing; and moderate active secondary traffic, along with 32 inches annual precipitation; the worksheet produces 8 tons/yr at a 400 ft stream crossing. Again, assuming only 25% delivery, the yield from this example is twice the delivery of CWE score = 28.

Besides sediment delivery to streams from the road prism at stream crossings, there is delivery from roads that are in close proximity to streams. There may be significant delivery from roads that are built on steep hillslopes above and parallel to streams where culvert discharges essentially create 1st order channels down to streams without an opportunity for sediment to be trapped or settle on the forest floor. Sediment may also be delivered from roads built within the flat floodplains of a stream.

The Washington Forest Practices Board Manual (WFPB 1995) considers that roads outside of a 200 ft buffer zone from stream channels are assumed to have inconsequential sediment supply to streams because of low probability of delivery. In a study of roads constructed in coarse-grained granitic materials, equations were developed to predict downslope sediment travel distance below road fills, rock drains, and culverts (Megahan and Ketcheson 1996). Factors influencing the degree of road sediment supply to streams included: hillslope gradient, drainage design of the road, erosion volume, forest floor obstructions such as downed and embedded logs, and extent of riparian buffers along the stream coarse. An attempt at developing sediment yield estimates for roads within a 200 ft buffer using methods such as presented in the WFPB manual would take considerable in-the-field assessments, which was not available for this TMDL.

In the GIS analysis of Priest River basin §303(d) watersheds, the mileage of roads within a 200 ft buffer on each side of streams was calculated (Table 4-1). This table also includes the total mileage of roads within a watershed. Because of the underestimation of not incorporating timber harvest activities in the forested acreage sediment loading, and an apparent underestimation of CWE load at stream crossings, this TMDL uses sediment load from the entire road network. The weighted mean CWE score for all roads inventoried in a watershed was applied to total miles of active unpaved roads (excluding road segments accounted for at stream crossings). Note in Table 4-1 that the mean CWE score at road crossings were often greater then the weighted mean for the total road system. This would be expected given the CWE delivery multiplier. For closed roads, the minimum CWE score of 10 was applied to total mileage of closed roads. The vast majority of CWE inventories were on active forest roads in public land, and it is believed that in general, the single greatest factor affecting generation of fine sediment from road surfaces is the amount of traffic (WFPB 1995). For the Lower West Branch calculations, the weighted mean CWE score was adjusted upwards for application to the private unpaved road mileage based on observations of erosion problems and inadequacy of road BMPs.

4.1.3.3 Road System Failures

Based on USFS maintenance experiences over the past twelve years, road failures at stream crossings within western watersheds have been rare (Janecek Cobb *pers comm*). Instead, problems arise at the inlet end of culverts when they become plugged with debris. Culvert plugging causes ditch water to overwash onto the road creating gulleys and rills as the wash goes down gradient, and then down onto the fill. Sediment delivery caused by a plugged culvert, or damaged culvert, was estimated at an average 10 cubic yards per event. An average number of plugged culvert events per year for each western watershed was assigned based on the USFS maintenance experiences (Table 4-1). To obtain sediment weight/yr, volume per event was multiplied by a density of 2.16 tons/yrd^3 (1.5 gr/cc, a silt-loam density recommended by USFS as an average representation of Priest River basin soils). Delivery to streams was assumed at 100%. For the East River drainage, failures at stream crossings were based on IDL - CWE recorded observations of Significant Management Problems and failures at crossings. Although the CWE inventories only cover a portion of the road network in a watershed, the number of failures were not prorated to the entire network, because when doing so gives unrealistic numbers based on IDL maintenance experiences.

To account for road prism failures other than at stream crossings, USFS maintenance experiences were again used. An average typical failure was figured as 30 ft wide by 40 ft long by 5 ft deep and 25% delivery to a stream. This calculates to 56 yrd^3. Average number of failures per year were given for the western watersheds (Table 4-1), and volume was multiplied by 2.16 tons/yrd^3. For the East River drainage, yearly loading from failures were strictly based on IDL - CWE recorded observations and estimates of cubic yards delivered to streams. For the Middle Fork CWE inventory, there were 5 failures recorded for an estimated delivery to streams of 391 tons (per year). For the North Fork there were 3 failures recorded for an estimated 154 tons. The East River CWE data was not prorated to the entire road network because of the uncertainty of the age of each failure (i.e. 5 observed failures does not necessarily equate to 5 failures/yr), and number of observed failures was close to IDL maintenance experiences within an average year.

There are occasional atypical large mass failures from the road system, often associated with high runoff years (such as in the spring of 1997). A few examples include: a failure on Bear Paw Road in 1997 near the Ole Creek crossing where an estimated 8,890 yrd^3 slumped, and about 25% of that volume was near the immediate vicinity of the crossing; a failure in Lamb Creek of an estimated 1,670 yrd^3 with 40% delivery to the stream; and in the Granite Creek watershed, a 1997 landslide above Athol Creek of an estimated 2,445 yrd^3, washing out portions of 3 roads, and with an estimated 50% delivery to Athol Creek. Sediment loading for atypical large mass failures along roads, with an average occurrence of one per ten years, was assigned to Lamb Creek and Lower West Branch (Table 4-1).

4.1.3.4 Canyon Wall Mass Failures in Lower West Branch

Section 4.1.2.3 described large slumps at canyon walls directly into the Lower West Branch main stem along a 5.5 mile lower reach stream course. One measured landslide was around 10,400 yrd^3 with 100% delivery. These slides are likely in part a natural phenomenon and have been assigned an average annual natural sediment load of 800 tons/yr (estimated average slide mass divided by a 15 year occurrence). At least one mass failure within the canyon (in 1993) can be directly attributed to a private clear-cut timber harvest on a steep slope followed by a thunderstorm and subsequent slide. Perhaps some slides have been related to hill cuts for construction of road segments, although road density within the canyon boundaries is low. Possibly sediment plugs or debris dams leading to bank toe undercut at peak flows, and subsequent hillslope failure, are related to upstream land use activities. It is extremely uncertain as to the ratio and degree of failures that are natural compared to slides relating to land use activity. Thus, an estimated annual sediment load due to both natural and landuse activities has been assigned 1,600 tons/yr (Table 4-1). This is double the loading from natural slides in the watershed.

4.1.3.5 Agricultural Land Sediment Yield

Sediment yield was estimated for lands with hay and alfalfa crops, and grazing, where it is assumed that there is periodic vegetation improvement by tilling and reseeding. Sediment yield was estimated using the Revised Universal Soil Loss Equation (RUSLE). Stream bank erosion, gully erosion, or scour is not taken into account by RUSLE. The range of coefficients that were used in RUSLE, as listed in the equation description below, were selected with the aid of the Idaho Soil Conservation Commission (Hogan *pers comm*).

RUSLE is: $A = RK(LS)CD$

A= average annual soil loss from sheet and rill erosion caused by rainfall and associated overland flow in tons/acre/year.

R= Erosivity Factor. NEZPERCE Req is recommended for northern Idaho, and was used in this analysis, where Req=140 which aligns with 24-25 inch precipitation.

K= Soil Erodibility Factor. This is a measure of the susceptibility of soil particle detachment by water. A value of K = 0.49 representing Bonner soil was used for Kalispell Creek, Lamb Creek, and main stem East River; and K = 0.45 for Lower West Branch as an estimate for a mixture of Selle and Mission soils which seem typical of the Lacustrine Plains landtype.

LS= Slope Length/Slope Steepness Factor. An LS factor of 0.32 was consistently assigned based on a maximum 550 ft slope length and an average 2% slope for crop land in the western watersheds.

C= Cover-Management Factor. This represents the effects of plants, soil cover, soil biomass, and soil disturbing activities on erosion. A consistent value of C = 0.002 was used based on a ten-year pasture/hay rotation and intense harvesting/grazing for worst case scenario.

P= Support Practices Factor. These practices may include contouring, strip cropping, and terraces. A value of P = 1 was consistently used indicating no support practices in place.

Acres of crop land and sediment yield to streams is presented in Table 4-1. For most RUSLE calculations in the basin watersheds, sediment yield was around 0.04 tons/acre/year.

4.1.3.6 Encroaching Roads and Stream Bank Erosion

Sediment yield calculations in the Coeur d'Alene Basin have taken into account the effect of encroaching roads (roads within 50 ft of a stream) on erosion either at the road bed, or within the stream banks and stream bed (Harvey 2000a). The effect of an encroaching road is that it can interfere with the stream's natural tendency to seek a steady state gradient. During high discharge periods, the constrained stream may erode at the road bed or fillslope, or if the road is sufficiently armored, the confined stream energy may erode the stream banks and the stream bed. As explored in Section 3, the only appreciable length of encroaching forest road (excluding stream crossings) within the §303(d) listed watersheds is a 0.9 mile stretch of Forest Road 308 along a low gradient middle reach of Kalispell Creek. Since the stream bank erosion survey included a portion of Kalispell Creek adjacent to the encroaching road, it seems preferable to include the encroaching road effect as part of the stream bank erosion results obtained in the survey.

Under a Memorandum of Understanding between DEQ, the Kootenai-Shoshone Soil Conservation District, Idaho Soil Conservation Commission, and USDA Natural Resources Conservation Service (NRCS), a trained summer crew conducted stream bank erosion surveys within many watersheds of the Coeur d'Alene and Priest River basins during the summer of 2000. The crew used a GPS unit to map location of the subsample stream segments surveyed, and to store stream bank condition scores and measurements in the GPS data dictionary. Soil samples were also obtained for laboratory analysis. Length of stream reaches surveyed ranged from 0.3 - 1.7 miles, and average reach length was around 1 mile. Most streams surveyed had two inventories, within a lower and middle reach. Within the Priest River basin, all surveys were within gradual gradient segments, less than 1.5% slope. Often, the surveys were through adjacent hay crop and grazing lands, but many reaches were through forested land.

The NRCS methodology of analyzing the data and producing a stream bank erosion sediment yield in tons/stream mile/year relies on the survey measurements of: 1) eroding bank length and eroding bank height, 2) six bank condition factors that are scored and compiled into a single index leading to an estimate of lateral recession rate (LRR) in inches/yr, and 3) soil type and soil particle size. A stream section with evidence of a current eroding condition is rated as having either one bank or both as eroding. Stream lengths with both banks in a good, stable condition without signs of erosion, are considered as having zero sediment yield.

A preliminary data analysis by NRCS has been made available for this final TMDL document (Sampson *pers comm*). The average erosion rate within segments surveyed ranged from 15 tons/stream mile/yr to 193 tons/stream mile/yr (detailed for each listed watershed in Section 3). The assigned error rate is a confidence interval of 60%. The erosion rates from surveyed segments were extrapolated to adjacent low gradient reaches as long as the difference in slope between surveyed segment and unsurvyed reach was not greater than 1%. Low gradient B channel sections that are within the valley depositional reaches were included. Stream bank erosion yields presented in Table 4-1 reflect estimates for low gradient main stem reaches only, and do not include any estimates for feeding tributaries. In addition, there has been no attempt to include bank erosion within the natural or background sediment load estimates. For East River, bank erosion rates were only available for the 2.5 mile main stem reach. Lastly, while estimated erosion rates are presented in tons/year, the rates supplied are meant to represent long-term (20 year+) averages, since erosion at a single site may come in one or two above normal flow events over that long-term average (Sampson *pers comm*).

Stream bank eroding condition may be reflecting a combination of several factors, including: the effect of encroaching roads; hydrologic disequilibrium in part due to accelerated peak flow; stream channel aggradation by sediment buildup and subsequent channel widening; loss of vegetation stability due to historic riparian harvest of conifers; constriction and then increase of stream energy at improperly sized culverts and bridges; and stream bank damage and loss of riparian vegetation by grazing cattle and horses. It is mostly very difficult to partition out these causes expect in a few places where local effects such as undersized crossings or cattle access has clearly resulted in damage.

4.1.3.7 Residential Stormwater Runoff

The only watershed where sediment laden stormwater runoff from a residential/commercial area was taken into consideration was lower Lamb Creek. The lower 4 miles of Lamb Creek winds it way through a rural residential/commercial zone where there is some agricultural activity and surrounding forest. Within the residential/commercial zone there is ever increasing semi-impervious and impervious area of unpaved roads, parking lots, driveways, subdivisions, and residential/commercial buildings. There are new excavations each spring through fall (including a nine-hole addition to the golf course), and there have been some observations of clearing riparian vegetation down to the stream banks. The Lamb Creek residential area is mostly flat terrain with permeable soils which mitigates some of the effect of stormwater runoff.

An estimate of fine sediment loading into Lamb Creek from the 311 acres of residential area was made using methods from the Minnesota Pollution Control Agency (1989). The calculation method is in part based on annual precipitation; a runoff coefficient based on estimated impervious and semi-impervious area; and an increase of Total Suspended Sediment in Lamb Creek attributed to the area as measured upstream and downstream. One multiple site sampling run was conducted in Lamb Creek during spring runoff in 1995 (Rothrock and Mosier 1997). Just upstream of the Lamb Creek rural residential area the TSS concentration was 26 mg/L, and downstream at the mouth, 46 mg/L. This 20 mg/L TSS gain cannot exclusively be attributed to the residential area. A rough estimate of the annual sediment load from the residential area was 4 tons/yr, insignificant compared to other sediment source values. The observed TSS gain within the water column, though, does represent a significant increase within the lower 4 mile reach.

4.2 Load Capacity and Instream Water Quality Targets

4.2.1 TMDL Authority

Section 303(d)(1) of the Clean Water Act requires states to prepare a list of waters not meeting state water quality standards in spite of technology based pollution control efforts. The prescribed remedy for these water quality limited waters is for states to determine the total maximum daily load (TMDL) for pollutants "...at a level necessary to implement applicable water quality standards with seasonal variations and a margin of safety." A margin of safety is included to account for any lack of knowledge about how limiting the pollutant loads will attain the desired water quality.

Section 303(d)(2) requires that both the §303(d) list and any TMDLs developed by the state, be submitted to the Environmental Protection Agency (EPA). The EPA is given thirty days to either approve or disapprove the state's submission. If the EPA disapproves, EPA has another thirty days to develop a list or TMDL for the state. Both the list and TMDLs, either approved or developed by EPA, are incorporated into the state's continuing planning process as required by section 303(e).

4.2.2 Loading Capacity in Relation to Appropriate Measurements of Beneficial Use Full Support

Referring back to the conceptual diagram of a sediment TMDL in Figure 4-1, a Loading Capacity is the calculated annual watershed sediment load that sets a level capable of fully supporting the beneficial uses. The load capacity for a TMDL, designed to address a sediment caused limitation to water quality, is complicated by the fact that the State's water quality standard is a narrative rather than a quantitative standard. Within the watersheds of the Priest River basin, the sediment interfering with the cold water biota and salmonid spawning beneficial uses is primarily fines from silt to large grained sand. Adequate quantitative measurements of the effect of excess sediment have not been developed. Given this difficulty, a sediment loading capacity for the TMDL is more difficult to develop. The sediment loading capacity for TMDLs in the Priest River basin would be based the following premises:

- natural background levels of sedimentation are assumed to be fully supportive of the beneficial uses cold water biota and salmonid spawning.

- the stream system has some finite yet unquantified ability to process (transport) a sedimentation rate greater than background rates.

- the beneficial uses (cold water biota and salmonid spawning) instream, will respond to a level of full support, which can be quantified when the finite yet unquantified ability of the stream system to process sediment is met.

- care must be taken to control factors which may interfere (fish harvest) with the quantification of beneficial use support.

The loading capacity rate at which Full Support is exhibited has been set at various levels within TMDL documents developed by DEQ. These have ranged from setting an interim loading capacity at the background level for some watersheds in the Coeur d'Alene Lake subbasin (Harvey 2000a) and the Pend Oreille basin (Bergquist 2000); to 50% above background for the North Fork Coeur d'Alene River (Harvey 2000b); and to 100% above background in the draft Priest River SBA and TMDL (Rothrock 2000). It was emphasized in the draft Priest River report that a 100% above background loading capacity was exclusively based on the methods of sediment yield and delivery presented in Section 4.1. Determined loading capacities within DEQ have been set with some varying approaches and assumptions when calculating sediment loads. In guidelines presented by the Washington Forest Practices Board (1995), watershed sediment delivery that has increased by 50% - 100% above background level is considered to have a small, but chronically detectable effect. If the increase in sediment load is more than 100%, than this will likely lead to an exceedance of water quality standards. As expected, the Washington guidelines express caution in interpreting the sediment load calculations.

An interim loading capacity set at background level is not to say that efforts at reducing current sediment load will reach background levels (in most watersheds this would be an impossibility). This instead reflects that the loading capacity over the background level which will allow full support of cold water biota is very uncertian or not known. By setting an interim loading capacity at background reflects the premise or assumption listed above that background levels allowed full support.

The concept of a TMDL is to work backward (Figure 4-1). If the current sediment load, which is an inexact estimate, is believed to be a cause for cold water biota impairment, begin reducing the current sediment load, and with continued monitoring of the stream environment, an identified or quantified recovery of full support condition will signal the loading capacity. There can certainly come a point when sediment reduction will reach its feasible and economical limits, and that may come at a point prior to the loading capacity and full support condition being reached. And, there certainly is the possibility that other factors within the stream such as instream cover, quality of pools, and stream temperature, may play a significant enough role that cold water biota may not exhibit full support with sediment reduction alone.

In their comment package to the draft Priest River SBA and TMDL, EPA opposed the recommended loading capacity of 100% above background sediment load (EPA 2001). EPA's primary concern was that the inherent errors of the sediment yield methods used for the Priest River basin were likely very high, and that the load estimate methods were without validation. Given the level of error, EPA's recommended approach is to set the target of the TMDL at the natural or background level of sediment production.

DEQ disagrees with the concept of establishing an interim load capacity at background level (Essig *pers comm*). This discounts the known fact that human land use activities which result in increased sediment delivery to streams can be at a level in which cold water biota and salmonid spawning beneficial uses continue to exhibit Full Support and water quality standards are met.

For Priest River basin it is instructive to revisit the estimated sediment loading of Section 4.1 and compare with the potential measurements of beneficial use support. The items below are appropriate measures of full support for cold water biota and salmonid spawning established for watersheds in the Coeur d'Alene basin (Harvey 2000a and 2000b):

- macroinvertebrate biotic index (MBI) score of 3.5 or greater.

- total trout density at minimum reference levels of 0.1 - 0.2 fish/m^2/hr electro-fishing effort; which is approximately equivalent in Priest River basin electro-fishing surveys to a range of 5 - 10 total trout/100 m^2.

- three or more salmonid age classes including juveniles (<100 mm).

- presence of sculpins.

The vast majority of MBIs in the Priest River basin are greater than 3.5, and it has been determined that this measure alone is not indicative of support status in the basin. A good example is Lower West Branch where four MBI scores ranged from 3.6 – 4.3, but fish statistics and habitat evaluations clearly indicated Not Full Support. Exceptions of meeting the MBI criteria have been Kalispell Creek (MBI <3.5 in 1995 BURP, but >3.5 in 1997 BURP), and Lamb Creek (MBI >3.5 in 1995 BURP, but <3.5 in 1997 BURP).

The target, minimum total salmonid density is placed into the units of fish/m^2/hr effort since this value can be calculated with BURP protocol, and it has been the target measurement stated in Coeur d'Alene basin TMDLs. The reason this unit of measurement was not used in Section 2 and 3 of the Priest River report is that electro-fishing surveys from various agencies were being compared, and effort in seconds shocked were not always available or reported. Also, some of the data compared was from snorkeling.

For salmonid spawning beneficial use, it is presumed that in all mid western streams draining into Priest Lake, and all streams draining into Lower Priest River, that there is self-propagating populations of brook trout, and in some cases cutthroat trout. In some electro-fishing surveys there simply were too few of a particular salmonid species captured to meet the WBAG criteria of salmonid spawning Full Support (for example Binarch Creek). If population numbers increased in response to a reduction in watershed sedimentation, the salmonid spawning criteria would likely be met.

Presence of native sculpins has been used in the Coeur d'Alene basin as a partial indicator of whether there is excess sedimentation (Harvey 2000a and 2000b). In general, sculpins are believed to prefer cool or cold flowing water and presence of cobble-riffle habitats. Sculpin populations may be rare or absent from fine-grained substrates (silt) or highly embedded cobble substrates (IDEQ 2001). As shown in Table 4-2 for lower Lamb Creek, which has a high sand component, sculpins were very abundant.

For the northern §303(d) listed streams, Trapper Creek and Two Mouth Creek, the timber road network with stream crossings, and timber harvesting activities would result in an estimated minimum 50% sediment load above background. These streams clearly meet the DEQ criteria of Full Support. These two watersheds, however, do not provide a good comparison for mid western and lower basin streams for reasons including: a history of restricted fishing regulations; a parent geology almost exclusively granitic; and channel types which are predominately steep A channel and moderately steep B channel.

Table 4-2 presents BURP electro-fishing data and current watershed sediment loading results for the mid and lower basin watersheds examined in this Section. East River is presented as Middle Fork and North Fork separately and does not include the East River main stem.

For the Middle Fork East River, agreement has been established between DEQ and EPA for a Full Support status call. While the total salmonid criteria at the lower and middle 1997 BURP sites are below the target 0.1 total trout/m^2/hr effort, IDFG sampling in 1986 showed total salmonid densities greater than 10 fish/100 m^2, and IDL electro-fishing in upper Middle Fork (1998) exhibited a mean density of 12 cutthroat/100 m^2. Also, there were good densities of sculpin in the BURP sampling, and the three

MBIs were greater than 4.0. For this watershed, current annual sediment load has been calculated as 145% above background. The North Fork East River, which is determined as Full Support in this SBA, has a calculated sediment load of 128% above background. Current sediment load calculations for both the Middle and North Forks did not include a stream bank erosion component as bank surveys were not conducted in these streams. Utilizing the Middle and North Forks for comparisons with other lower basin streams meets the requirement of a mixture of parent geology and landtypes similar to other watersheds; but overall channel type is steeper with far less depositional low gradient channel than other streams.

Full Support status is also assigned to Lamb Creek (just south of Kalispell Creek with similar watershed characteristics) using good brook trout and sculpin densities, and an average MBI > 3.5. Current sediment load in the Lamb Creek watershed is calculated at 218% over background.

Kalispell Creek and Binarch Creek have been assigned a Not Full Support status based primarily on low total salmonid densities, and yet the calculated sediment loads are only 79% and 73% above background, respectively. EPA referred to this data set as one reason why 100% loading capacity is not supportable (EPA 2001). While the errors of sediment load calculations are large and acknowledged, there is little doubt when examining the land use statistics between Middle Fork East River (clearly Full Support), and that of Kalispell Creek (apparently Not Full Support), that the sediment yield would be substantially less in Kalispell Creek. This may point to other mitigating factors in Kalispell Creek such as elevated water temperature, excessive sand from legacy fire and land use that has not worked through the stream system, and/or other habit issues such as poor instream cover and poor pool quality related to insufficient large woody debris. This also likely reflects that the relationship between sediment loading and cold water biota impairment is site specific at the level of 5th or 6th order watershed.

In conclusion, the target loading capacity for the Kalispell Creek and Lower West Branch TMDLs are set at 50% above background level. This is considered a reasonable or conservative target for Full Support attainment because of determined FS status for Middle Fork and North Fork East River, and Lamb Creek, which range from 128% - 218% current sediment load above background. It is also considered that the 50% loading capacity incorporates a minimum 50% margin of safety and does not warrant an additional 10% margin of safety reduction common in TMDL calculations.

Table 4-2. Current Sediment Loading of Selected §303(d) Watersheds in Relation to Salmonid and Sculpin Population Data: Fish Data is Exclusively from BURP Electro-fishing

§303(d) Listed Stream Segments	Increase of current sediment load over background sediment load	BURP electro-fishing year and reach	Total salmonid density (fish/m^2/hr effort)	3 salmonid age classes/WBAG spawning criteria support status	Sculpin density (fish/m2/hr effort)
Kalispell Creek	79%	2000 Lower 2000 Middle	0.02 0.07	Yes/FS No/FS	0.15 0.02
Lamb Creek	218%	2000 Lower 2000 Middle	0.44 0.77	Yes/FS Yes/FS	0.68 0
Binarch Creek	73%	2000 L-Middle	0.06	No/NFS	0
Lower West Branch	210% w/o canyon slides	2000 Lower 2000 Middle	0.01 0.06	No/NFS No/NFS	0.004 0.14
Middle Fork East River	145%	1997 Lower 1997 Middle	0.08 0.05	Yes/FS Yes/FS	0.44 0.25
North Fork East River	128%	1998 Lower	0.23	No/FS	0.08

4.3 Total Maximum Daily Loads for Water Quality Limited Waterbodies of the Priest River Basin

4.3.1 Lower West Branch Priest River

4.3.1.1 Introduction

Based on the information presented in Section 3.3.A, the Lower West Branch main stem for at least the middle and lower reaches are judged as Not Full Support of cold water biota and salmonid spawning beneficial uses. Water quality impairment is due in part to excess sediment, and current sediment loads contribute to this condition.

4.3.1.2 Segments Addressed and Points of TMDL Compliance

The stream segment that is addressed and must be monitored for TMDL compliance of Idaho Water Quality Standards (i.e. Full Support of cold water biota and salmonid spawning beneficial uses), is the main stem Lower West Branch from the Idaho – Washington border downstream to the mouth (Figure 3-13a). This low gradient segment is around 18 miles in length, and represents 80% of the total main stem length (excluding the steep A channel headwaters). Attainment of Full Support within this Idaho segment will require sediment reduction efforts throughout the watershed including lands within the state of Washington. There have been two DEQ BURP sites with electro-fishing data within the Idaho segment (Figure 3-13a), and these are logical future monitoring areas for evaluating compliance. Two other upstream BURP sites were on the main stem, in Washington. DEQ did not electro-fish there. The upper low gradient reach and steeper headwaters of the Lower West Branch, in Washington, are not within jurisdiction of Idaho Standards. This upper segment would have to be addressed by the Washington Department of Ecology. It is recommended that monitoring sites within the upper reach be established by Washington DOE and/or the USFS.

It is considered that data from the two BURP sites in Idaho, within the 4th order main stem, do not represent, or make a statement about, the water quality status of the numerous 1st to 3rd order tributaries to the main stem, or the steep headwaters of Lower West Branch. These tributary streams remain as Not Assessed. Tributaries such as Bear Paw Creek and Flat Creek are entirely within the state of Washington.

4.3.1.3 Appropriate Measurements of Full Beneficial Use Support

Sediment load reduction from the current level towards the interim sediment reduction goal is expected to attain an, as yet unquantified, sediment load at which the cold water biota and salmonid spawning beneficial uses will attain full support. The sediment load will be recognized by the appropriate measures of Full Support under the DEQ assessment guidance and process applicable at the time of the future assessment. The draft guidance under review at the time of this writing (WBAGII) utilizes a stream index scoring system from BURP sampling metrics comprised of a Stream Macroinvertebrate Index, Stream Fish Index, and Stream Habitat Index. Under the current guidance of WBAG+ and additional considerations, the appropriate measures of Full Support are:

- continuation of MBI scores of 3.5 or greater throughout the main stem,
- a total salmonid density at the minimum target levels of 0.1 - 0.2 fish/m^2/hr electro-fishing effort (approximately 5 – 10 fish/100 m^2),
- three or more salmonid age classes including juveniles (<100 mm),

- increased presence of sculpins below Torrelle Falls with a minimum target level of 0.1 sculpins/m^2/hr effort; and continuation of present sculpin density above Torrelle Falls,

- as established by a Watershed Advisory Group (WAG), appropriate instream targets for surrogate habitat characteristics such as percent fines and residual pool volume, and

- in addition to the biological measures above, the TMDL Implementation Plan may address fisheries management objectives regarding native cutthroat trout. Below Torrelle Falls there may be an objective to obtain adequate spawning gravels for fluvial cutthroat trout migrating up from Lower Priest River. Above the falls, there may be an objective of habitat improvement related to recovery of resident cutthroat trout. If interagency decisions and agreements are made to attempt an improvement of the cutthroat trout population, then monitoring for the effect of sediment reduction efforts should also include measurements of habitat parameters that are related to sedimentation.

4.3.1.4 Loading Capacity

A loading capacity of 50% increase above natural background level as established in Section 4.2 seems appropriate for this watershed, again based exclusively on the methods of sediment load calculations described in Section 4.1. The estimated background sediment delivery from the Lower West Branch watershed is calculated at 1,878 tons/yr (Table 4-3). The interim sediment TMDL goal is set at 50% above background, or 2,818 tons/yr.

The calculations of loading capacity and sediment load allocation (Section 4.3.1.7) treat separately the canyon wall mass failures into the main stem along the 5.5 stream mile reach from Cuban Creek inflow upstream past Pine Creek inflow (Section 4.1.2.3). This sediment source is kept separate from the other sediment sources in the TMDL Tables because of: 1) the high uncertainty of occurrence related to human land use activities versus natural landslides, 2) the high uncertainty of an average landslide mass and frequency of occurrence, and 3) because the estimated average slide of 12,000 tons occurring every 15 years, or 800 tons/yr, is sufficiently high to mask or dilute calculations from other determined sediment sources such as the unpaved road network (Table 4-3). A value of 800 tons/yr has been assigned to the natural sediment load for Lower West Branch (Table 4-1), and applying a 50% loading capacity above background equates to 1,200 tons/yr.

Critical Conditions are to be considered as part of the analysis of loading capacity. The beneficial uses in this watershed are impaired due to chronic sediment conditions, as such this TMDL deals with yearly sediment loads. The concept of critical conditions is difficult to reconcile with this type of impact. The critical condition concept assumes that under certain conditions, chronic pollution problems become acute pollution problems and therefore we need to ensure that the acute conditions do not occur. The proposed reductions in the TMDL will reduce the chronic sediment load and also reduce the likelihood that an acute sediment loading condition will exist. It is in this way that we have accounted for critical conditions in the TMDL.

4.3.1.5 Margin of Safety

As previously discussed in Section 4.2.2, a loading capacity of 50% above background is considered a sufficiently conservative target such that an additional margin of safety reduction is not warranted.

Table 4-3. Sediment Calculations for Lower West Branch Watershed by Ownership/Management Categories[a]

Categories of Sediment Loading	USFS	Private Idaho	Private WA	Timber Industry	Idaho State	County Roads	Totals
Natural Sediment Load							
Watershed area: square miles	66.7	15.4	3.0	2.3	1.1	0.3	88.8
Weighted mean tons/mi^2	20.8	22.5	19.3	23.8	22.8	21.8	21.1
Tons/year – 100% delivery	**1,387**	**347**	**57**	**54**	**26**	**6**	**1,878**
Current Sediment Load							
1. Forested area							
Forested area minus roads & crops (mi^2)	63.9	8.7	2.3	2.2	1.1	0.0	78.3
Weighted mean tons/mi^2	20.8	22.5	19.3	23.8	22.8	21.8	21.1
Tons/yr with 100% delivery	**1,330**	**196**	**45**	**52**	**25**	**0**	**1,649**
2. Unpaved roads							
Mean tons/stream crossing from CWE score	0.39	0.39	0.34	0.20	0	0.52	0.40
Number of stream crossings	141	48	3	5	0	23	220
Tons/yr at stream crossings	**54**	**19**	**1**	**1**	**0**	**12**	**87**
Miles of total roads - (minus stream crossings)	318	63	16	8	3	31	439
Mean tons/mile of total roads from CWE score	3.1	3.9	4.0	2.9	3.1	3.5	3.4
Tons/yr from total roads (minus crossings)	**1,017**	**256**	**65**	**26**	**8**	**117**	**1,489**
3. Failures at roads							
Number of washouts at stream crossings	3	2	0	0	0	1	6
Tons/yr from stream crossing washouts	**65**	**43**	**0**	**0**	**0**	**22**	**130**
Number of typical road prism failures	6	2	0	0	0	0	8
Tons/yr from typical road prism mass failures	**721**	**240**	**0**	**0**	**0**	**0**	**961**
% assigned to tons/yr atypical mass failure	75%	15%	0	0	0	10%	100%
Tons/yr from atypical failures	**360**	**72**	**0**	**0**	**0**	**48**	**480**
4. Hay land and grazing							
Acres of improved hay land and pasture	0	3,838	305	0	0	0	4,143
Tons/yr from agricultural improved land	**0**	**155**	**12**	**0**	**0**	**0**	**167**
5. Stream bank erosion							
% assigned to tons/yr stream bank erosion	75.2%	17.6%	3.4%	2.6%	1.3%	0%	100%
Tons/yr from stream bank erosion	**639**	**150**	**29**	**22**	**11**	**0**	**851**
Total current tons/yr	**4,186**	**1,131**	**152**	**101**	**46**	**199**	**5,816**
Percent of total	72.0%	19.4%	2.6%	1.7%	0.8%	3.4%	100%

a = Sediment load table does not include 800 tons/yr assigned to both natural and current loads from lower canyon mass failures (see Table 4-1 and Section 4.3.1.4)

4.3.1.6 Seasonality

Unlike pollutants discharged from point sources or soluble in the water column, sediment is generally transported on the rising limb of the annual discharge event(s). As a local example in the Priest River basin, monitoring at Kalispell Creek mouth during the Priest Lake baseline study (Rothrock and Mosier 1997), produced an annual load of 391 tons total suspended sediment (TSS) for water year 1995. The months of March - May produced 93% of the annual load with the peak in April at 40%. In recent times, major discharge events with corresponding sediment yield, delivery, and transport events, occurred in 1974 and 1997. Sediment loading capacities are most reasonably described in yearly increments, even though this quantification may be artificial.

4.3.1.6 Sediment Waste Load Allocation

There are no discrete or point source discharges of pollutants to Lower West Branch. No waste load allocation is necessary to address discrete sources.

4.3.1.7 Sediment Load Allocation

Load allocations are made to six ownership/management categories within the Lower West Branch watershed (Table 4-4). Bonner County maintained roads was added to the allocation list because of the contribution to current sediment loading from county roads. Acres of county roads were subtracted from the various ownership's in which the roads pass through.

The load allocations are based on the natural sedimentation yield from the GIS analysis of partitioning ownership/management acres into landtype categories. The calculated tons/yr were based on the landtype sediment yield coefficients in tons/mi^2/yr. Natural sediment yields were then increased by 50% for loading capacity, which incorporates a margin of safety. Note that sediment allocations in percent come close to

Table 4-4. Percentage of the Lower West Branch Watershed Owned and/or Managed by Various Entities, and the Sediment Load Allocated to each Ownership/Management

Ownership/ Management	Acres	Percent of Ownership/ Mgmt acres	Sediment Allocation (tons/yr)	Percent of sediment allocation	Percent of stream miles in canyon[a]	Slide Sediment allocation (tons/yr)
USFS	42,685	75.1	2,081	73.9	3.6	--
Industrial Timber Lands, ID & WA	1,459	2.6	81	2.9	--	--
Private Forest and Agricultural Lands, WA	1,907	3.4	86	3.1	--	--
Private Forest and Agricultural Lands, ID	9,875	17.4	521	18.5	67.3	--
Idaho State	724	1.3	39	1.4	29.1	--
Bonner County Maintained Roads	186	0.3	10	0.3	--	--
Totals	56,835	100%	2,818	100%	100%	1,200

a = Mass failure into 5.5 stream miles from canyon walls: Cuban Creek inflow upstream past Pine Creek inflow.

ownership/management percentages (Table 4-4). The sediment load allocation for canyon wall mass failures is 1,200 tons/yr, but this was not allocated among the ownership/management groups. While the percent of stream miles within each ownership through the canyon reach is calculated and shown, an equitable and workable sediment allocation and reduction scheme is best decided among stakeholders during development of the TMDL Implementation Plan.

4.3.1.8 Sediment Load Reduction Allocation

The current sediment load calculations for each ownership/management entity, and the yearly reduction required to meet the sediment allocations, are summarized in Table 4-5. A couple of the load reduction results do not correspond well with ownership/management percentages. While Bonner Count maintained roads encompass only 0.3% of the total land area, load reduction is 6.3% of the total. This land area however has been converted to a 100% road system, and thus received 100% of the road system sediment calculations. Also, county road stream crossings comprise 10.5% of the total crossings, 7% of the total road network, and 10% of the active road network. Several stream crossing segments on Bear Paw Creek Road were given road sediment CWE scores higher than the basin average. The road was inventoried during the fall when ditch scraping procedures were being conducted. The CWE inventory was during a period of fall rains, and fine sediment delivery to streams was observed from some of the ditches, and thus reflected in the CWE scores.

In their comment package to the draft Priest River SBA and TMDL, Bonner County (2001) remarked on the discrepancy of 0.3% land under county maintenance versus the calculated sediment load reduction. One comment regarded the higher CWE scores at some stream crossings due to fall ditch cleaning. The sediment load calculation presented here would assume an annual increased load due to this activity. But the county stated that while ditches were cleaned the last two consecutive years, this was part of a road building project and generally the ditches are cleaned when necessary or about every 5 – 10 years. This author has observed cleaning activities on Bear Paw Creek Road somewhat more frequent than this interval. Applying the same average CWE score to county road crossings as USFS active timber road crossings (Table 4-3), reduces the county load by 3 tons/yr.

Table 4-5. Sediment Load Reductions Required to meet TMDL Goals for the Lower West Branch

Ownership/Management	Sediment Allocation (tons/yr)	Calculated current sediment load (tons/yr)	Sediment reduction required in tons/yr	Percent of sediment reduction
USFS	2,081	4,186	2,105	70.2
Industrial Timber Lands, ID & WA	81	101	20	0.7
Private Forest and Agricultural Lands, WA	86	152	66	2.2
Private Forest and Agricultural Lands, ID	521	1,131	610	20.4
Idaho State	39	46	8	0.3
Bonner County Maintained Roads	10	199	189	6.3
Totals	2,818	5,816	2,998	100%
Canyon wall mass failures	1,200	1,600	400	--

An emphatic point stated by the county is that, "not only does everyone that uses the private, USFS or state lands benefit from the use of the county roadways, those roadways are only there to serve those stakeholders" (Bonner County 2001). The County has requested a more equitable distribution of sediment load reduction and perhaps financial assistance in their reduction efforts. During the development phase of the TMDL Implementation Plan, with fine-tuning of the load calculations and establishing sediment reduction priorities and projects, it is recommended that the concerns of the County be addressed.

Private forest and agricultural lands in Idaho also have a higher percent reduction than ownership percentage. This reflects that private lands had: the only added component of sediment from hay cropping; a road stream crossing number that was 22% of the total; and some higher CWE road sediment scores based on observations of inadequate BMPs. The load calculations for Idaho private land did have some sediment allocations for stream crossing washouts and road prism failures, based primarily on extrapolating the USFS maintenance experiences on Forest roads to private roads based on mileage percentages. This allocation was based on very little on-the-ground observations. On the other hand, it is considered that the load calculations are underestimating sediment load from non-industrial private timber harvesting, and this underestimation is supported by several observations of private timber harvests with inadequate BMPs.

The sediment load reduction for canyon wall mass failures is given simply as a total and not allocated among the ownership/management categories. While each ownership that encompasses the canyon lands can adopt timber harvest and new construction BMPs that may help prevent landslides, there may also be a portion of landslide occurrence that is related to upstream land use activities on various ownership's which alter such factors as peak flow intensity.

4.3.1.9 Monitoring Provisions

Instream monitoring of cold water biota and salmonid spawning beneficial use status, during and after implementation of sediment abatement projects, is key to establish the final sediment load reduction required by the TMDL. Instream monitoring, which will detect the threshold values identified in section 4.3.1.3, should be completed a minimum of every five years at randomly selected upper to lower sites within the main stem low gradient channel. Baseline data is available at four DEQ BURP sites, so these would be logical monitoring sites. Following the current BURP protocol, monitoring should assess a stream reach length that is at least 40 times bankfull width, and include sampling for macroinvertebrates, and electro-fishing. Monitoring data collected should be BURP compatible so that the DEQ Water Body Assessment Guidance, Second Edition (WBAGII), can be used to evaluate beneficial use support. Surrogate targets established in the TMDL Implementation Plan by the WAG, such as percent fines and residual pool volume, will also be monitored in a manner determined in the plan.

4.3.1.10 Pollution Control Strategies

Given the varied ownerships and management jurisdictions within the Lower West Branch watershed, a meaningful implementation of sediment reduction will require a high level of cooperation among ownership/management entities, as well as an agreed upon mutual goal toward water quality improvement. It is thus recommended that prior to development of a TMDL Implementation Plan, a local Watershed Advisory Group (WAG) be formed, comprised of stakeholder representatives.

The USFS should continue its efforts at identifying road segments where either reconstruction of active roads or obliteration of closed roads could most lead to sediment load reduction (high probability of sediment delivery to streams). For example, where stream crossings are no longer needed the crossings should be decommissioned to remove culverts, and prepare the stream bed and road approach for stabilization and permeable for water infiltration. The amount of sediment reduction achieved by TMDL implementation measures needs to be tracked and documented on a yearly basis.

On private agricultural lands there are several programs such as the USDA Conservation Reserve Program which provides cost share opportunities to cattle ranchers for fencing off stream segments to cattle, develop off-site water sources, and to plant riparian vegetation along denuded stream banks. Where feasible, programs such as the federal Wetland Reserve Program (WRP) provides grant funding for easements where low gradient stream courses are allowed to restore wetland functions such as meander, floodplains, and riparian vegetation. The WRP also includes funding for eliminating cross drain ditches.

Timber harvesting on non-industrial private lands needs to adhere to the Idaho Forest Practices Act (FPA). This requires both a willingness and awareness by private logging interests to ensure protection of streams from sedimentation, and an effort by IDL to monitor FPA compliance and enact enforcement when there are FPA violations. Within the slopes of the lower reach canyon walls, Site Specific BMPs for timber harvesting practices need to be set to account for the high risk of landslides.

For private roads, driveways, and stream crossings there would need to be additional expenses by landowners to ensure that: water runoff management measures are adequate; and that stream crossings have proper sized culverts and stabilization of the road prism around the crossing. These additional expenses would have to result from a willingness and awareness of private landowners to afford protection of streams from sedimentation. Bonner County roads are well maintained and most have a good gravel base. But the county needs to explore alternatives to their ditch scraping methods and placement of excavated dirt, and ditches draining into streams could use further structural measures for sediment trapping.

4.3.1.11 Additional Improvements not Directly Related to Sediment Delivery

The low salmonid densities measured in Lower West Branch are not solely the result of sediment delivery to the watershed streams. There also appears to be poor quality habitat features not directly linked to sediment. A TMDL allocation and implementation plan must address the pollutant of concern, which in this case is sediment. It will not address many habitat related factors. A more holistic approach is necessary to recover fish density in the Lower West Branch.

Habitat surveys by IDFG, DEQ, and USFS have noted a lack of good instream cover and quality pools created by large woody debris (LWD). In part this may relate to historic timber harvesting activities where conifers were removed from the riparian zone at a level not now allowed under the Idaho FPA. While walking many stream sections of Lower West Branch, large stumps of cedar and other conifer species can be found within the floodplain. These harvesting practices thus reduced the recruitment of LWD to the stream. Perhaps also, LWD within the stream channel was deliberately removed because of LWD interference with flood flow. Such removal historically occurred within the stream system of the North Fork Coeur d'Alene River (Harvey 2000b). Besides providing cover and creating pools for fish habitat, stream LWD also serves to create a series of sediment traps, thus metering the movement of larger sized sediment within the stream.

There are several methods used by fish biologists to artificially establish LWD within stream channels as fish habitat enhancements. Such projects should be explored in the TMDL Implementation Plan. Efforts toward riparian plantings, from shrubs to conifers depending on site conditions, has already been mentioned as a goal on grazing lands under such programs as the USDA Conservation Reserve Program. The initial purpose is stream bank stabilization where banks have been damaged and are eroding due to large animal access. Efforts at increasing riparian shrub and conifer density also serves to: create better buffer strips to intercept and settle sediment delivered from uplands; creates more shade to attenuate water temperature increases during summer; and in the very long-term, reestablishes a recruitment source of LWD.

There has been much discussion in Sections 2 and 3 of this report regarding population dominance of the introduced brook trout and decline of native cutthroat trout and bull trout. In a rhetorical question asked by the USFS in their comment package to the draft SBA, it was stated, “if one goal for a TMDL is to reduce sediment loading, what beneficial use are we attempting to improve? Are we trying to improve the habitat for brook trout?” (USFS 2000b). In the context of DEQ interpretation and application of Idaho Standards regarding total salmonid density as an indicator of cold water biota beneficial use, the answer is yes. The Priest Lake Watershed Advisory Group has also expressed a similar opinion regarding Lamb Creek. While it might be preferential to have a thriving native cutthroat trout fishery in that stream, recovery attempts are outside the purview of a TMDL, particularly with no guarantee of recovery success. The WAG felt it was satisfactory to have a productive, fishable population of the resident salmonid, in this case brook trout.

The last item of Section 4.3.1.3 does however, recommend that development of the TMDL Implementation Plan, as guided by a local WAG, consider a fisheries management approach with an objective of enhancing cutthroat trout populations. This will certainly require an interagency approach, and agreement among the local area stakeholders.

4.3.1.12 Feedback Provisions

Data from which the Subbasin Assessment and TMDL for the Lower West Branch were developed, are often from insufficient measurements and crude sediment load calculations. As more exact measurements are obtained during implementation plan development and subsequent to its development, this will be added to a revised TMDL as required.

When the appropriate measurements of cold water biota and salmonid spawning beneficial uses meet the full support attainment level, further sediment load reducing activities will not be required in the watershed. The interim sediment loading capacity will be replaced in a revised TMDL with the ambient sediment load. Best Management Practices for forest and agricultural activities, along with residential road construction and maintenance, will be prescribed by the revised TMDL. Regular monitoring of the beneficial uses will be continued for an appropriate period to establish maintenance of full support.

4.3 Total Maximum Daily Loads for Water Quality Limited Waterbodies of the Priest River Basin

4.3.2 Kalispell Creek

4.3.2.1 Introduction

Based on the information presented in Section 3.3.B, the Kalispell Creek main stem, from just upstream of the confluence of Hungry Creek downstream to the mouth (Figure 3-15a), is judged as Not Full Support of cold water biota beneficial use. This stream segment is 12 miles in length and mostly low gradient channel type. Salmonid spawning beneficial use within this segment is considered as Full Support. Water quality impairment is due in part to excess sediment, and current sediment load may be contributing to this condition.

As discussed in Section 3.3.B, boundaries of the Kalispell Creek watershed for the purpose of a sediment TMDL does not consider the northern 6th order subwatershed of Diamond Creek and other small streams that drain toward the Potholes Research Natural Area (Figure 3-15b). The resulting size of the Kalispell Creek watershed for TMDL consideration is 19,844 acres.

4.3.2.2 Segments Addressed and Points of TMDL Compliance

The stream segment that is addressed and must be monitored for TMDL compliance of Idaho Water Quality Standards (i.e. Full Support of cold water biota beneficial use), is main stem Kalispell Creek from the Idaho – Washington border downstream to the mouth. This segment is 8.3 miles in length, and represents around 70% of the total main stem length that is labeled as water quality impaired. Attainment of Full Support within this Idaho segment will require sediment reduction efforts throughout the watershed including lands within the state of Washington. There have been four DEQ BURP sites, two with electro-fishing surveys, within the Idaho segment (Figure 3-15a). These sites are logical future monitoring areas for evaluating compliance. One other BURP site was on the upper main stem, in Washington. DEQ did not electro-fish there, but USFS has electro-fished upper main stem sites. The middle to upper main stem to Hungry Creek confluence, and the steeper headwaters of Kalispell Creek, in Washington, are not within jurisdiction of Idaho Standards. This segment would have to be addressed by the Washington Department of Ecology. It is recommended that monitoring sites in this reach be established by Washington DOE and/or the USFS.

It is considered that data from the four BURP sites in Idaho, within the 3rd order main stem, do not represent, or make a statement about, the water quality status of the numerous 1st and 2nd order tributaries to the main stem, including the steep headwaters of Kalispell Creek. These tributary streams remain as Not Assessed. All tributaries that feed into the middle to upper segment of Kalispell Creek are entirely within the state of Washington.

4.3.2.3 Appropriate Measurements of Full Beneficial Use Support

Sediment load reduction from the current level towards the interim sediment reduction goal is expected to attain an, as yet unquantified, sediment load at which the cold water biota beneficial use will attain full support. The sediment load will be recognized by the appropriate measures of Full Support under the DEQ assessment guidance and process applicable at the time of the future assessment. The draft guidance under review at the time of this writing (WBAGII) utilizes a stream index scoring system from BURP sampling metrics comprised of a Stream Macroinvertebrate Index, Stream Fish Index, and Stream Habitat Index. Under the current guidance of WBAG+ and additional considerations, the appropriate measures of Full Support are:

- MBI scores of 3.5 or greater throughout the main stem,
- a total salmonid density at the minimum target levels of 0.1 - 0.2 fish/m^2/hr electro-fishing effort (approximately 5 – 10 fish/100 m^2),
- continuation of three or more salmonid age classes including juveniles (<100 mm),
- continued presence of sculpins with a minimum target level around 0.1 sculpins/m^2/hr effort,
- as established by a Watershed Advisory Group (WAG), appropriate instream targets for surrogate habitat characteristics such as percent fines and residual pool volume, and
- in addition to the biological measures above, the TMDL Implementation Plan may address fisheries management objectives regarding native resident cutthroat trout and possibly spawning of Priest Lake adfluvial cutthroat trout. If interagency decisions and agreements are made to attempt an improvement of the cutthroat trout population, then monitoring for the effect of sediment reduction efforts should also include measurements of habitat parameters that are related to sedimentation.

4.3.2.4 Loading Capacity

A loading capacity of 50% increase above natural background level as established in Section 4.2 seems appropriate for this watershed, again based exclusively on the methods of sediment load calculations described in Section 4.1. The estimated background sediment delivery from the Kalispell Creek watershed is calculated at 722 tons/yr (Table 4-6). The interim sediment TMDL goal is set at 50% above background, or 1,084 tons/yr.

Critical Conditions are to be considered as part of the analysis of loading capacity. The beneficial uses in this watershed are impaired due to chronic sediment conditions, as such this TMDL deals with yearly sediment loads. The concept of critical conditions is difficult to reconcile with this type of impact. The critical condition concept assumes that under certain conditions, chronic pollution problems become acute pollution problems and therefore we need to ensure that the acute conditions do not occur. The proposed reductions in the TMDL will reduce the chronic sediment load and also reduce the likelihood that an acute sediment loading condition will exist. It is in this way that we have accounted for critical conditions in the TMDL.

4.3.2.5 Margin of Safety

As previously discussed in Section 4.2.2, a loading capacity of 50% above background is considered a sufficiently conservative target such that an additional margin of safety reduction is not warranted.

4.3.2.6 Seasonality

Unlike pollutants discharged from point sources or soluble in the water column, sediment is generally transported on the rising limb of the annual discharge event(s). As a local example in the Priest River basin, monitoring at Kalispell Creek mouth during the Priest Lake baseline study (Rothrock and Mosier 1997), produced an annual load of 391 tons total suspended sediment (TSS) for water year 95. The months of March - May produced 93% of the annual load with the peak in April at 40%. In recent times, major discharge events with corresponding sediment yield, delivery, and transport events, occurred in 1974 and 1997. Sediment loading capacities are most reasonably described in yearly increments, even though this quantification may be artificial.

Table 4-6. Sediment Calculations for Kalispell Creek by Ownership Categories

Categories of Sediment Loading	USFS	Private Idaho	Timber Industry	Totals
Natural Sediment Load				
Watershed area: square miles	28.9	1.6	0.5	31.0
Weighted mean tons/mi^2	23.3	22.9	24.3	23.3
Tons/year – 100% delivery	**674**	**36**	**12**	**722**
Current Sediment Load				
1. Forested area				
Forested area minus roads & crops (mi^2)	28.2	1.2	0.5	30.0
Weighted mean tons/mi^2	23.3	22.9	24.3	23.3
Tons/yr with 100% delivery	**658**	**27**	**13**	**698**
2. Unpaved roads				
Mean tons/stream crossing from CWE score	0.72	0.68	NA	0.71
Number of stream crossings	36	5	0	41
Tons/yr at stream crossings	**25.9**	**3.4**	**0**	**29**
Miles of total roads - (minus stream crossings)	76	8	2	87
Mean tons/mile of total roads from CWE score	3.7	4.7	2.2	3.7
Tons/yr from total roads (minus crossings)	**280**	**38**	**5**	**322**
3. Failures at roads				
Number of washouts at stream crossings	0.5	0	0	0.5
Tons/yr from stream crossing washouts	**11**	**0**	**0**	**11**
Number of typical road prism failures	0	0	0	0
Tons/yr from typical road prism mass failures	**0**	**0**	**0**	**0**
% assigned to tons/yr atypical mass failure	NA	NA	NA	NA
Tons/yr from atypical failures	**0**	**0**	**0**	**0**
4. Hay land and grazing				
Acres of improved hay land and pasture	0	190	0	190
Tons/yr from agricultural improved land	**0**	**8**	**0**	**8**
5. Stream bank erosion				
% assigned to tons/yr stream bank erosion	90%	10%	0%	100%
Tons/yr from stream bank erosion	**202**	**23**	**0**	**225**
Total current tons/yr	**1,177**	**99**	**18**	**1,294**
Percent of total	90.9%	7.6%	1.4%	100%

Table 4-7. Percentage of the Kalispell Creek Watershed Owned and/or Managed by Various Entities, and the Sediment Load Allocated to each Ownership/Management

Ownership/Management	Acres	Percent of ownership/ management acres	Sediment Allocation (tons/yr)	Percent of sediment allocation
USFS	18,476	93.1	1,011	93.3
Private Forest, Agricultural and Residential Lands, ID	1,003	5.1	54	5.0
Industrial Timber Lands, ID & WA	365	1.8	19	1.7
Totals	19,844	100%	1,084	100%

4.3.2.6 Sediment Waste Load Allocation

There are no discrete or point source discharges of pollutants to Kalispell Creek. No waste load allocation is necessary to address discrete sources.

4.3.2.7 Sediment Load Allocation

Load allocations are made to three ownership/management categories within the Kalispell Creek watershed (Table 4-7). The load allocations are based on the natural sedimentation yield from the GIS analysis of partitioning ownership/management acres into landtype categories. The calculated tons/yr were based on the landtype sediment yield coefficients in tons/mi^2/yr. Natural sediment yields were then increased by 50% for loading capacity which incorporates a margin of safety. Note that sediment allocations in percent come close to ownership/management percentages (Table 4-7).

4.3.2.8 Sediment Load Reduction Allocation

The current sediment load calculations for each ownership/management entity, and the yearly sediment reduction required to meet the sediment allocations, are summarized in Table 4-8. The calculated load reduction for private forest, agricultural, and residential lands (not including timber industry lands), does not correspond well with the ownership percentage. While this category encompasses only 5.1% of the total land area, load reduction is 21.3% of the total. A part of this discrepancy relates to the road statistics where unpaved private road mileage accounts for 9% of the total road miles, and number of stream crossings is 10% of the total. Around 80% of the private road mileage is within the residential area surrounding the mouth of Kalispell Creek (Figure 3-15c). There have been some observed problems noted with ditches and culverts in this area, and there has been observance of sediment laden stormwater runoff from the unpaved roads and driveways into the stream. On the other hand, some runoff from within the drawn boundary of this area probably does not flow into the stream, but instead into Priest Lake.

Another reason for the load reduction discrepancy on private land relates to sediment assigned from stream bank erosion. Ten percent of the annual stream bank erosion from 12 miles of gradual gradient Kalispell Creek was assigned to the private land category. Of these 12 stream miles, 22% flows through private property. An assignment of stream bank erosion to private lands was meant to account for activities such as cattle access to the stream, and some loss of wetlands – wet meadows function associated with land conversion to hay cropping and grazing. However, an assignment of stream bank erosion to private land

Table 4-8. Sediment Load Reductions Required to meet TMDL Goals for Kalispell Creek

Ownership/Management	Sediment Allocation (tons/yr)	Calculated Current sediment load (tons/yr)	Sediment Reduction required in tons/yr	Percent of sediment reduction
USFS	1,011	1,177	165	78.7
Private Forest, Agricultural and Residential Lands, ID	54	99	45	21.3
Industrial Timber Lands, ID & WA	19	18	0	0
Totals	1,084	1,294	210	100%

does not have any quantitative bases. It is uncertain to what degree the current channel condition reflects hydrologic disequilibrium associated with historic and current land use activities on public and private lands. During the development phase of the TMDL Implementation Plan, with fine-tuning of the load calculations and establishing sediment reduction priorities and projects, it is recommended that the sediment load reduction allocated to private lands be reexamined.

4.3.2.9 Monitoring Provisions

Instream monitoring of cold water biota and salmonid spawning beneficial use status, during and after implementation of sediment abatement projects, is key to establish the final sediment load reduction required by the TMDL. Instream monitoring, which will detect the threshold values identified in section 4.3.2.3, should be completed a minimum of every five years at randomly selected upper to lower sites within the main stem low gradient channel. Baseline data is available at five DEQ BURP sites, so these would be logical monitoring areas. Following the current BURP protocol, monitoring should assess a stream reach length that is at least 40 times bankfull width, and include sampling for macroinvertebrates, and electro-fishing. Monitoring data collected should be BURP compatible so that the DEQ Water Body Assessment Guidance, Second Edition (WBAGII), can be used to evaluate beneficial use support. Surrogate targets established in the TMDL Implementation Plan by the WAG, such as percent fines and residual pool volume, will also be monitored in a manner determined in the plan.

4.3.2.10 Pollution Control Strategies

Unlike the situation in Lower West Branch, ownership and management jurisdictions within the Kalispell Creek watershed is much less varied with 93% of the land under USFS management. The existing Priest Lake Watershed Advisory Group (WAG) could serve as the local TMDL advisory group. There would however, need to be representation and input from the residential community within the watershed.

In their comment package to the draft Subbasin Assessment, USFS stated that there has been extensive surveys of the streams, road networks and timbered units, and with a few exceptions, identified sediment sources have been addressed (USFS 2000b). One road impact is Forest Road 308 (Kalispell Creek Road) which travels up the valley floor of the middle segment of Kalispell Creek, west of Hwy 57 (Figure 3-15c). Of the 4 miles that parallel the main stem, 3.3 miles are within a 200 ft zone from the stream, and 0.9 miles of this is within the 50 ft encroaching zone. Historically this road was the rail route for salvage logging. Road 308 is a well traveled and maintained transportation road with a surface of compacted aggregate. Undoubtedly there is sediment produced from the road surface, cut banks, and ditches delivered to the stream. The IDL – CWE inventory identified a 1 mile section of Road 308, as it turns northward in the headwaters of Kalispell Creek, as having moderate sediment delivery scores along with two Significant Management Problems (Figure 3-15c). Perhaps more importantly, the road constricts the stream and reduces the effective floodplain and riparian area of the reach.

USFS was considering obliteration of Road 308 that parallels the stream and relocating it along a more northerly route, as identified in a preliminary timber regeneration/watershed restoration draft EIS (USFS 1998c). Planning for this project was put on hold due to preparation of the Douglas-fir beetle project EIS, and administration of timber sales related to beetle mortality in lower western watersheds of the basin. It would seem that the draft plans associated with obliteration and relocation of Forest Road 308 would remain as a top priority for TMDL sediment reduction efforts.

Regarding agriculture land, there is a current effort underway led by the IDFG, to establish the 1,200 acre Bismark Meadows under a federal Wetland Reserve Program (WRP). Land owner signatures have been obtained for WRP easement purchases. This effort is still in a preliminary stage with grant funding not secured, but if a WRP is established this will help restore wetland functions to a small section of Kalispell Creek at the southern end of Bismark Meadows.

Timber harvesting on non-industrial private lands needs to adhere to the Idaho Forest Practices Act (FPA). This requires both a willingness and awareness by private logging interests to ensure protection of streams from sedimentation, and an effort by IDL to monitor FPA compliance and enact enforcement when there are FPA violations.

For private roads, driveways, and stream crossings there would need to be additional expenses by landowners to ensure that: water runoff management measures are adequate; and that stream crossings have proper sized culverts and stabilization of the road prism around the crossing. These additional expenses would have to result from a willingness and awareness of private landowners to afford protection of streams from sedimentation.

4.3.2.11 Additional Improvements not Directly Related to Sediment Delivery

Low salmonid densities measured in Kalispell Creek are not solely the result of current sediment delivery to watershed streams. Current sediment load may not even be the major related cause. There also appears to be many poor to mediocre fish habitat features not directly linked to current sediment load. For example, residual pool volume is often considered insufficient related to a thick sand bedload, and this sandy substrate may be related more to legacy issues than current land use (as well as the parent granitic geology). A TMDL allocation and implementation plan must address the pollutant of concern, which in this case is current sediment load. It will not address some of the other habitat related factors. A more holistic approach is necessary to recover fish density in Kalispell Creek, and such an approach was being planned during the preliminary draft of the Kalispell timber regeneration/watershed restoration EIS (USFS 1998c).

Habitat surveys by DEQ and USFS have noted a lack of good instream cover and quality pools created by large woody debris (LWD). In part this may relate to historic timber harvesting activities where conifers were removed from the riparian zone at a level not now allowed under the Idaho FPA. While walking many stream sections of Kalispell Creek, large stumps of cedar and other conifer species can be found within the floodplain. These harvesting practices thus reduced the recruitment of LWD to the stream. There was also a loss of riparian LWD to fires and salvage logging.

There are several methods used by fish biologists to artificially establish LWD within stream channels as fish habitat enhancements. Such projects should be explored in the TMDL Implementation Plan. It should be noted however, that in the past USFS personnel have created pools with placement of LWD, and some of these pools subsequently became nearly filled with moving sand bedload.

There has been much discussion in Sections 2 and 3 of this report regarding population dominance of the introduced brook trout and decline of native cutthroat trout and bull trout. In a rhetorical question asked by the USFS in their comment package to the draft SBA, it was stated, “if one goal for a TMDL is to reduce sediment loading, what beneficial use are we attempting to improve? Are we trying to improve the habitat for brook trout?” (USFS 2000b). In the context of DEQ interpretation and application of Idaho Standards regarding total salmonid density as an indicator of cold water biota beneficial use, the answer is yes. The Priest Lake WAG has also expressed a similar opinion regarding Lamb Creek. While it might be preferential to have a thriving native cutthroat trout fishery in that stream, recovery attempts are outside the purview of a TMDL, particularly with no guarantee of recovery success. The WAG felt it was satisfactory to have a productive, fishable population of the resident salmonid, in this case brook trout.

In section 3.3.B.1 it was mentioned that in 1960 IDFG conducted Rotenone treatments within large segments of the Kalispell Creek main stem and tributaries. IDFG subsequently planted 135,000 cutthroat fry. There seems to be no other follow-up documentation on fish management efforts in the stream, but current electro-fishing results clearly show a brook trout dominance with few cutthroats captured within the main stem

The last item of Section 4.3.2.3 does however, recommend that development of the TMDL Implementation Plan, as guided by the WAG, consider a fisheries management approach with an objective of enhancing resident cutthroat trout populations. This will certainly require an interagency approach, and agreement among the local area stakeholders. Current fish population surveys do show some decent resident cutthroat densities within the tributaries Bath Creek and Hungry Creek, and a few cutthroat are sampled within the main stem. Because of the situation noted for adfluvial cutthroat and bull trout within Priest Lake in Section 2, it may be unrealistic to expect Kalispell Creek to once again become a spawning ground for these large adfluvial natives.

4.3.2.12 Feedback Provisions

Data from which the Subbasin Assessment and TMDL for Kalispell Creek were developed are often from insufficient measurements and crude sediment load calculations. As more exact measurements are obtained during implementation plan development and subsequent to its development, this will be added to a revised TMDL as required.

When the appropriate measurements of cold water biota beneficial use meet the full support attainment level, further sediment load reducing activities will not be required in the watershed. The interim sediment loading capacity will be replaced in a revised TMDL with the ambient sediment load. Best Management Practices for forest and agricultural activities, along with residential road construction and maintenance, will be prescribed by the revised TMDL. Regular monitoring of the beneficial uses will be continued for an appropriate period to establish maintenance of full support.

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APPENDIX A

Priest River Basin:
History of Listings in DEQ Idaho Water Quality Status Reports –
§305(b) and §303(d) Lists

Table A-1. Trapper Creek

ID-17010215-17	**Trapper Creek**	upstream limit**: headwaters**
	PNRS: **1432.00**	downstream limit: **Upper Priest Lake**

Current Classification in Idaho Water Quality Standards

map code: **map codes not available for unclassified water bodies**	This water body is: **Unclassified**	Designated Special Resource Water: IDAPA 16.01.02.95: **no**

Idaho's Beneficial Uses: IDAPA 16.01.02.100	Domestic Water Supply	Agricul. Water Supply	Cold Water Biota	Warm Water Biota	Salmonid Spawning	Primary Contact Recreation	Secondary Contact Recreation
Designated Beneficial Uses for this water body:	**no**	**No**	**yes***	**no**	**no**	**yes***	**no**
	* denotes implicit designation through IDAPA 1601.02.101.01.a.						

1988 §305(b) and §303(d) Information

§303(d) listed: **no**
cause:

assessment info: **not assessed in 1988**

Idaho's Beneficial Uses: IDAPA 16.01.02.100	Domestic Water Supply	Agricul. Water Supply	Cold Water Biota	Warm Water Biota	Salmonid Spawning	Primary Contact Recreation	Secondary Contact Recreation
status assessment for 1988							

1992 §305(b) and §303(d) Information

§303(d) listed: **no**
cause:

assessment info: **not assessed in 1992**

Idaho's Beneficial Uses: IDAPA 16.01.02.100	Domestic Water Supply	Agricul. Water Supply	Cold Water Biota	Warm Water Biota	Salmonid Spawning	Primary Contact Recreation	Secondary Contact Recreation
status assessment for 1992							

1994 §305(b) and §303(d) Information

§303(d) listed: **yes**
cause: **sediment, habitat alteration**

assessment info**: no water bodies assessed in 1994. 303(d) listing resulted from SSOC designation, "supported/threatened" for CWB and SS**

Idaho's Beneficial Uses: IDAPA 16.01.02.100	Domestic Water Supply	Agricul. Water Supply	Cold Water Biota	Warm Water Biota	Salmonid Spawning	Primary Contact Recreation	Secondary Contact Recreation
status assessment for 1994							

1996 §305(b) and §303(d) Information

§303(d) listed: **yes**
cause: **sediment, habitat alteration**

assessment info**: no water bodies assessed in 1996. 303(d) listing resulted from SSOC designation, "supported/threatened" for CWB and SS**

Idaho's Beneficial Uses: IDAPA 16.01.02.100	Domestic Water Supply	Agricul. Water Supply	Cold Water Biota	Warm Water Biota	Salmonid Spawning	Primary Contact Recreation	Secondary Contact Recreation
status assessment for 1996							

Table A-2. Two Mouth Creek

ID-17010215-12 — **Two Mouth Creek** — upstream limit**: headwaters**

PNRS: **1427.00** — downstream limit: **Priest Lake**

Current Classification in Idaho Water Quality Standards

map code: **map codes not available for unclassified water bodies**

This water body is: **Unclassified**

Designated Special Resource Water: IDAPA 16.01.02.95: **no**

Idaho's Beneficial Uses: IDAPA 16.01.02.100	Domestic Water Supply	Agricul. Water Supply	Cold Water Biota	Warm Water Biota	Salmonid Spawning	Primary Contact Recreation	Secondary Contact Recreation
Designated Beneficial Uses for this water body:	**no**	**no**	**yes***	**no**	**no**	**yes***	**no**
	* denotes implicit designation through IDAPA 1601.02.101.01.a.						

1988 §305(b) and §303(d) Information

§303(d) listed: **no**
cause:

assessment info: **DEQ Coeur d'Alene Regional Office - evaluated**

Idaho's Beneficial Uses: IDAPA 16.01.02.100	Domestic Water Supply	Agricul. Water Supply	Cold Water Biota	Warm Water Biota	Salmonid Spawning	Primary Contact Recreation	Secondary Contact Recreation
status assessment for 1988			**Supported/ threatened**		**Supported/ threatened**		

1992 §305(b) and §303(d) Information

§303(d) listed: **no**
cause:

assessment info: **evaluated**

Idaho's Beneficial Uses: IDAPA 16.01.02.100	Domestic Water Supply	Agricul. Water Supply	Cold Water Biota	Warm Water Biota	Salmonid Spawning	Primary Contact Recreation	Secondary Contact Recreation
status assessment for 1992 Appendix A	**Partial Support**		**Partial Support**		**Partial Support**	**Supported/ threatened**	**Supported/ threatened**

1994 §305(b) and §303(d) Information

§303(d) listed: **yes**
cause: **sediment, habitat alteration**

assessment info**: no water bodies assessed in 1994. 303(d) listing resulted from SSOC designation, "supported/threatened" for CWB and SS**

Idaho's Beneficial Uses: IDAPA 16.01.02.100	Domestic Water Supply	Agricul. Water Supply	Cold Water Biota	Warm Water Biota	Salmonid Spawning	Primary Contact Recreation	Secondary Contact Recreation
status assessment for 1994							

1996 §305(b) and §303(d) Information

§303(d) listed: **yes**
cause: **sediment, habitat alteration**

assessment info**: no water bodies assessed in 1996. 303(d) listing resulted from SSOC designation, "supported/threatened" for CWB and SS**

Idaho's Beneficial Uses: IDAPA 16.01.02.100	Domestic Water Supply	Agricul. Water Supply	Cold Water Biota	Warm Water Biota	Salmonid Spawning	Primary Contact Recreation	Secondary Contact Recreation
status assessment for 1996							

Table A-3. Tango Creek

ID-17010215-21 | **Tango Creek** | upstream limit**: headwaters**

PNRS: **1428.00** | downstream limit: **Priest Lake**

Current Classification in Idaho Water Quality Standards

map code: **map codes not available for unclassified water bodies**

This water body is: **Unclassified**

Designated Special Resource Water: IDAPA 16.01.02.95: **no**

Idaho's Beneficial Uses: IDAPA 16.01.02.100	Domestic Water Supply	Agricul. Water Supply	Cold Water Biota	Warm Water Biota	Salmonid Spawning	Primary Contact Recreation	Secondary Contact Recreation
Designated Beneficial Uses for this water body:	**no**	**no**	**yes***	**no**	**no**	**yes***	**no**
	* denotes implicit designation through IDAPA 1601.02.101.01.a.						

1988 §305(b) and §303(d) Information

§303(d) listed: **no**
cause:

assessment info: **DEQ Coeur d'Alene Regional Office - evaluated**

Idaho's Beneficial Uses: IDAPA 16.01.02.100	Domestic Water Supply	Agricul. Water Supply	Cold Water Biota	Warm Water Biota	Salmonid Spawning	Primary Contact Recreation	Secondary Contact Recreation
status assessment for 1988			**Supported/ threatened**		**Partial Support**		

1992 §305(b) and §303(d) Information

§303(d) listed: **no**
cause:

assessment info: **evaluated**

Idaho's Beneficial Uses: IDAPA 16.01.02.100	Domestic Water Supply	Agricul. Water Supply	Cold Water Biota	Warm Water Biota	Salmonid Spawning	Primary Contact Recreation	Secondary Contact Recreation
status assessment for 1992 Appendix D			**Supported/ threatened**		**Partial Support**		

1994 §305(b) and §303(d) Information

§303(d) listed: **yes**
cause: **nutrients, sediment**

assessment info**: no water bodies assessed in 1994. 303(d) listing resulted from EPA analysis of 1992 305(b) report, Appendix D.**

Idaho's Beneficial Uses: IDAPA 16.01.02.100	Domestic Water Supply	Agricul. Water Supply	Cold Water Biota	Warm Water Biota	Salmonid Spawning	Primary Contact Recreation	Secondary Contact Recreation
status assessment for 1994							

1996 §305(b) and §303(d) Information

§303(d) listed: **yes**
cause: **nutrients, sediment**

assessment info**: no water bodies assessed in 1996. 303(d) listing resulted from EPA analysis of 1992 305(b) report, Appendix D.**

Idaho's Beneficial Uses: IDAPA 16.01.02.100	Domestic Water Supply	Agricul. Water Supply	Cold Water Biota	Warm Water Biota	Salmonid Spawning	Primary Contact Recreation	Secondary Contact Recreation
status assessment for 1996							

Table A-4. Kalispell Creek

ID-17010215-24	**Kalispell Creek**	upstream limit**: headwaters**
	PNRS: **1421.00**	downstream limit: **Priest Lake**

Current Classification in Idaho Water Quality Standards

map code: **map codes not available for unclassified water bodies**	This water body is: **Unclassified**	Designated Special Resource Water: IDAPA 16.01.02.95: **no**

Idaho's Beneficial Uses: IDAPA 16.01.02.100	Domestic Water Supply	Agricul. Water Supply	Cold Water Biota	Warm Water Biota	Salmonid Spawning	Primary Contact Recreation	Secondary Contact Recreation
Designated Beneficial Uses for this water body:	**no**	**no**	**yes***	**no**	**no**	**yes***	**no**
	* denotes implicit designation through IDAPA 1601.02.101.01.a.						

1988 §305(b) and §303(d) Information

§303(d) listed: **no** assessment info: **DEQ Coeur d'Alene Regional Office - evaluated**
cause:

Idaho's Beneficial Uses: IDAPA 16.01.02.100	Domestic Water Supply	Agricul. Water Supply	Cold Water Biota	Warm Water Biota	Salmonid Spawning	Primary Contact Recreation	Secondary Contact Recreation
status assessment for 1988			**Supported/ threatened**		**Supported/ threatened**		

1992 §305(b) and §303(d) Information

§303(d) listed: **no** assessment info: **not assessed in 1992**
cause:

Idaho's Beneficial Uses: IDAPA 16.01.02.100	Domestic Water Supply	Agricul. Water Supply	Cold Water Biota	Warm Water Biota	Salmonid Spawning	Primary Contact Recreation	Secondary Contact Recreation
status assessment for 1992							

1994 §305(b) and §303(d) Information

§303(d) listed: **no** assessment info**: no water bodies assessed in 1994.**
cause:

Idaho's Beneficial Uses: IDAPA 16.01.02.100	Domestic Water Supply	Agricul. Water Supply	Cold Water Biota	Warm Water Biota	Salmonid Spawning	Primary Contact Recreation	Secondary Contact Recreation
status assessment for 1994							

1996 §305(b) and §303(d) Information

§303(d) listed: **yes** assessment info**: no water bodies assessed in 1996. 303(d) listing resulted from Idaho Panhandle National Forest analysis.**
cause: **sediment**

Idaho's Beneficial Uses: IDAPA 16.01.02.100	Domestic Water Supply	Agricul. Water Supply	Cold Water Biota	Warm Water Biota	Salmonid Spawning	Primary Contact Recreation	Secondary Contact Recreation
status assessment for 1996							

Table A-5. Lamb Creek

ID-17010215-25 | **Lamb Creek** | upstream limit**: headwaters**

PNRS: **1419.00** | downstream limit: **Priest Lake – Outlet Bay**

Current Classification in Idaho Water Quality Standards

map code: **map codes not available for unclassified water bodies**

This water body is: **Unclassified**

Designated Special Resource Water: IDAPA 16.01.02.95: **no**

Idaho's Beneficial Uses: IDAPA 16.01.02.100	Domestic Water Supply	Agricul. Water Supply	Cold Water Biota	Warm Water Biota	Salmonid Spawning	Primary Contact Recreation	Secondary Contact Recreation
Designated Beneficial Uses for this water body:	**no**	**no**	**yes***	**no**	**no**	**yes***	**no**
	* denotes implicit designation through IDAPA 1601.02.101.01.a.						

1988 §305(b) and §303(d) Information

§303(d) listed: **no**
cause:

assessment info**: IDFG, and DEQ Coeur d'Alene Regional Office (CRO) evaluation**

Idaho's Beneficial Uses: IDAPA 16.01.02.100	Domestic Water Supply	Agricul. Water Supply	Cold Water Biota	Warm Water Biota	Salmonid Spawning	Primary Contact Recreation	Secondary Contact Recreation
status assessment for 1988 Appendix A			**Partial Support (IDFG)**		**Not Supported (IDFG)**		
Appendix B			**Supported/ threatened (CRO)**		**Supported/ threatened (CRO)**		

1992 §305(b) and §303(d) Information

§303(d) listed: **no**
cause:

assessment info: **evaluated**

Idaho's Beneficial Uses: IDAPA 16.01.02.100	Domestic Water Supply	Agricul. Water Supply	Cold Water Biota	Warm Water Biota	Salmonid Spawning	Primary Contact Recreation	Secondary Contact Recreation
status assessment for 1992 Appendix D			**Partial Support**		**Not Supported**		

1994 §305(b) and §303(d) Information

§303(d) listed: **yes**
cause**: sediment**

assessment info**: no water bodies assessed in 1994. 303(d) listing resulted from EPA analysis of 1992 305(b) report, Appendix D.**

Idaho's Beneficial Uses: IDAPA 16.01.02.100	Domestic Water Supply	Agricul. Water Supply	Cold Water Biota	Warm Water Biota	Salmonid Spawning	Primary Contact Recreation	Secondary Contact Recreation
status assessment for 1994							

1996 §305(b) and §303(d) Information

§303(d) listed: **yes**
cause: **sediment**

assessment info: **no water bodies assessed in 1996. 303(d) listing resulted from EPA analysis of 1992 305(b) report, Appendix D.**

Idaho's Beneficial Uses: IDAPA 16.01.02.100	Domestic Water Supply	Agricul. Water Supply	Cold Water Biota	Warm Water Biota	Salmonid Spawning	Primary Contact Recreation	Secondary Contact Recreation
status assessment for 1996							

Table A-6. Lower West Branch Priest River

ID-17010215-30 | **Lower West Branch** | upstream limit**: headwaters**

PNRS: **1411.00** | downstream limit: **Lower Priest River**

Current Classification in Idaho Water Quality Standards

map code: **map codes not available for unclassified water bodies**

This water body is: **Unclassified**

Designated Special Resource Water: IDAPA 16.01.02.95: **no**

Idaho's Beneficial Uses: IDAPA 16.01.02.100	Domestic Water Supply	Agricul. Water Supply	Cold Water Biota	Warm Water Biota	Salmonid Spawning	Primary Contact Recreation	Secondary Contact Recreation
Designated Beneficial Uses for this water body:	**no**	**no**	**yes***	**no**	**no**	**yes***	**no**
	* denotes implicit designation through IDAPA 1601.02.101.01.a.						

1988 §305(b) and §303(d) Information

§303(d) listed: **no**
cause:

assessment info: **assessed, but support status unknown**

Idaho's Beneficial Uses: IDAPA 16.01.02.100	Domestic Water Supply	Agricul. Water Supply	Cold Water Biota	Warm Water Biota	Salmonid Spawning	Primary Contact Recreation	Secondary Contact Recreation
status assessment for 1988							

1992 §305(b) and §303(d) Information

§303(d) listed: **no**
cause:

assessment info: **evaluated**

Idaho's Beneficial Uses: IDAPA 16.01.02.100	Domestic Water Supply	Agricul. Water Supply	Cold Water Biota	Warm Water Biota	Salmonid Spawning	Primary Contact Recreation	Secondary Contact Recreation
status assessment for 1992 Appendix A			**Partial Support**		**Partial Support**		

1994 §305(b) and §303(d) Information

§303(d) listed: **no**
cause:

assessment info**: no water bodies assessed in 1994.**

Idaho's Beneficial Uses: IDAPA 16.01.02.100	Domestic Water Supply	Agricul. Water Supply	Cold Water Biota	Warm Water Biota	Salmonid Spawning	Primary Contact Recreation	Secondary Contact Recreation
status assessment for 1994							

1996 §305(b) and §303(d) Information

§303(d) listed: **yes**
cause: **none listed**

assessment info**: no water bodies assessed in 1996. 303(d) listing resulted from Idaho Panhandle National Forest analysis.**

Idaho's Beneficial Uses: IDAPA 16.01.02.100	Domestic Water Supply	Agricul. Water Supply	Cold Water Biota	Warm Water Biota	Salmonid Spawning	Primary Contact Recreation	Secondary Contact Recreation
status assessment for 1996							

Table A-7. East River

ID-17010215-03 | **East River** | upstream limit**: headwaters**

PNRS: **1415.00** | downstream limit: **Lower Priest River**

Current Classification in Idaho Water Quality Standards

map code: **map codes not available for unclassified water bodies**

This water body is: **Unclassified**

Designated Special Resource Water: IDAPA 16.01.02.95: **no**

Idaho's Beneficial Uses: IDAPA 16.01.02.100	Domestic Water Supply	Agricul. Water Supply	Cold Water Biota	Warm Water Biota	Salmonid Spawning	Primary Contact Recreation	Secondary Contact Recreation
Designated Beneficial Uses for this water body:	**no**	**no**	**yes***	**no**	**no**	**yes***	**no**
	* denotes implicit designation through IDAPA 1601.02.101.01.a.						

1988 §305(b) and §303(d) Information

§303(d) listed: **no**
cause:

assessment info: **IDFG – evaluated**

Idaho's Beneficial Uses: IDAPA 16.01.02.100	Domestic Water Supply	Agricul. Water Supply	Cold Water Biota	Warm Water Biota	Salmonid Spawning	Primary Contact Recreation	Secondary Contact Recreation
status assessment for 1988			**Partial Support**		**Not Supported**		

1992 §305(b) and §303(d) Information

§303(d) listed: **no**
cause:

assessment info: **evaluated**

Idaho's Beneficial Uses: IDAPA 16.01.02.100	Domestic Water Supply	Agricul. Water Supply	Cold Water Biota	Warm Water Biota	Salmonid Spawning	Primary Contact Recreation	Secondary Contact Recreation
status assessment for 1992 Appendix D			**Partial Support**		**Not Supported**		

1994 §305(b) and §303(d) Information

§303(d) listed: **yes**
cause**: sediment, DO, temperature, flow**

assessment info**: no water bodies assessed in 1994. 303(d) listing resulted from EPA analysis of 1992 305(b) report, Appendix D.**

Idaho's Beneficial Uses: IDAPA 16.01.02.100	Domestic Water Supply	Agricul. Water Supply	Cold Water Biota	Warm Water Biota	Salmonid Spawning	Primary Contact Recreation	Secondary Contact Recreation
status assessment for 1994							

1996 §305(b) and §303(d) Information

§303(d) listed: **yes**
cause: **sediment, DO, temperature, flow**

assessment info: **no water bodies assessed in 1996. 303(d) listing resulted from EPA analysis of 1992 305(b) report, Appendix D.**

Idaho's Beneficial Uses: IDAPA 16.01.02.100	Domestic Water Supply	Agricul. Water Supply	Cold Water Biota	Warm Water Biota	Salmonid Spawning	Primary Contact Recreation	Secondary Contact Recreation
status assessment for 1996							

Table A-8. Binarch Creek

ID-17010215-26	**Binarch Creek**	upstream limit**: headwaters**
	PNRS: **1418.00**	downstream limit: **Lower Priest River**

Current Classification in Idaho Water Quality Standards

map code: **map codes not available for unclassified water bodies**

This water body is: **Unclassified**

Designated Special Resource Water: IDAPA 16.01.02.95: **no**

Idaho's Beneficial Uses: IDAPA 16.01.02.100	Domestic Water Supply	Agricul. Water Supply	Cold Water Biota	Warm Water Biota	Salmonid Spawning	Primary Contact Recreation	Secondary Contact Recreation
Designated Beneficial Uses for this water body:	**no**	**no**	**yes***	**no**	**no**	**yes***	**no**
	* denotes implicit designation through IDAPA 1601.02.101.01.a.						

1988 §305(b) and §303(d) Information

§303(d) listed: **no**
cause:

assessment info: **IDFG – data evaluation**

Idaho's Beneficial Uses: IDAPA 16.01.02.100	Domestic Water Supply	Agricul. Water Supply	Cold Water Biota	Warm Water Biota	Salmonid Spawning	Primary Contact Recreation	Secondary Contact Recreation
status assessment for 1988			**Partial Support**		**Partial Support**		

1992 §305(b) and §303(d) Information

§303(d) listed: **no**
cause:

assessment info: **evaluated**

Idaho's Beneficial Uses: IDAPA 16.01.02.100	Domestic Water Supply	Agricul. Water Supply	Cold Water Biota	Warm Water Biota	Salmonid Spawning	Primary Contact Recreation	Secondary Contact Recreation
status assessment for 1992 Appendix D			**Partial Support**		**Partial Support**		

1994 §305(b) and §303(d) Information

§303(d) listed: **yes**
cause**: sediment**

assessment info**: no water bodies assessed in 1994. 303(d) listing resulted from EPA analysis of 1992 305(b) report, Appendix D.**

Idaho's Beneficial Uses: IDAPA 16.01.02.100	Domestic Water Supply	Agricul. Water Supply	Cold Water Biota	Warm Water Biota	Salmonid Spawning	Primary Contact Recreation	Secondary Contact Recreation
status assessment for 1994							

1996 §305(b) and §303(d) Information

§303(d) listed: **yes**
cause: **sediment**

assessment info: **no water bodies assessed in 1996. 303(d) listing resulted from EPA analysis of 1992 305(b) report, Appendix D.**

Idaho's Beneficial Uses: IDAPA 16.01.02.100	Domestic Water Supply	Agricul. Water Supply	Cold Water Biota	Warm Water Biota	Salmonid Spawning	Primary Contact Recreation	Secondary Contact Recreation
status assessment for 1996							

Table A-9. Reeder Creek

ID-17010215-23	**Reeder Creek**	upstream limit**: headwaters**
	PNRS: **1424.00**	downstream limit: **Priest Lake**

Current Classification in Idaho Water Quality Standards

map code: **map codes not available for unclassified water bodies**	This water body is: **Unclassified**	Designated Special Resource Water: IDAPA 16.01.02.95: **no**

Idaho's Beneficial Uses: IDAPA 16.01.02.100	Domestic Water Supply	Agricul. Water Supply	Cold Water Biota	Warm Water Biota	Salmonid Spawning	Primary Contact Recreation	Secondary Contact Recreation
Designated Beneficial Uses for this water body:	**no**	**no**	**yes***	**no**	**no**	**yes***	**no**
	* denotes implicit designation through IDAPA 1601.02.101.01.a.						

1988 §305(b) and §303(d) Information

§303(d) listed: **no** cause:	assessment info**: IDFG, and DEQ Coeur d'Alene Regional Office (CRO) evaluation**

Idaho's Beneficial Uses: IDAPA 16.01.02.100	Domestic Water Supply	Agricul. Water Supply	Cold Water Biota	Warm Water Biota	Salmonid Spawning	Primary Contact Recreation	Secondary Contact Recreation
status assessment for 1988 Appendix A			**Partial Support (IDFG)**		**Not Supported (IDFG)**		
Appendix B			**Supported/ threatened (CRO)**		**Supported/ threatened (CRO)**		

1992 §305(b) and §303(d) Information

§303(d) listed: **no** cause:	assessment info: **evaluated**

Idaho's Beneficial Uses: IDAPA 16.01.02.100	Domestic Water Supply	Agricul. Water Supply	Cold Water Biota	Warm Water Biota	Salmonid Spawning	Primary Contact Recreation	Secondary Contact Recreation
status assessment for 1992 Appendix D			**Partial Support**		**Not Supported**		

1994 §305(b) and §303(d) Information

§303(d) listed: **yes** cause**: sediment**	assessment info**: no water bodies assessed in 1994. 303(d) listing resulted from EPA analysis of 1992 305(b) report, Appendix D.**

Idaho's Beneficial Uses: IDAPA 16.01.02.100	Domestic Water Supply	Agricul. Water Supply	Cold Water Biota	Warm Water Biota	Salmonid Spawning	Primary Contact Recreation	Secondary Contact Recreation
status assessment for 1994							

1996 §305(b) and §303(d) Information

§303(d) listed: **yes** cause: **sediment**	assessment info: **no water bodies assessed in 1996. 303(d) listing resulted from EPA analysis of 1992 305(b) report, Appendix D.**

Idaho's Beneficial Uses: IDAPA 16.01.02.100	Domestic Water Supply	Agricul. Water Supply	Cold Water Biota	Warm Water Biota	Salmonid Spawning	Primary Contact Recreation	Secondary Contact Recreation
status assessment for 1996							

Table A-10. Lower Priest River

ID-17010215-01 | **Lower Priest River** | upstream limit**: Upper West Branch Priest River**

PNRS: **1407.00** | downstream limit: **Pend Oreille River**

Current Classification in Idaho Water Quality Standards

map code: **PB-350P** | This water body is: **Classified** | Designated Special Resource Water: IDAPA 16.01.02.95: **yes**

Idaho's Beneficial Uses: IDAPA 16.01.02.100	Domestic Water Supply	Agricul. Water Supply	Cold Water Biota	Warm Water Biota	Salmonid Spawning	Primary Contact Recreation	Secondary Contact Recreation
Designated Beneficial Uses for this water body:	**yes**	**yes**	**yes**	**no**	**yes***	**yes**	**yes**
	* protected for future use						

1988 §305(b) and §303(d) Information

§303(d) listed: **no**
cause:

assessment info**: DEQ Coeur d'Alene Regional Office – data evaluated**

Idaho's Beneficial Uses: IDAPA 16.01.02.100	Domestic Water Supply	Agricul. Water Supply	Cold Water Biota	Warm Water Biota	Salmonid Spawning	Primary Contact Recreation	Secondary Contact Recreation
status assessment for 1988 Appendix A	**Supported/ threatened**	**Full Support**	**Partial Support**		**Partial Support**	**Supported/ threatened**	**Supported/ threatened**
Appendix B	**Full Support**	**Full Support**	**Full Support**		**Full Support**	**Full Support**	**Full Support**

1992 §305(b) and §303(d) Information

§303(d) listed: **no**
cause:

assessment info: **evaluated**

Idaho's Beneficial Uses: IDAPA 16.01.02.100	Domestic Water Supply	Agricul. Water Supply	Cold Water Biota	Warm Water Biota	Salmonid Spawning	Primary Contact Recreation	Secondary Contact Recreation
status assessment for 1992 Appendix A	**Partial Support**	**Supported/ threatened**	**Partial Support**		**Partial Support**	**Supported/ threatened**	**Supported/ threatened**
Appendix D	**Supported/ threatened**	**Full Support**	**Partial Support**		**Partial Support**	**Supported/ threatened**	**Supported/ threatened**

1994 §305(b) and §303(d) Information

§303(d) listed: **yes**
cause**: sediment**

assessment info**: no water bodies assessed in 1994. 303(d) listing resulted from EPA analysis of 1992 305(b) report, Appendix D.**

Idaho's Beneficial Uses: IDAPA 16.01.02.100	Domestic Water Supply	Agricul. Water Supply	Cold Water Biota	Warm Water Biota	Salmonid Spawning	Primary Contact Recreation	Secondary Contact Recreation
status assessment for 1994							

1996 §305(b) and §303(d) Information

§303(d) listed: **yes**
cause: **sediment**

assessment info: **no water bodies assessed in 1996. 303(d) listing resulted from EPA analysis of 1992 305(b) report, Appendix D.**

Idaho's Beneficial Uses: IDAPA 16.01.02.100	Domestic Water Supply	Agricul. Water Supply	Cold Water Biota	Warm Water Biota	Salmonid Spawning	Primary Contact Recreation	Secondary Contact Recreation
status assessment for 1996							

APPENDIX B

Significant Comments Received from Review of
Draft Priest River Subbasin Assessment and TMDL
and
DEQ Response to Comments Received

Table B-1. Significant Comments Received from Review of Draft Priest River Subbasin Assessment and TMDL, and DEQ Response to Comments Received

Acronyms used for commenting Agencies, Organizations, and Individuals

AWR =	Alliance for the Wild Rockies, The Lands Council, and Selkirk Priest Basin Association
BONN =	Bonner County
BRosen =	Mr. Barry Rosenberg
DHunt =	Mr. David Hunt, Chairman, Priest Lake Watershed Advisory Group
EPA =	U.S. Environmental Protection Agency
IDFG =	Idaho Department of Fish and Game
IDL =	Idaho Department of Lands
KEA =	Kootenai Environmental Alliance
KTOI =	Kalispel Tribe of Indians
* =	An asterisk at the end of an acronym signifies that the comment is similar to the one cited (without asterisk)

General Category of Comments Received, and Citation of Specific Comments within the Categories	Agency/ Organ.	DEQ Response to Comments
1. Dominance of brook trout in mid western and lower basin streams, and diminished populations of native cutthroat trout and bull trout:		The issue of population dominance of the introduced brook trout and decline of native cutthroat trout has been of significant debate. The §303(d) listed streams which are proposed for de-listing based in part on adequate population densities of brook trout are: Lamb Creek, upper Reeder Creek, and North Fork East River. A DEQ reply letter to EPA regarding this matter (Mabe 2001), states… "it is the goal of the Clean Water Act that water quality be adequate to support fisheries, however it can not be the goal of water quality management to always assure that fisheries management objectives are met. In the Priest River subbasin, our assessment is that the decline or depression in populations of native species may be only partially the result of changes in water quality, if at all. And it is not just a change in water quality we must look for, but a decline that has crossed a threshold to cause impairment. Fish managers introduced brook trout into the Priest River watershed during the early 1900s. Often these interlopers are better competitors than the natives are; to date few if any interlopers have been successfully extirpated. And there are other causes of species decline - migration barriers, direct habitat alteration - which are also concerns. These are certainly impairments of some sort, but are they water quality impairments? What seems clear is that they are not remedied by a pollutant load reduction that can be specified in a TMDL.
The discussion of factors and mechanisms for how land use practices affect native species is glossed over. University of Montana researchers (and others) have observed that brook trout may have a competitive advantage over bull trout in degraded habitats, and in particular increased fine sediment and loss of shade may favor exotic brook trout. Similar mechanisms have been suggested for the apparent ability of brook trout to replace westslope cutthroat trout in some streams. The presence of brook trout with few or no cutthroat or bull trout present, in a stream where they were historically present, is very possibly an indication that water quality has declined. We believe this is what has occurred on most west-side streams, where cutthroat are rare and bull trout are virtually non-existent.	IDFG EPA*	
There is considerable evidence to indicate that habitat and watershed disturbance in the Priest system has favored brook trout over native westslope cutthroat trout and bull trout. Where considerable road construction, agricultural use and/or timber harvest has occurred in tributary drainages with relatively low gradient stream reaches, brook trout are typically the predominant species. Because brook trout are more tolerant of higher water temperatures, and are capable of spawning in relatively sandy substrate provided there is some upwelling, they are persisting (and in some cases thriving) in conditions where native cutthroat trout and bull trout populations would be depressed or absent even if brook trout were not present in the system. We would expect to see healthy resident cutthroat populations in the tributaries where habitat conditions are good.	IDFG	
IDEQ has decided that sustaining populations of the non-native and invasive brook trout constitutes support of the beneficial uses cold-water biota and salmonid spawning. These decisions are of deep concern to us. The threat of brook trout to bull trout and cutthroat trout is widely documented. Your agency has an opportunity to work collaboratively with other agencies toward recovery of native species and native habitats and we encourage you to do so. Efforts consistent with this management strategy would be to defer de-listing tributaries currently not supporting cold-water biota and salmonid spawning until these uses are met by native species. We do not support IDEQ's decisions to de-list tributaries based on presence of brook trout indicating that cold-water biota and salmonid spawning beneficial uses are met. The Kalispel Tribe does not consider the presence of healthy brook trout populations, and no other salmonid populations, to be an indicator of support of cold water biota and salmonid spawning.	KTOI	

Table B-1. Continued

General Category of Comments Received, and Content of Specific Comments	Agency/ Organ.	DEQ Response to Comments
Comment 1 continued: native salmonids		**DEQ reply letter to EPA (Mabe 2001) continued:**
We do not agree that sustaining populations of non-native, invasive brook trout constitutes support of the beneficial uses. We contend that the responsibility for TMDL development clearly includes (and the Clean Water Act requires) restoration and/or maintenance of native fish populations. The threat of brook trout to bull trout and westslope cutthroat trout is widely documented, therefore their presence is indicative of impaired CWB and SS, not full support. The presence of large numbers of non-native brook trout in upper Reeder Creek are indicative of serious problems.	AWR DHunt* BRosen*	While we support IDFG's new fisheries management goal of restoring native species, we can not automatically conclude that our aquatic life use is not met were resident salmonids are self-sustaining. We suspect it is going to take more than TMDLs, even more than water quality improvements, to meet these new goals.
IDL recognizes that some agency research demonstrates that introduced brook trout may be more tolerant of increased sediment and temperature extremes. We agree that brook trout do have the ability to infringe upon and populate the range of suitable habitat conditions for both bull trout and cutthroat trout. However, there are examples where brook trout have successfully established thriving populations in pristine, undisturbed habitats. Therefore, we do not feel that the presence of brook trout in a waterbody necessarily indicates impaired water quality.	IDL	In the Priest River watershed IDFG has asserted that cutthroat and bull trout are less tolerant of elevated levels of sediment, and "believe" this has driven these species out of most west-side streams. Their comments to us speak of "considerable evidence", but they have not provided DEQ nor EPA with any evidence to substantiate the claim. This evidence would have to support a lower target for sediment loading that would (presently is) supporting brook trout. With such evidence we might be able to craft a TMDL for sediment on the basis of impairment to cold water aquatic life."
2. Lamb Creek should not be de-listed because of high current sediment loading, and lack of native salmonids.		
Lamb Creek should not be de-listed. The stream is laden with sediment, and the Forest Service is currently carrying on extensive clear-cut logging in the drainage for the Douglas fir beetle timber sale that will increase sediment load. Lamb Creek is also being impacted by grazing on Forest Service and private lands.	BRosen	Road density statistics for Lamb Creek are on the upper end for Priest River basin watersheds, and the sediment load calculations of Section 4 estimate a current sediment load of 218% above natural background levels.
The SBA data for Lamb Creek does not support IDEQ's recommendation to de-list Lamb Creek for sediment. The USFS characterization of Lamb Creek is Not Properly Functioning and Functioning at Risk; there is a high road density of 6.2 mi/mi^2; and the are 52 stream crossings over 31 miles of perennial streams.	KTOI AWR* DHunt*	However, the instream bioassessments measured within Lamb Creek do meet DEQ criteria for cold water biota and salmonid spawning beneficial uses: average MBI = 3.7
Our agency continues to be very concerned about the criteria being used for de-listing, and that some streams which in fact are impaired, such as Lamb Creek, will be de-listed with no effort to improve conditions. Our preference is to see impaired streams remain on the list, and to have TMDLs established which reasonably, fairly, and equitably distribute the responsibility of water quality improvement, using methods which are adequate to get the job done while minimizing impacts on affected parties. We encourage review of the criteria to ensure that impaired streams are not removed from the list.	IDFG	average total salmonid density = 0.6 salmonids/m^2/hr effort 4 salmonid age classes including juveniles (<100 mm) [density and age classes were brook trout] abundant sculpin density in the lower reach sampling area.

Table B-1. Continued

General Category of Comments Received, and Content of Specific Comments	Agency/ Organ.	DEQ Response to Comments
3. Draft recommendation to de-list Kalispell Creek and Binarch Creek because of current, low - moderate sediment load calculations.		
The fact that excess sediment delivery may be the result of past land use more so than current use does not eliminate the need to address it in a TMDL. Does USFS have monitoring data indicating that the sediment sources in the Kalispell Creek watershed that have been fixed, are no longer contributing sediment to the system? The relocation of Road 308 is not guaranteed. Kalispell Creek should not be de-listed, and it should have a TMDL. For Binarch Creek, excessive sediment is clearly affecting the fish, hence the need for a TMDL.	AWR BRosen* DHunt* IDFG* KTOI*	The Priest Lake Watershed Advisory Group (WAG) in their review of the SBA and TMDL, recommended that any §303(d) listed stream judged as Not Full Support should not be de-listed, regardless of the results of sediment calculations. Kalispell Creek remains on the list and a TMDL has been prepared.
Although there is conflicting information, it would appear that Binarch Creek does not fully support its uses, and should not be de-listed. We recommend retaining this water on the 303(d0 list and writing a sediment TMDL, or revising the TMDL schedule and collecting additional information to better assess beneficial use support status.	EPA	For the same reason stated above, the Priest Lake WAG recommended not to de-list Binarch Creek. However, for this stream the NFS status was in large part based on a single electro-fishing survey. The WAG stated that this was insufficient data to make a confident status call. The WAG agreed with DEQ that a status call for Binarch Creek will be deferred until a more thorough fish population survey is conducted during the summer of 2001 within the Binarch Creek Research Natural Area.
Binarch Creek should also not be de-listed. The USFS project files for the Douglas-fir beetle (DFB) project indicate that: the B channel reaches have extremely poor pool habitat due to the aggradation of sediment; the DFB timber sales will increase peak flows; the DFB project proposes to obliterate only 0.5 miles of road out of the 50 miles of road currently in the drainage; and there has been considerable timber harvesting over the past 25 years. The impacts of the DFB timber sale should be quantitatively assessed before this stream is considered for de-listing, and it would be foolish to jeopardize a genetically pure population of westslope cutthroat trout.	BRosen	
4. Proposed §303(d) de-listing of Trapper Creek, Two Mouth Creek, and Tango Creek.		
IDL strongly supports the proposed de-listing of Trapper Creek and Two Mouth Creek. All collected data indicates that these streams are in full support of beneficial uses according to established criteria.	IDL	As detailed in Section 3 of this report, these three streams clearly meet the DEQ Full Support criteria for cold water biota and salmonid spawning. Native cutthroat trout are present in the electro-fishing surveys, and bull trout have been captured within Trapper Creek and Two Mouth Creek.
The de-listing decisions for Trapper, Two Mouth and Tango Creeks should be re-visited in light of current levels of sediment and non-native species. One logical option would be to defer de-listing tributaries currently not supporting native species based on temperature criteria or other data, until these are met.	AWR KTOI*	
The SBA cites an IDL report as saying that the Trapper Creek bull trout population is stable. We disagree with that statement. Our data indicate a small and "at risk" bull trout population.	IDFG	
5. Fish habitat was not sufficiently taken into consideration for judgement of beneficial use status.		BURP habitat scores, HIs, were used only to a minor extent in beneficial use status calls for Priest River basin. It has been DEQ policy as stated in the Water Body Assessment Guidance documents, to rely heavily upon bioassessment protocols. It is believed that many habitat measurements are subjective, and lack repeatability among stream survey crews.
Fish habitat, including stream temperatures, pool quantity and quality, and spawning habitat should be evaluated against qualities that provide good native fish habitat and not be compared with basin wide averages. Especially since the drainages in the Priest River basin are, for the most part, severely degraded.	BRosen	

Table B-1. Continued

General Category of Comments Received, and Content of Specific Comments	Agency/ Organ.	DEQ Response to Comments
6. Proposed §303(d) de-listing of Middle Fork and North Fork East River.		
The data collected and analyzed for the Middle Fork and North Fork East River, including: BURP, channel stability, cumulative effects analysis and fish density surveys, clearly indicate that these streams are currently in full support of designated beneficial uses. There appears to be no actual water quality data presented that indicates beneficial uses are suppressed; thus, an Advisory Sediment TMDL is not warranted. In fact, the East River Forks are supporting some of the highest densities of cutthroat in the Priest River subbasin. In addition, the Middle Fork is the only subwatershed in the lower basin that supports a bull trout population. It has been well documented that bull trout are highly sensitive to both temperature and sediment, yet they continue to exist in the Middle Fork, indicating that stream temperatures and instream sediment levels are low and water quality is more than adequate to support bull trout.	IDL	Instream bioassessments of Middle Fork East River clearly meet DEQ criteria for CWB and SS beneficial uses. EPA has agreed with this assessment. Measures of Full Support were: average MBI = 4.3 average total salmonid density = 0.07 salmonids/m^2/hr effort for BURP, but IDFG & IDL electro-fishing results were 11 salmonids/100 m^2 with abundant cutthroat in mid to upper reaches. 4 salmonid age classes including juveniles (brook trout). abundant sculpin density in both lower and middle sampling reaches. Instream bioassessments within North Fork East River were less clearly FS, but data did meet measures of FS: average MBI = 4.3 average total salmonid density = 0.2 salmonids/m^2/hr effort for BURP, and IDFG electro-fishing results were 6 salmonids/100 m^2 with cutthroat in upper reaches. 2 salmonid age classes including juveniles (brook trout), but SS = FS under WBAG criteria with HI > 73. presence of sculpins
Much of the available information points to the need for a mandatory TMDL for the Middle and North Forks of East River. These major tributaries appear to suffer from poor to mediocre habitat conditions and low densities of cutthroat. The lower reaches of the two Forks and the main stem suffer from the "cumulative effects of excessive sediment, hydrologic disequilibrium, historic riparian harvests, and possibly elevated temperatures" (SBA at 114). The Middle Fork does not meet the minimum target levels of 0.1 – 0.2 fish/m^2/hr effort.	AWR	
The North Fork East River should not be de-listed because it has no native cutthroat trout, and a very low non-native brook trout population. The Middle Fork should not be de-listed to protect the dwindling and threatened bull trout and cutthroat trout.	DHunt	
Referring to the East River as a last stronghold for bull trout is probably an over statement. Based on our data and more recent observations by IDL, bull trout in the East River are in a remnant status.	IDFG EPA*	
The East River is listed for DO, flow, temperature and sediment on the 1998 303(d) list. We assume that DO will remain on the list until measurements are obtained.	EPA	
7. Main Stem East River		
The limited water quality data that was collected in the lower main stem East River does identify serious long term direct impacts to the stream and surrounding riparian area. The conversion of riparian wetlands, beaver ponds, and cedar/hemlock habitats to pasture and agriculture has permanently removed LOD and future recruitment. This conversion to pastureland has allowed for accelerated stream bank erosion, reducing long-term bank stability, reducing streamside shade, and reducing favorable fish habitat. We believe the accelerated bank erosion and high percentage of unstable banks is a reflection of the direct impacts associated with the adjacent land use activities, and not an undocumented water yield or sediment problem.	IDL	It is acknowledged that the main stem East River has had accelerated stream bank erosion and a high percentage of unstable banks due in part to a history of large animal access. The CWE Hydrologic Risk Rating for Middle Fork East River also suggests a risk to stream bank erosion from increased peak flows. A beneficial use status call for the main stem is proposed for deferral until a current fish survey is conducted during the summer of 2001.
The main stem East River should not be de-listed because it has severe cattle damage, and severe dissolved oxygen, sediment and temperature problems. Also, a current fish survey has not been conducted on this section.	DHunt	

Table B-1. Continued

General Category of Comments Received, and Content of Specific Comments	Agency/ Organ.	DEQ Response to Comments
8. Priest River basin streams that are not on the §303(d) list, and appear to be Not Full Support based on the BURP and other data.		
According to Table 2-13 several of the Non-listed (NL) streams have high road densities, and a high frequency of stream crossings. Other information in the SBA indicates that beneficial uses are likely not fully supported in many of the NL streams. Soldier Creek is a prime example. The BURP habitat score was very poor in the lower reach, 75% of the watershed has been logged, the headwaters have been burned, and the timber road density and riparian road density is extremely high. Soldier Creek is also considered as likely to support bull trout spawning and rearing. This is obviously a watershed in need of restoration efforts that could benefit from a TMDL.	AWR EPA* KTOI*	All non-listed stream segments presented in Section 3.5 of this report will be evaluated for beneficial use status for the DEQ 2002 §303(d) list. The Coeur d'Alene Regional Office will accomplish this evaluation by December 2001. It is anticipated that the mechanism for making status calls will be the Water Body Assessment Guidance, Second Edition (WBAGII). This guidance document is currently in draft format and undergoing peer review and a public comment period.
The draft Priest River SBA and TMDL provides a cursory description of the streams that have not yet been assigned WQLS status. The Upper West Branch and its tributary Goose Creek is a good example of this type of cursory description. The UWB is extremely degraded, and Goose Creek, its main tributary, is probably one of the most degraded streams in the Priest lake area.	BRosen EPA*	
Should Caribou Creek be categorized as Not Full Support and put on the 303(d) list? The electro-fishing results do not meet the criteria you suggest for being Full Support of cold water biota on page 169.	EPA	
9. Exceedances of various water temperature criteria, and deferral of §303(d) listing decisions based on temperature exceedance.		
The SBA concentrates on sediment loads and defers all decisions concerning temperature pending resolution of DEQ re-evaluation of various temperature criteria and negotiations with EPA. We encourage you to consider effects of land use on temperature when making decisions concerning sediment loads. Many of the land use practices affecting sediment delivery to streams also affect stream temperatures. A prudent approach involves mandating or recommending management practices to address multiple parameters. It is inappropriate to delay judgment on temperature exceedances given the irrefutable data showing high temperatures. Again, we encourage IDEQ to take the opportunity to manage for multiple water quality parameters when drafting subbasin assessments and total maximum daily loads.	KTOI	The final version of this SBA and TMDL continues with the deferral of §303(d) listing decisions for streams that exceed current temperature criteria. In the Priest River basin it appears that all main stem stream segments, from lower to middle reaches, exceed the State cutthroat spawning and incubation criteria during July, and where applicable, the EPA bull trout criteria from July - September. Temperature exceedance judgements will defer until the mentioned negotiations with DEQ and EPA are complete, along with forthcoming guidance received from the Northwest Regional Temperature Criteria Development Team. For the two watersheds that will be going forth with a sediment TMDL, Lower West Branch and Kalispell Creek, development of the TMDL Implementation Plans can certainly incorporate measures to help mitigate elevated water temperature.

Table B-1. Continued

General Category of Comments Received, and Content of Specific Comments	Agency/ Organ.	DEQ Response to Comments
10. Inclusion of Advisory TMDL for East River and Lamb Creek		
It is not clear what is meant by the term "Advisory TMDL". Does "advisory" mean that load calculations are advised, but won't be required? We would recommend that you not use this term and simply call the water quality plans TMDLs.	EPA	The draft SBA and TMDL included Advisory TMDLs for the Lamb Creek and East River watersheds, two stream systems where Full Support of beneficial uses were determined (excluding the main stem East River). These TMDLs were meant as resource information, to the Priest Lake WAG and others, as a means to present calculation results for sediment yield and load allocations for two watersheds that did show moderate - high current sediment load over background. The concept of an Advisory TMDL caused confusion, and they have been eliminated from the final report.
11. Appropriate Measures of Full Beneficial Use Support as part of a TMDL.		
The trout density level criteria (0.1 - 0.2 fish/m^2/hr) is based on "reference" streams within the NF Coeur d'Alene drainage. In comments on the draft SBA we expressed concern regarding the criteria used to select the reference streams on which it is based. This SBA indicates that appropriate reference streams for the mid and lower western Priest Basin streams unfortunately do not exist.	AWR	The target density criteria of 0.1 - 0.2 total trout/m^2/hr effort for the North Fork Coeur d'Alene River, was in part established from data supplied for the upper Priest River basin streams, Trapper Creek and Two Mouth Creek. Data collected within the Priest River basin shows that the target density above is approximately equivalent to the range of 5 – 10 total trout/100 m^2.
As we have repeatedly pointed out in previous comments on the adequacy of the WBAG process, the Full Support criteria for salmonid spawning is inadequate, and its use as a criteria for determining FS for SS is arbitrary.	AWR	While the Trapper Creek and Two Mouth Creek watersheds have had a history of timber harvesting and road building, they are clearly Full Support, and are considered potential candidates as reference streams. Other candidate reference streams reside in the Hughes Fork and Upper Priest River watersheds, where densities are most commonly in the range of 5 - 10 total trout/100 m^2; although in a few tributary streams densities ranged 20 - 30 total trout/100 m^2.
The use of sculpin for determining whether excess fine sediment is a problem cannot be applied in the Priest Basin since high numbers of sculpin were found in lower Lamb Creek which has a high sand component.	AWR	The presence of sculpins within electro-fishing surveys has become incorporated into the DEQ indicator metrics for cold – clean water in the draft WBAGII methods. The primary sculpin species in the Priest River basin, slimy sculpin, can apparently thrive within large grained sandy substrate of lower stream reaches, e.g. lower segments of Lamb, Kalispell, Quartz, and Big Creeks; but are absent in reaches of more silty substrate, e.g. mid Reeder Creek, Lower West Branch, and Binarch Creek.

Table B-1. Continued

General Category of Comments Received, and Content of Specific Comments	Agency/ Organ.	DEQ Response to Comments
12. Methods used for sediment load calculations; use of WATSED model in sediment calculations; and the establishment of a loading capacity 100% above natural background.		
It appears that most assumptions used to calculate sediment load tend to underestimate the load. Just using CWE for road sediment likely underestimates the load significantly as you point out with your example of a modeling method that estimates more than twice the CWE load calculated. From the partial road CWE inventories, you do not prorate the entire road network in the watershed for either road failures at stream crossings or for failures at other than stream crossings. Landslides are not included in the calculations at all. You do include the total road network mileage in sediment yield calculations, specifically to offset the underestimate of not including forest activities in the forested land calculations. However, there is no discussion of why you would expect that these assumptions would approximately cancel each other out in terms of load volume. It is necessary to apply conservative assumptions to deal with this uncertainty.	EPA	The TMDL discussion of Section 4 fully acknowledges the inherent high error of predicting sediment yield to streams using the methods presented. **The approach taken was more geared to estimate the relative, current sediment increase over background which could be comparable among the mid to lower basin watersheds that were analyzed**. Producing sediment yield values to streams with less error would take far more detailed in-the-field assessments for each watershed than currently exists. This report has recommended that increased field assessments and validation of sediment calculation methods be incorporated into the TMDL Implementation Plan.
EPA has a number of concerns with IDEQ's proposed approach for using the results of WATSED for setting TMDL targets and annual sediment levels, which fully support beneficial uses. EPA does not believe the use of 100% above background as a sediment target is justified based on information presented in the Lower West Branch TMDL. Concerns with WATSED and a 100% loading capacity are as follows: - WATSED is a model most used to provide useful information to identify sources of sediment and compare management alternatives, not to predict specific quantities of sediment yielded and to base significant decisions, - model extrapolation outside the Idaho Batholith should be done with caution, - there is insufficient model validation and calibration in northern Idaho Forests, - at best the certainty of annual load predictions is +/- 50% to 70% where there is good information on critical parameters, particularly road mileage and maintenance information. Unless the model is calibrated and validated, the accuracy of sediment estimates from differing geology's and landforms is unknown.	EPA	There seems to be a misconception that the sediment calculation method is from a WATSED computer run. This is not correct. WATSED landtype sediment yield coefficients were used for the entire estimate of background sediment yield (with assumed 100% delivery to streams), and the forested acreage of current sediment load (minus the acreage of the road system and land converted to agriculture). The WATSED landtype coefficients take into account erosional characteristics of the varying parent geology, soils, and hydrology, such as differences between granitic and belt geology. While not calibrated to the degree of BOISED in the Boise National Forest, there have been some in-field assessments of sediment yield from different WATSED landtypes in northern Idaho forests. WATSED coefficients were determined to be the best available method at hand for northern Idaho TMDLs. Section 4.1.3 clearly describes the other sediment yield methods and calculations to develop current sediment yield estimates other than WATSED for forested land. State wide, DEQ TMDLs have adopted the IDL – CWE inventory protocol and conversion of road CWE scores to sediment delivery to streams. While appearing to underestimate sediment yield compared to more site-specific methods cited in Section 4, the CWE inventory and scoring protocol provides a time efficient method to cover many hundreds of road miles that must be addressed in a 4th order HUC SBA and TMDL.
One approach recommended by EPA is to set the target of the TMDL at the natural level of sediment production. We agree with IDEQ's explanation that beneficial uses would be fully supported at some yet undefined level above natural background even though it is beyond current available predictive tools to identify what that level above background is.	EPA	
To establish a loading capacity other than natural background level would require a sediment calculation method more robust than presented in the draft SBA and TMDL.	EPA	

Table B-1. Continued

General Category of Comments Received, and Content of Specific Comments	Agency/ Organ.	DEQ Response to Comments
Comment 12 continued: methods of sediment calculation.		**DEQ response continued:** As described in Section 4.1.3, an attempt to offset the apparent underestimation of CWE, and by not accounting for timber harvesting activities other than road building (skid trails for example), was to apply CWE sediment delivery to the entire road network mileage. This method was used throughout all watersheds analyzed for the sake of consistency. EPA's comment is correct in that there is no estimate attempted on the degree in which the sediment calculation for the entire road system may offset that lack of sediment yield from other timber activities. The EPA comment on not prorating road mass failures to the entire road network is only correct for sediment calculations of the East River drainage. On all west side watersheds of USFS management, total slides and stream crossing washouts per year were based on USFS road maintenance experiences and considered the entire road network. Landslide sediment delivery was included on the road prism. An estimate of landslides occurring on non-roaded forested land was not included. From aerial photographs, these appear to be minor. The concept of establishing loading capacity at 100% above background for the Lower West Branch TMDL and 50% above background for the Kalispell Creek TMDL was fully explored in Section 4.2.2. It remains the contention of DEQ that watersheds throughout the Priest River basin exhibit Full Support for cold water biota and salmonid spawning beneficial uses with historical land use activities and sediment delivery to streams beyond the natural background level. Establishing loading capacity at background level discounts this known fact, and it is not a feasible or realistic target from an economical and societal standpoint. By agreement with EPA, the loading capacity for Lower West Branch has been lowered to 50% above background for this final TMDL. Several comments refer to the lack of calibration and validation of the sediment load calculations specifically within 5th and 6th order watersheds of the Priest River basin. DEQ agrees with these comments. The task of BURP sampling and the Water Body Assessment Guidance is to determine which of the watershed streams in a large 4th HUC such as Priest River basin are truly water quality impaired (Not Full Support), and which streams are fully supporting their beneficial uses. The results of this task have been documented within this Subbasin Assessment. As the scope of this task and acreage involved narrows by identifying impaired streams, a focus can change to more accurately and thoroughly developing sediment sources and amounts yielded. DEQ would expect that within TMDL identified watersheds, in-the-field assessments leading to calibration of sediment yield calculations would be incorporated into development of the TMDL Implementation Plan.
Any model used in the "credit" process, such as the Forest Service's WATSED model, should be validated and a report of the validation process should be available to the public. To date, the INPF has not validated the WATSED model. Monitoring is the key.	BRosen	
The WATSED model does not account for rain-on-snow events. The Final Assessment should indicate: the date of the most recent calibration and verification of the model; the watersheds on the Priest Lake R.D. where the calibration and verification occurred; and indicate if any 1st, 2nd, or 3rd order watersheds were included during the calibration and verification process of WATSED by the Forest Service.	KEA	
We find the rationale for the decision to use 100% above estimated natural background levels to be somewhat inscrutable. We do not find that the data sets presented (calculated current sediment load) indicate conclusively that 100% above background is a suitable threshold for loading capacity/TMDL purposes.	KEA	
The sediment calculation method identifies relative sediment delivery rates rather than actual rates. The Middle Fork and North Fork East River were modeled to have 145% and 128% increase of current sediment load over background, yet these streams have some of the lowest percentages of measured fine sediment in the entire Priest River basin, ranging from 11 to 35 %. In contrast, streams such as Binarch and Kalispell have been modeled to have 73% and 84% increase sediment over background, yet the percent fine sediment in both these drainages ranges from 24 – 100%.	IDL	
The calculation method is based on perceived assumptions and modeled coefficients that have insufficient validation, and the modeled sediment load calculations are not reflected in the water quality sediment monitoring data.	IDL	

Table B-1. Continued

General Category of Comments Received, and Content of Specific Comments	Agency/ Organ.	DEQ Response to Comments
13. The effect and relationship of roads and clear-cut harvests on: peak flows; sediment from rain-on-snow events; stream bank erosion; and fisheries habitat degradation.		
[Editors note: in their comment package, the Kootenai Environmental Alliance cites several pages of peak high flow statistics from the USGS gauging stations on Lower Priest River and other gauging stations from the Priest Lake baseline study. Also cited are numerous statistics of clear-cut harvests in the basin, and studies in other northern Idaho National Forests on the relationship of clear-cut harvests and peak rain-on-snow events. These statistics are not repeated here. Below are the main points stated regarding these statistics:]		The comment package from KEA was difficult to decipher for main points because of the numerous flow data cited which for some reason included cfs conversions to gallons. The pages of data were prefaced by stating that, "the following information seems to indicate that flow alterations in the watersheds have caused streambed instability and extensive coarse bedload movement in streams." I could not come up with that conclusion based on the data supplied.
Information presented in our comments seems to indicate that flow alterations in the watersheds have caused streambed instability and extensive coarse bedload movement in streams and creeks in the Priest River subbasin. This has resulted in degradation to fisheries habitat, which includes the filling of pools, a loss of pool complexity and a reduction of pool frequency.	KEA	The Priest River Subbasin Assessment did provide: all flow data where known; maps and data of canopy removal indexes from CWE aerial photography interpretation, and historical clear-cut acreages from the USFS; the calculated CWE Hydrological Risk Ratings; instream BURP habitat data and other collected habit data such as width/depth ratio, pool frequency, and residual pool volume; stream bank erosion data; and USFS analysis of watershed disequilibrium in the way of "Functioning Condition." Also mentioned was construction by USFS of structures to create pools in Kalispell Creek, and then subsequent pool filling by moving sand bedload.
The large amount of water that was moving in the 902 sq mile area on the days cited, together with the associated stream power would be expected to have moved significant amounts of coarse bedload in a number of streams and creeks in watersheds within the drainage. The clear-cut units in the watersheds that are less than 40 years old have not recovered hydrologically, according to the information supplied.	KEA	
The Final Assessment report should supply data that would inform the public as to the number of acres that have been clear-cut since 1960 in the watersheds on the Priest Lake Ranger District.	KEA	This author contests the comments by KEA that water flow, clear-cut harvest acreage, and other data and information was withheld from the public in this SBA.
The Final Assessment should also supply data for the number of acres of State Forest lands that have been clear-cut since 1960 in the watersheds that are within the Subbasin Assessment boundary. Cites that the CWE HRR for Middle Fork East River may indicate stream channel impairment due to increases in peak flow discharge and sediment delivery. The Final Assessment should indicate to the public whether there is any long term historical data regarding actual or estimated annual flow volumes from the East River watershed.	KEA	It is agreed that an analysis of the relationship between canopy removal and road construction with peak flows and instream habitat conditions was not as fully explored as what would be desired by KEA and others. Degradation of habitat linked to watershed activities was though considered in the judgement of Lower West Branch as water quality impaired. Again, the approach taken by DEQ for beneficial use status does heavily rely on the instream bioassessment measurements. It would be assumed that TMDL implementation efforts for sediment reduction will lead to a degree of improvement in channel disequilibrium linked to accelerated peak flows.
Final Assessment should indicate if historical cfs flow volume exists for all other east side streams, and if WY 95 peak flows for each watershed are considered as normal. Final Assessment should indicate if historical cfs flow volume data for all watersheds would show high peak flows occurring in these watersheds before there were logging activities.	KEA	
It is expected that rain-on-snow events will continue to occur in the Subbasin Assessment area, and that high cfs flows will continue to occur. If the proposed TMDLs do not reduce the high cfs flows and movement of course bedload continues, will important fisheries and habitat be protected and improved with the proposed TMDLs? The Final Assessment should supply analysis of the expected impacts to fisheries habitat in the streams if high cfs flows continue to occur after TMDL sediment reduction actions.	KEA	

Table B-1. Continued

General Category of Comments Received, and Content of Specific Comments	Agency/ Organ.	DEQ Response to Comments
Comment 13 continued: the effect and relationship of roads and clear-cut harvests on: peak flows; sediment from rain-on-snow events; stream bank erosion; and fisheries habitat degradation.		
Page 59 mentions instream fish habitat structures constructed by USFS. Final Assessment should indicate if there is USFS survey information concerning the number of structures that have been damaged or removed in one or more streams after high peak flows and/or rain-on-snow events.	KEA	
Closer attention should be paid to the relationship of in-channel and stream bank erosion resulting from logging, especially when employing the "credit" scheme. Site-specific monitoring should be employed to determine the relationship between peak flows generated by roads, and clear-cut logging, and in-channel and stream bank erosion. The risk of massive inputs of sediment from rain-on-snow events should also be given more consideration.	BRosen	As TMDL watersheds go into the implementation phase, it would be anticipated that a greater degree of site-specific analysis of sediment yield and monitoring would be incorporated. This must be done to achieve a level of cost effective measures for sediment reduction.
14. Habitat and flow alterations as pollutants of concern under the Clean Water Act.		
KEA disputes that habitat and flow alterations are not pollutants under Section 303(d) of the CWA. Habitat and flow alterations that have negatively affected bull trout and westslope cutthroat populations and fisheries habitat in the Basin fall under the fisheries requirements of the CWA in our opinion. There are no Federal Court rulings that we are aware of that have stated the establishment of TMDLs supersedes the requirements of the CWA.	KEA	
15. Inequity of sediment load allocation to Bonner County for Lower West Branch TMDL.		
From your analysis, the County maintains around 0.3% of the land in the Lower West Branch watershed. In addition, the county roadways only contribute 3.6% of the total sediment load. However, in your scenario, the County would be required to provide 8.4% of the TMDL reduction, or 28 times our land allocation. I believe this puts too high a burden on the County. I believe there must be a more equitable way to allocate. All of the land maintained by the county is roadway, while a small percentage of land held publicly or privately is roadway. Certainly, dirt or gravel roadways produce more sediment than forested land. So it follows that the state, USFS and private holdings benefit from the portions of their land that are not roadway. Further, not only does everyone that uses the private, USFS or state lands benefit from the use of the county roadways, those roadways are only there to serve those stakeholders. Therefore, I propose the sediment reduction allocation assigned to the county be reduced to a figure between the 0.3% of land holdings and the 3.6% of the calculated current sediment load. Further, the sedimentation numbers attributed to the County road may need to be adjusted. In your explanation, it is stated that the county cleans the ditches each year. Though we have been cleaning the ditches the past two years as a part of a road building project, generally we clean the ditches when necessary or about once every 5 - 10 years.	BONN	The methods of sediment load calculation for county roads, and the reasons that an inequity developed between land ownership percentage and load allocation, are explored in Section 4.3.1.8, the TMDL for Lower West Branch. A primary reason as stated by the County comments is that 100% of land assigned to county maintenance is a road system. During the development phase of the TMDL Implementation Plan, DEQ has recommended that a more equitable allocation for County roads be made. It would be anticipated that Bonner County would be a member of a local Watershed Advisory Group for the Lower West Branch TMDL, and thus would be a part of the planning team.