Addendum
Priest River Subbasin Assessment
And Total Maximum Daily Load

April 2003

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Prepared by:
Glen Rothrock
Coeur d'Alene Regional Office
Idaho Department of Environmental Quality
2110 Ironwood Parkway
Coeur d'Alene Idaho 83814

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Abbreviations, Acronyms, and Symbols

303(d)	Refers to section 303 subsection (d) of the Clean Water Act, or a list of impaired water bodies required by this section
µ	micro, one-one thousandth
§	Section (usually a section of federal or state rules or statutes)
AWS	agricultural water supply
BAG	Basin Advisory Group
BMP	best management practice
BOD	biochemical oxygen demand
BURP	Beneficial Use Reconnaissance Program
C	Celsius
CFR	Code of Federal Regulations (refers to citations in the federal administrative rules)
cfs	cubic feet per second
cm	centimeters
CWA	Clean Water Act
CWAL	cold water aquatic life
CWE	cumulative watershed effects
DEQ	Idaho Department of Environmental Quality
DO	dissolved oxygen
DWS	domestic water supply
EPA	United States Environmental Protection Agency
EPT	ephemeroptera – plecoptera – trichoptera (macroinvertebrate taxa)
F	Fahrenheit
FPA	Idaho Forest Practices Act
FS	Fully Supporting
GIS	Geographical Information Systems
HUC	Hydrologic Unit Code
IDAPA	Refers to citations of Idaho administrative rules
IDFG	Idaho Department of Fish and Game
IDL	Idaho Department of Lands
IDWR	Idaho Department of Water Resources
IPNF	Idaho Panhandle National Forests
IREAF	Idaho River Ecological Assessment Framework
LA	load allocation
LC	load capacity
LWD	Large woody debris
m	meter
m^2	square meters
mi	mile

mi^2	square miles
mg/l	milligrams per liter
mm	millimeter
MOS	margin of safety
MWMT	maximum weekly maximum temperature
n.a.	not applicable
NA	not assessed
NB	natural background
nd	no data (data not available)
PCR	primary contact recreation
ppm	part(s) per million
NFS	Not Fully Supporting
NRCS	Natural Resources Conservation Service
NTU	nephlometric turbidity unit
RDI	DEQ's river diatom index
RFI	DEQ's river fish index
RMI	DEQ's river macroinvertebrate index
RPI	DEQ's river physiochemical index
RNA	Research Natural Area
SBA	subbasin assessment
SCR	secondary contact recreation
SFI	DEQ's stream fish index
SHI	DEQ's stream habitat index
SMI	DEQ's stream macroinvertebrate index
SS	salmonid spawning
TDS	total dissolved solids
TIN	total inorganic nitrogen
TKN	total Kjeldahl nitrogen
TMDL	total maximum daily load
TP	total phosphorus
TS	total solids
TSS	total suspended solids
tons/yr	tons per year
USFS	United States Forest Service
USGS	United States Geological Survey
WAG	Watershed Advisory Group
WBAG	*Waterbody Assessment Guidance*
WBID	waterbody identification number
WLA	wasteload allocation
WRP	Wetland Reserve Program

ERRATA
Addendum Priest River Subbasin Assessment and Total Maximum Daily Load

The relevant information for Implementation Strategies pursuant to the TMDL Settlement Agreement of July 2002 for each of the five TMDLs presented in the *Addendum* can be found on the following Sections and pages:

1. 5.1 Sediment TMDL for Reeder Creek
   Section 5.1.4 beginning on page 84.
   a. **Time Frame**: Table 19, page 86.
   b. **Approach**: Pollution Control Strategies, page 85 and Additional Improvements not Directly Related to Sediment Delivery, page 87.
   c. **Responsible Parties**: Table 19, page 86.
   d. **Monitoring Strategy**: Monitoring Provisions, page 86.

2. 5.2 Sediment TMDL for Binarch Creek
   Section 5.2.4 beginning on page 93.
   a. **Time Frame**: Table 22, page 95.
   b. **Approach**: Pollution Control Strategies, page 95.
   c. **Responsible Parties**: Table 22, page 95.
   d. **Monitoring Strategy**: Monitoring Provisions, page 95.

3. 5.3 East River Sediment TMDL
   Section 5.3.4 beginning on page 105.
   a. **Time Frame**: Table 26, page 107.
   b. **Approach**: Pollution Control Strategies, page 107 and Additional Improvements not Directly Related to Sediment Delivery, page 108.
   c. **Responsible Parties**: Table 26, page 107.
   d. **Monitoring Strategy**: Monitoring Provisions, page 108.

4. 5.4 East River Temperature TMDL
   a. **Time Frame**: Section 5.4.1 Instream Water Quality Targets, pages 111 and 112.
   b. **Approach**: Section 5.4.1 Instream Water Quality Targets, pages 111 and 112.
   c. **Responsible Parties**: Table 30, page 118.
   d. **Monitoring Strategy**: Monitoring Points, page 113.

5. 5.5 Lower Priest River Sediment TMDL
   Section 5.5.4 beginning on page 130.
   a. **Time Frame**: no reasonable estimate of a time frame.
   b. **Approach**: Pollution Control Strategies, page 134 and Additional Improvements not Directly Related to Sediment Delivery, page 135.
   c. **Responsible Parties**: Table 34, page 132.
   d. **Monitoring Strategy**: Monitoring Provisions, page 134.

Executive Summary

The federal Clean Water Act (CWA) requires that states and tribes restore and maintain the chemical, physical, and biological integrity of the nation's waters (33 USC § 1251.101). States and tribes, pursuant to section 303 of the CWA are to adopt water quality standards necessary to protect fish, shellfish, and wildlife while providing for recreation in and on the waters whenever possible. Section 303(d) of the CWA establishes requirements for states and tribes to identify and prioritize water bodies that are water quality limited (i.e., water bodies that do not meet water quality standards). States and tribes must periodically publish a priority list of impaired waters, currently every two years. For waters identified on this list, states and tribes must develop a total maximum daily load (TMDL) for the pollutants, set at a level to achieve water quality standards.

In October 2001, a *Priest River Subbasin Assessment and TMDL* was published (Rothrock 2001) and forwarded from DEQ to EPA for review and approval. In March 2002 EPA approved sediment TMDLs for two of the §303(d) listed watersheds: Kalispell Creek and Lower West Branch Priest River. The *Priest River SBA and TMDL* also included a request for a short term delay of beneficial use support status calls and TMDLs where required for four of the listed segments (Table B). Reasons for this request mostly stemmed from the need for further data collection and analysis. This *Addendum* document addresses the water bodies in the Priest River Subbasin that have been placed on what is known as the "§303(d) list," and received short term delay of beneficial use support status calls.

The *Priest River Subbasin Assessment and TMDL* analysis was developed to comply with Idaho's TMDL schedule. This assessment describes: the physical, biological, and cultural setting; water quality status; pollutant sources; and recent pollution control actions in the Priest River Subbasin located in the northwest corner of Idaho. The first part of this document, the subbasin assessment, is an important first step in leading to the TMDL. The starting point for this assessment was Idaho's current §303(d) list of water quality limited water bodies. Ten segments of the Priest River Subbasin were listed on this list. The subbasin assessment portion of this document examines the current status of §303(d) listed waters, and defines the extent of impairment and causes of water quality limitation throughout the subbasin. The loading analysis quantifies pollutant sources and allocates responsibility for load reductions needed to return listed waters to a condition of meeting water quality standards.

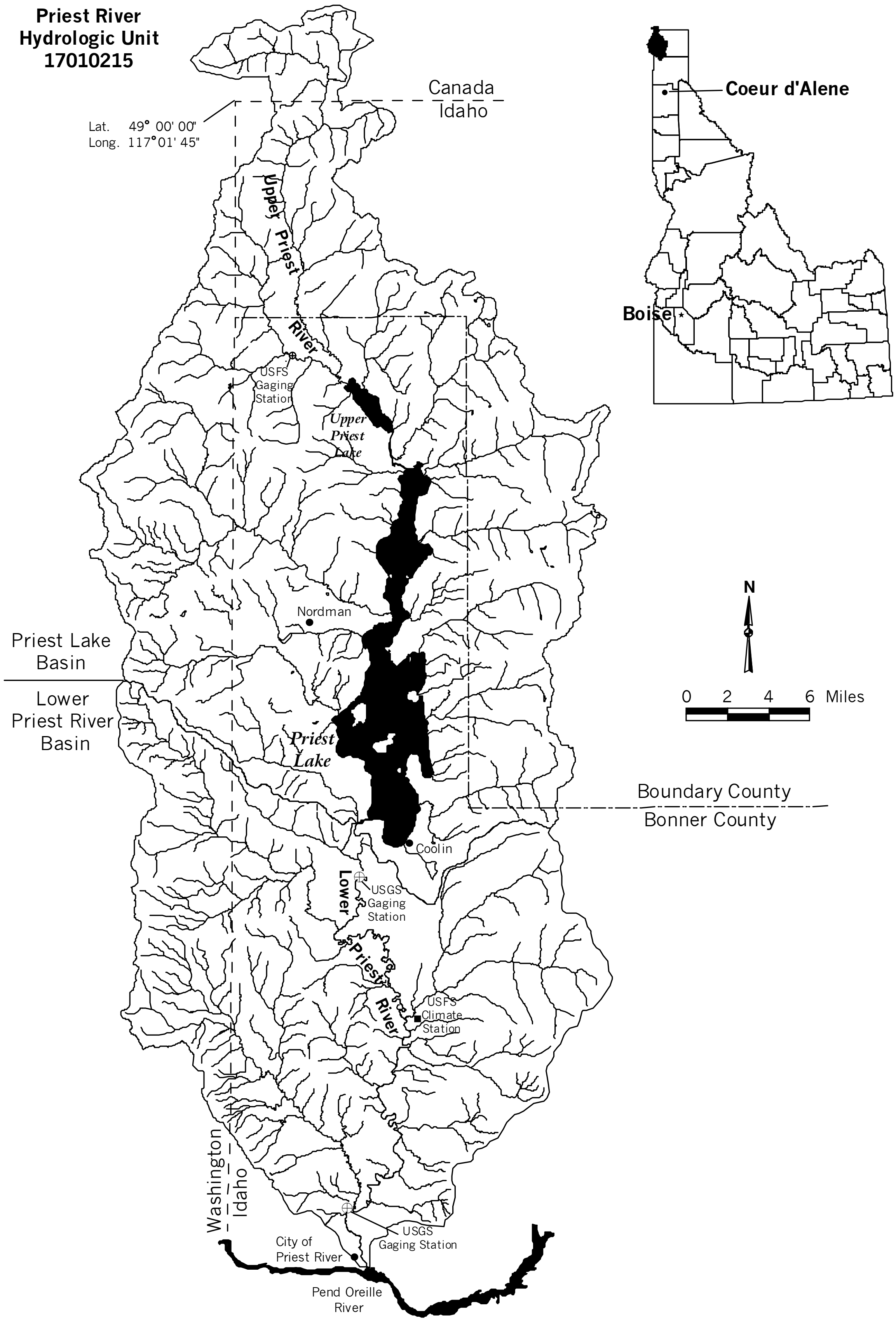


Figure A. Location map of Priest River Subbasin.

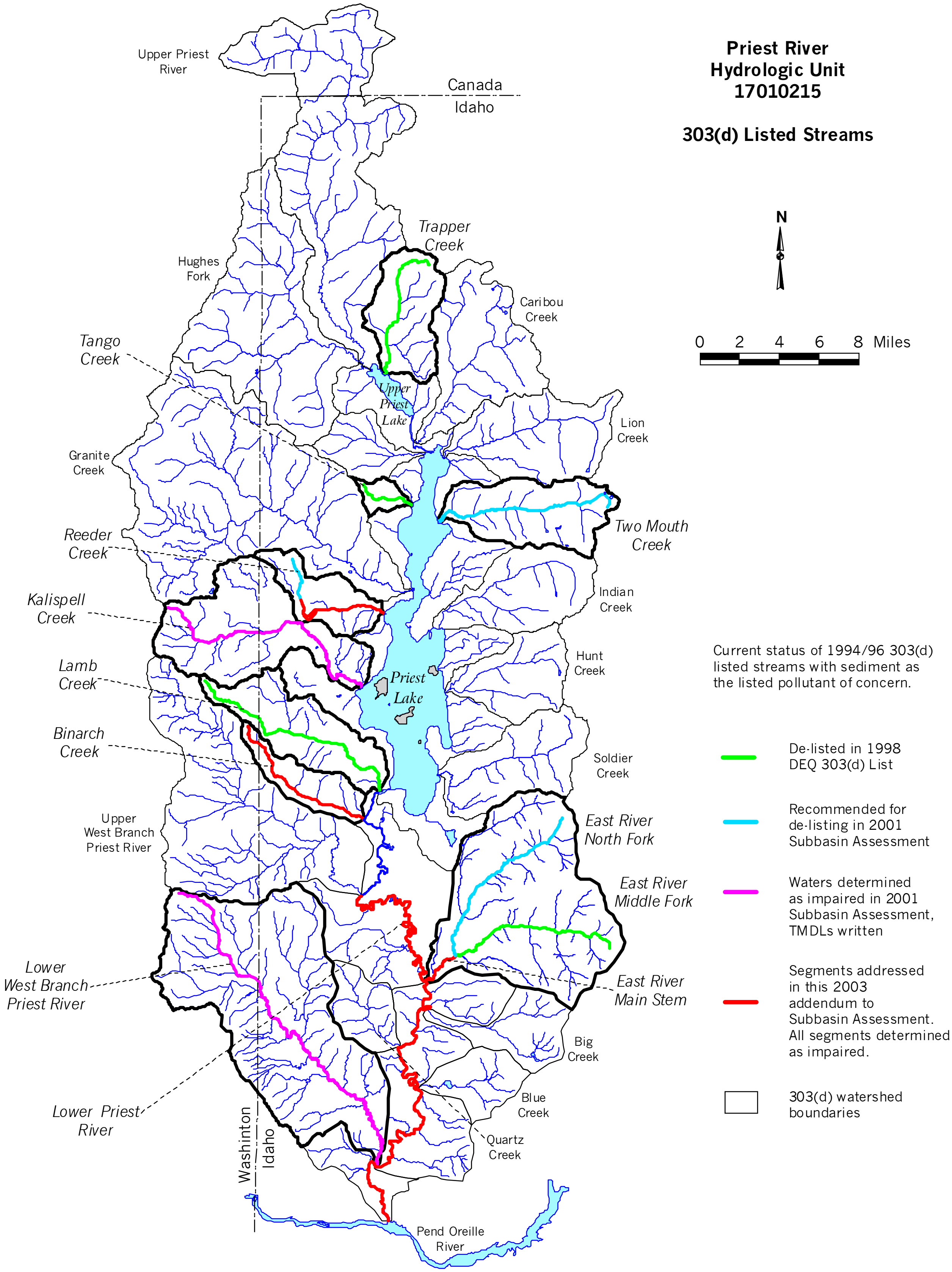


Figure B. §303(d) listed stream segments of the Priest River Subbasin.

Subbasin at a Glance

Hydrologic Unit Code	17010215 – Priest River Subbasin (Figure A)
Listed Water Quality Limited Segments	Reeder Creek from elevation 2680 ft to mouth, Binarch Creek, East River main stem, and Lower Priest River, all listed for sediment; and East River for temperature (see Figure B)
Beneficial Uses Affected	Cold water aquatic life, salmonid spawning
Pollutants of concern	Sediment, heat (solar radiation)
Streams requiring TMDLs	Reeder Creek, Binarch Creek, East River, and Lower Priest River for sediment, East River for water temperature.
Key indicators of impairment	Integrated WBAG II index scoring for cold water aquatic life (macroinvertebrates and fish), and stream habitat, indicating Not Fully Supporting.
Known land uses	Forestry, agriculture, rural residential

Comments to Draft *Addendum* Report and Major Changes Made

The draft *Addendum* report was published in September 2002 with document distribution as shown in Appendix C. There was an advertised public comment period from October 7 through November 8 (Appendix D), as well as discussion of comments received and a public forum for further comments at a December 5th meeting of the Panhandle Basin Advisory Group (BAG). Based on comment packages received from the EPA, Alliance for the Wild Rockies, Kootenai Environmental Alliance, and the DEQ Technical Services unit in Boise (Appendix D), two major changes were made to the draft *Addendum* as incorporated in a revised draft and this final report. Because of changes in recommendations regarding the §303(d) list along with inclusion of two sediment TMDLs not presented in the original draft, DEQ decided to provide another 30 day public comment period for review of a revised draft (February 5 to March 7, 2003).

The draft *Addendum* recommended that Binarch Creek be removed from the §303(d) list with sediment as the pollutant of concern. Comments received disputed this recommendation, citing a 1998 USFS field survey (USFS 1998) that depicted moderate to high percent fines in many upper reach spawning gravels of a pure strain westslope cutthroat population, and poor pool quality due to filling in by sediment. Also cited was a significant watershed disturbance of timber cuts and associated roads between 1960 –1996. Based on these comments, Binarch Creek is retained on the §303(d) list and a sediment TMDL was presented in the revised draft.

The draft *Addendum* also recommended that sediment be removed as a pollutant of concern from the §303(d) listing for Lower Priest River. Evidence suggests that there has been a decline in the cold water fishery of the river, particularly the fluvial cutthroat fishery. The draft *Addendum* presented a case that sediment was not the primary cause for cold water fishery impairment. This was based on excellent scores of the DEQ River Macroinvertebrate Index and River Diatom Index, and because other factors such as warm water temperatures, degradation within tributary spawning habitat, and competition from non-native salmonids, are thought to be more prevalent as impairment causes. Comments received cited the draft report as acknowledging a high sediment load from eroding riverbanks and three of the major tributary watersheds. The comments concluded that sediment could not be discounted as a contributing cause to impairment. The revised draft *Addendum* reflected those comments by keeping sediment listed for the river and preparing a sediment TMDL.

Only one comment of significance was received during the comment period of the revised draft *Addendum*. This comment was from Stimson Lumber Company (Appendix D) regarding evaluation of Stimson operations in the Redder Creek sediment TMDL. The comment letter pointed to omission of a 5 mile road network within a Stimson land block at the southeastern portion of the Reeder Creek watershed (section 25, Figure 3c). This road network inclusion resulted in a recalculation of the Reeder Creek TMDL (Section 5.1).

Key Findings

Table A. Streams and Pollutants for which TMDLs were Developed

Stream	Pollutant(s)
Reeder Creek	Sediment
Binarch Creek	Sediment
East River main stem (TMDL for entire watershed)	Sediment
East River main stem, Middle Fork East River, North Fork East River	Heat (incoming solar radiation)
Lower Priest River	Sediment

Reeder Creek from Elevation 2680 ft to Mouth

Reeder Creek is a 2nd order tributary on the west side of Priest Lake (Figure B), flowing south and then due east to the lake. Main stem length is 7.7 miles and watershed size is 8,454 acres. Ownership/management within the watershed is 73% Idaho Panhandle National Forests (IPNF) under USFS management, 20% private agricultural and residential property, and 7% industrial timber lands.

The headwaters of the stream down to elevation 2680 ft was determined as Full Support of cold water aquatic life beneficial (CWAL) use in the *Priest River SBA and TMDL* (Rothrock 2001). From elevation 2680 ft to near the mouth is a 5 mile segment of mainly low gradient channel,

Table B. Summary of Subbasin Assessment Outcomes

Waterbody Segment	Water Quality Limited Segment #, and Idaho Water Body Identification Assessment Unit #[a] ID17010215…	Pollutant	TMDL(s) Completed	Recommended Changes to §303(d) List	Recommended Schedule Changes	Justification
Reeder Creek	3424, PN023_02 PN023_03	Sediment: listed in 1994	1 (for entire watershed)	None	None	n.a.
Reeder Creek	3424, PN023_02 PN023_03	Heat: temperature listed in 1998	None	None	Temperature TMDL due in 2007	By agreement, initial temp. listing in 1998 DEQ §303(d) list does not require TMDL until 2007.
Binarch Creek	3418, PN026_02	Sediment: listed in 1994	1	None	None	n.a.
Binarch Creek	3418, PN026_02	Heat: temperature not listed	None	List for temperature in 2002/03 DEQ §303(d) list	Temperature TMDL due in 2007	By agreement, initial temp. listing in 2002/03 DEQ §303(d) list does not require TMDL until 2007.
East River main stem	3415, PN003_04	Sediment listed in 1994	1 (for entire watershed)	None	None	n.a.
East River: Middle Fork, North Fork, main stem	3415, PN003_02 & _03 PN004_02 & _03 PN003_04	Dissolved oxygen: listed in 1994	None	De-list DO in 2002/03 DEQ §303(d) list	None	DO measurements in 2001 show levels above standards criteria.
East River: Middle Fork, North Fork, main stem	3415 PN003_02 & _03 PN004_02 & _03 PN003_04	Heat: temperature listed in 1994	1	None	None	n.a.
Lower Priest River	3407, PN001_05	Sediment: listed in 1994	1	None	None	n.a.
Lower Priest River	3407, PN001_05	Heat: temperature not listed	None	List for temperature in 2002/03 DEQ 303(d) list.	Temperature TMDL due in 2007	By agreement, initial temp. listing in 2002/03 DEQ §303(d) list does not require TMDL until 2007.

a = In the 1998 DEQ §303(d) List, water body segments were identified with a Water Quality Limited Segment Number. Following the 1998 list, an Idaho Water Body Identification System (WBID) was developed to more uniquely code Idaho waters. The WBAG II document (Grafe *et al*. 2002) described the WBID along with Water Body Stratification, a classification method that adds a sub-identifier to the WBID number, called an Assessment Unit (AU). Taking Reeder Creek as an example, WBID = ID17010215PN023_02, where the _02 is an AU for the 2nd order segments of Reeder Creek, and _03 is the AU for the 3rd order segments.

0.4 - 1% slope, flowing through a broad floodplain of wetlands and wet meadows. This segment was delayed for a beneficial use status call until all results from a BURP survey in 2000 were analyzed and reported.

The 2000 BURP site was placed in the middle stream segment as Reeder Creek flows through Bismark Meadows (around 1,200 acres in size). While once a contiguous wetland and wet meadows, a large portion of Bismark Meadows has been converted to hay cropping and grazing. Impacts to Reeder Creek within this lowland have included: the development of extensive cross ditches to facilitate drainage of the meadows for hay cropping; stream channel straightening; removal of riparian shrub overstory by hay cropping and large animal grazing; and some streambank damage by grazing animals. The stream bottom is predominately silt-sand.

The stream index scoring for the above BURP site, from the DEQ *Waterbody Assessment Guidance*, second edition (WBAG II, Grafe *et al*. 2002) is as follows:

! Stream Macroinvertebrate Index (SMI) = 21, or Condition Rating = Minimum Threshold (SMI < minimum reference condition),

! Stream Fish Index (SFI) = 39, or Condition Rating = 1, and

! Stream Habitat Index (SHI) = 52, or Condition Rating = 1.

The WBAG II preliminary beneficial use assessment for CWAL is Not Fully Supporting based on the SMI score of Minimum Threshold. A low SMI score might be expected from the Reeder Creek site because of a meadow stream with minimal fast water riffle habitat. However, results of the BURP electro-fishing were below the minimum subbasin targets. Stream habitat was also marginal with an absence of woody debris in the channel and poor riparian cover. This assessment thus concludes that the WBAG II stream index scoring properly depicts a condition of Not Fully Supporting.

While the headwaters segment down to elevation 2680 ft is judged as CWAL = FS, the upper and middle reaches of Reeder Creek have been placed within the same Assessment Unit (see footnote of Table B). When there are two BURP evaluation sites in the same AU, DEQ uses the lower multimetric index score to interpret aquatic life use support (Grafe *et al*. 2002). Since CWAL = NFS for the middle BURP site, the upper reach remains as a portion of Reeder Creek on the §303(d) list, and is included in the Reeder Creek sediment TMDL.

A sediment TMDL for the entire Reeder Creek watershed was prepared (Section 5.1). Natural background sediment load was estimated at 310 tons/year. Load capacity for the Priest River Subbasin is set at 50% above background which includes a margin of safety (Rothrock 2001), or 465 tons/yr for the Reeder Creek watershed. Existing sediment load was estimated at 600 tons/yr, or 93% above background. Sediment load allocations and sediment reduction allocations were made to the three ownership/management entities in the watershed.

Under the current guidance of WBAG II and additional considerations, the appropriate measures of Full Support for Reeder Creek include: 1) scores of SMI, SFI, and SHI which integrated together produce an average Condition Rating score ≥ 2.0, 2) a total salmonid density at the minimum target levels of 5 – 10 total trout/100 m^2, 3) presence of sculpins, and 4) in addition to the biological and habitat 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.

While a sediment TMDL is required by the Not Fully Supporting status call, there appears to be limited opportunities for significant sediment reduction from the unpaved road network. It is believed that a newly established Wetland Reserve Project (WRP) within Bismark Meadows, under the administration of the National Resources Conservation Service (see Chapter 4), is an important implementation program that holds promise for habitat improvement within the middle segment of Reeder Creek. Restoration of historic wetland and floodplain function, including meander and beaver activity, and the planting of streamside vegetative cover, could well be the primary mechanism to restore instream beneficial uses.

Lastly, a temperature sensor was placed in Reeder Creek by the USFS in 2001. The data showed exceedances (greater than 10% exceedance frequency) of the Idaho water quality standards numeric temperature criteria for cutthroat trout and bull trout spawning and incubation. Under the guidelines of WBAG II, a temperature TMDL is required for Reeder Creek. Based on a negotiated TMDL settlement schedule, the due date for a Reeder Creek temperature TMDL is 2007 (Table B).

Binarch Creek

Binarch Creek is a 2nd order tributary on the west side of Lower Priest River (Figure B), flowing southeast to the river. Main stem length is 8.6 miles, and watershed size is 7,232 acres. The entire watershed is IPNF land under USFS management. Binarch Creek was delayed for a beneficial use status call until USFS conducted an electro-fishing survey, which was accomplished in 2001 (USFS 2001).

The Binarch Creek watershed is mostly forested and steep sloped, but much of the stream is low to moderate gradient meandering through an uncontained floodplain in a wide valley bottom. In 1989 a 660 acre Binarch Creek Research Natural Area (RNA) was established, an area surrounding a 2.5 mile middle stream segment. RNA status was justified by principle distinguishing features (USFS 1989) including: 1) senescent and active beaver dams and ponds, 2) marshes and wet meadows, 3) riparian vegetation of the stream and adjacent marshes and wet meadows that harbor numerous reptiles, birds, and mammals, and 4) an unusually diverse assemblage of aquatic plants and animals including a pure strain of westslope cutthroat trout.

The WBAG II stream index scoring for two BURP sites within a mid-lower, low gradient reach just downstream of the RNA boundary is as follows:

- SMIs = 24 and 26, or Condition Rating = Minimum Threshold,
- at one BURP site, SFI = 65, or Condition Rating = 1, and
- at one BURP site SHI = 42, or Condition Rating = 1.

The WBAG II preliminary beneficial use assessment for CWAL is Not Fully Supporting based on the SMI scores of Minimum Threshold.

Besides the single BURP electro-fishing site, USFS electro-fished seven reaches from the mouth to the headwaters (USFS 2001). Taken together, the SFI range from the eight electro-fishing sites was SFI = 55 – 88, with mean SFI = 74 or Condition Rating = 2. Above average scores within the SFI metrics were related to the presence of cutthroat trout with overall good density (catch per unit electro-fishing effort). Low metric scores were generally due to the failure to detect slimy sculpin within mid to lower reaches.

In the draft *Addendum* (Rothrock 2002) it was concluded that CWAL = FS in Binarch Creek, and that sediment be removed as a pollutant of concern from the §303(d) listing. This conclusion and recommendation was based on the following reasons:

- The BURP scores for macroinvertebrates at the mid-lower sites represent slow water, silt-sand substrate, beaver pond type habitats.

- The DEQ and USFS electro-fishing results show a dominance of cutthroat trout except near the mouth, and the average score from eight sample sites of SFI = 74 produces a good, Condition Rating = mid-range 2.

- While the mid-lower BURP habitat score was poor, this scoring was in a beaver pond type habitat with natural characteristics that produces low BURP scores. The Binarch Creek RNA was in part established because of recognized "senescent and active beaver dams and ponds, marshes and wet meadows, riparian vegetation of the stream and adjacent marshes that harbor numerous reptiles, birds, and mammals, and an unusually diverse assemblage of aquatic plants" (USFS 1989).

- Within the boundaries of the Binarch Creek RNA, there is a prohibition of land use activities such as road building, timber harvesting, and cattle grazing.

- Sediment load calculations of current condition in the Binarch Creek watershed (Rothrock 2001), are low – moderate on a basin wide comparison, and relate to a low – moderate active road density of 2.2 mi/mi^2 and a stream crossing density of 1.2 crossings/mile of stream.

Comments to the draft *Addendum* report debated the conclusion of non-impairment by sediment (Appendix D). This included an EPA comment that "the information currently presented does not fully support the recommendation for sediment de-listing." Comments pointed to the USFS 1998 stream survey which found: a moderate amount of fine sediment in gravel beds of upper stream reaches which would serve as cutthroat spawning areas; observations that overall pool quality in upper reaches was poor because of filling in by sand; and high percent fines in mid to lower channel reaches (USFS 1998). Comments stated that significant sediment input related to timber sales between 1960 – 1996 could not be discounted. Approximately 43% of the watershed was harvested in those years with many acres of clear cuts, along with a high road density of 5.9 miles/mi^2 to service the timber sales.

The support status for this final *Addendum* report is established as CWAL = NFS, based on: 1) the mid-lower reach BURP results, 2) the absence of a BURP site within the upper one-half of the stream even though USFS surveys produced good SFI scores, and 3) moderate to high percent fines throughout the stream in which the timber sale and road activity between 1960 – 1996 cannot be discounted as contributing to sediment impairment.

A sediment TMDL for the Binarch Creek watershed was prepared (Section 5.2). Natural background sediment load was estimated at 266 tons/year. Load capacity for the Priest River Subbasin is set at 50% above background which includes a margin of safety (Rothrock 2001), or 399 tons/yr for the Binarch Creek watershed. Existing sediment load was estimated at 472 tons/yr, or 77% above background. Sediment load and reduction allocation is made to the single ownership/management, USFS. Opportunities for significant reduction in sediment yield from the current unpaved road network appear to be limited. It is perceived that impairment from excess sedimentation relates to the legacy of rather extensive timber harvests and road construction. Keeping Binarch Creek on the §303(d) list as impaired with sediment as the pollutant of concern essentially translates to a "rest and recovery" requirement within the watershed.

Under the current guidance of WBAG II and additional considerations, the appropriate measures of Full Support for Binarch Creek include: 1) scores of SMI, SFI, and SHI which integrated together produce an average Condition Rating score ≥ 2.0, 2) maintenance or improvement of the cutthroat trout density at the minimum target levels of 5 – 10 cutthroat /100 m^2, 3) presence of sculpins in reaches below 4% stream gradient, and 4) meeting instream targets set for surrogate habitat characteristics such as percent bed fines and residual pool volume.

Binarch Creek is considered secondary contact recreation. There are no bacteria data to assess the standards criteria. The WBAG II screening procedure (Grafe *et al*. 2002) determines that there is low potential risk for bacteria contamination. Support status for contact recreation is assigned Fully Supporting.

A temperature sensor was placed in Binarch Creek by DEQ in 2000. The data showed exceedances of the state standards numeric temperature criteria for cutthroat spawning and incubation. Under the guidelines of WBAG II, Binarch Creek will be listed for temperature in the 2002/03 DEQ §303(d) list. Based on a negotiated TMDL settlement schedule, the due date for a Binarch Creek temperature TMDL is 2007 (Table B).

East River

Sediment

The East River watershed is 43,163 acres (Figure B). The Middle Fork East River is a 3rd order stream that flows 9 miles almost due west until the confluence with the North Fork. The North Fork is a 3rd order stream that flows 10 miles southwest to its confluence. At the confluence of the forks, the 4th order main stem flows 2.8 miles to the mouth at Lower Priest River. The Middle Fork was de-listed for sediment in the 1998 DEQ §303(d) list (DEQ 1999), and the North Fork was recommended for sediment de-listing in the *Priest River SBA and TMDL* (Rothrock 2001). The main stem was delayed for a beneficial use status call until DEQ and IDL conducted an electro-fishing survey, which was accomplished in 2001.

Ownership/management within the watershed is 87% Idaho state lands managed by IDL, 8% federal lands primarily as the Priest River Experimental Forest, 3% private agricultural and rural residential property, and 2% industrial timber lands.

The East River drainage takes on an additional management emphasis as it is the only stream system of the Lower Priest River Subbasin where in recent time, bull trout have been captured and observed spawning.

The WBAG II stream index scoring for the East River main stem BURP site (SMI and SHI in 1995 sampling, SFI in 2001 electro-fishing) is as follows:

- SMI = 60, or Condition Rating = 2,
- SFI = 72, or Condition Rating = 2, and
- SHI = 50, or Condition Rating = 1.

The WBAG II preliminary beneficial use assessment for CWAL is Not Fully Supporting based on integration of indexes which produce an average Condition Rating = 1.7 (CR < 2.0 = fail). It seems to this assessor that beneficial use status is borderline between Full Support and Not Fully Supporting. If Not Fully Supporting is the determined status call, there is an uncertainty as to whether CWAL has been impacted by excess sediment from land use activities.

The recommended decision is Not Fully Supporting, based on the following information at hand:

- while the BURP macroinvertebrate sample depicts a satisfactory condition of clean, cold water insects, and the SFI score was satisfactory, the electro-fishing survey produced a low total salmonid abundance of 0.5 catch per minute effort, and a low qualitative density estimate of 1.3 total salmonids/100 m^2, well below the subbasin target salmonid density. The dominant salmonid in the main stem survey was brook trout, with only a single bull trout juvenile sampled, and no captured cutthroat.

- BURP habitat scores and other habitat evaluations show poor conditions within the main stem. This primarily relates to lack of LWD and instream cover, and a shallow, wide stream with poor riparian bank cover and stability, and eroding streambanks. There are large pools within the reach with good residual pool volume, but other pool quality characteristics are poor. BURP sampling did show that within sampled rifles, there were low percent fines and low embeddedness, and good distribution of pebble sizes through small cobble.

- It is known that part of the damaged and eroding streambank condition can be related to the history of land use activities.

- Lastly, sediment load calculations for the entire East River watershed (Middle Fork, North Fork, and main stem) produced an existing annual sediment load 185% above natural background. There were identified areas of excess sediment yield and opportunities for load reductions. Contradicting that sediment load is a cause for beneficial use impairment is the evaluation that the Middle Fork clearly meets the various criteria for CWAL Full Support, and the calculated annual sediment load is 157% above background (Rothrock 2001). Middle Fork is overall a fairly steep gradient stream (two-thirds of the Middle Fork main stem >1.5% gradient), and therefore may primarily be a sediment transport stream.

The East River main stem should be retained on the §303(d) list. Reasons for impairment could be related to: elevated water temperatures, historic removal of riparian conifers and therefore a reduction in LWD recruitment, a widening of the stream channel with damaged and eroding streambanks, and significant stretches of thick, sandy substrate. The degree to which sediment load from land use activities throughout the watershed, over the last several decades, relates to or has caused impairment is unknown. But it seems that sediment load cannot be discounted as a contributing cause.

A sediment TMDL for the entire East River watershed (excluding the Lost Creek subwatershed) was prepared (Section 5.3). Background sediment load was estimated at 1,032 tons/year. Load capacity is set at 50% above background, or 1,548 tons/yr. Existing sediment load was estimated at 2,937 tons/yr, or 185% above background. Sediment load allocations and sediment reduction allocations were made to the four ownership/management entities in the watershed, and also to Bonner County maintained roads.

Under the current guidance of WBAG II and additional considerations, the appropriate measures of Full Support for East River main stem include: 1) scores of SMI, SFI, and SHI which integrated together produce an average Condition Rating score ≥ 2.0, 2) a total salmonid density at the minimum target levels of 5 – 10 total trout/100 m^2, 3) three or more salmonid age classes including juveniles (<100 mm), 4) appropriate instream targets for surrogate habitat characteristics, and 5) in addition to the biological and habitat measures, the TMDL Implementation Plan may address fisheries management objectives regarding rearing conditions for juvenile and sub adult bull trout and cutthroat trout.

Dissolved Oxygen

Based on measurements taken by DEQ in early September 2001, this subbasin assessment determines that the East River main stem, the Middle Fork, and the North Fork do not violate standards dissolved oxygen numeric criteria. It is recommend that these water bodies be removed from the §303(d) list for DO (Table B).

Water Temperature

IDL and DEQ placed temperature sensors in the Middle Fork, North Fork, and main stem from 1997 - 1999. This data shows that except in the headwaters of the Middle Fork, there are exceedances of the state standards numeric temperature criteria for cutthroat and bull trout spawning and incubation, and the EPA bull trout juvenile rearing and adult spawning criteria.

Under the guidelines of WBAG II a temperature TMDL is required for the East River drainage. Because water temperature was explicitly listed in the 1994/96 §303(d) list for East River, agreements between EPA and DEQ call for immediate evaluation of data and presentation of a temperature TMDL if warranted. A temperature TMDL has been prepared and is presented in Section 5.4.

The East River temperature TMDL utilizes the IDL- CWE Canopy Closure – Stream Temperature protocol (IDL 2000a). This method calculates increases in stream shade needed to achieve water temperatures that approach the EPA bull trout juvenile rearing and spawning criteria for July – mid September (10 °C - 7 day moving average of daily maximum temperatures). Existing percent canopy cover and increased canopy cover needed, are thus surrogate measures of heat loading per unit area per time.

From the mouth of East River main stem at elevation 2230 ft to elevation 4000 ft, the CWE model calculates 100% canopy cover required to approach a 10 °C maximum weekly maximum temperature (MWMT) that relates to the EPA bull trout criteria. The majority of stream segments within the watershed fall within these elevations. The CWE protocol to estimate existing percent canopy cover utilizes evaluation of aerial photographs under a stereoscope. For the East River main stem, and the lower one-half of the Middle Fork and North Fork main stems, existing conditions range from 5% to 80% canopy cover. This equates to 20% to 95% canopy cover increases needed to meet the calculated canopy target.

The East River temperature TMDL is presented as tables with evaluations and calculations for each stream segment between 200 foot elevation contours. For each segment the TMDL tables include: 1) existing percent canopy cover, 2) CWE calculated percent target canopy cover needed to approach 10 °C MWMT, 3) canopy cover increase to meet target calculations, 4) calculations that estimate target heat load capacity, current heat loading, and target heat load reduction in watts/m^2, and 5) land ownership and assumed responsibilities for TMDL implementation.

There has been impact to the riparian zone vegetative cover of the East River drainage from land use activities. Prior to enactment of the Idaho FPA in 1974, there were minimal or no restrictions of harvesting timber within the riparian zones of streams. Historic accounts clearly show cases of significant large tree removal in this zone. Even in current times under the FPA, there is an allowable take within the stream protection zone (SPZ). In addition, clearing of land for agricultural purposes in basin lowlands has resulted in significant removal of riparian cover. There also has been damage to the riparian zone and streambanks from large animal access. Widening of some stream reaches may have been accelerated because of the above mentioned riparian zone impacts, plus an effect from excess sediment deposition.

Given that impacts have occurred from land use activities, it is unlikely however that the CWE calculated canopy targets can be considered background or natural canopy cover. It is unlikely that 100% cover uniformly existed historically between 2,200 – 4,000 feet elevation due to factors such as: large rock formations, landslides, marsh conditions that prohibit conifer growth, wide stream widths, and a reoccurring wildfire cycle. It is just as unlikely that a 100% canopy cover between these elevations can be achieved through active riparian zone management because of the above factors, and also including man-induced factors such as adjacent transportation roads. Thus, the temperature TMDL presented represents an interim load capacity until sufficient research can be done to define and map the potential maximum riparian vegetation density and stream canopy cover that could be achieved under current stream and adjacent watershed conditions.

Lower Priest River

Lower Priest River originates as outlet from Priest Lake and flows south to the confluence with Pend Oreille River (Figure B). By the time it reaches its mouth it is a 5th order river. The §303(d) listed segment begins at the tributary inflow point of Upper West Branch Priest River. From this point to the mouth the distance is 34.4 river miles, and the average gradient over this river length is 0.15%. Lower Priest River was delayed for a beneficial use status call until the Idaho River Ecological Assessment Framework (IREAF) was in final form, and until IDFG conducted an electro-fishing survey, which was accomplished in spring 2002. Beneficial uses for Lower Priest River are designated in the Idaho water quality standards as: domestic water supply, cold water aquatic life, primary and secondary contact recreation, and as a special resource water (IDAPA 58.01.02.110.06).

Watershed size draining into the listed river segment is 219,980 acres, with approximately 475 miles of perennial streams. Ownership/management within the drainage is: 50% IPNF land under USFS management; 31% state lands managed by IDL; 17% private agricultural, timber, and rural residential property (both in Idaho and Washington); and 2% industrial timber lands.

The WBAG II river index scoring for one BURP site at river mile 16.2, one USGS electro-fishing survey in September 1998 near river mile 3.8, and one IDFG electro-fishing survey in April 2002 from river mile 7.5 to near the mouth, is follows:

- BURP River Macroinvertebrate Index (RMI) = 23, or Condition Rating = 3,
- BURP River Diatom Index (RDI) = 37, or Condition Rating = 3,
- USGS River Fish Index (RFI) = 29, or Condition Rating = Minimum Threshold, and
- IDFG RFI = 45, or Condition Rating = Minimum Threshold.

The WBAG II preliminary beneficial use assessment for CWAL is Not Fully Supporting based on the RFI scores of Minimum Threshold from USGS and IDFG sampling. As a point of emphasis, the USGS sampling site, in the vicinity of the river mile 3.8 gaging station, was 12 river miles south of the BURP site. The IDFG sampling, from river mile 7.5 to the mouth, is again some distance south of the BURP site. Input – output access of boats for river electro-fishing is very difficult in the vicinity of the BURP site.

In the September USGS survey, largescale sucker and northern pikeminnow were dominant in the sampling, and mountain whitefish was the only salmonid captured. During this cool - warm water period, it might be expected that other salmonids such as cutthroat trout might seek refuge in selected pools within the river, or migrate into colder water feeding tributaries (DuPont *pers comm*). In the April IDFG survey, mountain whitefish and largescale sucker were dominant. The sampling included cutthroat, rainbow, and brown trout, but at low occurrence. RFI metrics from both surveys that scored low included: number of cold water species, percent sculpin, percent sensitive native species, percent tolerant individuals (high percent), and number of salmonid age classes (mountain whitefish are not included in this metric).

In the draft *Addendum* (Rothrock 2002) it was recommended that sediment be removed as a pollutant of concern from the Lower Priest River §303(d) listing. This recommendation was based on the following considerations:

- IDFG theorizes that primary factors relating to the low RFI scores include: 1) cool - warm water temperatures from July – mid September, 2) habitat degradation of historical tributary spawning beds of fluvial and adfluvial cutthroat trout and bull trout, and 3) the effect of competition from the introduced lake trout in Priest Lake and brook trout in basin streams. It is not believed that sediment within the river is a major factor for suppression of cold water aquatic life.

- That sediment is not a major contributing cause seems to be supported by the macroinvertebrate and periphyton data collected at the BURP site which show a good clean water condition with Condition Rating = 3 for both RMI and RDI (Full Support).

- 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*). IDFG believes that mountain whitefish have maintained a viable population in the river (whitefish in the IDFG survey was 55% of total catch). Length range of whitefish from the USGS and IDFG surveys was 84 - 418 mm. This data suggests Full Support for salmonid spawning beneficial use. A small population of introduced rainbow trout does appear to still exist in the river. Rainbow trout may spawn in river gravel beds.

Comment packages to the draft document disputed the recommendation of removing sediment as a pollutant of concern (Appendix D). EPA concluded, "the information currently presented does not fully support the recommendation for sediment de-listing." Comments pointed to statements in the draft report of severe erosion observed during a 2000 riverbank survey (the data work-up of survey results presented in this final version was not available for the draft), and that sediment input to the river from three major drainages was considered as significant.

This final version of the subbasin assessment determines that sediment within the river cannot be discounted as a contributing factor in the decline of the fluvial cutthroat fishery, and will remain as a listed pollutant of concern on the §303(d) listing. A sediment TMDL for Lower Priest River has four separate components: 1) an EPA approved sediment TMDL for the Lower West Branch watershed as presented in the initial *Priest River Subbasin Assessment and TMDL* (Rothrock 2001), 2) a sediment TMDL for the East River watershed presented in Section 5.3 of this *Addendum* report, 3) a sediment TMDL that will be developed for the Upper West Branch watershed resulting from this stream being newly listed in the pending 2002/03 DEQ §303(d) list, and 4) a riverbank sediment TMDL presented in Section 5.5 of this *Addendum* report.

The TMDL for Lower Priest River bank erosion begins by assigning a 90% bank stability regime as the interim load capacity. Based on back calculation from the 2000 riverbank survey (covering 9.3 river miles), sediment load from 10% bank instability is estimated at a 5,946 tons/yr load capacity for 34.4 river miles. Existing sediment load coming from a measured condition of 28% bank instability was estimated at 16,030 tons/yr. Improvement projects reducing current bank condition to 10% instability (stabilizing 12.1 miles of riverbank), would reduce sediment load by an estimated 10,084 tons/yr. Sediment load and reduction allocations will be made to three ownership/management groups: USFS, state of Idaho, and private ownerships.

The Lower West Branch sediment TMDL assigned an interim loading capacity of 4,018 tons/yr with an estimated current sediment load of 7,416 tons/yr. The East River sediment TMDL assigned an interim loading capacity of 1,548 tons/yr with an estimated current load of 2,937 tons/yr. A sediment TMDL for Upper West Branch has yet to be developed.

Under the current guidance of WBAG II and additional considerations, the appropriate measures of cold water aquatic life Full Support for Lower Priest River would include: 1) scores of RMI, RDI, and RFI which integrated together produce an average Condition Rating score ≥ 2.0, 2) cold water fishery targets as established by the IDFG and presented in a TMDL Implementation Plan. This should include an ecological evaluation of existing and potential fisheries in relation to factors such as flow regime, water temperature, spawning habitat in tributaries, non-native salmonid species, and nonpoint source sedimentation, and 3) meeting instream targets set by a WAG for surrogate habitat characteristics such as pool quality and residual pool volume.

USGS placed a temperature data logger at the river mile 3.8 gaging site from June – September of 1998 and 2000. This data showed that the state standards numeric temperature criteria for CWAL (19 °C daily mean) was exceeded 44% of the criteria days in 1998, and 27% in 2000. Based on lines of evidence outlined in WBAG II, it is determined that at this point in time CWAL is an appropriate designated use for Lower Priest River. Therefore, there is a violation of the standards and the support status is Not Fully Supporting.

Lower Priest River will be listed for water temperature in the 2002/03 DEQ §303(d) list (Table B). Based on a negotiated TMDL settlement schedule, the due date for a Lower Priest River temperature TMDL is 2007. This will provide needed time to evaluate canopy cover and stream temperature potential of feeding tributaries, as well as river thermal potential, for the TMDL calculations. From this analysis, DEQ may seek a designated use change to seasonal cold water aquatic life (IDAPA 58.01.02.250.03).

1. Subbasin Assessment – Watershed Characterization

The federal Clean Water Act (CWA) requires that states and tribes restore and maintain the chemical, physical, and biological integrity of the nation's waters (33 USC § 1251.101). States and tribes, pursuant to section 303 of the CWA are to adopt water quality standards necessary to protect fish, shellfish, and wildlife while providing for recreation in and on the waters whenever possible. Section 303(d) of the CWA establishes requirements for states and tribes to identify and prioritize water bodies that are water quality limited (i.e., water bodies that do not meet water quality standards). States and tribes must periodically publish a priority list of impaired waters, currently every two years. For waters identified on this list, states and tribes must develop a total maximum daily load (TMDL) for the pollutants, set at a level to achieve water quality standards. This document addresses the water bodies in the Priest River Subbasin that have been placed and remain on what is known as the "303(d) list." (Figure 1).

The overall purpose of this addendum to the subbasin assessment and TMDL is to characterize and document pollutant loads within watersheds of the Priest River Subbasin that were delayed for beneficial use status determinations in the *Priest River Subbasin Assessment and TMDL* (Rothrock 2001). The first portion of this document, the subbasin assessment, is partitioned into four major sections: watershed characterization, water quality concerns and status, pollutant source inventory, and a summary of past and present pollution control efforts (Chapters 1 – 4). This information will then be used to develop a TMDL for each pollutant of concern for watersheds in the Priest River Subbasin that are determined as Not Full Support of a beneficial use (Chapter 5).

1.1 Introduction

In 1972, Congress passed public law 92-500, the Federal Water Pollution Control Act, more commonly called the Clean Water Act. The goal of this act was to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters" (Water Pollution Control Federation 1987). The act and the programs it has generated have changed over the years as experience and perceptions of water quality have changed. The CWA has been amended 15 times, most significantly in 1977, 1981, and 1987. One of the goals of the 1977 amendment was protecting and managing waters to insure "swimmable and fishable" conditions. This goal, along with a 1972 goal to restore and maintain chemical, physical, and biological integrity, relates water quality with more than just chemistry.

Background

The federal government, through the U.S. Environmental Protection Agency (EPA), assumed the dominant role in defining and directing water pollution control programs across the county. The Idaho Department of Environmental Quality (DEQ) implements the CWA in Idaho, while the EPA oversees Idaho and certifies the fulfillment of CWA requirements and responsibilities.

Section 303 of the CWA requires DEQ to adopt, with EPA approval, water quality standards and to review those standards every three years. Additionally, DEQ must monitor waters to identify those not meeting water quality standards. For those waters not meeting standards, DEQ must establish TMDLs for each pollutant impairing the waters. Further, the agency must set appropriate controls to restore water quality and allow the water bodies to meet their designated uses. These requirements result in a list of impaired waters, called the "303(d) list." This list describes water bodies not meeting water quality standards. Waters identified on this list require further analysis. A subbasin assessment and TMDL provide a summary of the water quality status and allowable TMDL for water bodies on the 303(d) list. *Addendum: Priest River Subbasin Assessment and TMDL* provides this summary for the currently listed waters in the Priest River Subbasin.

The subbasin assessment section of this report (Chapters 1 – 4) includes an evaluation and summary of the current water quality status, pollutant sources, and control actions in the Priest River Subbasin to date. While this assessment is not a requirement of the TMDL, DEQ performs the assessment to ensure impairment listings are up to date and accurate. The TMDL is a plan to improve water quality by limiting pollutant loads. Specifically, a TMDL is an estimation of the maximum pollutant amount that can be present in a waterbody and still allow that waterbody to meet water quality standards (40 CFR § 130). Consequently, a TMDL is waterbody- and pollutant-specific. The TMDL also includes individual pollutant allocations among various sources discharging the pollutant. The EPA considers certain unnatural conditions, such as flow alteration, a lack of flow, or habitat alteration, that are not the result of the discharge of a specific pollutants as "pollution." TMDLs are not required for water bodies impaired by pollution, but not specific pollutants. In common usage, a TMDL also refers to the written document that contains the statement of loads and supporting analyses, often incorporating TMDLs for several water bodies and/or pollutants within a given watershed.

Idaho's Role

Idaho adopts water quality standards to protect public health and welfare, enhance the quality of water, and protect biological integrity. A water quality standard defines the goals of a waterbody by designating the use or uses for the water, setting criteria necessary to protect those uses, and preventing degradation of water quality through antidegradation provisions.

The state may assign or designate beneficial uses for particular Idaho water bodies to support. These beneficial uses are identified in the Idaho water quality standards and include:

- Aquatic life support – cold water, seasonal cold water, warm water, and salmonid spawning

- Contact recreation – primary (swimming), secondary (boating)

- Water supply – domestic, agricultural, industrial

- Wildlife habitats, aesthetics

The Idaho legislature designates uses for water bodies. Industrial water supply, wildlife habitat, and aesthetics are designated beneficial uses for all water bodies in the state. If a waterbody is unclassified, then cold water and primary contact recreation are used as additional default designated uses when water bodies are assessed.

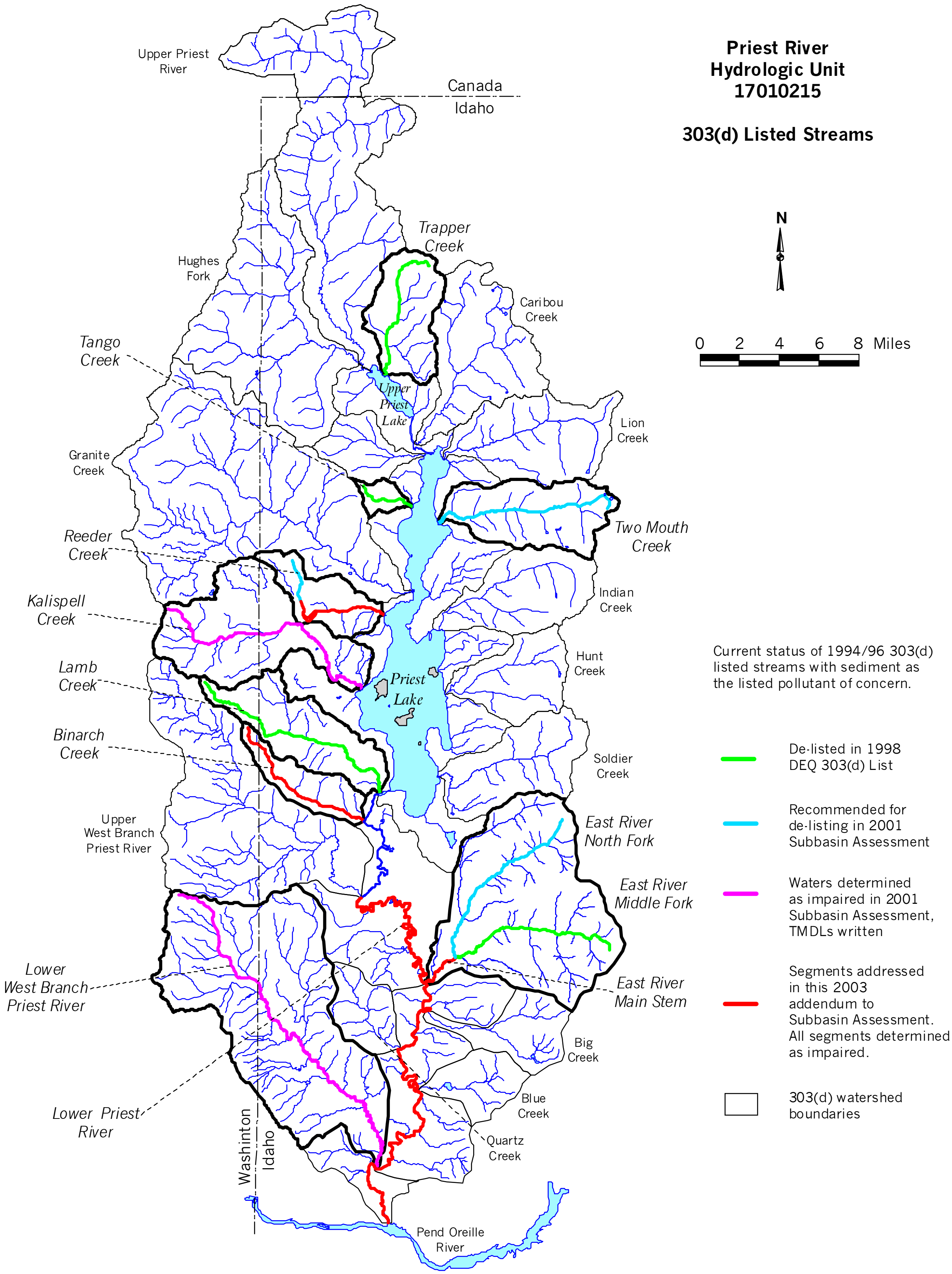


Figure 1. §303(d) listed stream segments of the Priest River Subbasin.

A subbasin assessment entails analyzing and integrating multiple types of waterbody data, such as biological, physical/chemical, and landscape data to address several objectives:

- Determine the degree of designated beneficial use support of the waterbody (i.e., attaining or not attaining water quality standards).

- Determine the degree of achievement of biological integrity.

- Compile descriptive information about the waterbody, particularly the identity and location of pollutant sources.

- When water bodies are not attaining water quality standards, determine the causes and extent of the impairment.

1.2 Physical and Biological Characteristics

Physical and biological attributes within the Priest River Subbasin were presented in the *Priest River SBA and TMDL*, Section 2.1.1, pages 6 – 21 (Rothrock 2001). Discussion topics were: climate, hydrology, geology and soils, vegetative cover and wildfire, fisheries, and stream characteristics.

1.3 Cultural Characteristics

Cultural characteristics within the Priest River Subbasin were presented in the *Priest River SBA and TMDL*, Section 2.1.2, pages 21 – 28 (Rothrock 2001). Discussion topics were: land ownership and land use, protected river designations, minimum stream flow, appropriated water use, regional history and population, area industry, and local groups working on water quality issues.

2. Subbasin Assessment – Water Quality Concerns and Status

Water quality concerns and status within the Priest River Subbasin were detailed in the *Priest River SBA and TMDL*, Section 2.2, pages 28 – 54 (Rothrock 2001).

The *Priest River SBA & TMDL* requested a short term delay for determination of beneficial use support status for four of the waterbody segments listed for sediment on the 1998 DEQ §303(d) list (DEQ 1999). These segments were: Reeder Creek from elevation 2680 ft to the mouth, Binarch Creek, East River main stem, and Lower Priest River (Figure 1). The reasons for a delay included gathering additional electro-fishing data to aid in support status determinations, and to obtain laboratory analysis of BURP macroinvertebrate samples taken during the 2000 field season. For Lower Priest River it was desired to use the Idaho Rivers Ecological Assessment Framework of DEQ's *Waterbody Assessment Guidance*, second edition (WBAG II, Grafe *et al*. 2002), to aid in support status determination. WBAG II was only in draft form and under public review and comment at the time the *Priest River SBA & TMDL* was published.

In addition to listings with sediment as the pollutant of concern, the East River watershed was listed for water temperature and dissolved oxygen in the 1994/96 §303(d) list. The Middle Fork East River was removed for sediment in the 1998 DEQ list (DEQ 1999), and the North Fork East River was recommended for sediment de-listing in the *Priest River SBA & TMDL*. However, data from temperature data loggers have shown that most East River stream segments exhibit temperatures that exceed the EPA bull trout numeric criteria for rearing and spawning during late June through September. East River temperatures also exceed numeric criteria of Idaho water quality standards for westslope cutthroat trout and bull trout spawning and incubation. Because of the explicit listing of temperature for what was labeled "East River" in the 1994/96 §303(d) list, a temperature TMDL has been developed for the entire East River watershed in this document. This document also addresses the dissolved oxygen listing.

2.1 Water Quality Limited Segments Occurring in the Subbasin

Table 1 presents the listed waterbody segments addressed in this report, including the boundaries of water quality limited segments, listed pollutants, when the pollutants were first listed, and sources of data for listing.

2.2 Applicable Water Quality Standards

Applicable Idaho water quality standards, along with designated and existing beneficial uses for all §303(d) listed segments in the Priest River Subbasin were presented in the *Priest River SBA and TMDL* in Section 2.2.2, pages 29 – 32 (Rothrock 2001). Current applicable standards are presented in this document, as well as designated and existing beneficial uses for the segments addressed in this report (Table 2).

<u>Beneficial Uses</u>

Idaho water quality standards require that surface waters of the state be protected for beneficial uses, wherever attainable (IDAPA 58.01.02.050.02). These beneficial uses are interpreted as

Table 1. §303(d) Segments in the Priest River Subbasin Addressed in this Report

Waterbody Name	Water Quality Limited Segment #, and Idaho Water Body Identification Assessment Unit #[a] ID17010215…	1998 303(d)[b] Boundaries	Pollutants	Listing Basis
Reeder Creek	3424, PN023_02 & _03	Headwaters to Priest Lake	Sediment	Appendix D 1992 305(b)
Binarch Creek	3418, PN026_02	Headwaters to Lower Priest River	Sediment	Appendix D 1992 305(b)
East River main stem	3415, PN003_04	From confluence of Middle Fork and North Fork to Priest River	Sediment	Appendix D 1992 305(b)
East River	3415, PN003_02 & _03 PN004_02 & _03 PN003_04	Middle Fork North Fork main stem	Dissolved oxygen	Appendix D 1992 305(b)
East River	3415, PN003_02 & _03 PN004_02 & _03 PN003_04	Middle Fork North Fork main stem	Heat	Appendix D 1992 305(b)
Lower Priest River	3407, PN001_05	Upper West Branch Priest River confluence to Pend Oreille River	Sediment	Appendix D 1992 305(b)

a = Refer to Table B (page 6) for description of Water Quality Limited Segment number and Water Body Identification System.
b = Refers to a list created in 1998 of water bodies in Idaho that did not fully support at least one beneficial use. This list is required under section 303, subsection "d" of the Clean Water Act.

existing uses, designated uses, and "presumed" uses as briefly described in the following paragraphs. The *Waterbody Assessment Guidance*, second edition (Grafe *et al*. 2002) gives a more detailed description of beneficial use identification for use assessment purposes.

Existing Uses

Existing uses under the CWA are "those uses actually attained in the waterbody on or after November 28, 1975, whether or not they are included in the water quality standards." The existing instream water uses and the level of water quality necessary to protect the uses shall be maintained and protected (IDAPA 58.01.02.003.35, .050.02, and 051.01 and .053). Existing uses include uses actually occurring, whether or not the level of quality to fully support the uses exists. Practical application of this concept would be when a water could support salmonid spawning, but salmonid spawning is not yet occurring.

Table 2. Designated and Existing Beneficial Uses for §303(d) Segments in the Priest River Subbasin Addressed in this Report

Waterbody	Designated Uses[1]	1998 §303(d) List[2]
Lower Priest River[D] Upper West Branch confluence to mouth	CW, SS[E], PCR, DWS, SRW	x
Reeder Creek	CW[P], SS[E], PCR[P]	x
Binarch Creek headwaters to mouth	CW[P], SS[E], SCR[P]	x
East River main stem Confluence of Middle and North Forks to Lower Priest River	CW[P], SS[E], DWS[E], PCR[P]	x

1= CW – Cold Water Aquatic Life, SS – Salmonid Spawning, PCR – Primary Contact Recreation, SCR – Secondary Contact Recreation, DWS – Domestic Water Supply, SPW – Special Resource Water.
2= Refers to a list created in 1998 of water bodies in Idaho that did not fully support at least one beneficial use. This list is required under section 303 subsection "d" of the Clean Water Act.
D= "Designated use" in 58.01.02.110.06 of Idaho water quality standards.
P= "Presumed use" of Undesignated Surface Waters as established through 58.01.02.101 of standards.
E= "Existing use" identified as result of Beneficial Use Reconnaissance Project monitoring or observation.

Designated Uses

Designated uses under the CWA are "those uses specified in water quality standards for each waterbody or segment, whether or not they are being attained." Designated uses are simply uses officially recognized by the state. In Idaho these include things like aquatic life support, recreation in and on the water, domestic water supply, and agricultural use. Water quality must be sufficiently maintained to meet the most sensitive use. Designated uses may be added or removed using specific procedures provided for in state law, but the effect must not be to preclude protection of an existing higher quality use such as cold water aquatic life or salmonid spawning. Designated uses are specifically listed for water bodies in Idaho in tables in the standards (see IDAPA 58.01.02.003.22, and IDAPA 58.01.02.109-160 in addition to citations for existing uses.).

The only §303(d) listed segment in the Priest River Subbasin that is currently cited in the standards for designated uses is Lower Priest River, from Priest Lake to the mouth. The designated beneficial uses are: domestic water supply, cold water aquatic life, primary and secondary contact recreation, and as a special resource water.

Presumed Uses

In Idaho, most water bodies listed in the tables of designated uses in the water quality standards do not yet have specific use designations (the case for all §303(d) water bodies in the Priest River Subbasin except Lower Priest River). These undesignated uses are to be designated. In the interim, and absent information on existing uses, DEQ presumes that most waters in the state will support cold water aquatic life and either primary or secondary contact recreation (IDAPA 58.01.02.101.01). To protect these so-called “presumed uses,” DEQ will apply the numeric criteria cold water and primary or secondary contact recreation criteria to undesignated waters. If in addition to these presumed uses, an additional existing use, (e.g., salmonid spawning) exists, because of the requirement to protect levels of water quality for existing uses, then the additional numeric criteria for salmonid spawning would additionally apply (e.g., intergravel dissolved oxygen, temperature). However, if for example, cold water is not found to be an existing use, a use designation to that effect is needed before some other aquatic life criteria (such as seasonal cold) can be applied in lieu of cold water criteria. (IDAPA 58.01.02.101.01).

Water Quality Standards

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 water quality parameters that would be applicable in the Priest River Subbasin (potential violation of Idaho standards) are listed in Table 3. The EPA has established bull trout temperature criteria for specifically cited streams in the Priest Lake subbasin, and also the East River in the Lower Priest River subbasin (EPA 1997b). The EPA criteria is also shown in Table 3.

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 waterbody has designated or established existing beneficial uses, numeric criteria specific to the use apply to the water as a minimum requirement for support status.

2.2.1 Evaluation Methods of Beneficial Use Support Status

Wadeable Streams

IDAPA 58.01.02.053 codifies DEQ's procedure to determine whether a waterbody fully supports designated and existing beneficial uses. It relies heavily upon biological parameters and aquatic habitat, and is a procedure presented in WBAG II (Grafe *et al*. 2002). The WBAG II requires the use of the most complete data available to make beneficial use support status determinations. Figure 2 provides an outline of the wadeable stream assessment process for support status determinations of the beneficial uses: cold water aquatic life, salmonid spawning, and contact recreation.

Initial assessments of Figure 2 are for exceedances of numeric criteria in Idaho water quality standards for water temperature, dissolved oxygen, pH, and turbidity. Evaluation for exceedances begins with a test of whether more than 10 percent of the collected data exceeds the criteria being examined. Results greater than 10 percent frequency exceedance are considered a violation of standards criteria, and support status of the beneficial use under consideration is assigned Not Fully Supporting (NFS). The WBAG II provides guidance on the desired extent of parameter data collected for evaluations, particularly for water temperature during the criteria time periods. In evaluating temperature violations, the standards do have a temperature exemption provision (IDAPA 58.01.02.80.04), that states when ambient air temperature is extremely high, exceeding water temperature criteria may not be a standards violation. The standards also state that natural background conditions must be considered in criteria evaluations (IDAPA 58.01.02.200.09).

If the frequency of exceedance is between 0 – 10%, an assessor may also assign NFS if documented evidence indicates a measurable adverse effect. This is a best professional judgement based on the data at hand regarding the degree to which the magnitude and duration of the exceedance affects the biota (or human health), and whether exceedances are responsible for the waterbody not fully supporting its beneficial use(s). If there are no measurable adverse effects, support status evaluations turn to the BURP and other supporting data.

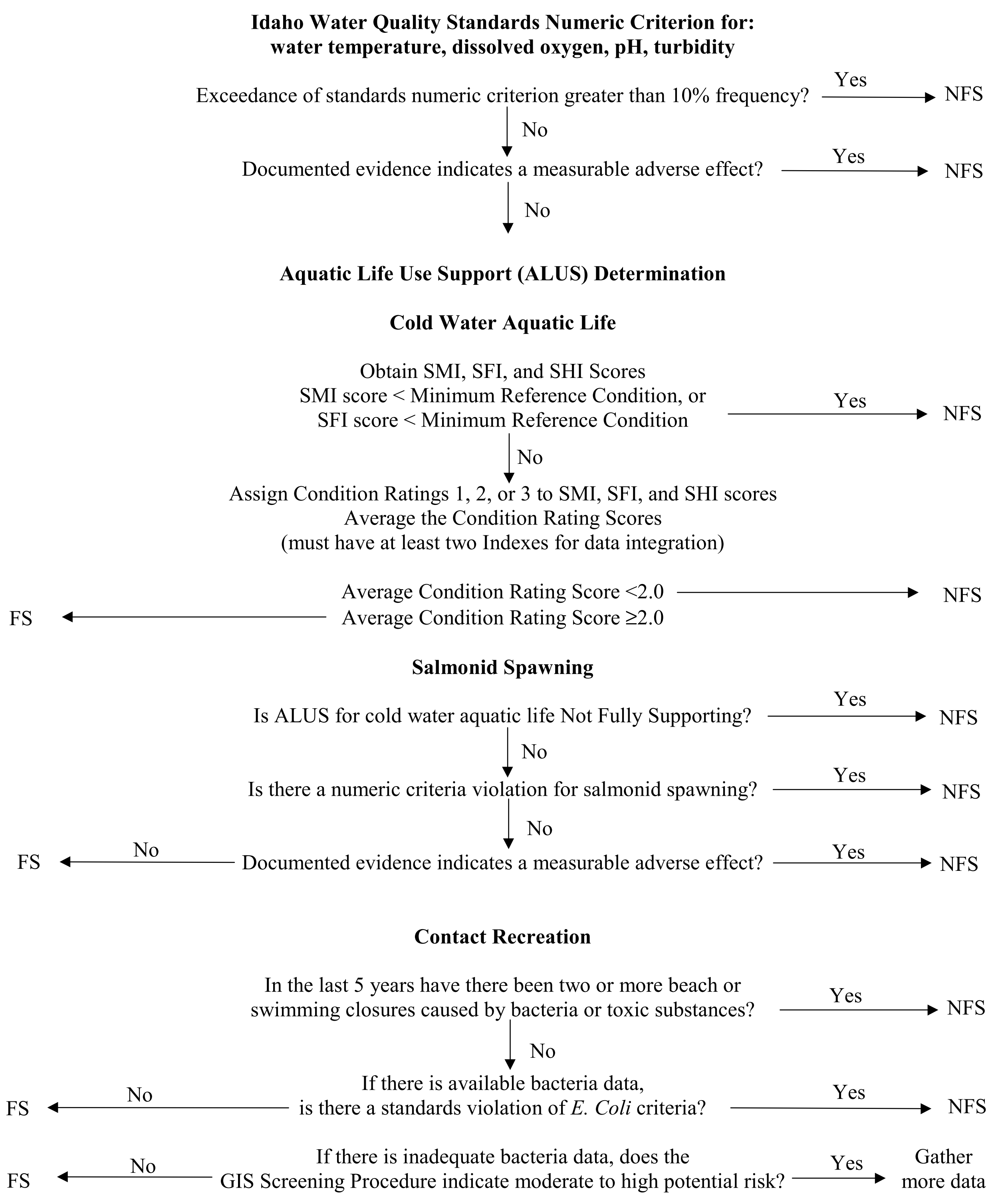
The next step in Figure 2 is Aquatic Life Use Support (ALUS) determination for cold water aquatic life (CWAL) beneficial use. This determination utilizes Stream Index Scoring with three multimetric indexes. Scoring criteria are presented in the WBAG II document (Grafe *et al*. 2002), and description of the metrics and calculation methods used are presented in the supporting document, Idaho Stream Ecological Assessment Framework (Grafe 2002a). The three indexes are calculated from BURP or Tier I BURP-compatible data from outside sources. Each index has scoring criteria divisions that vary depending on Bioregion Classification. For the Priest River Subbasin, the three indexes are: Northern Mountains Stream Macroinvertebrate Index (SMI), Forest Stream Fish Index (SFI), and Northern Rockies Stream Habitat Index (SHI).

If a SMI score is <39, the score is considered below Minimum Reference Condition (SMI = Minimum Threshold), and CWAL is considered Not Fully Supporting. SMI scores 39 and greater are given Condition Rating scores 1, 2, or 3 based on established breakpoints. If a SFI score is <34, the score is considered Minimum Threshold and CWAL is assigned NFS regardless

Table 3. Selected Numeric Criteria Supportive of Designated Beneficial Uses in Idaho Water Quality Standards

Designated and Existing Beneficial Uses				
Water quality parameters	**Primary Contact Recreation**	**Secondary Contact Recreation**	**Cold Water Aquatic Life**	**Salmonid Spawning during spawn and incubation period for inhabiting species**
Water Quality Standards Adopted April 5, 2000: IDAPA 58.01.02.250				
Coliforms, ph, and Dissolved oxygen	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 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
Temperature			22EC or less daily maximum, daily average no greater than 19EC.	13EC or less daily maximum, daily average no greater than 9EC. Bull trout: not to exceed 13EC maximum weekly maximum temp. over warmest 7 day period, June – August, for juvenile rearing.
			Seasonal Cold Water - IDAPA 58.01.02.250.03. Between summer solstice - autumn equinox: 27EC or less daily maximum, daily average of 24EC 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.	
Turbidity			Turbidity shall not exceed background by more than 50 NTU instantaneous or more than 25 NTU for more than 10 consecutive days.	
Ammonia			Ammonia not to exceed calculated concentration based on pH and temp.	
EPA Bull Trout Temperature Criteria: Water Quality Standards for Idaho, 40 CFR Part 131				
Temperature				7 day moving average of 10EC or less maximum daily temperature for June - September for bull trout rearing and spawning.

Figure 2. Determination Steps and Criteria for Support Status of Beneficial Uses in Wadeable Streams: *Waterbody Assessment Guidance*, Second Addition (Grafe *et al*. 2000)



FS =Fully Supporting, NFS =Not Fully Supporting of the SMI score. SFI scores 34 and greater are given Condition Rating scores from 1 to 3. For SHI scores there is no Minimum Threshold concept. Condition Rating scores also range from 1 to 3.

Assuming neither the SMI or SFI are Minimum Threshold, an index data integration approach is used to assign support status. The Condition Rating scores are added and averaged (there must be at least two index scores to make an evaluation). An average score <2.0 results in NFS for CWAL; an average score ≥2.0 results in Fully Supporting (FS).

Under WBAG II, the salmonid spawning beneficial use is evaluated within the context of the ALUS determination and applicable numeric criteria. If CWAL = NFS, then salmonid spawning is NFS. If CWAL = FS, then the next step is to determine if readily available data exists to apply appropriate numeric criteria (water column and/or intergravel dissolved oxygen, water temperature, and ammonia criteria) specific to salmonid spawning. If appropriate data does not exist, then salmonid spawning is assumed to be FS based on CWAL = FS. If sufficient data exists then it is examined for numeric criteria violations, essentially a loop back to the top of Figure 2. If numeric criteria are violated above the 10% frequency threshold, salmonid spawning is NFS. If numeric criteria are not violated at the 10% threshold, and evidence does not indicate a measurable impairment, then salmonid spawning is FS.

For primary or secondary contact recreation, DEQ evaluates if beach or swimming closures have occurred in the last five years to identify potential exceedances. If two of more closures indicate bacteria or toxic substance causes, then DEQ concludes that the waterbody is Not Fully Supporting for contact recreation.

If bacteria data is available, then violations of numeric criteria are examined (Table 3). Exceedances of the *E. Coli* criteria results in NFS for contact recreation. If there are no or insufficient bacteria data at hand, then DEQ would use a bacteria screening procedure. DEQ uses GIS capabilities and local knowledge to determine if upstream land uses have the potential for increasing bacteria concentrations in the waterbody. Activities that could affect the reach include agriculture, grazing, urban or housing development, wastewater treatment facilities, or septic tanks. If an assessor assigns a low potential risk, then the waterbody is considered Fully Supporting for recreation. If it is judged that there is a moderate to high potential risk, then the waterbody is determined Not Assessed and additional or first time data is gathered.

While domestic water supply is an existing use in the Priest River Subbasin, 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. Agricultural and industrial water supply is evaluated by narrative criteria, and unless there is evidence to the contrary, DEQ presumes use support as Fully Supporting. Wildlife habitat and aesthetics are designated uses for all surface waters of Idaho, and unless there is evidence to the contrary, DEQ presumes use support as Fully Supporting.

Large Rivers

In 1997 DEQ established a separate sampling protocol for large rivers (DEQ 1997). From a practical standpoint of sampling and safety considerations, biological collections and habitat measurements in rivers needed a different approach than used in wadeable streams. From the standpoint of waterbody ecology, lowland large rivers would have a naturally different makeup of macroinvertebrate communities than upland streams (Grafe 2002b), and the assemblage of attached algae on rocks (periphyton) can be a useful bioassessment to judge human disturbance impact within rivers.

Like the methods for wadeable streams, support status for large rivers begins with examining data for violations of standards numeric criteria (Figure 2). If the result is Fully Supporting, then the River Index Scoring is used to determine CWAL beneficial use support. The River Index Scoring is comprised of three multimetric indexes: River Macroinvertebrate Index (RMI), River Fish Index (RFI), and River Diatom Index (RDI). The IREAF is the supporting document for description of the metrics and calculation methods used (Grafe 2002b).

The RMI and RFI have Minimum Threshold scores, where scores below the Minimum Reference Condition result in Not Fully Supporting (RMI <11 and RFI <54). If scores are above the minimum breakpoint, Condition Rating scores 1, 2, or 3 are assigned to the three indexes. Like the wadeable stream approach, an index data integration is used to assign support status. The Condition Rating scores are added and averaged (there must be at least two index scores to make an evaluation). An average score <2.0 results in river CWAL = NFS; an average score ≥2.0 results in FS. A fourth index may also be calculated, the River Physicochemical Index (RPI), an index using the methods of the Oregon Water Quality Index (Cude 1998). The RPI score is not used in the river data integration process, but the result may be used for supplemental water quality interpretations.

For salmonid spawning beneficial use in large rivers, the assessment approach is the same as previously described for wadeable streams.

2.3 Summary and Analysis of Existing Water Quality Data

A comprehensive summary of existing water quality data was presented for the Priest River Subbasin (4th field hydrologic unit) in the *Priest River SBA and TMDL*, Section 2.2.3, pages 32 – 54 (Rothrock 2001). For each of the original ten waterbody segments listed in the 1994/94 §303(d) list, a document Section was developed for individual watershed assessments (5th field hydrologic units). These report Sections included a summary and analysis of: physical and biological characteristics, cultural characteristics, pollutant source inventory, past and present pollution control efforts, water quality concerns and status, existing water quality data, status of beneficial uses where there was sufficient data available to make such determinations, and data gaps. The watershed assessments of §303(d) listed segments were presented in Sections 3.1 – 3.4, pages 62 – 150.

This current *Addendum* document revisits the watershed assessments for the four waterbody segments that were delayed for support status determinations (Table 1). In each case, data that have been collected in 2000 and 2001 is presented and incorporated into the data collected before that time. Some information from the watershed assessments in the *Priest River SBA and TMDL* is repeated here for continuity and clarity in order to explain the support status determinations that are made.

2.3.1 Reeder Creek from Elevation 2680' to Mouth

<u>Summary</u>

The watershed assessment for Reeder Creek in the *Priest River SBA and TMDL* is presented in Section 3.2.A, pages 91 – 96.

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 DEQ §303(d) list (DEQ 1999). Reeder Creek from the headwaters to elevation 2680 ft was determined Full Support of cold water aquatic life and salmonid spawning beneficial uses in the *Priest River SBA and TMDL.* This segment was recommended for removal from the §303(d) list with sediment as the pollutant of concern. Reeder Creek from elevation 2680 ft to the mouth was retained on the §303(d) list until laboratory analysis of BURP macroinvertebrate data taken in 2000 was complete.

Reeder Creek is a 2nd order stream on the west side of Priest Lake (Figure 1), flowing south and then due east to the lake. Main stem length is 7.7 miles and watershed size is 8,454 acres. The watershed can be divided into three sections (Figure 3). 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 consists of alders and willows with some conifer overstory, and the stream bottom is sandy-silt. The last one-half mile gets steeper with Rosgen B and A (Rosgen 1985) 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.

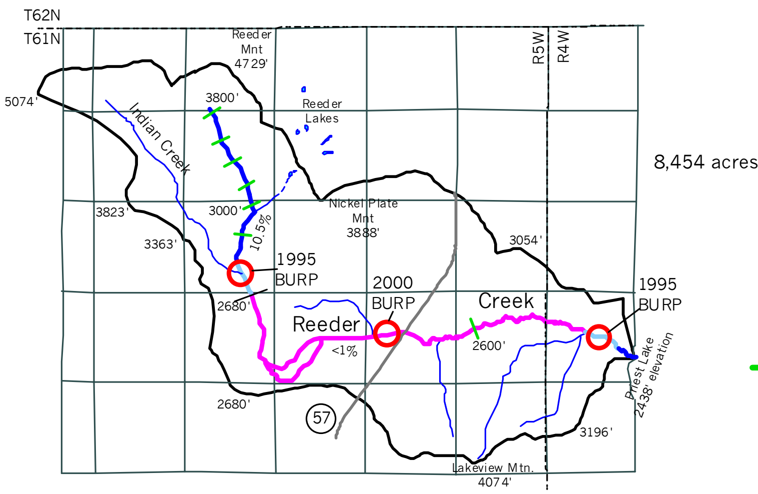
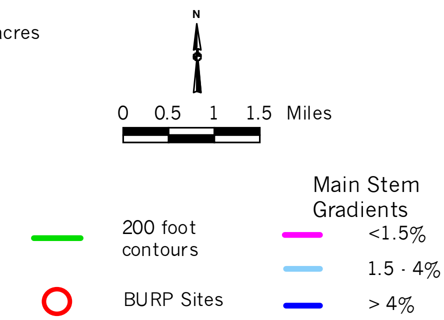


Figure 3a. Reeder Creek Watershed: streams, BURP sites, and gradients.



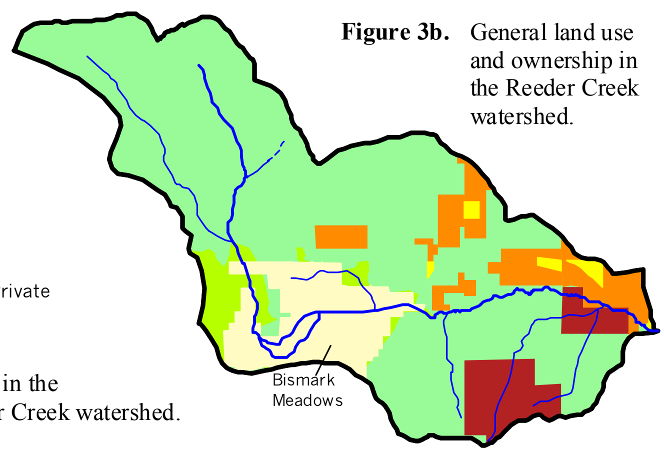


Figure 3b. General land use and ownership in the Reeder Creek watershed.

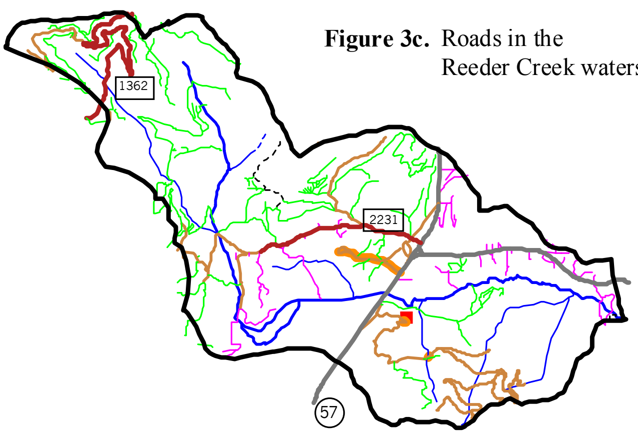


Figure 3c. Roads in the Reeder Creek watershed.

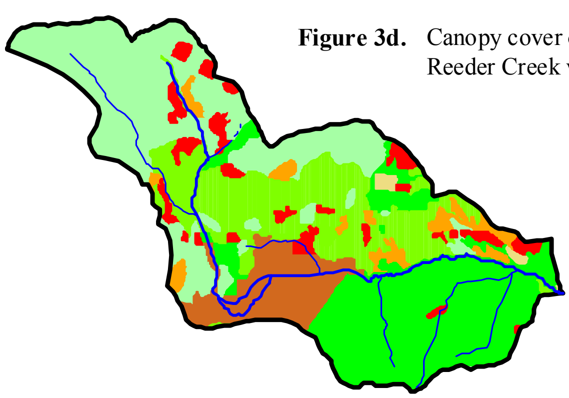


Figure 3d. Canopy cover of the Reeder Creek watershed.

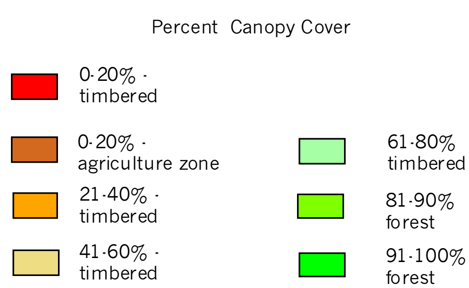


Figure 3. Reeder Creek hydrology, BURP sites, land use, roads, and watershed canopy cover.

The middle watershed section is west of Hwy 57 as Reeder Creek flows through the broad floodplain of Bismark Meadows. While once a contiguous wetland and wet meadows, a large 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). The stream bottom is sand-silt-muck. A large section of Bismark Meadows has just recently become a federal Wetland Reserve Program (WRP). The details and significance of the WRP project for beneficial use support in Reeder Creek is explored in Chapter 4 (Summary of Past and Present Pollution Control Efforts).

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.

Reeder Creek watershed is a mixture of federal lands and private ownership (Figure 3b). A substantial area of land is private (2,253 acres, 27% of the watershed). Land use on private ownership includes: scattered single family residences and a 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.

BURP data were collected at two sites on Reeder Creek in 1995 (Figure 3a), which pre-dated electro-fishing as part of the BURP sampling protocol. The lower site was near the mouth on an A channel gradient, 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 low gradient channel flowing through wet meadow habitat. The upper BURP site was in a B channel reach representative of the headwaters, above the main middle section.

In 2000 a BURP site was established within the middle section, just west of the Hwy 57 crossing. Electro-fishing was included in the sampling. DEQ also electro-fished the upper 1995 BURP site in 2000. At both sites brook trout were the only salmonids captured. There are no other known fish sampling efforts documented for Reeder Creek. It was known from USFS field observations and from accounts of local fishermen, that brook trout are present throughout the stream. Local residents have stated that a few cutthroat trout have been caught in Reeder Creek, but not in recent years. Resident cutthroat may reside in the headwaters. It is uncertain if bull trout inhabited Reeder Creek historically, but they are probably not present now (Panhandle Basin Bull Trout TAT 1998).

IDFG file records show that there was a Rotenone treatment of Reeder Creek in August 1958 for brook trout removal, followed by a plant of cutthroat fry (Fredericks *pers comm*).

Flow Characteristics

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. 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. A daily hydrograph was established for Reeder Creek for WY 94 and 95 from stream gaging 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. 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 to Priest Lake in WY 95 was estimated at 14,270 ac-ft.

Water Column Data

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. 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 ground water with above average phosphorus (relative to granitic basin streams), and relative high dissolved inorganic and organic nitrogen, iron, and tea colored to reddish brown colored water from iron and organics.

During 1993 - 1995, thirteen samples were taken for fecal coliform bacteria near the mouth. Reeder Creek is considered 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.

Numerous instream measurements were taken of pH and DO during 1993 – 1995 with no numeric criteria exceedances. Only instantaneous temperature readings were taken in Reeder Creek between 1993 - 1995. Maximum temperature recorded was 15.6 °C. EPA added water temperature (heat) as a listed pollutant to Reeder Creek on the 1998 DEQ §303(d) list (DEQ 1999). In 2001, USFS placed a temperature data logger near the mouth of Reeder Creek (Figure 4). Period of record was July 16 through October 14. The highest recorded daily maximum was 18.0 °C, and highest daily mean was 15.6 °C. For the warmest period of record, July 16 – August 18, the mean temperature was 13.8 °C.

Historic use of Reeder Creek by bull trout for spawning and juvenile rearing is unknown, and Reeder Creek is considered low priority in bull trout recovery plans (Panhandle Basin Bull Trout TAT 1998). EPA did not list this stream as a bull trout protected water in their listing for the

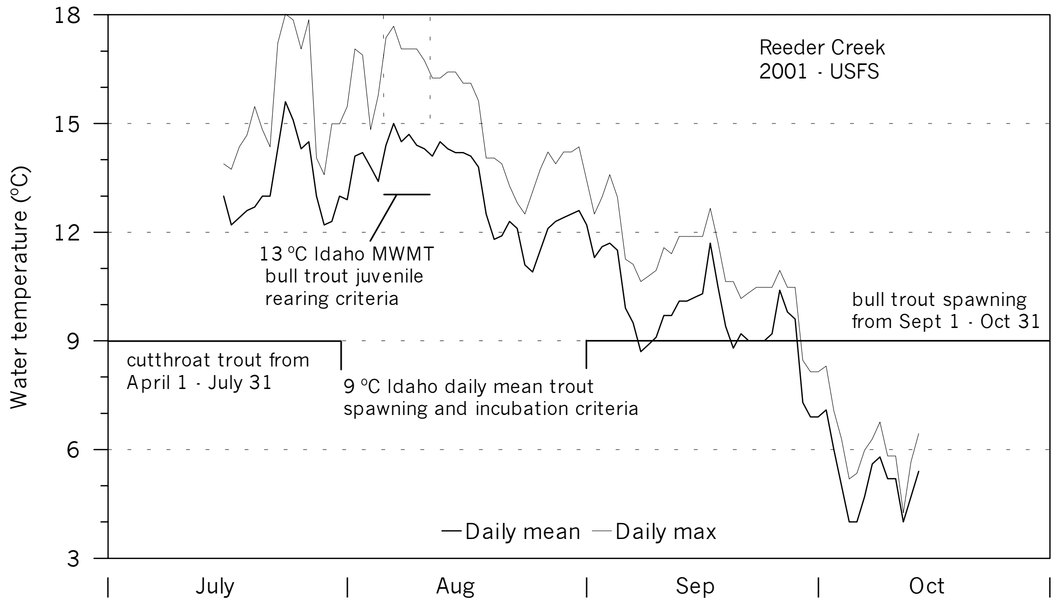


Figure 4. Mean daily and daily maximum water temperatures from July 16 – October 14, 2001 at Reeder Creek near the mouth (USFS data logger).

Priest River basin (EPA 1997b). Beside the headwaters there are mid to lower stream reaches of Reeder Creek which may have provided suitable habitat for both bull trout and cutthroat spawning.

Reeder Creek does fall within the boundary of the Priest Lake Key Watershed in Appendix F of Governor Batt's State of Idaho Bull Trout Conservation Plan (Batt 1996). As such, the standards bull trout temperature criteria would seem to apply (IDAPA 58.01.02.250.02.f.i). The standards bull trout rearing criteria of 13 °C maximum weekly maximum temperature (MWMT) during the warmest consecutive 7 day period was exceeded August 6 – August 12 (Figure 4). At that time the MWMT was 17.0 °C. The standards bull trout spawning criteria of 9 °C daily mean for September through October was exceeded at a rate of 38% (23 days > 9 °C/61 days in the period). The standards cutthroat trout spawning and incubation criteria is extended to July 31 as established by the Coeur d'Alene DEQ Regional Office. This criteria of 9 °C daily mean was exceeded on all days for the period of record from July 16 – 31 for a 13% exceedance rate (16 days/122 days in the period).

Biological and Other Data

Electro-fishing results from BURP sampling in 2000 at the middle and upper sites (Figure 3a), are presented in Table 4.

The middle BURP electro-fishing site was representative of the primary reach which flows through Bismark Meadows: a low gradient stream with some meander and braiding, a substrate comprised mainly of silt and sand, little confer shading, some beaver activity, and some modifications in the way of channel straightening and numerous cross drainage ditches to facilitate hay cropping. The high abundance of speckled dace exhibits a characteristic more in common with Idaho rangeland streams compared to forest streams (Grafe 2002a). Brook trout abundance at the middle site was low (estimated 4 fish/100 m^2) in comparison with some other meadow streams. In Moores Creek, a meadow stream of similar dimension and characteristics further south in the basin, brook trout densities in qualitative electro-fishing surveys have ranged from 20 – 40 fish/100 m^2 (Horner 1988, USFS 1998). For WBAG II scoring using six forest stream metrics, SFI = 39. This low score reflects a lack of native salmonids, an absence of slimy sculpin, and low catch per unit effort of cold water individuals. Speckled dace is considered a cool water species (Zaroban *et al.* 1999).

Table 4. DEQ Electro-fishing Results in Reeder Creek, July 2000

Fish Species	Catch per minute electro-fishing effort (single-pass BURP protocol) Middle BURP Site	Upper BURP Site
Brook trout including YOY	0.8	5.2
Cutthroat trout	0	0
Slimy sculpin	0	0
Long-nose sucker	0.6	0
Speckled dace	9.6	0

The BURP macroinvertebrate scores were: SMI = 52 for the lower site (Condition Rating = 1), SMI = 21 for the middle site (CR = Minimum Threshold), and SMI = 71 for the upper site (CR = 3). All three macroinvertebrate sample sites at the middle BURP reach (composited into one sample sent to the laboratory), were obtained in run habitat with no riffles to sample. EPT taxa representation in the sample was low, and taxa abundance was dominated by Chironomidae taxa. Macroinvertebrate samples in the lower and upper sites were in riffle, B channel habitat.

The BURP habitat scores were: good at the lower site, SHI = 73 (CR = 3); poor at the middle site, SHI = 52 (CR = 1); and SHI = 74 at the upper site (CR = 3). Habitat categories that scored very low at the middle site were LWD at only 1 piece counted, high embeddedness of what little cobble existed, zone of influence (adjacent hay cropping and cross drain ditches), and high percent fines. The linear habitat distribution was 81% run, 19% pools, and no riffles. Four laterally scoured pools were measured, and average pool quality score was good with above average scores for submerged cover, undercut banks, and overhead cover.

Status of Beneficial Uses

Based on numerous measurements of pH, DO, turbidity, and samples for ammonia obtained at lower Reeder Creek during the 1993 - 1995 Priest Lake baseline study (Rothrock and Mosier 1997), there are no exceedances of standards numeric criteria for these parameters related to cold water aquatic life (CWAL) or salmonid spawning beneficial uses. There is a greater than 10% exceedance of standards cutthroat spawning and incubation numeric criteria between April 1 to

July 31. The standards bull trout rearing criteria of 13 °C MWMT was exceeded (17.0 °C measured MWMT), as well the spawning criteria of 9 °C daily mean from September through October (38% exceedance). Salmonid spawning (SS) beneficial use is thus Not Fully Supporting based on temperature violations, at least for the lower and middle stream reaches.

The WBAG II scoring results of multiple data type integration for use support determination - cold water aquatic life, is presented in Table 5.

Table 5. WBAG II Preliminary Use Support Determination - Cold Water Aquatic Life, for Reeder Creek

BURB site	SMI score & (condition rating)	SFI score & (condition rating)	SHI score & (condition rating)	Average condition rating score
Lower: 1995SCDAB021	52 (1)	nd	73 (3)	2.0 - Pass
Middle: 2000SCDA0001	21 (MT)	39 (1)	52 (1)	SMI=MT- Fail
Upper: 1995SCDAB018	71 (3)	50 (1)	73 (3)	2.3 - Pass

nd = No data:
MT = Minimum Threshold (SMI or SFI score below minimum of reference condition).

A determination of CWAL = NFS from the middle BURP site seems reasonable for the 2.7 mile stream reach through Bismark Meadows (elevation 2680 ft to Hwy 57). This low gradient reach has historically seen some hay cropping and cattle grazing, and the reach suffers from poor instream structure such as low LWD, marginal streambank cover, and lack of gravel-cobble riffles. The dominance of silt-sand substrate might however reflect a natural condition. Historically there may have been little in the way of gravel-cobble substrate suitable for cutthroat and bull trout spawning.

Just east of Hwy 57 the stream is similar to the segment through Bismark Meadows. But for the remaining 2.2 miles of low gradient channel through Forest Service land, there is very little documented information about habitat condition and there are no BURP sites. There are areas where conifer canopy is close to the stream. The support status for this reach is assigned Not Fully Supporting based on the single BURP site west of Hwy 57. For the last 0.5 miles of B and A channel type, from elevation 2520 ft to the mouth, CWAL = FS based on the SMI and SHI results of the lower BURP site. Likewise, CWAL = FS for the headwaters reach from elevation 2680 ft based on the average CR = 2.3 of the upper BURP site.

The lower-most section of Reeder Creek flowing through Elkins Resort is considered primary contact recreation. The remaining stream is considered secondary contact recreation. During the 1993 – 1995 sampling for bacteria near the mouth, the data did not exceed the primary contact numeric criteria for fecal coliform (standards criteria prior to April, 2000). The four samples for *E. Coli* bacteria taken in 2000 near the middle BURP site had a geometric mean of 113 *E. coli*/100 ml, below the standards criteria of 126 *E. coli*/100 ml geometric mean of five samples over 30 days (Table 3). Support status for contact recreation is assigned Fully Supporting.

Conclusions

This subbasin assessment concludes that the reach of Reeder Creek from elevation 2680 ft to about 0.5 miles from the mouth (elevation 2520 ft) is Not Fully Supporting of cold water aquatic life and salmonid spawning beneficial uses. The lower-most segment from elevation 2520 ft to the mouth is Fully Supporting for CWAL, but SS = NFS based on water temperature.

The headwaters segment down to elevation 2680 ft is judged as Fully Supporting of CWAL based on WBAG II criteria. This upper segment was previously judged as FS in the *Priest River SBA and TMDL* using WBAG+ criteria (Rothrock 2001). However, the upper and middle reaches of Reeder Creek have been placed within the same evaluation Assessment Unit (AU, a subset segment of the Idaho Water Body Identification System based on the DEQ water body stratification approach). When there are two BURP evaluation sites in the same AU, DEQ uses the lower multimetric index score to interpret aquatic life use support (Grafe *et al*. 2002). Since CWAL = NFS for the middle BURP site, the upper reach remains as a portion of Reeder Creek on the §303(d) list, and is included in the Reeder Creek sediment TMDL. There is no water temperature data for this upper reach to judge whether there is an exceedance of standards temperature criteria.

The Wetland Reserve Project (WRP) within Bismark Meadows, under the administration of the NRCS (see Chapter 4), is an important implementation program that holds promise for habitat improvement within the reach west of Hwy 57. Restoration of historic wetland and floodplain function, including meander and beaver activity, and addition of streamside vegetative cover, could well be the primary mechanism to restore instream beneficial uses. These improvements west of Hwy 57 may also translate to habitat improvement east of Hwy 57.

Regardless of the potential improvements achieved through the WRP, the WBAG II results require that the entirety of Reeder Creek remain on the §303(d) as water quality impaired with sediment and heat as the pollutants of concern. Chapter 5 presents a sediment TMDL for the Reeder Creek watershed including the headwater lands, since the impaired middle stream segment may receive sediment from the upper reach. It would be anticipated that reduction in sediment load to the stream will be complementary to the efforts of the WRP projects.

Under the guidelines of WBAG II, a temperature TMDL is also required for Reeder Creek. Based on a negotiated TMDL Settlement Schedule, the due date for a Reeder Creek temperature TMDL is 2007. This will provide needed time to evaluate canopy cover and stream temperature potential for the TMDL calculations.

2.3.2 Binarch Creek

Summary

The watershed assessment for Binarch Creek is presented in the *Priest River SBA and TMDL* in Section 3.4.C, pages 135 – 141.

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 DEQ §303(d) List (DEQ 1999). The *Priest River SBA and TMDL* requested a delay of beneficial use status determinations for Binarch Creek until further electro-fishing surveys were conducted.

Binarch Creek is a small stream system that has been difficult to assess under WBAG guidelines 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. Several segments of the stream go subsurface, or become intermittent. Two BURP sites within beaver complex of E5 channel type, have resulted in very low macroinvertebrate scores. The benthic 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. Also, until 2001 there had only been a single electro-fishing effort within the last 15 years.

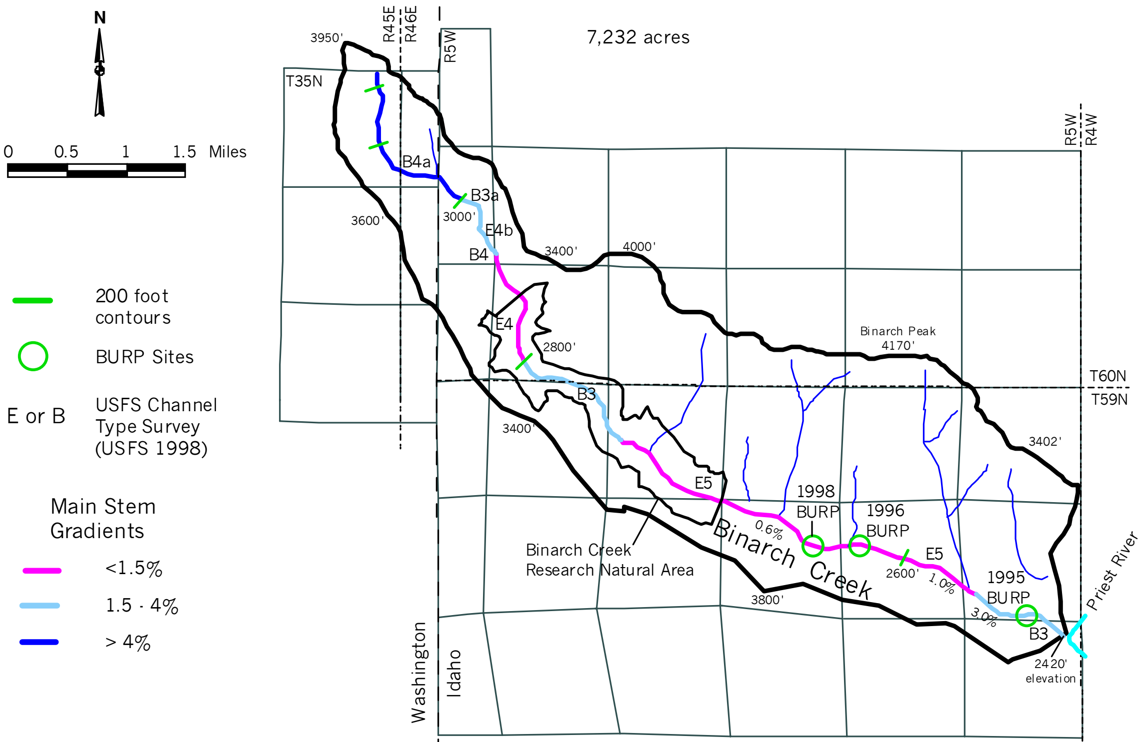
Binarch Creek is a 2nd order stream on the west side of Lower Priest River (Figure 1), flowing southeast to the river. Main stem length is 8.6 miles, and watershed size is 7,232 acres. The watershed is mostly forested and steep sloped, ranging in elevation from 2,420 ft at the river to 4,170 ft at Binarch Mountain. Much of the stream is low to moderate gradient meandering through an uncontained floodplain in a wide valley bottom.

The entire watershed is IPNF land. In 1989 a 660 acre Binarch Creek Research Natural Area (RNA) was established (Figure 5a), an area surrounding a 2.5 mile middle stream segment. RNA status was justified by the following principle distinguishing features (USFS 1989):

- A low-gradient, meandering stream representative of glaciated northern Idaho.
- Senescent and active beaver dams and ponds.
- Marshes and wet meadows.
- Riparian vegetation of the stream and adjacent marshes and wet meadows that harbor numerous reptiles, birds, and mammals.
- An unusually diverse assemblage of aquatic plants and animals including a pure strain of westslope cutthroat trout.
- Mature forests on the slopes growing at least nine habitat types.

A 1975 sampling by University of Idaho in Binarch Creek found 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).

Figure 5a. Binarch Creek Watershed: streams, BURP sites, and gradients.



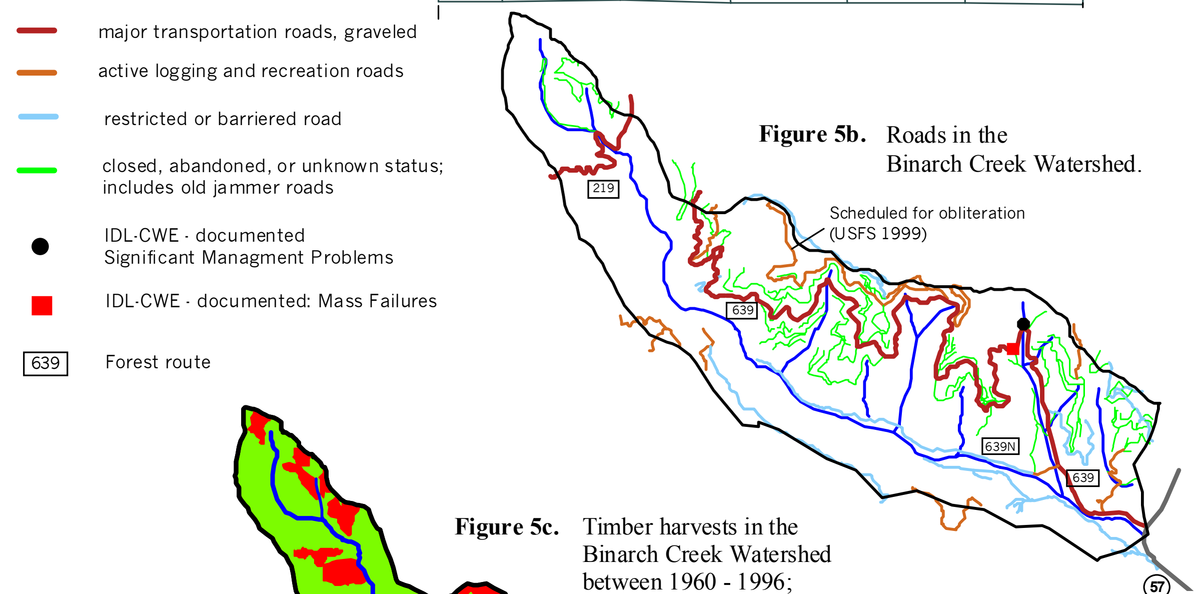


Figure 5b. Roads in the Binarch Creek Watershed.

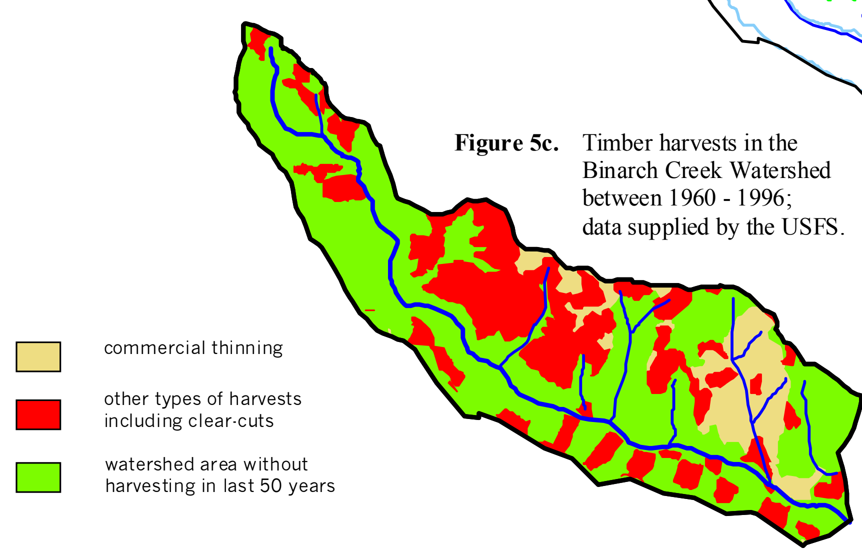


Figure 5c. Timber harvests in the Binarch Creek Watershed between 1960 - 1996; data supplied by the USFS.

Figure 5. Binarch Creek hydrology, BURP sites, roads, and watershed timber harvests.

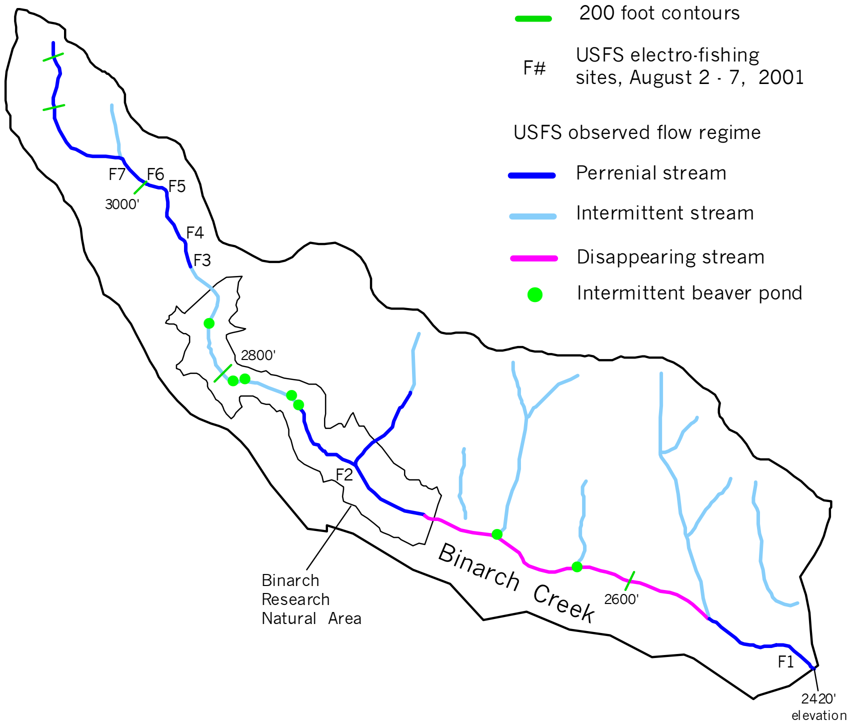


Figure 6. USFS electro-fishing sites and observed flow regime in Binarch Creek, August 2 – 7, 2001.

The 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).

Around 1890, almost the entire drainage of Binarch Creek was burned in a large wildfire (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 RNA. Presently, the USFS manages 6,572 acres for timber production. Because of the large fire around 1890, little historic logging occurred in the drainage, with the majority of harvesting occurring since the 1960s. Around 43% of the watershed had been harvested between 1960 – 1996 (USFS 2000a, Figure 5c). There has been some infestation of the Douglas-fir beetle and beetle caused mortality, and harvesting of affected trees was proposed beginning in 2000 (USFS 1999). However, these timber sales did not occur. Current density of active roads is moderate at 2.1 miles/mi^2 (Figure 5b).

There have been three BURP sites: a lower site in 1995, and two mid-lower sites, one sampled in 1996 and the other in 1998 (Figure 5a). All BURP sites were below the RNA lower boundary. There has been only a single BURP electro-fishing sample, done in 2000 at the 1996 mid-lower site. At the request of DEQ, the USFS conducted an electro-fishing survey in August, 2001. Seven sites from the mouth to the headwaters were electro-fished following BURP protocol, along with channel-type classification and mapping of beaver complexes and intermittent stream segments (Figure 6).

Recent electro-fishing surveys have captured brook trout near the mouth and cutthroat trout throughout the stream. It is unknown if bull trout inhabited Binarch Creek historically, but they are not thought to be present now, and the stream is considered low priority in bull trout recovery plans (Panhandle Basin Bull Trout TAT 1998).

Flow Characteristics

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. The only flow measurements on record are from BURP sampling, with no development of a hydrograph. Based on the daily hydrograph established at Lamb Creek (to the immediate north) during the 1993 – 1995 Priest Lake study, peak flow is during mid-March through late April (Rothrock and Mosier 1997). Peak flow for Binarch Creek was estimated between 55 – 60 cfs. Late summer base flow from BURP sampling ranged 2 – 3.5 cfs.

Water Column Data

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 data logger within mid-lower Binarch Creek, near the 1996 BURP site, from June 24 - October 2, 2000. Upon visitation in October 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 (Figure 7).

Bull trout temperature criteria do not apply to Binarch Creek. This stream was not listed by EPA as a bull trout protected water in their listing for the Priest River Basin (EPA 1997b). Binarch Creek is also below the Priest Lake Key Watershed bull trout boundary and considered low priority in bull trout recovery plans (Panhandle Basin Bull Trout TAT 1998).

The Idaho standards numeric criteria for cutthroat spawning and incubation do apply in Binarch Creek. Because this is a 2nd order stream, there is potential cutthroat spawning throughout the stream where there is suitable gravel-cobble habitat. With a spawning and incubation period set from April 1 to July 31, the period of record data showed a 31% exceedance rate of the 9 °C daily mean criteria (38 days exceedance/122 days in the period).

Biological and Other Data

Table 6 presents electro-fishing results from BURP sampling in July 2000 at the mid-lower 1996 site, and USFS electro-fishing from August 2 -7, 2001 at seven sites. Translated to SFI scores, the range from the eight electro-fishing sites was SFI = 55 – 88, with mean SFI = 74, or Condition Rating = 2. Above average scores within the SFI metrics were related to the presence of cutthroat trout with overall good abundance (catch per unit electro-fishing effort). Low metric

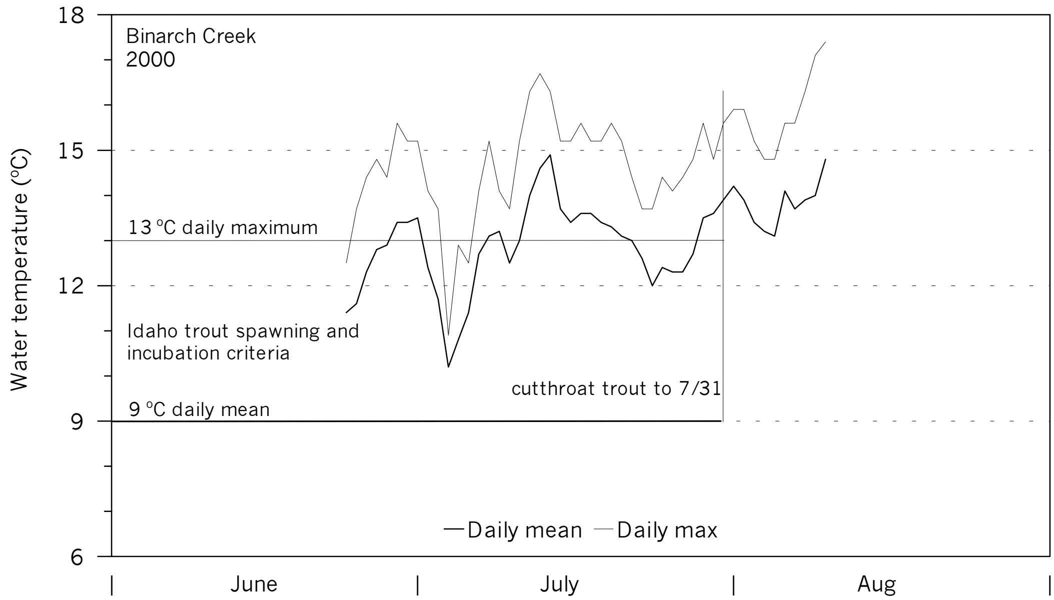


Figure 7. Mean daily and daily maximum water temperatures from June 24 – August 9, 2001 at mid-lower Binarch Creek (DEQ data logger).

Table 6. Results of Electro-fishing by DEQ (2000) and USFS (2001) in Binarch Creek.

	Catch per minute electro-fishing effort (single-pass BURP protocol)				
Fish Species including YOY	**DEQ @ 1996 BURP Site**	**USFS Site 1**	**USFS Site 2**	**USFS Sites 3 & 4**	**USFS Sites 5, 6, 7**
Brook trout	0	2.0	0	0,0	0,0,0
Cutthroat trout	0.5	0.3	3.7	5.7, 5.4	1.9, 0.6, 2.7
Slimy sculpin	0	0	0	1.4, 1.2	0, 0, 0

scores were generally from the absence of sculpin at all but two of the sample sites. For the upper reaches 5, 6, and 7, SFIs are calculated without the sculpin metric because this metric is omitted when stream grade >4% (Grafe 2000a).

The BURP macroinvertebrate scores were SMI= 64 at the 1995 lower site near the mouth (Condition Rating = high 2), and low scores at the two mid-lower sites with SMI= 24 and 26. The latter scores are CR = Minimum Threshold.

The macroinvertebrate sampling at the 1995 lower site was in B3 channel riffles with good representation of EPT taxa. Sampling at the two mid-lower BURP sites were in E5 channel, silt-sand, and slow water run/glide habitat characteristic of the beaver pond complexes. At the 1996 site (SMI = 26), taxa richness was low and dominant organisms numerically were within the order Diptera (true flies). At the 1998 site (SMI = 24), all 3 macroinvertebrate samples were

Table 7. WBAG II Preliminary Use Support Determination – Cold Water Aquatic Life, for Binarch Creek.

BURB site	SMI score & (condition rating)	SFI score & (condition rating)	SHI score & (condition rating)	Average condition rating score
Lower: 1995SCDAB039	64 (2)	55 (1)[a]	77 (3)	2.0 - Pass
Mid-lower: 1996SCDAA017	26 (MT)	65 (1)[b]	42 (1)	SMI=MT - Fail
Mid-lower: 1998SCDAA025	24 (MT)	Nd	nd	SMI=MT - Fail
Mid Binarch: USFS electro-fish	nd	77 (2)	nd	n.a.
Mid-Upper: USFS electro-fish	nd	79 (2) 79 (2)	nd	n.a.
Upper: USFS electro-fish	nd	85 (3) 67 (2) 88 (3)	nd	n.a.

a = USFS electro-fishing data used for lower BURP site
b = DEQ electro-fishing data used for the 1996 mid-lower BURP site
nd = No data
n.a. = not applicable; only one stream index, cannot use data integration
MT = Minimum Threshold (SMI or SFI score below minimum of reference condition)

taken in glide habitat. Taxa richness was high, but there was low representation of EPT taxa, high representation of Diptera taxa, and dominant organisms numerically included Hemiptera (water bugs), but also two taxa within order Ephemeroptera (*Callibaetis* sp. and *Centroptilum* sp.)

The BURP habitat scores were a good SHI = 77 at the 1995 lower site (CR = 3), but a poor SHI = 42 (CR = 1) at the 1996 mid-lower site. Habitat scoring for the 1998 BURP site was incomplete because BURP crews encountered swampy conditions. Poor habitat metric scores at the 1996 site, within E5 channel type, related to: low instream cover, 100% fines with only two Wolman pebble size classes, high embeddedness, and marginal canopy cover.

A fairly comprehensive habitat survey was conducted by USFS over much of Binarch Creek in October 1998 as part of the Douglas-fir beetle project EIS (USFS 1998). In addition to very high percent fines in the middle E5 channel reach, measured percent fines in gravel substrate of B3, B4, and E4 channel types of the upper one-half stream segment (Figure 5a) tended to be moderately high. Percent fines of 0 – 2 mm grain size within selected channel segments and pool tailouts of five upper reaches ranged from 11 – 47% with a mean of 27% (giving a low BURP equivalent score for percent fines). Field notes from the 1998 survey also made reference to “B channel type reaches that had poor pool quality due to aggradation of sediment.”

Status of Beneficial Uses

There are no measurements of pH, DO, turbidity, or samples for ammonia, to judge exceedances of standards numeric criteria for these parameters. Binarch Creek water temperatures exhibited a greater than 10% exceedance of standards cutthroat trout spawning and incubation numeric criteria. Salmonid spawning beneficial use is thus Not Fully Supporting based on temperature violations.

The WBAG II scoring results of multiple data type integration for use support determination - cold water aquatic life, is presented in Table 7.

Based on BURP results the lower-most 0.9 mile B3 stream segment is Fully Supporting of CWAL beneficial use. The mid-lower BURP results, representing 3.8 miles of mid-lower to middle E5 channel (44% of the main stem), is initially judged Not Fully Supporting based on the two SMI results of CR = Minimum Threshold. For the upper one-third stream segment there is no Tier I BURP-compatible macroinvertebrate or habitat data to calculate SMI and SHI scores. Five reaches were electro-fished by USFS within this reach (Figure 6 and Table 7). Results were good with mean SFI = 80, borderline between CR = 2 and 3.

In the draft *Addendum* report (Rothrock 2002), this assessor concluded that the entirety of Binarch Creek be evaluated as CWAL = FS, and that sediment should be removed from the §303(d) listing as the pollutant of concern. This assessment was based on the following reasons:

- The BURP scores for macroinvertebrates at the mid-lower sites represent slow water, silt-sand substrate, beaver pond type habitats. These reaches are also prone to become intermittent (Figure 6).

- The DEQ and USFS electro-fishing results show a dominance of cutthroat trout except near the mouth, and the average score from eight sample sites of SFI = 74 produces a good Condition Rating = mid-range 2.

- While the 1996 mid-lower BURP habitat score was poor (SHI = 42), this scoring was again in a beaver pond type habitat with natural characteristics that produces low BURP scores. The Binarch Creek RNA was in part established because of recognized "senescent and active beaver dams and ponds, marshes and wet meadows, riparian vegetation of the stream and adjacent marshes and wet meadows that harbor numerous reptiles, birds, and mammals, and an unusually diverse assemblage of aquatic plants" (USFS 1989).

- Within the boundaries of the RNA, there is a prohibition of land use activities such as road building, timber harvesting, and cattle grazing.

- Sediment load calculations in the Binarch Creek watershed (Rothrock 2001) are low to moderate on a basin wide comparison. This relates to a current, low – moderate active road density of 2.1 mi/mi^2 with low IDL - CWE road scores, and a low stream crossing density of 1.2 crossings/mile of stream.

Public comment packages to the draft *Addendum* report, including an independent review from the DEQ technical services unit, debated the above conclusion of support status (Appendix D). This included an EPA comment that "the information currently presented does not fully support the recommendation for sediment de-listing." Comments pointed to the USFS 1998 stream survey which found a moderate amount of fine sediment in gravel beds of upper stream reaches which would serve as cutthroat spawning areas, and observations that overall pool quality in upper reaches was poor because of filling in by sand.

Binarch Creek would naturally have sediment-laden substrate, particularly in the lower one-half, due to a valley, low gradient stream cut through landtypes of belt outwash and belt breaklands (see Figure 17). However, it would be difficult to discount the possibility of significant sediment input related to timber sales between 1960 – 1996. Again, approximately 43% of the watershed was harvested in those years with many acres of clear cuts (Figure 5c), and an estimated high road density of 5.9 miles/mi^2 to service those sales (all roads in Figure 5b including those currently closed, abandoned, and restricted).

The support status for this final version of the *Addendum* report is established as CWAL = NFS, based on: 1) the mid-lower reach BURP results, 2) the absence of a BURP site within the upper one-third of the stream even though USFS surveys produced good SFI scores, and 3) moderate to high percent fines throughout the stream in which the timber and road activity between 1960 – 1996 cannot be discounted as contributing to sediment impairment.

Binarch Creek is considered secondary contact recreation. There are no bacteria data to assess the standards criteria. The WBAG II screening procedure (Grafe *et al*. 2002) determines that there is low potential risk for bacteria contamination. Support status for contact recreation is assigned Fully Supporting.

Conclusions

This subbasin assessment concludes that cold water aquatic life and salmonid spawning beneficial uses are Not Fully Supporting in Binarch Creek. Because the entirety of the stream is within the same WBID Assessment Unit, the lower 0.9 mile B3 stream segment remains included in the Binarch Creek §303(d) listing as water quality impaired with sediment as the pollutant of concern. Section 5.2 presents a sediment TMDL for the entirety of the Binarch Creek watershed.

Due to violation of the standards temperature criteria for cutthroat trout spawning and incubation, heat as a pollutant of concern will be added to Binarch Creek on the 2002/03 DEQ §303(d) list. Based on a negotiated TMDL Settlement Schedule, the due date for a Binarch Creek temperature TMDL is 2007. This will provide needed time to evaluate canopy cover and stream temperature potential for the TMDL calculations.

2.3.3 East River Main Stem for Sediment, and East River System for Dissolved Oxygen

<u>Summary</u>

The watershed assessment for the East River watershed (main stem, Middle Fork, and North Fork) is presented in the *Priest River SBA and TMDL* in Section 3.2.B, pages 97 – 109.

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 DEQ §303(d) List changed the boundaries of the East River listing to the North Fork (headwaters to Priest River which includes the main stem); retained the North Fork on the list; and de-listed the Middle Fork for sediment from its headwaters to the confluence with the North Fork (DEQ 1999).

The *Priest River SBA and TMDL* supported the 1998 §303(d) de-listing of the Middle Fork (for sediment) with a determined Full Support of CWAL and SS beneficial uses. The *Priest River SBA and TMDL* recommended that the North Fork (not including the main stem) be removed from the §303(d) list with sediment as the pollutant of concern with a determined Full Support of CWAL and SS beneficial uses. East River main stem was retained on the §303(d) list until a DEQ electro-fishing survey was conducted (accomplished in June, 2001).

The East River is also listed for dissolved oxygen. The history of the DO listing is unknown. At the time of publishing the *Priest River SBA and TMDL*, there were no known measurements of DO within streams of this drainage, and East River was retained on the §303(d) list with DO as a concern. DEQ obtained DO measurements in early September, 2001.

The entire East River drainage is 43,165 acres (Figure 8a). The Middle Fork is a 3rd order stream and watershed size is 21,788 acres. The stream flows 9 miles almost due west until the confluence with the North Fork. The North Fork is a 3rd order stream with a watershed size of 13,190 acres. The stream flows 10 miles southwest to its confluence. The Lost Creek subwatershed has been separated from the North Fork drainage since Lost Creek 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. At the confluence of the North and Middle forks, the 4th order main stem flows 2.8 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. 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.

Figure 8a. East River Watershed: streams, BURP sites, and gradients.

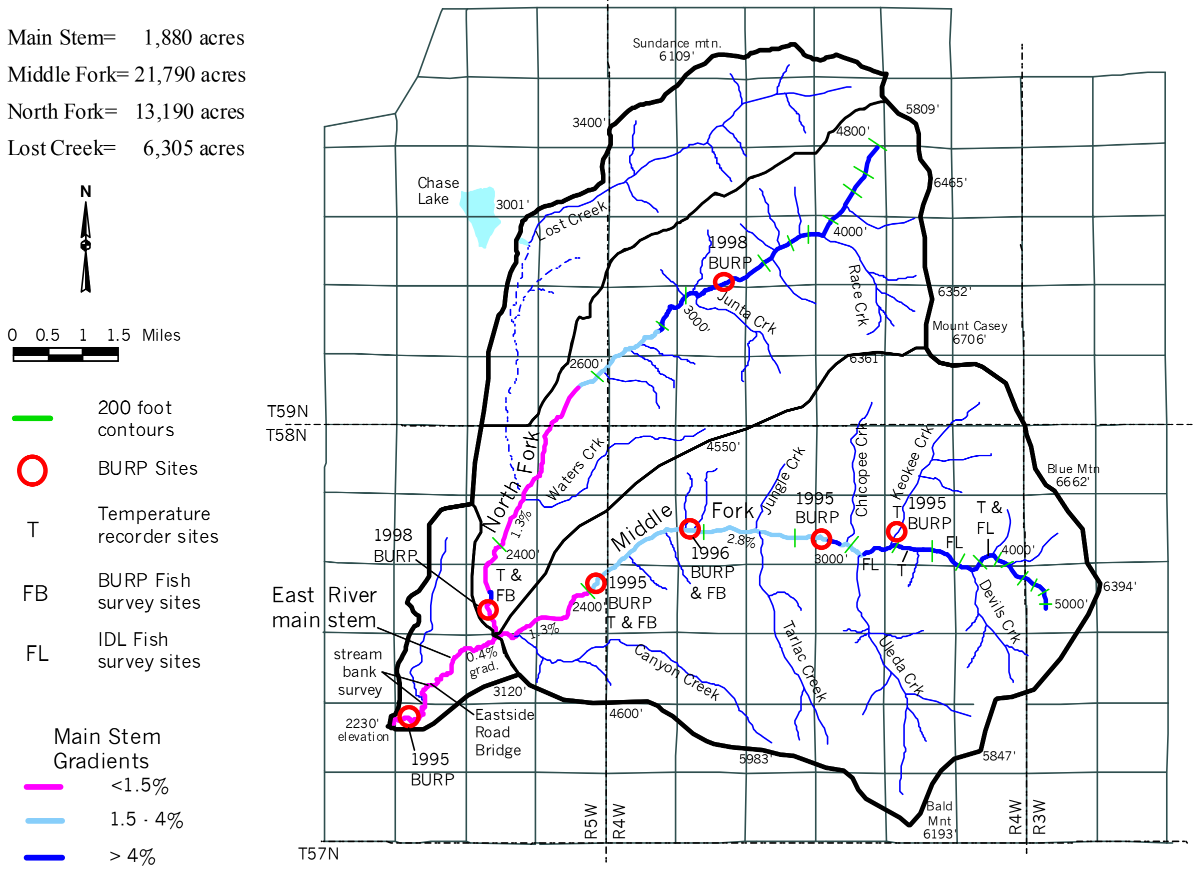


Figure 8b. General land use in the East River Watershed.

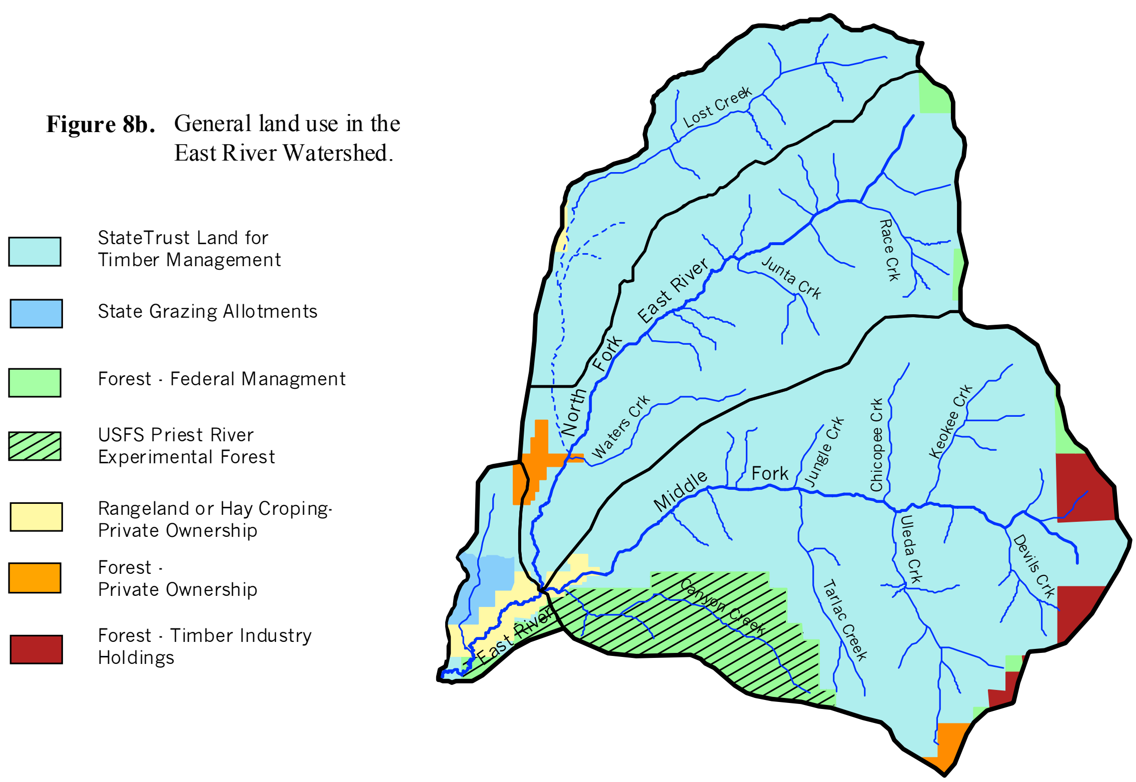


Figure 8. East River hydrology, BURP sites, and general land use.

The entire main stem has a gradual slope, #0.5% (Figure 8a). Historically, the main stem course was likely a large floodplain with a high degree of meander. However, much of the main stem now runs through private property where wetlands and wet meadows have been converted to pasture and grazing lands, and rural residential development (Figure 8b).

The East River watershed as a whole is mostly state of Idaho Trust Land managed by IDL (87% of the watershed). The USFS Priest River Experimental Forest with Canyon Creek running through this land totals 3,200 acres. Adjacent to the main stem and lower-most Middle Fork is 682 acres of a private ownership agriculture zone with hay cropping and grazing. This includes rural residential development of mainly large acre lots, including hobby farms with grazing animals. A portion of the northern main stem watershed is state grazing allotments, and the southern edge of the subwatershed is part of the Experimental Forest.

The East River 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, low to moderate in the North Fork, and likely moderate to heavy along the main stem. Total road density is moderate. The stream segment impacted by commercial grazing is along the main stem, just west of the Eastside Road bridge (the bridge is 1.4 stream miles upstream of the mouth, Figure 8a). Here, direct cattle access to about 0.3 miles of stream have lead to damaged streambanks that are sloughing and eroding, and very little shrub riparian vegetation. East of the bridge is 1.4 miles of main stem that runs through private property where there has been development of a few rural homesteads. Observations show access to the stream by large animals, conversion to pasture, and eroding streambanks.

There was a single BURP site on the East River main stem, surveyed in 1995. Electro-fishing was not conducted at this time. Personnel from IDL and DEQ electro-fished a 200 m reach of the main stem in June, 2001. The site was above the 1995 BURP site (Figure 8a).

There have been numerous fish surveys within the Middle Fork and some if its tributaries conducted by IDFG, DEQ, and IDL (see Section 2.3.4). Collectively, these surveys show a good population of cutthroat trout in the headwaters and the presence of bull trout in low numbers. The Middle Fork is considered of high importance to bull trout recovery (Panhandle Basin Bull Trout TAT 1998). In the North Fork, brook trout are dominant, cutthroats have low density, and no bull trout have been captured in recent times. However, spawning and early rearing of bull trout is suspected within the North Fork, and the stream is also considered of high importance to bull trout recovery. The East River main stem is an assumed migratory corridor for adult fluvial cutthroat and bull trout that reside in Lower Priest River, and/or adfluvial fish from Priest Lake or Pend Oreille Lake, that spawn in the Middle Fork and possibly the North Fork.

The EPA listing for waters that are protected for bull trout spawning and rearing cites: "East River", and "Middle Fork East River" (EPA 1997b). While the main stem is an unlikely spawning grounds for bull trout, juvenile rearing is likely.

Flow Characteristics

Average annual precipitation increases from 32 inches at the mouth to 40 - 50 inches at high elevations in the Selkirks. Precipitation is mostly snow with a snowmelt dominated runoff pattern. A hydrograph has not been established for the East River system. Based on hydrographs for WY 1994 and 1995 established on Soldier Creek (Rothrock and Mosier 1997), the watershed just north, 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.

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. 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.

Water Column Data

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

On September 7, 2001 DEQ personnel measured dissolved oxygen at the lower BURP sites on the Middle Fork, North Fork, and main stem (Figure 8a). Measurements were made with a YSI - DO probe, and duplicated with a Hach DO kit. Results were:

- Middle Fork - 9.5 °C water temperature, 10.6 mg/L DO
- North Fork - 9.0 °C water temperature, 11.2 mg/L DO
- Main stem - 12.0 °C water temperature, 11.2 mg/L DO.

Based on numerous measurements of pH and DO obtained within Priest Lake east side streams during the 1993 - 1995 baseline study (Rothrock and Mosier 1997), there is no reason to suspect exceedances of pH and DO within the East River drainage.

DEQ placed a temperature data logger within the East River main stem from August 8 - October 23, 1997. Highest daily mean was 14.9 °C and highest daily maximum was 17.7 °C (Figure 9). The EPA bull trout juvenile rearing criteria extends to September 30, and all days for the period of record exceeded the criteria for a 39% exceedance (48 days/122 days in the period). The state Standard for juvenile bull trout rearing would have been applicable during the 7 day period of August 17 – 23. The MWMT was 17.1 °C versus the 13 °C MWMT Standard. The state bull trout spawning and incubation criteria from September 1 to October 31 would not seem applicable to the main stem (spawning unlikely in the main stem). The data of record did have an exceedance of 54%.

Biological and Other Data

Electro-fishing results from IDL and DEQ sampling on June 26, 2001 within the main stem (0.7 stream miles from the mouth) are shown in Table 8.

The WBAG II scoring was SFI = 72, Condition Rating = 2. Metrics that scored high were cold water native species (slimy sculpin, bull trout), sculpin age classes, percent cold water individuals, and salmonid age classes (brook trout). Metrics that scored low were percent

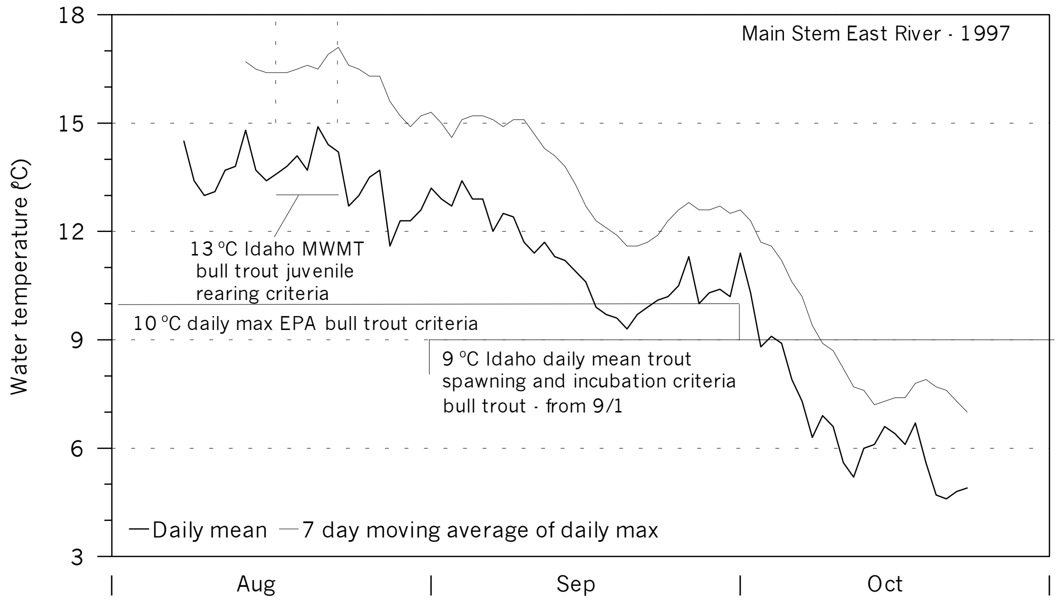


Figure 9. Daily mean water temperature and 7 day moving average of daily maximums from August 8 – October 23, 1997 in East River main stem (DEQ data logger).

Table 8. Electro-fishing Results in East River Main Stem

Fish Species	**Catch per minute electro-fishing effort (single-pass BURP protocol)**
Brook trout	0.1
Salmonid YOY	0.4
Bull trout	0.02
Brown trout	0.02
Slimy sculpin	2.8
Long nose dace	0.05

sensitive native individuals, and catch per minute electro-fishing of cold water individuals. The single bull trout captured was 195 mm in length. Twenty of the 22 captured YOY (27 – 44 mm length) were vouchered for later identification by EcoAnalysts, Inc. Ten of these were identified as brook trout, but unfortunately the other ten were simply identified as Salmonidae YOY. Therefore, it is not known if these were bull trout, cutthroat trout, or brown trout.

The BURP macroinvertebrate score at the main stem was SMI = 60, or CR = 2. The BURP site was 0.3 stream miles upstream from the mouth.

As will be seen in the following section of beneficial use status, a low BURP habitat score drives the multiple data type integrated score below 2.0, or Not Fully Supporting. Thus, habitat data from BURP and other habitat evaluations will be presented in some detail.

The BURP habitat scoring was low, SHI = 50 or CR = 1. Poor habitat metric scores related to: low instream cover, low amounts of LWD, marginal percent bank cover, low percent canopy cover, and determination of land use impact on streambanks and within the riparian zone. These scores, along with a streambank erosion survey conducted in 2000 along 0.34 miles of the main stem, reflect streambanks with evidence of a recent eroded condition. Segments of the main stem are known to have severe bank erosion due in part to damage by large animal access, but also by suspected problems of flow constriction by the Eastside Road bridge stream crossing. There are segments with very little conifer and shrub riparian vegetation. The BURP wetted width/depth ratio = 45; a high ratio depicting a shallow and wide stream. Accelerated widening can be due sediment deposition and streambank erosion.

BURP habitat metrics that received good scores were those measured in the three sampled riffles (for macroinvertebrate samples): a low 9% percent fines (less than 2.5 mm size); a distribution of 8 Wolman pebble count size categories; and a good qualitative score for degree of cobble embeddedness. Two large pools were within the BURP reach and they had good depth and volume; but other parameters of the pool quality index (substrate type, overhead cover, and submerged cover) had poor scores.

The 1992 DEQ Use Attainability survey (Hartz 1993) assessed one site on the main stem, upstream of the Eastside Road bridge. This reach was rated “poor” for overall habitat quality. Low scores related to sand deposition, streambank instability and erosion, and lack of riparian vegetation. There were six large pools, half created by woody debris, the other half by lateral scour. Residual pool volume was good at 2,308 m^3/km.

In 1986, IDFG made general observations of stream habitat during electro-fishing surveys (Horner *et al*. 1987). It was noted that the East River main stem lacked good quality riparian vegetation, that bank sloughing and erosion were common, and that there was a reduced quality of spawning gravels.

Status of Beneficial Uses

There are no measurements of pH, turbidity, or samples for ammonia, to judge exceedances of standards numeric criteria for these parameters. Measurements of DO in early September 2001 show no exceedances of standards criteria.

The collected temperature data calculated a 39% exceedance of the EPA bull trout juvenile rearing criteria. The state standards bull trout rearing criteria was also violated. Bull trout rearing beneficial use is considered Not Fully Supporting.

The WBAG II scoring results of multiple data type integration for use support determination – cold water aquatic life, is presented in Table 9. Based on the BURP results, CWAL = NFS for the 2.8 miles of East River main stem.

Table 9. WBAG II Preliminary Use Support Determination - Cold Water Aquatic Life, for East River Main Stem

BURB site	SMI score & (condition rating)	SFI score & (condition rating)	SHI score & (condition rating)	Average condition rating score
Lower: 1995SCDAA037	60 (2)	72 (2)[a]	50 (1)	1.7 - Fail

a = DEQ and IDL electro-fishing upstream of BURP site, June 26, 2001.

East River main stem is considered primary contact recreation because of the potential for swimming activity down to the confluence with Lower Priest River. There are no bacteria data to assess the standards criteria. The WBAG II screening procedure (Grafe *et al*. 2002) determines that there is at least a moderate potential risk for bacteria contamination due to direct access of large animals within the middle and upper parts of the main stem and lower-most Middle Fork. These animals come from commercial ranching downstream of the Eastside Road bridge, and from rural ranchettes upstream of the bridge. The main stem is thus determined Not Assessed, and this determination calls for collection of bacteria data (Grafe *et al*. 2002).

Conclusions

The WBAG II preliminary use support determination is CWAL = NFS. It seems to this assessor that: 1) beneficial use status is borderline between FS and NFS, and 2) if NFS is the determined status call, there is an uncertainty as to whether cold water aquatic life has been impacted by excess sediment from land use activities. Below is a synopsis of the information collected within the main stem reach and the upland watersheds draining into the main stem:

! The BURP macroinvertebrate sample depicts a Full Support condition of clean, cold water insects.

! While the BURP electro-fishing survey provided a satisfactory SFI score, there was a low total salmonid abundance of 0.5 salmonid catch per minute effort. The qualitative estimate of density from the survey was 1.3 total salmonids/100 m^2. The minimum target salmonid density stated in Priest River Subbasin sediment TMDLs is 5 – 10 total salmonds/100 m^2. The dominant salmonid in the main stem survey was brook trout, with only a single bull trout juvenile sampled, and no captured cutthroat.

! Several metrics of good scores for the SFI related to abundant numbers of slimy sculpin captured. Presence of sculpin is meant to be indicative of streambeds which are not highly embedded with fine sediment (Grafe 2002a). However, we have sampled several streams in the subbasin with abundant slimy sculpin among long reaches of thick sand beds (e.g., Lamb Creek, Kalispell Creek, and Lower West Branch). Sand sized particles are typically the deposited fines into streams within granitic geology.

! BURP habitat scores and other habitat evaluations show poor conditions within the main stem. This primarily relates to lack of LWD and instream cover, and a shallow, wide stream with poor riparian bank cover and stability and eroding streambanks. There are large pools within the reach with good residual pool volume, but other pool quality characteristics are poor. BURP sampling did show that within sampled rifles there were low percent fines and low embeddedness, and good distribution of pebble sizes through small cobble.

! A portion of the damaged and eroding streambank condition comes from large animal access to the stream. There is suspicion that constriction at the Eastside Road bridge may produce bank damaging velocities downstream during peak flow.

In the draft *Addendum* report it was also stated that there was evidence suggesting an accelerated spring peak flow from the Middle Fork East River which in turn may have lead to stream channel impairment of the main stem (Rothrock 2002). This statement was based on the IDL – CWE survey in 1998 which produced a Hydrologic Risk Rating (HRR) of "high-end moderate", relating to a Canopy Removal Index of 0.49, the highest of the many watersheds surveyed in the Priest River Subbasin, and a moderate Channel Stability Index.

The IDL comment package to the draft report (Appendix D), presented an analysis of channel stability within the East River system which included underlying geology, along with an emphasis that the HRR is a qualitative estimate. IDL concludes in their comment package that the statement regarding accelerated spring peak flow "cannot be substantiated by existing documentation", and further, "hydrologic adverse conditions do not exist sufficient to require the development of CWE drainage-wide site-specific BMPs." This assessor agrees with the IDL conclusion that hydrologic patterns and related channel impairment cannot be quantitatively analyzed with the existing information.

! Lastly, sediment load calculations for the entire East River watershed (Middle Fork, North Fork, and main stem), produced an estimated annual sediment load 185% above natural background. There were identified areas of excess sediment yield and opportunities for load reductions. On the other hand, Middle Fork East River clearly meets the various criteria for Full Support of cold water aquatic life beneficial use, and the calculated annual sediment load is 157% above background (Rothrock 2001). Middle Fork is overall a fairly steep gradient stream (two-thirds of the Middle Fork main stem >1.5% gradient), and therefore may primarily be a sediment transport stream.

This subbasin assessment concludes that CWAL = NFS is a proper conclusion for the East River main stem. The main stem should be retained on the §303(d) list with sediment as the listed pollutant of concern. Reasons for impairment could be related to: elevated water temperatures, historic removal of riparian conifers and therefore a reduction in LWD recruitment, a widening of the stream channel with damaged and eroding streambanks, and significant stretches of thick sandy substrate. The degree in which sediment load from land use activities throughout the watershed, over the last several decades, relates to or has caused impairment is unknown. But it seems that sediment load cannot be discounted as a contributing cause. A sediment TMDL incorporating the entire East River watershed has been prepared and presented in Section 5.3.

IDFG does not consider the main stem as spawning and incubation habitat for fluvial or adfluvial cutthroat trout or bull trout (DuPont *pers comm*). EPA does list "East River" for protection of bull trout rearing and spawning (EPA 1997b). Rearing of juvenile bull trout may occur within the main stem, and therefore the main stem remains on the §303(d) list for water temperature based on criteria violations. A temperature TMDL for the entire East River stream system has been prepared and is presented in Chapter 5.

This subbasin assessment determines that the East River main stem, the Middle Fork, and the North Fork do not violate standards dissolved oxygen numeric criteria. It is recommend that DO be removed for these water bodies from the §303(d) listing.

This subbasin assessment determines that the East River main stem has at least a moderate potential risk of bacteria contamination that could impact primary and secondary contact recreation. This determination requires bacteria sampling on the main stem.

2.3.4 East River for Water Temperature

Because water temperature was explicitly listed in the 1994/95 §303(d) list for East River, (Middle Fork, North Fork, main stem), agreements between EPA and DEQ call for immediate evaluation of data and presentation of a temperature TMDL if warranted.

Salmonid Distribution

Various water temperature numeric criteria relate to specific salmonid species. Therefore a salmonid species distribution map has been prepared for East River streams (Figure 10). This map marks the presence of captured species in electro-fishing surveys conducted since 1986. These surveys are:

IDFG 1986	main stem	1 reach
	Middle Fork	3 reaches
	North Fork	6 reaches
DEQ BURP	main stem 2001	1 reach
	Middle Fork 1997	2 reaches
	North Fork 1998	1 reach
IDL 1998	Upper Middle Fork	3 reaches
USFS 2000	Canyon Creek	7 reaches
IDFG 2001	Middle Fork tributaries: Tarlac Creek, Uleda Creek, Chicopee Creek, Keokee Creek	

Cutthroat trout are widely distributed in the middle to upper segments of the Middle Fork main stem, and Middle Fork tributaries. These may represent a population mix of fluvial and adfluvial cutthroat trout and resident cutthroat. Cutthroat have been captured in mid to upper reaches of the North Fork. Bull trout have been captured throughout the Middle Fork main stem, Tarlac Creek, and Uleda Creek (all at low densities), and a single bull trout was captured in the East River main stem. No bull trout have been sampled in the North Fork in recent times. During IDFG electro-fishing within Uleda Creek in August 2001, six adult spawning bull trout were observed, ranging in size from 490 – 700 mm (IDFG field notes). Brook trout are present throughout the streams, and a few brown trout have been captured.

Water Temperature

IDL placed temperature data loggers within the Middle Fork and North Fork during 1998 and 1999 (Figure 10). DEQ placed a sensor within the main stem in 1997 with data presented in Section 2.3.3. The 1998 IDL placement of sensors was 3 sensors within the Middle Fork main stem, a lower site and two upper sites, and one sensor within the tributary Keokee Creek. Period of record was June 13 – October 7. In 1999, IDL placed a sensor at the lower Middle Fork site

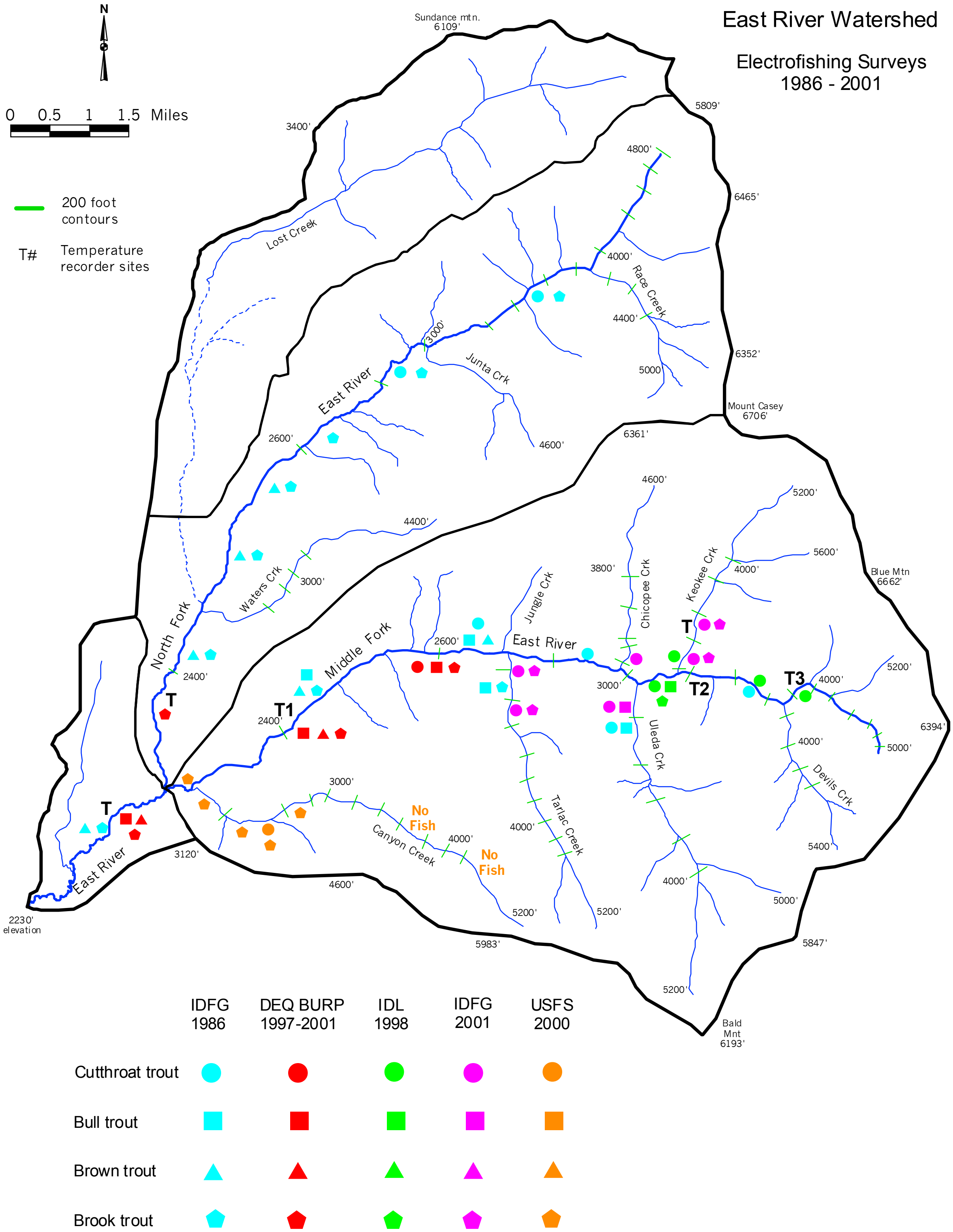
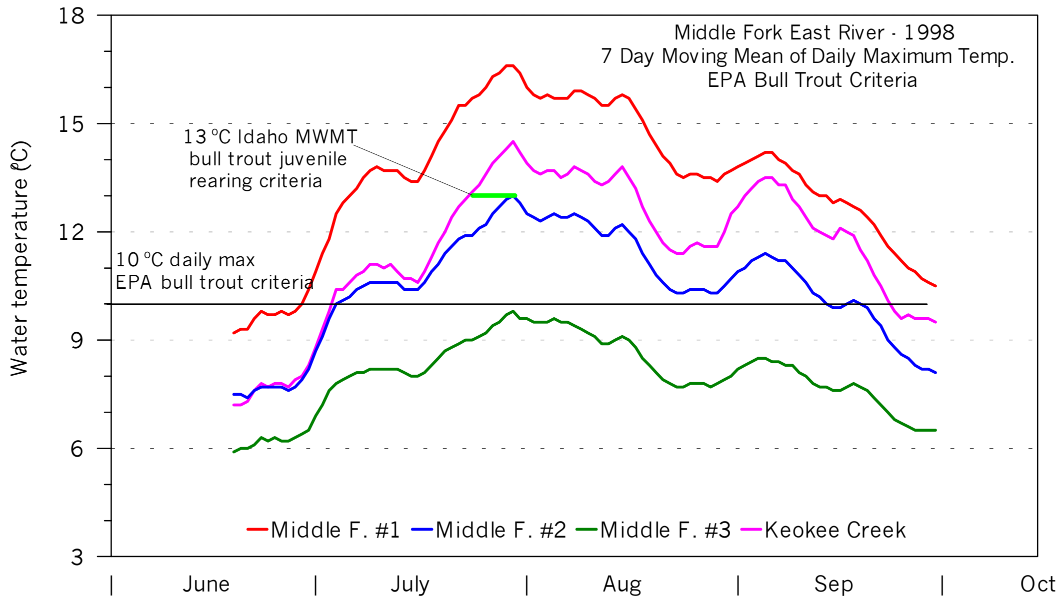


Figure 10. Distribution of salmonid species in the East River system based on electro-fishing surveys between 1986 – 2001.

(same lower site as 1998), and at a lower North Fork site. Period of record was August 1 – November 20. The 1998 Middle Fork data is presented as two graphs: one showing the 7 day moving average of daily maximum temperature in relation to the EPA bull trout criteria, and the second graph depicts daily mean temperature in relation to the Idaho standards spawning and incubation criteria for cutthroat trout and bull trout (Figure 11).



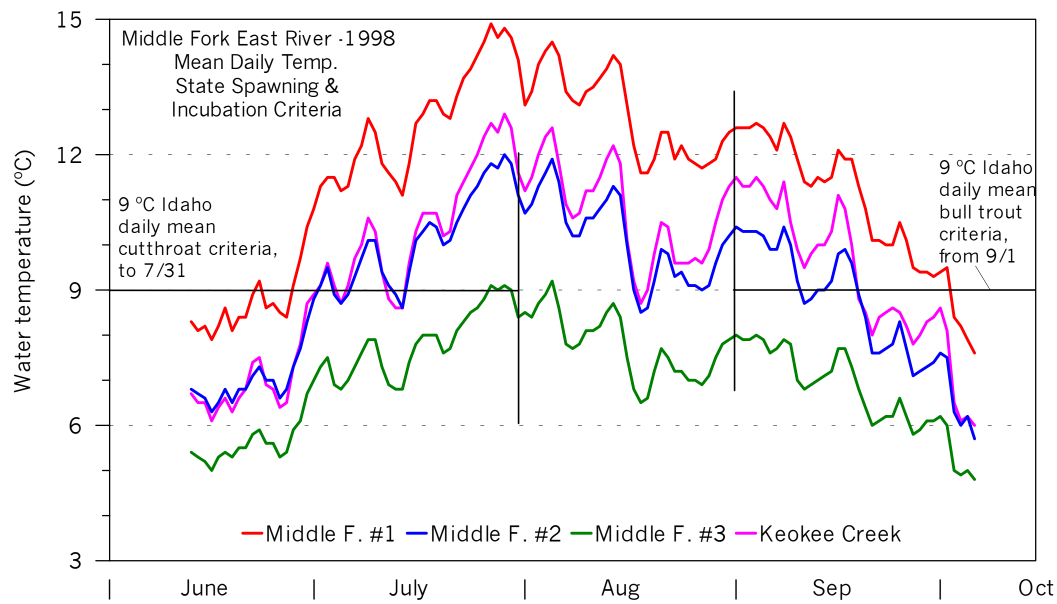


Figure 11. Water temperature from data loggers in 1998 for the Middle Fork East River system.

Status of Beneficial Uses

Table 10 provides a statistics summary of all temperature data collected by data loggers in the East River system, including exceedances of various numeric criteria.

Table 10. Summary of Water Temperature from Data Loggers in the East River System

Temperature data categories	Middle Fork #1 1998	Middle Fork #2 1998	Middle Fork #3 1998	Keokee Creek 1998	Middle Fork #1 1999	North Fork 1999	Main Stem 1997
Period of Record	6/13 – 10/7	6/13 – 10/7	6/13 – 10/7	6/13 – 10/7	8/1 – 9/20	8/1 – 9/20	8/8 – 10/23
Highest daily mean (°C)	14.9°	12.0°	9.2°	12.9°	12.7°	14.8°	14.9°
Highest daily maximum (°C)	17.3°	13.5°	10.3°	15.1°	14.5°	16.8°	18.1°
Mean temperature during warmest period[a] (°C)	13.7°	10.9°	8.3°	11.5°	11.7°	13.3°	13.9°
State cutthroat spawning and incubation criteria, 9 °C daily mean, April 1 – July 31 (122 days). Percent exceedance, and (number of days data within criteria period).	29% (49)	20% (49)	2% (49)	21% (49)	No data	No data	No data
EPA bull trout rearing and spawning criteria, 10 °C - 7 day moving mean of daily max., June 1 – Sept. 30 (122 days). Percent exceedance, and (number of days data within criteria period).	77% (104)	61% (104)	0% (104)	67% (104)	36% (45)	37% (45)	39% (48)
State juvenile bull trout rearing criteria, 13 °C MWMT over warmest consecutive 7 day period. MWMT (°C) from sensors during criteria period.	16.6°	13.0°	9.8°	14.5°	14.1°	16.1°	17.1°
State bull trout spawning and incubation criteria, 9 °C daily mean, Sept. 1 – Oct. 31 (61 days). Percent exceedance, and (number of days data within criteria period).	52% (36)	26% (36)	0% (36)	30% (36)	8% (20)	16% (20)	54% (53)

a = warmest period for 1998 data is July 15 – August 15; for 1999, August 1 – August 15; and for 1997, August 8 – August 23.

The locations of temperature sensors at lower Middle Fork (MF #1) and lower North Fork are not considered as representative of habitat locations for fluvial or adfluvial cutthroat spawning and egg incubation. These main stem segments of the two Forks are at least 3rd order streams. Fluvial cutthroat spawning would mostly occur in 1st and 2nd order segments of the middle and upper sections of the main stems, and within feeding tributaries (DuPont *pers comm*). The 1998 temperature sensor at MF #3 (elevation 3900 ft) represents headwater sections of the main stem and upper portions of the feeding tributaries. MF #2 and Keokee Creek were between elevations 3200 – 3400 ft. These three sensors would represent areas of cutthroat spawning. There are 0% exceedances of state cutthroat criteria from these sensors when the spawning and incubation period ends at July 1. With a conservative extension of the window to July 31, the exceedance rate surpasses 10% at MF # 2 and Keokee Creek, but not at MF #3. Data collected in 1999 started later than the July 31 cutthroat window.

The lower most sections of the two Forks, as well as the East River main stem are not likely habitat for bull trout spawning and incubation, although bull trout will spawn in larger water bodies than cutthroat. Young-of-the-year bull trout may migrate into 3rd or 4th order main stem segments. This was confirmed by DEQ electro-fishing on August 5, 1997 at the mid Middle Fork BURP site (1996 BURP site, Figure 8a). Two vouchered YOY (44 and 50 mm) were identified as bull trout (EcoAnalysts, Inc). The 1997 electro-fishing at the lower Middle Fork site (1995 BURP site) captured 5 juvenile bull trout, ranging in size from 100 – 119 mm. The single bull trout captured in the main stem sampling in 2001 was 190 mm, age class II or III.

The EPA bull trout rearing and spawning standard is thus considered applicable throughout the East River drainage. All temperature sensor data had a high rate of criteria exceedance (Table 10), except for MF #3 which had 0% exceedance. The state juvenile bull trout rearing criteria was exceeded at MF #1, Keokee Creek, North Fork, and main stem. The exceedance trend is similar when examining the state bull trout spawning and incubation period of September 1 – October 31, except that MF #1 for 1999 was only at 8% exceedance.

Conclusions

This subbasin assessment concludes that the East River system is in violation of the state cutthroat trout spawning and incubation criteria, and the EPA and state bull trout juvenile rearing and spawning criteria. The East River is to remain on the §303(d) list for water temperature. A temperature TMDL has been prepared and presented in Section 5.4

2.3.5 Lower Priest River

Summary

The subbasin assessment for Lower Priest River is presented in the *Priest River SBA and TMDL* in Section 3.4.D, pages 142 – 150 (Rothrock 2001).

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 DEQ §303(d) List (DEQ 1999). The *Priest River SBA and TMDL* requested a delay of beneficial use status determinations. The reasons for a delay were to request IDFG to conduct an electro-fishing survey, and await approval of the Idaho River Ecological Assessment Framework (IREAF) referenced in WBAG II (Grafe *et al*. 2002).

Lower Priest River originates as outlet from Priest Lake and flows south to the confluence with Pend Oreille River (Figure 1). 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 begins at the tributary inflow point of Upper West Branch Priest River (Figure 12a). From this point to the mouth the distance is 34.4 river miles. Size of the drainage into the listed river segment is 219,980 acres, with approximately 475 miles of perennial streams.

The §303(d) listed Lower Priest River drainage has been separated into nine units (Table 11 and Figure 12a); which are six, 5th field hydrologic units (watersheds), and three artificially designated sidewall watersheds that each include numerous small 1st and 2nd order perennial streams. Two of the watersheds were examined in detail in the *Priest River SBA and TMDL*; Lower West Branch and East River.

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 of the IPNF elevation tops out at 6,173 ft at North Baldy.

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. Base flow wetted width commonly ranges 30 - 45 m. The river channel is a combination of riffles, runs and pools. There are significant areas of river bed with cobbles and gravels.

The basin draining into the §303(d) listed segment of Lower Priest River is a mixture of federal, state, and private ownership (Table 12 and Figure 12b). Total private land in the drainage is 40,337 acres (18% of total). Industrial timber holdings total 4,021 acres and 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 the city of Priest River is 2,020 acres.

Table 11. Watersheds Draining into the §303(d) Listed Segment of Lower Priest River

Drainage units	Acreage	Percent of Basin
Upper West Branch Priest River watershed	45,201	20.5
Upper River Sidewall Dubius, Murray & Cottonwood Creeks	18,766	8.5
East River watershed	43,170	19.6
Lower West Branch Priest River watershed	56,705	25.8
Quartz Creek watershed	7,081	3.2
Middle River Sidewall Benton, Fox, Prater, Ranger, Little Pine, Crazy, & Sanborn Creeks	26,051	11.8
Big Creek watershed	9,354	4.3
Blue Creek watershed	7,435	3.4
Lower River Sidewall Saddler Creek	6,217	2.8
Total	219,980	100

Table 12. Land Ownership Surrounding the §303(d) Listed Segment of Lower Priest River

Ownership categories in acres, percentages in parenthesis							
	Federal		Private		Idaho	Open	
	Idaho	Wash.	Idaho	Wash.	State	Water	Total
Lower Priest River	62,301 (28)	48,637 (22)	38,041 (17)	2,296 (1)	67,885 (31)	820 (0.4)	219,980

The land under USFS management totals 110,938 acres. Of this there are 16,309 acres in grazing allotments, and 6,256 acres as the Priest River Experimental Forest. Idaho state lands total 67,855 acres with some acres in grazing allotments.

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 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. Throughout the non-industrial private lands there are small scale timber operations.

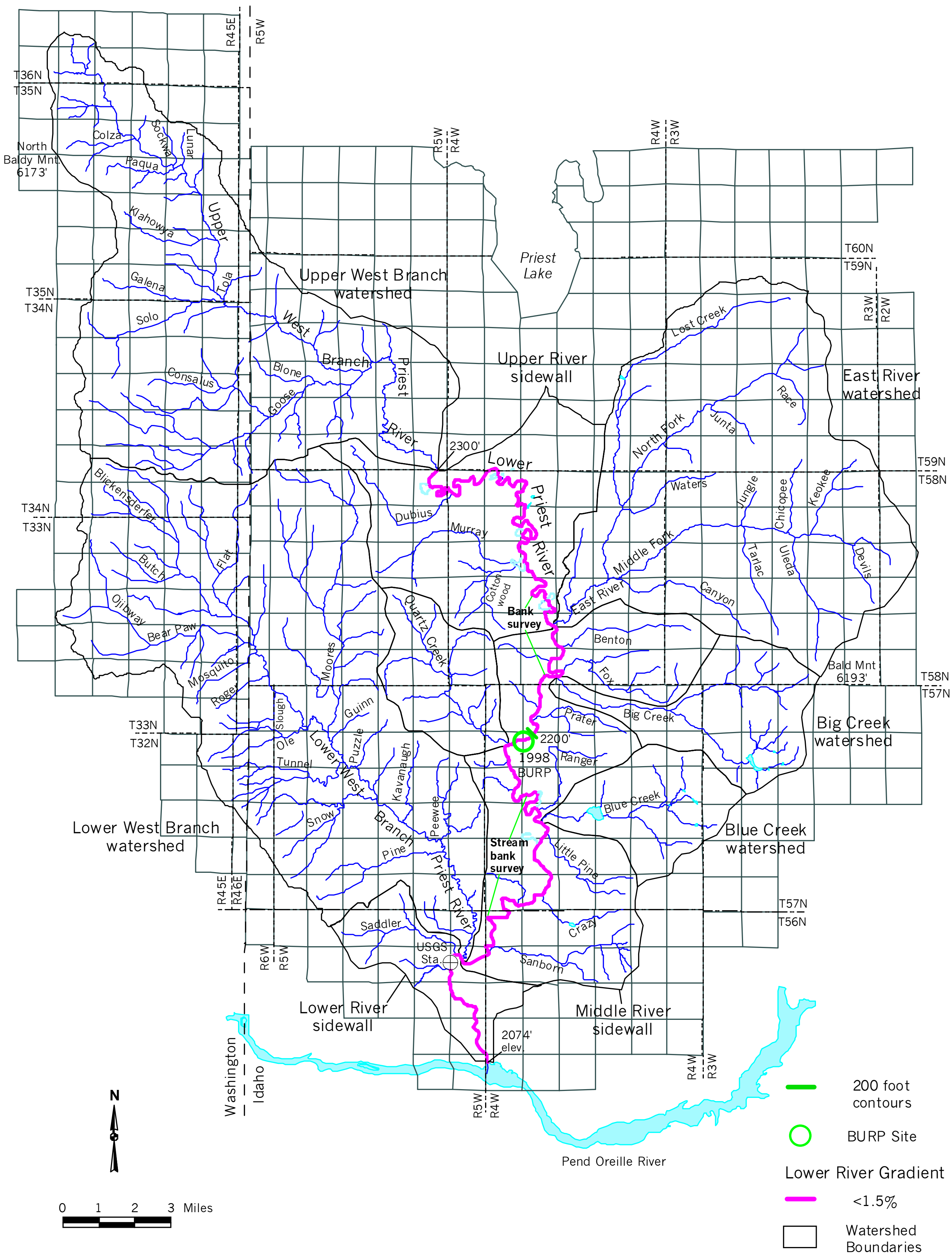


Figure 12a. Watersheds and hydrology of the §303(d) listed segment of Lower Priest River.

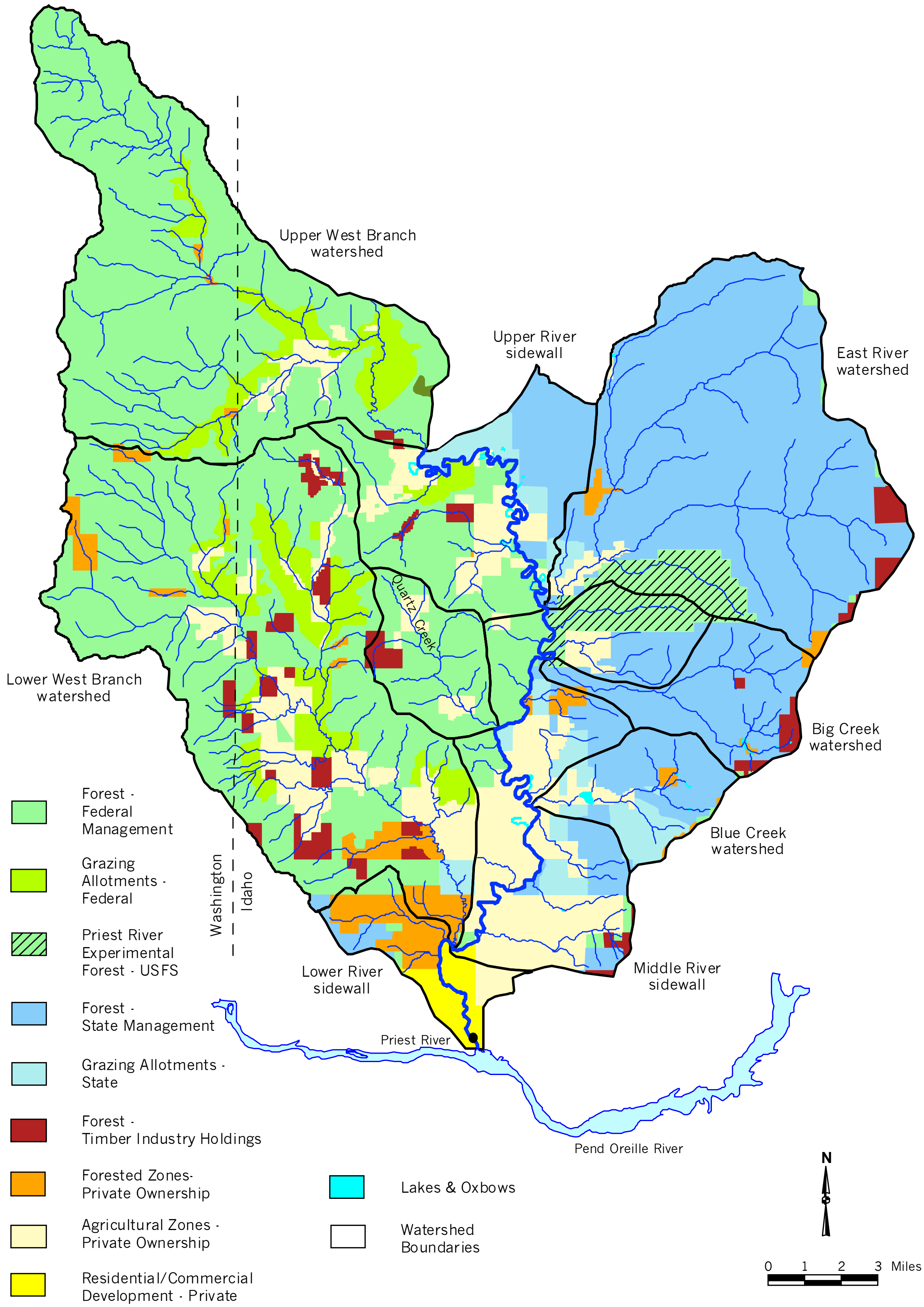


Figure 12b. General land use and ownership of the §303(d) listed Lower Priest River drainage.

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 field watersheds (USFS 2000a).

Based on observations from a river bank erosion survey conducted in 2000, there are several segments of raw banks with signs of recent erosion and even chunks of upper bank broken off and slumped into the high water zone. Some river segments have high raw banks, 20 ft high or so, with a thick layer of gravelly sand and silt loam overlaying a dense clay layer. This condition is susceptible to slippage and mass failure, and failures are commonly observed along the river course. In a few cases bank slumping was associated with fill slopes of adjacent roads, such as just upstream of McAbee Falls. One streambank legacy 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.

There has been one BURP site on Lower Priest River (assessed in 1998) at river mile 16.2 (Figure 12a). BURP data that can be used for judgement of aquatic life beneficial use status, using the IREAF (Grafe 2002b) are: 1) macroinvertebrate samples calculated into a multi-metric based River Macroinvertebrate Index (RMI), and 2) samples of periphyton collected on rocks calculated into a River Diatom Index (RMI).

A third IREAF index is the River Fish Index (RFI). In September 1998, USGS conducted for the first time, a backpack and boat electro-fishing survey near the lower river USGS gaging station, at river mile 3.8 (Brennan *et al.* 2000). This data can be used to calculate a RFI. In April 2002, IDFG conducted a drift boat electro-fishing survey within selected reaches from river mile 7.5 to near the mouth. There has been no other quantitative fish sampling within the river for at least 25 years.

In the USGS electro-fishing survey, the only salmonid captured was the native mountain whitefish. In the IDFG survey, westslope cutthroat trout, brown trout, and rainbow trout were also captured. The latter two species had been introduced by IDFG into the river system. Brook trout also likely inhabit river waters. From historical accounts it is known that the river was once a viable and popular fluvial cutthroat trout fishery. Some fluvial cutthroat are still caught today by local anglers (Barnes *pers comm*). 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. Local anglers state that on occasion a bull trout is caught. The river is considered of high importance in bull trout recovery plans (Panhandle Basin Bull Trout TAT 1998).

A fourth multi-metric index may also be calculated, the River Physicochemical Index (RPI). The RPI score is not used in the WBAG II river data integration process, but the result may be used for supplemental water quality interpretations. Data of water column physical and chemical parameters that can be used to calculate an RPI comes from the lower USGS station.

Flow Characteristics

There is a long standing record of river flow based on two USGS gaging stations (Figure A, page 2). Station Priest River Near Coolin is located 5.2 miles downstream from the Priest Lake outlet dam. Period of record for this station began in 1948. River flow at this point represents drainage into and from Upper and Lower Priest Lakes in addition to a couple of minor tributaries between the outlet dam and the gaging station. River flow is partly regulated by the Priest Lake outlet dam which began operation in 1951 (IWRB 1995).

The second USGS 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 have been taken continuously since 1929. Average annual runoff between WY 1950 - 2000 was 1,259,000 ac-ft. Highest recorded daily mean flow was 10,700 cfs in May 1997, and lowest daily flow was 150 cfs in November 1979.

Mean daily flow pattern for the two gaging stations for WY 1995 is shown in Figure 13 (Brennan *et al*. 1996). WY 1995 was selected because annual runoff was very close to the 1950 - 2000 average, and there is considerable measured flow data in WY 1995 from Priest Lake tributaries associated with a base line 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 around 40 °F), 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 70 °F which rapidly melts the mid to high elevation snowpack.

Note in Figure 13 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 through early spring warm-up and rain events.

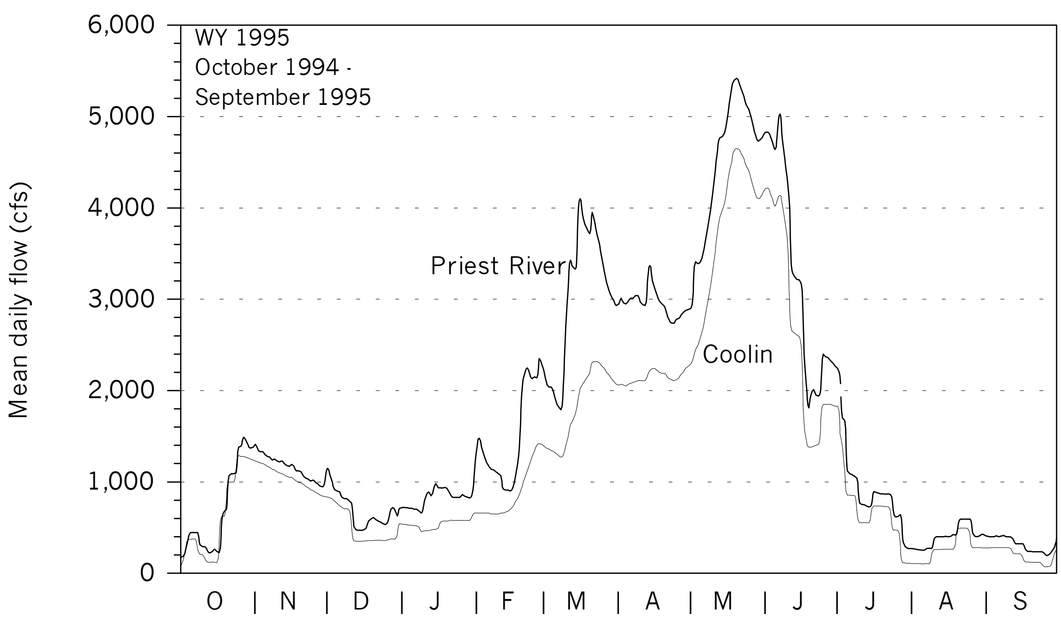


Figure 13. Mean daily flow of Lower Priest River for Water Year 1995 as recorded at the USGS gaging stations Priest River Near Coolin (12394000) and Priest River near Priest River (12395000).

Average annual runoff for WY 1950 - 2000 at the lower station represents a 25% gain from the upper station. The two stations closely bracket the land area that drains into the §303(d) listed segment (around 340 mi^2 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.

Water Column Data

The USGS conducts routine water quality sampling at the lower gaging station every other year. Water sampling frequency for 1994 - 2000 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). Table 13 presents a summary of the USGS data from 1990 - 2000 that can be examined for violations of standards numeric criteria, and can be used in the RPI calculation.

Table 13. Summary of USGS Water Quality Sampling at Lower Priest River, Lower Gaging Station, 1990 – 2000.

Parameter measured	Mean	Range	Number of samples
Dissolved oxygen	10.5 mg/L	7.7 – 13.4 mg/L	35
pH	7.5	6.8 – 8.8	36
Total solids	59 mg/L	20 – 178 mg/L	30
Fecal coliform	33 FC/100 ml	2 – 120 FC/100 ml	36
Total phosphorus	0.012 mg/L	0.004 – 0.052 mg/L	68
NO_2+NO_3+ammonia	0.041 mg/L	<0.005 – 0.136 mg/L	68
Water temperature	18.3 °C (summer)	1.0 – 25.5 °C	54

In August 2000, DEQ responded to a concern by a home owner adjacent to Lower Priest River. The concern was about the low flow conditions in the river, and the water temperature of pools that he believed were refuge spots for fluvial cutthroat trout. A DEQ crew sampled 5 pools with a Hydrolab®, measuring temperature and DO at the surface, mid point, and near the bottom of pools. Location of the sampling was river mile 7.5 up to near the Priest Lake outlet dam. Results of the temperature and DO sampling are presented in Table 14. Measurements of conductivity ranged from 44 – 55 μmhos, and pH ranged 6.5 – 7.4 units.

In 1998, USGS installed a temperature data logger at the lower gaging station from June - September. Mean daily and daily maximum temperature is plotted in Figure 14 (Brennan *et al*. 1999). Daily average exceeded the standards cold water aquatic life criteria of 19 °C by early July and remained above the criteria until August 17. This was an exceedance of 44% for the 93 day standards period (June 21 – September 21). Highest daily mean was 23.4 °C, highest hourly maximum was 25.3 °C. A data logger was again installed in 2000 (Brennan *et al*. 2001). There

Table 14. Measurement of Temperature and DO Within Pools of Lower Priest River, August 8, 2000.

	Measurements within pools near surface, midpoint, and near bottom; pools were about 1 m in depth		
Location	**Range of temp readings (°C)**	**Range of DO (mg/L)**	**Range of DO %saturation**
Near river mile 7.5	All 3 = 21.0	8.3 - 8.4	92.6 - 94.1
Near river mile 7.5	All 3 = 21.0	8.3 - 8.4	93.3 - 93.8
Near river mile 14	All 3 = 22.9	8.8 - 8.9	102.9 - 104.1
Near river mile 39	All 3 = 22.8	8.3 - 9.4	96.6 - 108.9
Near river mile 43	All 3 = 21.5	8.4 - 8.5	95.2 - 96.3

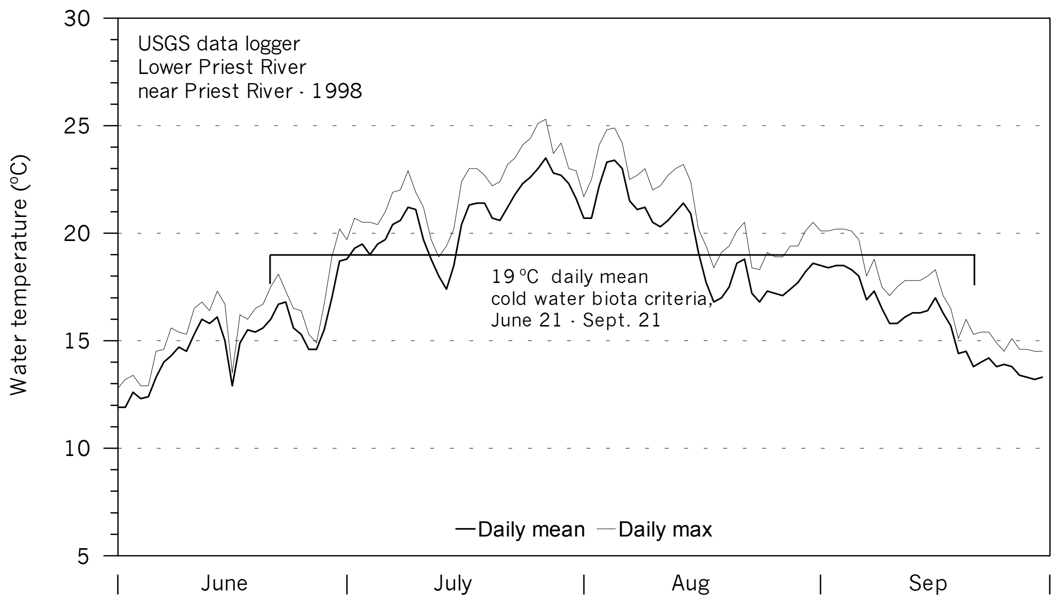


Figure 14. Mean daily water temperature of Lower Priest River measured at the lower USGS gaging station, river mile 3.8, June - September 1998 (Brennan *et al* 1999).

was a loss of data between July 1 – July 17. Overall temperatures were somewhat less than 1998 with the highest daily mean at 21.2 °C and highest hourly maximum at 22.8 °C. With the data available for the period of cold water aquatic life criteria there was a 27% exceedance rate.

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.

Of the salmonid species that reside in the river, the species that will primarily utilize river habitat for spawning is the mountain whitefish, *Prosopium williamsoni* (Horner *pers comm*). The mountain whitefish spawning and incubation period is listed as October 15 – March 15 (Grafe *et al*. 2002), a time when the 9 C° daily mean state criteria is met. There seems to be remnant brown trout and rainbow trout populations in the river based on the IDFG 2002 electro-fishing survey, and from accounts of local anglers. Brown and rainbow trout can be river spawners (Corsi *pers comm*). While brown trout are considered fall spawners, the rainbow trout period is listed as March 15 – July 15. Local IDFG biologists observe that rainbow trout in northern Idaho are generally early spawners and fry will have emerged by late May. Lower Priest River temperatures should be within or slightly above the criteria during this local spawning and incubation period (DuPont *pers comm*). Bull trout and cutthroat trout will primarily migrate to tributary habitat for spawning.

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).

Taking the USGS measures of physicochemical parameters together, the WBAG II - RPI may be calculated from seven metrics: water temperature, DO (using formulas based on percent DO saturation), pH, total solids, ammonia+nitrate, total phosphorus, and fecal coliform (Grafe 2002b). RPI = 98 during the months of October – June (maximum RPI is 100). RPI would be lower for July – September when water temperatures and fecal coliform are higher, and DO is lower. Depending on what temperature statistic is used for Lower Priest River, summer RPI ranges from 84 – 94. RPI scores above 80 are considered as representing good physicochemical environmental conditions (Grafe *et al*. 2002).

<u>Biological and Other Data</u>

Composite samples of periphyton from the BURP site (composites of three samples within the reach), were collected on three separate occasions as part of a state-wide 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 and Grafe 2000). A final set of 10 periphyton metrics were selected as RDI response indicators to degree of human disturbance.

The mean RDI of the Lower Priest River samples on three sampling days was RDI = 37 (28, 40, 42). The mean RDI score is assigned a high Condition Rating = 3 in the WBAG II river scoring method (Grafe *et al*. 2002).

One composite sample for macroinvertebrates was taken at the BURP site. RMI metrics from the sample analysis 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%). The RMI = 23 converts to a high CR = 3.

The 1998 USGS electro-fishing effort as reported in Brennan *et al.* 2000 is reproduced in Table 15. Fish density in numbers per square area were not reported. Largescale sucker and northern pikeminnow were dominant in the sampling, and mountain whitefish was the only salmonid captured. During this cool - warm water period, it might be expected that other salmonids such as cutthroat trout might seek refuge in selected pools within the river, or migrate into colder water feeding tributaries (DuPont *pers comm*).

Table 15. USGS and IDFG Electro-fishing Results in Lower Priest River

	USGS – Sept. 1998: near lower gaging station, river mile 3.8			IDFG - April 24, 2002: selected reaches from river mile 7.5 to mouth		
Fish Species including YOY	**No. of individuals**	**Percent Comp.**	**Total length range (mm)**	**No. of individuals**	**Percent Comp.**	**Total length range (mm)**
Largescale sucker	45	32.6	86-423	114	39.7	75-510
Bluegill	7	5.1	26-35	0	--	--
Largemouth bass	1	0.7	70	0	--	--
Slimy sculpin	2	1.4	50-62	3	1.1	no record
Northern pikeminnow	42	30.4	30-360	2	0.7	350-455
Longnose dace	1	0.7	58	0	--	--
Redside shiner	16	11.6	56-115	0	--	--
Yellow perch	3	2.2	176-205	0	--	--
Mountain whitefish	21	15.2	84-236	159	55.4	100-418
Cutthroat trout	0	--	--	7	2.4	275-320
Rainbow trout	0	--	--	1	0.3	312
Brown trout	0	--	--	1	0.3	310
Bull trout	0	--	--	0	--	--

The RFI for the USGS survey is a low RFI = 29, or CR = Minimum Threshold (RFI <54). Metrics with low scores (ten metrics comprise the RFI) included: number of cold water species (2), percent sculpin (1.4%), percent sensitive native species (0%), percent tolerant individuals (69%), and number of salmonid age classes (0, mountain whitefish are not included in this metric). The USGS sampling, in the vicinity of the river mile 3.8 gaging station, is 12 river miles south of the BURP site. Between the BURP site and the USGS gaging station there is a large adjacent agriculture zone of hay cropping, cattle grazing, and rural development of ranchettes. Strictly from visual observations, habitat conditions at the gaging site are less favorable than that measured at the 620 m BURP reach, and upriver of the BURP site.

In the April 2002 IDFG survey (Table 15), mountain whitefish and largescale sucker were dominant. The sampling included cutthroat, rainbow, and brown trout, but at low occurrence. Based solely on accounts of local anglers, there might have been an expectation of greater cutthroat abundance in the sampling. While the IDFG sampling produced a bit more variety as far as salmonid species captured, the RFI = 45 is still CR = Minimum Threshold. Again, this survey began at river mile 7.5, nine miles south of the BURP site (input – output access of boats for river electro-fishing is very difficult in the vicinity of the BURP site). IDFG biologists did remark that river fish habitat appeared satisfactory for most of the lower reach surveyed (DuPont *pers comm*).

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.

The 2000 streambank erosion survey was conducted within two river reaches; between river miles 7 – 13, and between river miles 18 – 23 (Figure 12a, and see Table 32 for all survey results). For the lower reach, 4.6 miles were surveyed and 34% of the bank length (both east and west banks included) had a current eroding condition. Most often the eroding bank was on an outside curve. Height of eroding bank averaged 8.2 ft (bank heights in this survey reached 23 ft). The sum of the six bank conditions for eroding segments were often high (see methods in Appendix A), depicting bare banks of significant erosion (Figure 15). Erosion rate averaged a significant 539 tons/mile/yr over the miles surveyed. For the upper reach, 4.7 miles were surveyed and 22% of the bank length had an eroding condition. Erosion rate averaged 410 tons/mile/yr over the miles surveyed.

Figure 15. Example of eroding bank on Lower Priest River encountered in 2000 streambank erosion survey.

Status of Beneficial Uses

Beneficial uses for Lower Priest River are designated in the Idaho water quality standards as: domestic water supply, cold water aquatic life, primary and secondary contact recreation, and as a special resource water (IDAPA 58.01.02.110.06). In light of the water temperature patterns during summer months, where Lower Priest River originates as the warmer upper waters of Priest Lake, the designation of cold water aquatic life use and application of cold water standards might be examined. The standards includes a category of seasonal cold water aquatic life (IDAPA 58.01.02.250.03), where between summer solstice and autumn equinox the water temperature criteria is 27 °C or less daily maximum and a daily average of 24 °C or less.

The WBAG II guidelines, Section 3.2, describes several lines of evidence to determine whether cold water aquatic life use should be assessed for undesignated waters (Grafe *et al*. 2002). These lines of evidence are: macroinvertebrate cold water indicator taxa, fish cold water indicator taxa, and fishery management objectives. Similar lines of evidence could be used to determine if cold water aquatic life is an appropriate designated use for Lower Priest River.

The BURP macroinvertebrate sample, collected September 20, 1998, exhibited 40 taxa. Only one of these taxa, *Sweltsa* sp. (Plecoptera) is listed as an obligate cold water taxa (Grafe *et al*. 2002, Appendix A). From the WBAG II table of temperature tolerances for macroinvertebrates in Idaho BURP samples (Appendix B), 25 sampled taxa are labeled as eurythermal - warm summer, 9 taxa as eurythermal – cool summer; and only one taxa as stenothermal – cold. Recall that the RMI was a good CR = 3.

For fish indicator taxa, the WBAG II criteria is a dominance of cold water adapted species where 50% or more of the species present or individual fish in a sample are classified as cold water species (Grafe *et al*. 2002, Appendix C). In the September USGS electro-fishing sample, 17% of the total fish sampled were cold water adapted (slimy sculpin and mountain whitefish). In the April IDFG sample there were 60% cold water individuals (sculpin, whitefish, cutthroat, rainbow, and brown trout). Again, from historical accounts Lower Priest River was at one time a thriving cutthroat fishery. Currently, this fishery appears to be depressed. What is not known is the fate of cutthroat trout during the warm months of July through September. While it is not known if the river is inhabited by fluvial bull trout, it is known that it is a migratory corridor for adult bull trout that spawn in the East River drainage. In the opinion of the Panhandle Basin Bull Trout TAT (1998), the river is considered as supporting sub adult and adult rearing, and was labeled as high importance in bull trout recovery plans.

In the most current 5-year fisheries management plan of IDFG, Lower Priest River and its tributaries are listed as a cold water type fishery (IDFG 2001). Listed management directions include: 1) encourage appropriate agencies to evaluate changes in water level management of Priest Lake to enhance fishery flows in Priest River, and 2) direct anglers to Priest River tributaries to provide consumptive trout fishing opportunities for brook trout.

Based on the above lines of evidence, it is determined at this point that cold water aquatic life is an appropriate designated use for Lower Priest River. Therefore, there is a violation of the standards numeric temperature criteria and CWAL = Not Fully Supporting. At the time that a temperature TMDL will be required for Lower Priest River, there will be investigation into the thermal potential of the river. If it is determined that the maximum achievable thermal potential cannot meet the standards numeric criteria, DEQ may recommend a Use Attainability study to seek a designated use change to seasonal cold water aquatic life.

Based on numerous measurements of pH, DO, turbidity, and samples for ammonia obtained at the lower USGS gaging station since 1990, there are no exceedances of standards numeric criteria for these parameters related to cold water aquatic life or salmonid spawning beneficial uses.

The WBAG II scoring results of multiple data type integration for use support determinations - river cold water aquatic life, are shown in Table 16.

Table 16. WBAG II Preliminary Use Support Determination - Cold Water Aquatic Life for Lower Priest River.

BURB site, USGS site, IDFG sampling	RDI score & (condition rating)	RMI score & (condition rating)	RFI score & (condition rating)	Average condition rating score	RPI score & (condition rating)
Lower: 1995SCDAB039 at river mile 16.2	37 (3)	23 (3)	--	3.0 = Pass	--
USGS at river mile 3.8 (electro-fishing: Sept 1998)	--	--	29 (MT)	MT = Fail	84-98 (3)
IDFG electro-fishing, April 2002, river mile 7.5 - mouth	--	--	45 (MT)	MT = Fail	--

MT = Minimum Threshold (RFI score below minimum of reference condition).

The RDI and RMI indexes received maximum Condition Rating scores at the BURP site. While the RPI is not used in the data type integration, the RPI score as measured at the lower USGS gaging site also receives a maximum CR = 3. The two RFI scores, representing fish sampling from river mile 7.5 to near the mouth, are both below the reference condition of RFI <54, and CR = Minimum Threshold. Thus, CWAL = Not Fully Supporting for at least the lower 7.5 river miles.

Following the WBAG II assessment steps, salmonid spawning beneficial use is Not Fully Supporting based on CWAL = NFS (Grafe *et al*. 2002). The IREAF does call for support determination by the IDFG. IDFG believes that mountain whitefish have maintained a viable population in the river (Horner *pers comm*), which is supported by the electro-fishing surveys. Water temperatures meet the standards criteria during whitefish spawning and incubation. The introduced rainbow trout are considered by IDFG as an inhabiting and probable spawning species in the river. Because of the early spring rainbow trout spawning, there appears not to be a violation of state spawning and incubation temperature criteria.

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.

Conclusions

Water temperatures collected by a data logger at the USGS lower gaging station in 1998 and 2000 show an exceedance of greater than 10% of the standards numeric criteria for cold water aquatic life. Therefore, CWAL = Not Fully Supporting. At this point in time cold water aquatic life remains as the designated use for Lower Priest River, and water temperature will be listed in the 2002/03 DEQ §303(d) list. Based on a negotiated TMDL settlement schedule, the due date for a Lower Priest River temperature TMDL is 2007. This will provide needed time to evaluate river thermal potential, including analysis of canopy cover and temperature potential of feeding tributaries. From this analysis, DEQ may seek a designated use change to seasonal cold water aquatic life.

Macroinvertebrate and periphyton data collected at the BURP site show a good cold water condition with Condition Rating = 3 for both RMI and RDI. However, fish data collected by USGS and IDFG between river mile 7.5 to the mouth show a poor cold water fishery condition with RFI = Minimum Threshold (Not Fully Supporting). IDFG theorizes that primary factors relating to this fishery condition include: 1) cool - warm water temperatures from July – mid September, 2) habitat degradation of historical tributary spawning beds of fluvial and adfluvial cutthroat trout and bull trout, and 3) the effect of competition from the introduced lake trout in Priest Lake and brook trout in basin streams.

In the draft *Addendum* report it was recommended that sediment as a pollutant of concern be removed from the §303(d) listing for Lower Priest River (Rothrock 2002). This recommendation was based on the good RMI and RDI scores at the BURP site, and qualitative observations by IDFG biologists that sediment deposition within the river did not appear to be a major factor in fish habitat impairment. Comment packages to the draft document disputed the above recommendation (Appendix D). EPA concluded, "the information currently presented does not fully support the recommendation for sediment de-listing." Comments pointed to statements of severe erosion observed during a 2000 riverbank survey (the data work-up of survey results presented in this final version was not available for the draft report), and that sediment input to the river from three major drainages was considered as significant (i.e. Lower West Branch, East River, and Upper West Branch).

It is determined in this final version of the subbasin assessment that sediment within the river cannot be discounted as a contributing factor in the decline of the fluvial cutthroat fishery, and will remain as a listed pollutant of concern on the §303(d) listing. A sediment TMDL for the bank condition along the river course is presented in Section 5.5, along with reference to TMDL efforts for the three major drainage watersheds listed in the paragraph above.

Salmonid spawning beneficial use is labeled as Not Fully Supporting strictly based on the CWAL = NFS result. However, evidence shows that mountain whitefish spawning is a Full Support beneficial use, and state temperature criteria for rainbow trout spawning and incubation are not violated.

2.4 Data Gaps

Water quality data gaps for §303(d) listed segments were presented in the *Priest River SBA and TMDL* in Section 2.2.4, page 54 (Rothrock 2001). Many of the data gaps listed were addressed during the 2001 field season. Some data gaps do remain, and they are as follows:

East River - The subbasin assessment determines that the East River main stem has at least a moderate potential risk of bacteria contamination that could impact primary or secondary contact recreation. This determination requires bacteria sampling on the main stem.

Lower Priest River - An electro-fishing survey by IDFG is still needed in the vicinity of the BURP site and upstream. However, access for a boat and electro-fishing equipment into this river segment is difficult. In addition, a single BURP site is insufficient to properly assess a waterbody 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.

Temperature TMDLs – The temperature TMDL in this report uses data and calculation models from the IDL – CWE protocol to calculate canopy cover needed to match the shade/temperature requirements for the EPA bull trout numeric criteria (10 °C MWMT). More realistically, the target canopy cover should be maximum potential riparian vegetative cover or effective shade. Investigations are needed to develop a natural background riparian vegetative type, density, and resulting shade cover. The extent to which riparian timber harvest has altered streamside shading and channel morphology is not known. There is little in the way of historic records that show how much shading existed before logging began, nor what the channels looked like. Therefore, we don't have a very accurate picture of what really is human-caused heat loading and what is natural.

One of the biggest questions regarding water quality in the Priest River Subbasin has to do with heat as a pollutant and to what degree water temperature might be limiting the beneficial uses of a given waterbody. It is known at this point that summer stream temperatures for many streams in the subbasin exceed the EPA bull trout standard and state water quality standards for salmonid spawning. A question beyond the scope of this subbasin assessment is whether the state temperature standards (including the methods for measuring stream temperature) are correct for the designated beneficial uses. The stream temperature data collected indicates water pollution according to the EPA and state water quality standards. In some streams of temperature criteria violations there appear to be healthy, reproducing populations of sensitive salmonids such as westslope cutthroat trout, while in other streams cutthroat trout populations are depressed. Throughout the basin bull trout populations are low in numbers or absent altogether.

3. Subbasin Assessment – Pollutant Source Inventory

A comprehensive pollutant source inventory (sediment) and pollutant source data gaps was presented in the *Priest River SBA and TMDL* for: the basin as a whole in Section 2.3, pages 55 – 59; and then for each of the §303(d) listed watersheds in the subbasin assessments of Section 3, pages 62 – 150; and finally as a discussion of current sediment load calculations for TMDLs in Section 4.1.3, pages 166 – 172 (Rothrock 2001). This information will not be repeated here in the *Addendum* except for discussion of specific sediment load calculations for the TMDLs in Chapter 5.

Several streams in the Priest River Subbasin are currently listed for temperature on the §303(d) list. This means that heat is the pollutant. In evaluation of temperature data loggers placed throughout the basin, it seems clear that lower to mid-upper reaches of most main stem stream channels exceed the EPA bull trout numeric criteria from late June through mid September, and also the state standards cutthroat trout spawning and incubation criteria in July. Other water bodies not included on the current §303(d) list for temperature will be evaluated during the development of Idaho's 2002 - §303(d) listing cycle.

Additional heat being absorbed by a waterbody beyond background in forested environments is usually a function of shade reduction (Dechart *et al*. 2000). There are many instances throughout the Priest River Subbasin where the riparian area was heavily logged between initial Euroamerican settlement in the early 1900s up to passage of the Idaho FPA in 1974 (Rothrock 2001). It is reasonable to think that an additional heat load and, therefore, increased stream temperature, have resulted from decreased stream shading.

Another aspect of heat loading is a change in channel morphology where a channel becomes wider and shallower (higher width to depth ratio), with a resultant increase in surface exposure to solar and long-wave radiation. Through BURP habitat sampling, relatively high wetted width-to-depth ratios were measured. It is suspected that in some cases, loss of channel depth and increase in channel width has been accelerated from human activity. Causes of altered width to depth ratios may include: 1) increased sediment deposition into streams from the constructed road network and adjacent timber harvesting, 2) encroaching roads, built close to a stream within the riparian floodplain, which through armoring prevent a stream course from natural meandering and leads to streambank erosion, 3) removal of streamside vegetation that kept the channel narrow and sinuous, 4) streambank damage from large grazing animals, and 5) altered flow regimes as a result of widespread watershed canopy removal where there may be increased peak flows in spring, and lower base flows in summer when air temperatures are highest.

4. Subbasin Assessment – Summary of Past and Present Pollution Control Efforts

A summary of past and present pollution control efforts was presented in the *Priest River SBA and TMDL* for: the basin as a whole in Section 2.4, pages 59 – 61; and then for each of the §303(d) listed watersheds in the subbasin assessments of Section 3, pages 62 – 150 (Rothrock 2001). This information will not be repeated here in the *Addendum* except for an update of the Wetland Reserve Program (WRP) within Reeder Creek as an important adjunct to the Reeder Creek TMDL in Chapter 5.

Reeder Creek

There is a current effort underway, initially led by the IDFG, to establish the 1,200 acre Bismark Meadows under a federal WRP. The IDFG impetus for a WRP was to secure and develop additional habitat for the recovery of grizzly bear habit.

The Bismark Meadows, historic wetlands – wet meadow floodplain habitat, is west of the Hwy 57 crossing of Reeder Creek. A 2.7 mile, low gradient stream segment (less than 0.5%) flows through Bismark Meadows. A large potion of this lowland had been converted to hay cropping, and there has been some cattle grazing. There has been extensive development of cross ditches to facilitate drainage for early summer hay cropping, and some segments of the stream had been straightened. The riparian zone is primarily shrub overstory with abundant grasses and forbs, and channel type is D, G, and E (USFS 1994). The stream bottom is sand-silt-muck.

Leading the WRP effort is the Natural Resources Conservation Service (NRCS), with a regional office in Sandpoint, Idaho. Signatures for permanent conservation easements have been obtained from seven (7) private owners of Bismark Meadows land, totaling around 1,000 acres. A WRP federal funding grant that includes purchase of easements was applied for in 2000, and the project received funding approval in 2001. The meadows have had land appraisals, and the property was surveyed in the fall of 2001.

Some of the planned projects that relate to anticipated improvement of water quality conditions within the meadows segment of Reeder Creek include: blocking many of the cross drain ditches; riparian shrub plantings, and tree plantings were historically there was likely tree cover; promoting stream meander; and allow for the reestablishment of beaver populations. While again, the focus of the project is securing habitat to be utilized by grizzly bears, a stated purpose of a WRP is to restore hydrology and riparian plant communities to predevelopment conditions.

5. Total Maximum Daily Load(s)

Introduction

A TMDL prescribes an upper limit on discharge of a pollutant from all sources so as to assure water quality standards are met. It further allocates this load capacity (LC) among the various sources of the pollutant. Pollutant sources fall into two broad classes: point sources, each of which receives a wasteload allocation (WLA); and nonpoint sources, which receive a load allocation (LA). Natural background (NB), when present, is considered part of the load allocation, but is often broken out on its own because it represents a part of the load not subject to control. Because of uncertainties regarding quantification of loads and the relation of specific loads to attainment of water quality standards, the rules regarding TMDLs (40 CFR § 130) require a margin of safety (MOS) be a part of the TMDL.

Practically, the MOS is a reduction in the load capacity that is available for allocation to pollutant sources. The natural background load is also effectively a reduction in the load capacity available for allocation to human made pollutant sources. This can be summarized symbolically as the equation: LC = MOS + NB + LA + WLA = TMDL. The equation is written in this order because it represents the logical order in which a loading analysis is conducted. First the LC is determined. Then the LC is broken down into its components: the necessary MOS is determined and subtracted; then NB, if relevant, is quantified and subtracted; and then the remainder is allocated among pollutant sources. When the breakdown and allocation is completed we have a TMDL, which must equal the LC.

Another step in a loading analysis is the quantification of current pollutant loads by source. This allows the specification of load reductions as percentages from current conditions, considers equities in load reduction responsibility, and is necessary in order for pollutant trading to occur. Also a required part of the loading analysis is that the LC be based on critical conditions – the conditions when water quality standards are most likely to be violated. If protective under critical conditions, a TMDL will be more than protective under other conditions. Because both LC and pollutant source loads vary, and not necessarily in concert, determination of critical conditions can be more complicated than it may appear on the surface.

A load is fundamentally a quantity of a pollutant discharged over some period of time, and is the product of concentration and flow. Due to the diverse nature of various pollutants, and the difficulty of strictly dealing with loads, the federal rules allow for "other appropriate measures" to be used when necessary. These "other measures" must still be quantifiable, and relate to water quality standards, but they allow flexibility to deal with pollutant loading in more practical and tangible ways. The rules also recognize the particular difficulty of quantifying nonpoint loads, and allow "gross allotment" as a load allocation where available data or appropriate predictive techniques limit more accurate estimates. For certain pollutants whose effects are long term, such as sediment and nutrients, EPA allows for seasonal or annual loads.

For the Reeder Creek, Binarch Creek, East River, and Lower Priest River sediment TMDLs, loads are calculated and expressed in traditional mass-per-unit-time as tons of sediment per year. For the East River temperature TMDL, excess heat load from solar radiation impinging on the stream system is the pollutant of concern. Excess heat load occurs primarily because of the removal of riparian shading. The TMDL utilizes a surrogate for heat loading; existing stream canopy cover as the current condition, and target canopy cover needed to eventually approach the EPA bull trout temperature standard from early July to mid-September.

For sediment TMDLs, the estimation methods for calculating natural background and current sediment load are presented in Appendix A. For the East River temperature TMDL, calculation methods are presented in the introductory of Section 5.3.

Sediment load 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 Subbasin, the sediment interfering with cold water aquatic life beneficial use 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 load capacity for the TMDL is more difficult to develop. The sediment load capacity for TMDLs in the Priest River Subbasin would be based the following premises:

- natural background levels of sedimentation are assumed to be fully supportive of the cold water aquatic life beneficial uses,

- the stream system has some finite yet unquantified ability to process (transport) a sedimentation rate greater than background rates,

- the beneficial uses (cold water aquatic life) 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, and

- care must be taken to control factors which may interfere (fish harvest) with the quantification of beneficial use support.

A comprehensive discussion of sediment load capacity within the Priest River Subbasin was presented in the *Priest River SBA and TMDL,* Section 4.2.2, pages 172 – 175 (Rothrock 2001). In that discussion, a sediment load capacity of 50% above natural background was established for subbasin watersheds. This was 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 was also considered that the 50% load capacity incorporates a minimum 50% margin of safety and does not warrant an additional 10% margin of safety reduction common in TMDL calculations. A load capacity of 50% above natural background, which incorporates a margin of safety, is used for the sediment TMDLs in this *Addendum* report.

5.1 Sediment TMDL for Reeder Creek

5.1.1 Instream Water Quality Targets

The instream water quality target for the Reeder Creek segment between elevation 2680 feet to 2530 feet is Full Support of cold water aquatic life (CWAL) and salmonid spawning (SS) beneficial uses. West of Hwy 57 within Bismark Meadows, Full Support would be signaled by WBAG II field measures leading to integrated scores of SMI, SFI, and SHI which produce an average Condition Rating score of ≥ 2.0. Because of the "rangeland type" stream characteristics through Bismark Meadows, the macroinvertebrate assemblage may not exhibit medium to high SMI scores reflective of swift riffle-run habitat. More primary targets would be improvement of habitat values, in particular an increase of riparian shrubs and trees, increased LWD, and a decrease in percent fines within gravel beds. Correspondingly, there would be the expectation of improved fish populations as reflected by increased SFI scores. Targets would include a minimum resident salmonid density of 5 – 10 total trout/100 m^2, a presence of sculpin, and a presence of cutthroat trout.

It is recommended that a second monitoring point to assess CWAL be established east of Hwy 57 within USFS managed land. This portion of Reeder Creek has a greater occurrence of riffle-run habitat through forested land than Bismark Meadows.

The Reeder Creek sediment TMDL will develop loading capacities in terms of mass-per-unit-time. The sources yielding sediment to the system can be reduced, but a substantial period (20 – 30 years) will be required for the stream to clear a portion of its current sediment bed load and for a decrease in percent fines to be observed.

Target Selection

The Reeder Creek sediment TMDL applies sediment allocations in tons per year and calculates sediment reduction goals. Since the middle reach of Reeder Creek through Bismark Meadows does not meet the WBAG II criteria for full support of CWAL, with an implication that sediment has played some role in the impairment, sediment reduction will be required through the middle and upper watershed sections. The BURP results of Not Fully Supporting west of Hwy 57 applies at this time to the gradual gradient reach east of Hwy 57. Therefore, sediment reduction will also be required from watershed sections draining into this mid-lower reach.

The established load capacity for the Priest River Subbasin is 50% above background (Rothrock 2001), and calculated current sediment load for Reeder Creek is 93% above background. While management actions to reduce sediment load can be documented and tracked, the TMDL Implementation Plan may apply an instream surrogate measurement of success. Surrogate measurements related to sediment that scored poorly in the SHI of WBAG II were high percent bed fines (< 2.5 mm), and a low number of Wolman size classes. Expectations of watershed sediment reduction efforts in conjunction with one or two high flow events would be improvement in these scores of surrogate measurements.

There are no appropriate reference streams in the Priest River Subbasin for comparison to Reeder Creek. Other minor flow streams with low gradient "rangeland stream" characteristics have had at least moderate land use surrounding them. For size, flow and gradient comparisons, other comparable streams in the basin include Lamb Creek, Binarch Creek, Moores Creek, and Quartz Creek. All these streams tend to have high percent fines in low gradient reaches.

Monitoring Points

Two points of compliance are set. One point is the existing BURP site just west of the Hwy 57 crossing of Reeder Creek, or the downstream segment within Bismark Meadows and the WRP project area. The second point would be the establishment of a monitoring reach east of Hwy 57 within a forested section of USFS management.

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 CWAL and SS 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 future assessments. The current guidance, WBAG II, utilizes a stream index scoring system from BURP sampling metrics comprised of a Stream Macroinvertebrate Index (SMI), Stream Fish Index (SFI), and Stream Habitat Index (SHI). Under the current guidance of WBAG II and additional considerations, the appropriate assessments of Full Support are:

! scores of SMI, SFI, and SHI which integrated together produce an average CR ≥ 2.0,

! a total salmonid density, determined by quantitative methods, at a minimum target level of 5 – 10 total trout/100 m^2. Currently, brook trout is the only salmonid sampled in Reeder Creek. A fisheries management objective might be set to reestablish cutthroat trout at the minimum target abundance.

! three or more salmonid age classes including juveniles (<100 mm),

! presence of sculpins,

! as established by a Watershed Advisory Group (WAG), appropriate instream targets for surrogate habitat characteristics such as percent bed fines, 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.

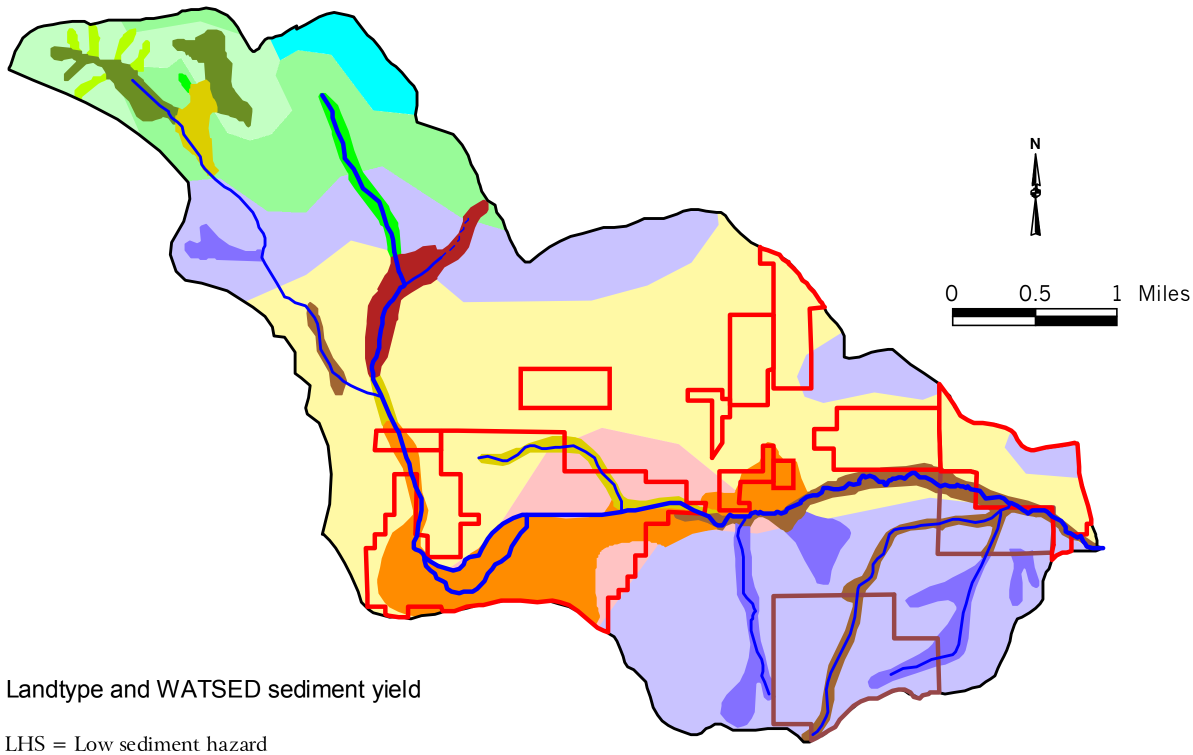
5.1.2 Load Capacity

The natural background sedimentation rate for the entire Reeder Creek watershed is calculated at 310 tons/yr (Table 17). See Appendix A for methods of calculating natural background from USFS supplied base geology and landtype maps (Niehoff *pers comm*). The DEQ method for TMDLs assumes 100% delivery to streams, and does not incorporate the WATSED routing coefficient. The landtype map for Reeder Creek shown in Figure 16 includes associated

Table 17. Sediment Load Calculations for Reeder Creek by Ownership Categories

Categories of Sediment Loading	USFS	Private	Timber Industry	Totals
Natural Sediment Load				
Watershed area: square miles	9.7	2.7	0.86	13.2
Weighted mean tons/mi^2	24.0	19.8	28.3	23.4
Tons/year – 100% delivery	**233**	**53**	**25**	**310**
Current Sediment Load				
1. Forested area[a]				
Forested area minus roads & crops (mi^2)	9.3	1.2	0.83	11.3
Tons/yr with 100% delivery	**223**	**24**	**23**	**270**
2. Unpaved roads				
Mean tons/yr/stream crossing from CWE score	0.43	0.73	0.36	0.47
Number of stream crossings	11	3	4	18
Tons/yr at stream crossings	**4.8**	**2.2**	**1.4**	**8.4**
Miles of total unpaved roads - (stream crossings)	49	9	4.7	63
Mean tons/mile of total roads from CWE score	3.9	4.1	3.0	3.9
Tons/yr from total roads (minus crossings)	**194**	**38**	**14**	**246**
3. Failures at roads				
Number of washouts at stream crossings	0	0	0	0
Tons/yr from stream crossing washouts	**0**	**0**	**0**	**0**
Number of typical road prism failures	1	0	0	1
Tons/yr from typical road prism mass failures	**28**	**0**	**0**	**28**
% assigned to tons/yr atypical mass failure	n.a.	n.a.	n.a.	n.a.
Tons/yr from atypical failures	**0**	**0**	**0**	**0**
4. Hay land and grazing				
Acres of improved hay land and pasture	0	850	0	850
Tons/yr from agricultural improved land	**0**	**37**	**0**	**37**
5. Other				
Tons/yr from residential storm water	**10**	**0**	**0**	**10**
Tons/yr from streambank erosion	**0**	**0**	**0**	**0**
Total current tons/yr	**459**	**101**	**39**	**600**

a = See Appendix A, Forested Acres, on calculations incorporating natural sediment load into current load.



Landtype and WATSED sediment yield

LHS = Low sediment hazard
MHS = Medium SH
HSH = High SH

23. Highly Weathered, Dissected Residual Granitic Bottoms & Toes: HSH - 31.7 tons/sq mi

30. High Elev. Glaciated Granitic Mt. Slopes and Ridges: LSH - 22.7 tons/sq mi

37. Dissected, Glaciated Granitic Mt. Slopes: MSH - 38.8 tons/sq mi

40. High Elev., Glaciated Belt Mt. Slopes & Ridges: LSH - 19.8 tons/sq mi

47. Dissected, Glaciated Belt Mt. Slopes: MSH - 36.5 tons/sq mi

48. Steep, Dissected, Glaciated Belt Mt. Slopes: HSH - 67.5 tons/sq mi

50. High Elevation, Residual Belt Slopes & Ridges: LSH - 12.5 tons/sq mi

52. Dissected, Residual Belt Slopes: MSH - 35.9 tons/sq mi

60. Belt Alluvial Bottoms and Toeslopes: HSH - 51.5 tons/sq mi

70. Granitic Alluvial Bottoms and Toeslopes: HSH - 55.0 tons/sq mi

80. Belt/Granitic Outwash Plains and Alluvial Deposits: LSH - 11.0 tons/sq mi

81. Belt/Granitic, Wet Meadows and Poorly Drained Floodplains: HSH - 33.0 tons/sq mi

82. Belt/Granitic, Steep Glacio-Fluvial Breaklands: VHSH - 173.0 tons/sq mi

88. Lacustrine Plains: LSH - 15.0 tons/sq mi

Private ownership: grazing and hay cropping, forest, residential.

Private industrial timber land

Area outside of outlined areas is National Forest managed by the USFS.

Figure 16 Reeder Creek landtype map and associated WATSED sediment yield coefficients (from USFS).

WATSED sediment yield coefficients. Landtype units were partitioned according to the three general ownership/management groups within the watershed, and background sediment yield is calculated for each entity (Table 17).

The load capacity, or interim sediment TMDL goal, is set at 50% above natural background or 465 tons/yr. Discussion on the rationale of establishing load capacity rate at 50% above background was presented in the *Priest River SBA and TMDL* (Rothrock 2001).

Critical Conditions are to be considered as part of the analysis of load capacity. The beneficial uses in this watershed are impaired, in part, 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.

5.1.3 Estimates of Existing Pollutant Loads

There are no point sources of sediment to Reeder Creek, and therefore an analysis of point source existing loads is not applicable.

Table 17 details the calculations of existing sediment yield into Reeder Creek for the three ownership/management groups. Methods for each category of existing sediment yield are discussed in Appendix A. The total calculated annual sediment load into Reeder Creek is 600 tons/yr, 93% greater than background.

The vast majority of the calculated current sediment load attributed to land use activity comes from the unpaved road network (246 tons/yr plus 8 tons/yr at stream crossings). There are around 65 total miles of unpaved roads in the watershed for a density of 4.9 mi/mi^2 watershed area. Of the total unpaved network, 34 miles (52%) are classified as closed roads or abandoned roads, undrivable from either tank traps and/or shrub and tree growth. Active road density (some roads gated) equals 2.3 mi/mi^2. The CWE survey inventoried 9 miles of the total road network (14%), evaluating both open and closed roads. The weighted mean CWE road score was 17.6 (in the "low" range of CWE road sediment scores), converting to 4.0 tons/mile/yr. Weighted mean CWE scores from various categories of the inventoried roads were applied to the non-inventoried roads. Stream crossings are calculated and reported separately from the road network (Appendix A). As expected, the stream crossing CWE scores are higher than road scores not crossing streams. The mean CWE score of the seven stream crossings evaluated was 24.3. There are only 18 known stream crossings in the watershed.

Only one mass failure was reported in the CWE inventory, at a stream crossing on USFS Road 1356 south of Reeder Creek in Section 26 (see Figure 3c). The estimated stream load from this failure was 28 tons. This value was used as the yearly sediment load for the category, Failures at Roads.

For hay cropping within 850 acres of Bismark Meadows, the RUSLE equation yielded 37 tons/yr. This value may be overestimated from the LS factor (Appendix A) since the ground slope is mostly flat, and from the C factor since the ground may not be tilled every ten years and there is not intense harvesting/grazing. On the other hand, the myriad cross drain ditches likely contributes sediment as they may occasionally be cleaned out. Also, a streambank erosion component has not been estimated for Reeder Creek, but there has been some documented streambank damage from large grazing animals (USFS 1994).

Lastly, a component for residential storm water was added to the Reeder Creek calculations to account for known, direct sediment runoff from the Elkins Resort entrance driveway and parking area. This runoff however is delivered at the mouth, not affecting the beneficial uses at the BURP site area.

5.1.4 Load Allocation

The nonpoint source, sediment pollutant allocation in this TMDL is equal to the load capacity. The load capacity of 50% above natural background is considered to include a margin of safety (see below). This TMDL treats background sediment yield as part of the load capacity and is allocated as part of the load capacity. The load allocation is assigned to the three ownership/management groups (Table 18). Note that sediment allocations in percent come close to ownership/management percentages. The non-industrial private land group has a lower sediment allocation percentage than land ownership percentage. This is due to a proportionally greater land area of the low sediment hazard landtypes Belt/Granitic Outwash Plains and Alluvial Deposits, and Lacustrine Plains (Figure 16). Since there are no known point sources in the Reeder Creek watershed, there is no wasteload allocation in the TMDL.

Table 18. Percentage of the Reeder 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)[a]	Percent of sediment allocation
USFS	6,202	73.4	349	75.1
Private Forest, Agricultural and Residential Lands	1,702	20.1	79	17.0
Industrial Timber Lands	552	6.5	37	7.9
Totals	8,456	100%	465	100%

a = Sediment allocation includes natural background sediment load from forested acres.

Margin of Safety

As developed in Section 4.2.2, pages 172 – 175 of the *Priest River SBA and TMDL*, a load capacity of 50% above background for Priest River basin watersheds is considered a sufficiently conservative target such that an additional MOS reduction is not warranted (Rothrock 2001).

Seasonal Variation

Sediment from nonpoint sources is loaded episodically, primarily during high discharge events. 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 Subbasin, 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 load capacities are most reasonably described in yearly increments, even though this quantification may be artificial.

Background

The background sediment yield for lands of each ownership/management group is shown as the initial entry in Table 17. The background is treated as part of the load capacity and is allocated as part of the load capacity. The reason for this inclusion is that the calculation method of current existing sediment load begins by applying the WATSED landtype coefficients to forested acreage minus the area of the road system and land converted to hay cropping and grazing (initial entry under Current Load in Table 17). As discussed in Appendix A, this "forested area" portion of the existing sediment load is essentially land given a background load with the assumption of minimal land use activity and sediment contribution above background.

Reserve

No part of the load allocation is held for additional load. All new earth disturbing activities should be conducted or mitigated to allow no net increase in sediment yield to the watershed.

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 19. On federal land the calculated load reduction is around 10% more than ownership percentage (82% reduction to 73% ownership), while for industrial timber lands (Stimson Lumber Company) load reduction is less than ownership percentage (1.5% reduction to 6.5% ownership). This relates to a higher road and stream crossing density on federal lands.

Pollution Control Strategies

The existing Priest Lake Watershed Advisory Group (WAG) could serve as the local TMDL advisory group. There would, however, need to be further representation and input from the agricultural and residential community within the Reeder Creek watershed.

Table 19. Sediment Load Reductions Required to meet TMDL Goals for Reeder Creek

Ownership/ Management	Sediment allocation (tons/yr)	Calculated current sediment load (tons/yr)	Sediment reduction required (tons/yr)	Percent of total sediment reduction	Time frame for meeting allocations
USFS	349	459	111	82%	15 years
Private Forest, Agricultural and Residential Lands	79	101	22	17%	15 years
Industrial Timber Lands	37	39	2	1.5%	15 years
Totals	465	599	135	100%	--

The CWE analysis indicated that there are some sediment yield problems along the 2 mile USFS Road 1356 that accesses federal timber land and a block of Stimson land in Section 25. The problems observed were primarily at two crossings of a small tributary stream where there is cut bank slumping near the culverts (Figure 3c). In the comment letter submitted by Stimson, improvements at these crossings, done in 1998, were cited (Appendix D). These improvements included: installation of a new 18" culvert with the approach armored by a 6" lift of pit run rock; an armored driveable drain dip constructed 40 ft upgrade from the culvert to prevent road surface runoff from draining into the stream; and 60 yards of additional surface rock placed in two other locations within the first mile of the road to provide additional erosion control.

Regarding hay cropping and cattle grazing on private land, the current effort for a Wetland Reserve Program on 1,000 acres of Bismark Meadows (see Chapter 4), will serve as an TMDL Implementation Plan for this sector.

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.

Monitoring Provisions

Instream monitoring of CWAL and SS beneficial use status, during and after implementation of sediment abatement projects and the WRP, is key to establish the final sediment load reduction required by the TMDL. Instream monitoring, which will detect the threshold values identified in Section 5.1.1, should be completed a minimum of every five years at randomly selected sites within the Reeder Creek low gradient channel. Baseline data are available at the single DEQ BURP site west of Hwy 57, so this would be logical monitoring area. 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, habitat evaluation, and electro-fishing.

Monitoring data collected should be BURP compatible so that the DEQ WBAG II can be used to evaluate beneficial use support. Surrogate targets established in the TMDL Implementation Plan by the WAG will also be monitored in a manner determined in the plan.

Additional Improvements not Directly Related to Sediment Delivery

Low salmonid densities and diversity measured at the Reeder Creek BURP site west of Hwy 57 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 poor to mediocre fish habitat features not directly linked to current sediment load. In part, this appears to be related to land conversion to hay cropping and grazing with channel straightening, a network of cross drainage ditches, and elimination of riparian shrubs and trees. Besides the lack of pools created by wood including beaver dams, there is also a lack of stream shading by shrubs, and possibly elevated water temperatures. Also, in section 2.3.1 it was mentioned that in 1958 IDFG conducted Rotenone treatments within Reeder Creek. IDFG subsequently planted cutthroat fry. There seems to be no other follow-up documentation on fish management efforts in the stream, but the 2000 BURP electro-fishing showed only brook trout with no cutthroats captured.

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 Reeder Creek. An excellent opportunity for this resides in the WRP effort. The TMDL Implementation Plan, as guided by the WAG, might consider a fisheries management approach with an objective of reestablishing resident cutthroat trout populations. This will certainly require an interagency approach, and agreement among the local area stakeholders. Because of the depressed populations of adfluvial cutthroat and bull trout within Priest Lake, it may be unrealistic to expect Reeder Creek to become a spawning ground for these large adfluvial natives.

Feedback Provisions

Data from which the Subbasin Assessment and TMDL for Reeder 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 CWAL and SS 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.

5.1.5 Conclusions

Opportunities for significant reduction in sediment yield to Reeder Creek from the unpaved road network appear to be limited. While some improvements can be targeted in the Implementation Plan, these would not seem to add up to the calculated reduction assigned to the USFS of 111 tons/yr to meet their load allocation (Table 19). There are only a few stream crossings and the majority of the road network is considerably beyond a 200 foot buffer distance from Reeder Creek. About one-half of the USFS unpaved road network is classified as closed or abandoned, and while sediment load calculations are assigned to these roads, many are brushed in and stable.

It is the opinion of this assessor that the single most beneficial improvement within the watershed will come from the WRP. Sediment reduction will come from: 1) plugging some of the cross drain ditches and eliminate ditch cleaning and dredging, 2) allowing restoration of wetland – wet meadow conditions including stream meander and beaver activity, and 3) the discontinuation of hay cropping and cattle grazing along the stream course. Likely, sediment reduction resulting from the WRP will exceed the sediment reduction assigned to the private ownership sector (Table 19). Perhaps pollutant-trading concepts can be applied.

5.2 Sediment TMDL for Binarch Creek

5.2.1 Instream Water Quality Targets

The instream water quality target for Binarch Creek is Full Support of cold water aquatic life (CWAL) and salmonid spawning (SS) beneficial uses. Full Support would be signaled by WBAG II field measures leading to integrated scores of SMI, SFI, and SHI which produce an average Condition Rating score of ≥ 2.0. Because of the low gradient valley stream in the lower half, with beaver complexes and associated slow water environment, the macroinvertebrate assemblage may not exhibit medium to high SMI scores reflective of swift riffle-run habitat. More primary targets might be improvement of habitat values, in particular a decrease in percent fines within gravel beds, and improved pool quality with less filling in by sediment. Such an improvement would need to be evaluated within the upper one-half of E4, B3, and B4 channel types with cutthroat trout spawning gravels. Fish targets would include maintenance or improvement of the pure strain westslope cutthroat trout population, with a minimum density of 5 – 10 cutthroat trout/100 m^2, and the presence of sculpin in reaches of less than 4% gradient.

The Binarch Creek sediment TMDL will develop loading capacities in terms of mass-per-unit-time. The current sources yielding sediment to the system can be reduced, but only to a limited extent. A substantial period (20 –30 years) will be required for the stream to clear a portion of its current sediment bed load and for a decrease in percent fines to be observed.

Target Selection

The Binarch Creek sediment TMDL applies sediment allocations in tons per year and calculates sediment reduction goals. Since the mid-lower reach of Binarch Creek does not meet the WBAG II criteria for full support of CWAL, with an implication that sediment has played some role in the impairment, sediment reduction will be required throughout lower to upper watershed sections.

The established load capacity for the Priest River Subbasin is 50% above background (Rothrock 2001), and calculated current sediment load for Binarch Creek is 77% above background. While management actions to reduce sediment load can be documented and tracked, the TMDL Implementation Plan may apply an instream surrogate measurement of success. Surrogate measurements related to sediment that would be appropriate for Binarch Creek would be percent fines (< 2.5 mm) in cutthroat spawning gravels, and residual pool volumes. Expectations of watershed sediment reduction efforts in conjunction with one or two high flow events would be lessening of fines and increase in pool volume.

There are no appropriate reference streams in the Priest River Subbasin for comparison to Binarch Creek. Other minor flow streams with low gradient “meadow land” characteristics have had at least moderate land use surrounding them. For size, flow and gradient comparisons, other comparable streams in the basin include Reeder Creek, Lamb Creek, Goose Creek, Moores Creek, and Quartz Creek. All these streams tend to have high percent fines in low gradient reaches.

Monitoring Points

Two points of compliance are set. One point is in the area of the two mid-lower BURP sites accessed by Forest Service road 639N. The second point would be the establishment of a monitoring reach within the upper one-half of the stream.

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 CWAL and SS 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 future assessments. The current guidance, WBAG II, utilizes a stream index scoring system from BURP sampling metrics comprised of a Stream Macroinvertebrate Index (SMI), Stream Fish Index (SFI), and Stream Habitat Index (SHI). Under the current guidance of WBAG II and additional considerations, the appropriate assessments of Full Support are:

- scores of SMI, SFI, and SHI which integrated together produce an average CR ≥ 2.0,
- a total salmonid density, determined by quantitative methods, at a minimum target level of 5 – 10 total trout/100 m^2. For Binarch Creek, a fisheries management objective would be maintenance and improvement of the existing pure strain westslope cutthroat trout population,
- three or more salmonid age classes including juveniles (<100 mm),
- presence of sculpins in reaches below 4% stream gradient, and
- as established by a Watershed Advisory Group (WAG), appropriate instream targets for surrogate habitat characteristics such as percent bed fines and residual pool volume.

5.2.2 Load Capacity

The natural background sedimentation rate for the Binarch Creek watershed is calculated at 266 tons/yr (Table 20). See Appendix A for methods of calculating natural background from USFS supplied base geology and landtype maps (Niehoff *pers comm*). The DEQ method for TMDLs assumes 100% delivery to streams, and does not incorporate the WATSED routing coefficient. The landtype map for Binarch Creek shown in Figure 17 includes associated WATSED sediment yield coefficients.

The load capacity, or interim sediment TMDL goal, is set at 50% above natural background or 399 tons/yr. Discussion on the rationale of establishing load capacity rate at 50% above background was presented in the *Priest River SBA and TMDL* (Rothrock 2001).

Critical Conditions are to be considered as part of the analysis of load capacity. The beneficial uses in this watershed are impaired, in part, 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

Table 20. Sediment Load Calculations for Binarch Creek; 100% USFS Ownership

Categories of Sediment Loading	**USFS**
Natural Sediment Load	
Watershed area: square miles	11.3
Weighted mean tons/mi^2	23.5
Tons/year – 100% delivery	**266**
Current Sediment Load	
1. Forested area[a]	
Forested area minus roads & crops (mi^2)	10.8
Tons/yr with 100% delivery	**254**
2. Unpaved roads	
Mean tons/yr/stream crossing from CWE score	0.20
Number of stream crossings	18
Tons/yr at stream crossings	**4**
Miles of total unpaved roads - (stream crossings)	65
Mean tons/mile of total roads from CWE score	2.4
Tons/yr from total roads (minus crossings)	**153**
3. Failures at roads	
Number of washouts at stream crossings	0
Tons/yr from stream crossing washouts	**0**
Number of typical road prism failures	0.5
Tons/yr from typical road prism mass failures	**60**
Tons/yr from atypical failures	**0**
4. Hay land and grazing	
Acres of improved hay land and pasture	0
Tons/yr from agricultural improved land	**0**
5. Other	
Tons/yr from streambank erosion	**0**
Total current tons/yr	**472**

a = See Appendix A, Forested Acres, on calculations incorporating natural sediment load into current load.

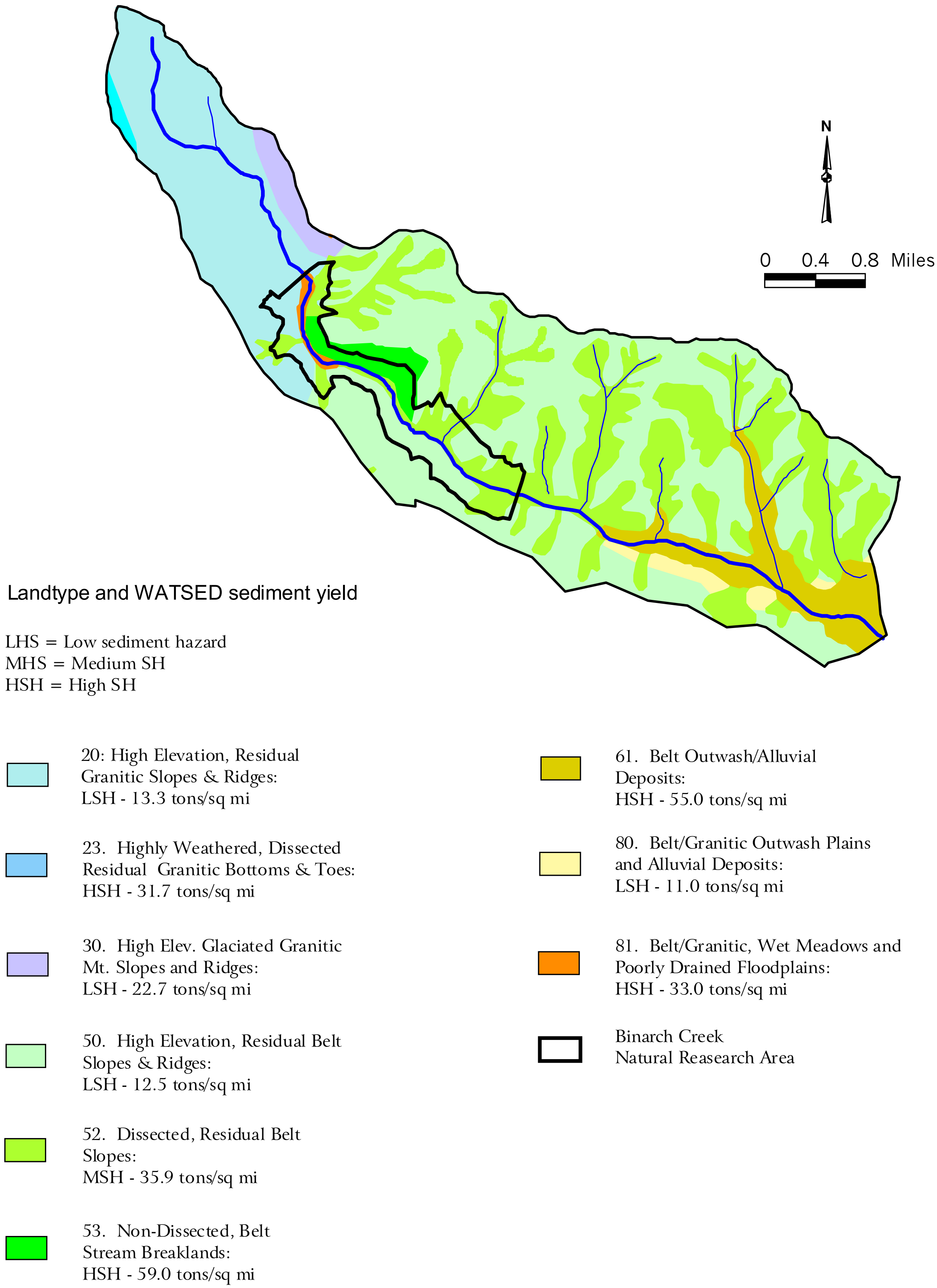


Figure 17. Binarch Creek landtype map and associated WATSED sediment yield coefficients (from USFS).

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.

5.2.3 Estimates of Existing Pollutant Loads

There are no point sources of sediment to Binarch Creek, and therefore an analysis of point source existing loads is not applicable.

Table 20 details the calculations of existing sediment yield into Binarch Creek for the single ownership/management group, the USFS. Methods for each category of existing sediment yield are discussed in Appendix A. The total calculated annual sediment load into Binarch Creek is 472 tons/yr, 77% greater than background.

The entirety of the calculated current sediment load attributed to land use activity comes from the unpaved road network: 4 tons/yr at stream crossings, 153 tons/yr from the remaining unpaved road network, and 60 tons/yr from road prism mass failures. There are around 66 total miles of unpaved roads in the watershed for a high density of 5.9 mi/mi^2 watershed area. However, of the total unpaved network, 43 miles (65%) are classified as closed or abandoned roads, undrivable from either tank traps and/or shrub and tree growth, and also roads that have barriers or restricted travel. An example of a closed road is Forest Service Road 639N which at one time was an active 3.3 mile road running adjacent to lower Binarch Creek, but now 3.1 miles are a hiking trail (Figure 5b). Density of active roads is a moderate 2.1 mi/mi^2.

The CWE survey inventoried 16 miles of the total road network (24%), evaluating both open and closed roads. The weighted mean CWE road score was 12 (in the "lowest" range of CWE road sediment scores), converting to 2.6 tons/mile/yr. Weighted mean CWE scores from various categories of the inventoried roads were applied to the non-inventoried roads. Stream crossings are calculated and reported separately from the road network (Appendix A). The mean CWE score of the 13 stream crossings evaluated was also 12. There were 18 stream crossings in the watershed which sediment calculations were applied to.

Only one mass failure was reported in the CWE inventory, at a stream crossing on the primary Forest Service Road 639 (Figure 5b). Based on USFS maintenance experiences in the watershed along with the CWE inventory, a value of 0.5 road prism failures per year was established at 60 tons/yr delivered to streams for the category of Failures at Roads. A streambank erosion survey has not been conducted along Binarch Creek, and no estimate of this component was incorporated into the calculated annual sediment load.

5.2.4 Load Allocation

The nonpoint source, sediment pollutant allocation in this TMDL is equal to the load capacity. The load capacity of 50% above natural background is considered to include a margin of safety (see below). This TMDL treats background sediment yield as part of the load capacity and is allocated as part of the load capacity. The load allocation of 399 tons/yr is assigned to the single ownership/management group, the USFS (Table 21). Since there are no known point sources in the Binarch Creek watershed, there is no wasteload allocation in the TMDL.

Table 21. Sediment Load Allocated to the USFS Ownership/Management in Binarch Creek

Ownership/Management	Acres	Percent of ownership/ management acres	Sediment Allocation (tons/yr)[a]
USFS	7,232	100	399

a = Sediment allocation includes natural background sediment load from forested acres.

Margin of Safety

As developed in Section 4.2.2, pages 172 – 175 of the *Priest River SBA and TMDL*, a load capacity of 50% above background for Priest River basin watersheds is considered a sufficiently conservative target such that an additional MOS reduction is not warranted (Rothrock 2001).

Seasonal Variation

Sediment from nonpoint sources is loaded episodically, primarily during high discharge events. 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 Subbasin, 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 load capacities are most reasonably described in yearly increments, even though this quantification may be artificial.

Background

The background sediment yield for the Binarch Creek watershed is shown as the initial entry in Table 20. The background is treated as part of the load capacity and is allocated as part of the load capacity. The reason for this inclusion is that the calculation method of current existing sediment load begins by applying the WATSED landtype coefficients to forested acreage minus the area of the road system and land converted to hay cropping and grazing (initial entry under Current Load in Table 20). As discussed in Appendix A, this “forested area” portion of the existing sediment load is essentially land given a background load with the assumption of minimal land use activity and sediment contribution above background.

Reserve

No part of the load allocation is held for additional load. All new earth disturbing activities should be conducted or mitigated to allow no net increase in sediment yield to the watershed.

Sediment Load Reduction Allocation

The current sediment load calculation for the Binarch Creek watershed, and the yearly sediment reduction required to meet the sediment allocation is shown Table 22.

Table 22. Sediment Load Reduction Required to meet TMDL Goals for Binarch Creek

Ownership/ Management	Sediment allocation (tons/yr)	Calculated current sediment load (tons/yr)	Sediment reduction required (tons/yr)	Time frame for meeting allocations
USFS	399	472	73	15 years

Pollution Control Strategies

In the USFS comment package to the original *Priest River SBA and TMDL*, it was stated that "few actual opportunities exist to reduce the existing sediment load into Binarch Creek", and "after intensive surveys of the streams, road networks, and existing timber units, we have not found any significant sources of sediment that could reach the main stem of Binarch Creek" (USFS 2000b). As a result of the Douglas-fir beetle project EIS, the USFS did propose to obliterate a network of roads on the northern face of Binarch Creek to improve slope hydrology and reduce the risk of slope failure (Figure 5b). The USFS also states a commitment to "continue protection within the Binarch RNA, prohibit cattle access to the drainage, maintain the existing road network, and obliterate non-essential or resource threatening roads" (USFS 200b).

From field notes of the 1998 surveys for the Douglas-fir beetle EIS, it was observed that the section of upper Binarch Creek immediately below the crossing of 219 appeared to be influenced by the road crossing (USFS 1998). This stream section was noted to have bank failures, channel migration, side channels, and stream divergence. LOD jams, filled in with sediment were the cause of some channel migrations. The stream above the road crossing was noted to be more stable. It appears then that improvements could be targeted for this section of Road 219.

It would seem to this assessor, that with some work to reduce risks of road prism mass failures and improvements at the Road 219 crossing, the yearly calculated sediment reduction of Table 22 might be approached. Importantly, there also needs to be a rest period for Binarch Creek such that existing instream sediment beds are moved out of the system by high flows without further sediment input from newly created sources.

Monitoring Provisions

Instream monitoring of CWAL and SS beneficial use status, during and after implementation of sediment abatement, is key to establish the final sediment load reduction required by the TMDL. Instream monitoring, which will detect the threshold values identified in Section 5.2.1, should be completed a minimum of every five years at randomly selected sites within the Binarch Creek low gradient E5 channel type, and within the upper one-half stream segment in E4, B3, or B4 channel types. 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, habitat evaluation, and electro-fishing.

Monitoring data collected should be BURP compatible so that the DEQ WBAG II can be used to evaluate beneficial use support. Surrogate targets established in the TMDL Implementation Plan will also be monitored in a manner determined in the plan.

Feedback Provisions

Data from which the Subbasin Assessment and TMDL for Binarch 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 CWAL and SS 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 activities 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.

5.2.5 Conclusions

Opportunities for significant reduction in sediment yield to Binarch Creek from the current unpaved road network appear to be limited. Some improvements can be targeted in the Implementation Plan, as previously discussed in Pollution Control Strategies. It may be that these improvements can approach the initial estimate of sediment reduction required, 73 tons/yr (Table 22).

The primary impairments in Binarch Creek are considered to be: 1) deposition of fines within mid to upper gravel beds utilized for cutthroat spawning, 2) filling in of pools by sediment, and 3) possibly excess fines within the lower half, E5 channel type. It is perceived that impairment from excess sedimentation relates to a legacy of rather extensive timber harvests with an associated high road density that serviced these timber sales between 1960 – 1996. Keeping Binarch Creek on the §303(d) list as impaired with sediment as the pollutant of concern essentially translates to a “rest and recovery” requirement within the watershed. There needs to be a period of controls on sediment input along with periodic high flow years to assess whether the stream will exhibit characteristics more favorable to cold water aquatic life.

5.3 East River Sediment TMDL

5.3.1 Instream Water Quality Targets

The instream water quality target for East River main stem is Full Support of cold water aquatic life (CWAL) beneficial use. Full Support would be signaled by WBAG II field measures leading to integrated scores of SMI, SFI, and SHI which produce an average Condition Rating (CR) score of ≥ 2.0. The single BURP macroinvertebrate sample did produce a passing SMI score of CR = 2. However, the overall habitat conditions were rated as poor (SHI - CR = 1). Primary targets for habitat improvement based on low BURP scores would be: increased streambank cover and stability (decreased streambank erosion), increased LWD within the stream and improvement of instream cover, and improvement of pool quality. A decrease in summer water temperatures is a target for the East River temperature TMDL (Section 5.4).

The above habitat targets do not directly relate to measured sediment parameters such as percent fines and degree of cobble embeddedness. These BURP metrics scored satisfactorily at the single BURP site. It was argued in Section 2.3.3 that excess sediment load from the East River watershed could not be dismissed as part of the cause of suspected channel widening in the main stem. It is the observation of this assessor that while sampled gravel/cobble riffles may produce good macroinvertebrate scores and have satisfactory low fines and embeddedness, this does not depict that major sections of the East River main stem are homogeneous thick sand beds. It is recommended that TMDL monitoring include a reach profile which measures lengths of gravel/cobble habitat and sand bed habitat.

The single BURP electro-fishing survey did produce a passing SFI score of CR = 2. However, the qualitative estimate of salmonid density was low (1.3 total salmonids/100 m^2), with only 1 juvenile bull trout captured and no cutthroat. With improvement in habitat conditions and water temperatures, there would be the expectation of improved salmonid populations. Targets would include a minimum resident salmonid density of 5 – 10 total trout/100 m^2 including increased presence of cutthroat trout, and juvenile and sub adult bull trout.

The East River sediment TMDL will develop loading capacities in terms of mass-per-unit-time. The sources yielding sediment to the system can be reduced, but a substantial period (20 –30 years) will be required for the stream to clear a portion of its current sediment bed load (sand).

Target Selection

The East River sediment TMDL applies sediment allocations in tons per year and calculates sediment reduction goals. Since the East River main stem does not meet the WBAG II criteria for Full Support of CWAL, with the implication of impairment being in part sediment related, sediment reduction will be required throughout the East River drainage. This will be the subwatersheds of the Middle Fork, North Fork, and main stem. The Lost Creek subwatershed is excluded because surface water does not connect with the North Fork.

The established load capacity for the Priest River Subbasin is 50% above background (Rothrock 2001), and calculated current sediment load for East River is 185% above background. While management actions to reduce sediment load can be documented and tracked, the TMDL Implementation Plan may apply an instream surrogate measurement of success. Traditionally within DEQ sediment TMDLs, surrogate measurements relating to sediment have included percent bed fines (< 2.5 mm), cobble embeddedness, and residual pool volume. For the East River main stem, poor habitat values relate to streambank erosion, lack of good instream cover including LWD, and poor quality of pools (residual pool volume appears satisfactory). Proper surrogate parameters to measure success will need to be established by a WAG during formulation of the TMDL Implementation Plan.

There are no appropriate reference streams in the Priest River Subbasin for comparison to East River main stem. Other major flow streams (watershed size >35,000 acres) with low gradient characteristics have had at least moderate land use surrounding them. For size, flow and gradient comparisons, other comparable streams in the basin include Lower West Branch Priest River, and Upper West Branch Priest River. Both these streams tend to have high percent fines in low gradient reaches.

Monitoring Points

Two points of compliance are set. One point would be down stream of the Eastside Road bridge. The existing BURP site has difficult access to bring in sampling equipment (Figure 8a). The 2001 electro-fishing site has better access. A preferable sampling location would be between the two sites if an access point can be developed. A second site of compliance would be the establishment of a monitoring reach upstream of the Eastside Road bridge. Access to an upstream site would have to be through private property.

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 CWAL 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 future assessments. The current guidance, WBAG II, utilizes a stream index scoring system from BURP sampling metrics comprised of a Stream Macroinvertebrate Index (SMI), Stream Fish Index (SFI), and Stream Habitat Index (SHI). Under the current guidance of WBAG II and additional considerations for the East River main stem, the appropriate measures of Full Support are:

- scores of SMI, SFI, and SHI which integrated together produce an average Condition Rating score ≥ 2.0,

- a total salmonid density, determined by quantitative methods, at a minimum target level of 5 – 10 total trout/100 m^2. Species inhabiting East River main stem are brook trout, brown trout, bull trout, and likely cutthroat trout. A fisheries management objective might be set to establish bull trout plus cutthroat at the minimum target abundance.

- three or more salmonid age classes including juveniles (<100 mm),

- continued presence of sculpins,

- as established by a Watershed Advisory Group (WAG), appropriate instream targets for surrogate habitat characteristics, and

! in addition to the biological measures above, the TMDL Implementation Plan may address fisheries management objectives regarding rearing conditions for juvenile and sub adult bull trout and cutthroat trout. If interagency decisions and agreements are made to attempt an improvement of these native salmonid populations, then monitoring for the effect of sediment reduction efforts should also include measurements of habitat parameters that are related to sedimentation, water temperature, and instream habitat quality.

5.3.2 Load Capacity

The natural background sedimentation rate for the entire East River watershed is calculated at 1,032 tons/yr (Tables 23 and 24). See Appendix A for methods of calculating natural background from USFS supplied base geology and landtype maps (Niehoff *pers comm*). The DEQ method for TMDLs assumes 100% delivery to streams, and does not incorporate the WATSED routing coefficient. The landtype map for East River (Figure 18) includes associated WATSED sediment yield coefficients. Landtype units were partitioned according to the five general ownership/management groups within the watershed, and background sediment yield is calculated for each entity (Table 24).

The load capacity, or interim sediment TMDL goal, is set at 50% above natural background or 1,548 tons/yr. Discussion on the rationale of establishing load capacity rate at 50% above background was presented in the *Priest River SBA and TMDL* (Rothrock 2001).

Critical Conditions are to be considered as part of the analysis of load capacity. The beneficial uses in this watershed are impaired, in part, 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.

5.3.3 Estimates of Existing Pollutant Loads

There are no point sources of sediment to East River, and therefore an analysis of point source existing loads is not applicable.

Table 24 details the calculations of existing sediment yield into East River main stem for the five ownership/management groups. Methods for each category of existing sediment yield are discussed in Appendix A. The total calculated annual sediment load into East River is 2,937 tons/yr (Middle Fork, North Fork, and main stem), 185% greater than background.

The vast majority of the calculated current sediment load attributed to land use activity comes from the unpaved road network: 1,503 tons/yr combined for stream crossings, the road prism other than at crossings, road washouts at crossings, and road prism mass failures.

Table 23. Sediment Calculations for East River by Subwatershed

Categories of Sediment Loading	Middle Fork	North Fork[a]	Main Stem	Totals
Natural Sediment Load				
Watershed area: square miles	34.0	20.6	2.9	57.6
Weighted mean tons/mi^2	17.9	18.1	17.3	17.9
Tons/year - 100% delivery	**609**	**372**	**51**	**1,032**
Current Sediment Load				
1. Forested area[b]				
Forested area minus roads & crops (mi^2)	32.9	19.8	2.6	55.3
Tons/yr with 100% delivery	**589**	**357**	**45**	**991**
2. Unpaved roads				
Mean tons/yr/stream crossing from CWE score	0.33	0.23	0.33	0.29
Number of stream crossings	61	44	5	110
Tons/yr at stream crossings	**20**	**10**	**2**	**32**
Miles of total unpaved roads - (crossings)	143	103	14	260
Mean tons/mile of total roads from CWE score	3.3	2.8	3.0	3.1
Tons/yr from total roads (minus crossings)	**474**	**282**	**41**	**797**
3. Failures at roads				
Number of washouts at stream crossings	4	2	0	6
Tons/yr from stream crossing washouts	**86**	**43**	**0**	**130**
Number of typical road prism failures	5	3	0	8
Tons/yr from typical road prism mass failures	**391**	**154**	**0**	**545**
Tons/yr from atypical failures	**0**	**0**	**0**	**0**
4. Hay land and grazing				
Acres of improved hay land and pasture	12	0	201	213
Tons/yr from agricultural improved land	**0.5**	**0**	**9**	**9**
5. Streambank Erosion				
Tons/yr from streambank erosion	**nd**	**nd**	**434**	**434**
Total current tons/yr	**1,561**	**846**	**530**	**2,937**
Percent of total current sediment load	53%	29%	18%	100%

a = North Fork subwatershed calculations exclude the 6,305 acre Lost Creek subwatershed.

Table 24. Sediment Calculations for East River by Ownership/management Group

Categories of Sediment Loading	Idaho State	Federal	Private	Timber Industry	County Roads	Totals
Natural Sediment Load						
Watershed area: square miles	49.0	5.6	1.7	1.2	0.1	57.6
Weighted mean tons/mi^2	17.9	18.9	16.1	15.5	16.2	17.9
Tons/year - 100% delivery	**879**	**105**	**28**	**19**	**1**	**1,032**
Current Sediment Load						
1. Forested area[b]						
Forested area minus roads & crops (mi^2)	47.2	5.4	1.4	1.2	0.1	55.3
Tons/yr with 100% delivery	**847**	**102**	**23**	**19**	**1**	**991**
2. Unpaved roads						
Mean tons/yr/stream crossing from CWE score	0.29	0.30	0.28	0.26	0.42	0.29
Number of stream crossings	99	4	1	4	2	110
Tons/yr at stream crossings	**28**	**1**	**0.3**	**1**	**1**	**32**
Miles of total unpaved roads - (crossings)	227	21	4	2	5	260
Mean tons/mile of total roads from CWE score	3.1	3.0	3.3	2.6	3.1	3.1
Tons/yr from total roads (minus crossings)	**698**	**64**	**14**	**6**	**15**	**797**
3. Failures at roads						
Number of washouts at stream crossings	6	0	0	0	0	6
Tons/yr from stream crossing washouts	**130**	**0**	**0**	**0**	**0**	**130**
Number of typical road prism failures	8	0	0	0	0	8
Tons/yr from typical road prism mass failures	**545**	**0**	**0**	**0**	**0**	**545**
Tons/yr from atypical failures	**0**	**0**	**0**	**0**	**0**	**0**
4. Hay land and grazing						
Acres of improved hay land and pasture	0	0	213	0	0	213
Tons/yr from agricultural improved land	**0**	**0**	**9**	**0**	**0**	**9**
5. Streambank Erosion						
%assigned to tons/yr streambank erosion	53%	9%	30%	2%	5%	100%
Tons/yr from streambank erosion	**231**	**41**	**130**	**10**	**22**	**434**
Total current tons/yr	**2,479**	**208**	**176**	**36**	**38**	**2,937**
Percent of total current sediment load	84%	7%	6%	1.2%	1.3%	100%

b = See Appendix A, Forested Acres, on calculations incorporating natural sediment load into current load.

There are around 265 total miles of unpaved roads in the watershed for a density of 4.5 total road mi/mi^2 watershed area (Figure 19). This density is above the basin wide average. Of the total unpaved network, 73 miles (27%) are classified as closed roads or abandoned roads, undrivable by either tank traps and/or shrub and tree growth. The 1998 CWE survey inventoried 80 miles of the total road network (30%), evaluating both open and closed roads. The weighted mean CWE road score was 14.7, in the "low" range of CWE road sediment scores (10 – 30 scores), converting to 3.2 tons/mile/yr. Weighted mean CWE scores from various categories of the inventoried roads were applied to the non-inventoried roads.

Sediment load from the total road prism (minus crossings and not including failures) was 797 tons/yr, 27% of total current load. Through GIS analysis it was determined that around 17 road miles are within a 200 foot buffer of watershed streams (not including the stream crossings). There are sections of State Road 10 that are as close as 25 – 50 feet from the Middle Fork stream channel (between the Tarlac Creek to Keokee Creek crossings), and sections of State Road 14 are close to the upper North Fork. It is these segments within 25 - 200 feet of streams that may receive highest priority in the TMDL Implementation Plan, and may be recalculated to receive a much greater proportion of the road prism sediment load.

Stream crossings are calculated and reported separately from the road network (Appendix A). The stream crossing CWE scores are somewhat higher than road scores not crossing streams. The mean CWE score of the 37 stream crossings evaluated (out of 110 total crossings) was 16.4. This translates to 0.27 tons/yr/crossing. The mean CWE score was applied to crossings not evaluated by the CWE survey. Tons/yr at stream crossings (32 tons/yr not counting washouts and failures) are a small percentage of the total load. However, the substantial number of stream crossings (110) translates to a density of 1.4 crossings/mi of stream, at the high end relative to other subbasin watersheds (Rothrock 2001). As a TMDL Implementation Plan is formulated, improvements at selected stream crossings will likely receive high priority and the contribution of crossings may be recalculated to a greater overall contribution to total sediment load.

The category of washouts at stream crossings that relate to debris plugging at a culvert inlet (Appendix A), total 130 tons/yr. Each culvert washout event has been assigned an average 10 cubic yards sediment delivery to streams (in a year), or 21.6 tons/event. Based on CWE observed washouts at stream crossings and documented Special Management Problems (Figure 19), prorated over the entire watershed road network, 4 washouts/yr are assigned to Middle Fork subwatershed and 2 washouts/yr to North Fork (Table 23).

For road prism mass failures, the CWE inventory recorded 5 mass failures in the Middle Fork drainage for a combined estimated delivery to streams of 391 tons. For the North Fork, 3 observed failures gave a combined estimated stream delivery of 154 tons. These values are used for annual sediment load. The CWE mass failure 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 prorating CWE observed mass failures gives unrealistic numbers based on IDL maintenance experiences.

The 2000 streambank erosion survey over 0.34 miles of the East River main stem produced an estimated 193 tons/stream mile/yr (Appendix A). Prorating this value to the 2.8 miles of the main stem equals 542 tons/yr. The reach surveyed (just west of the Eastside Road bridge), was selected as a known stretch of severe bank erosion in part caused by large animal access.

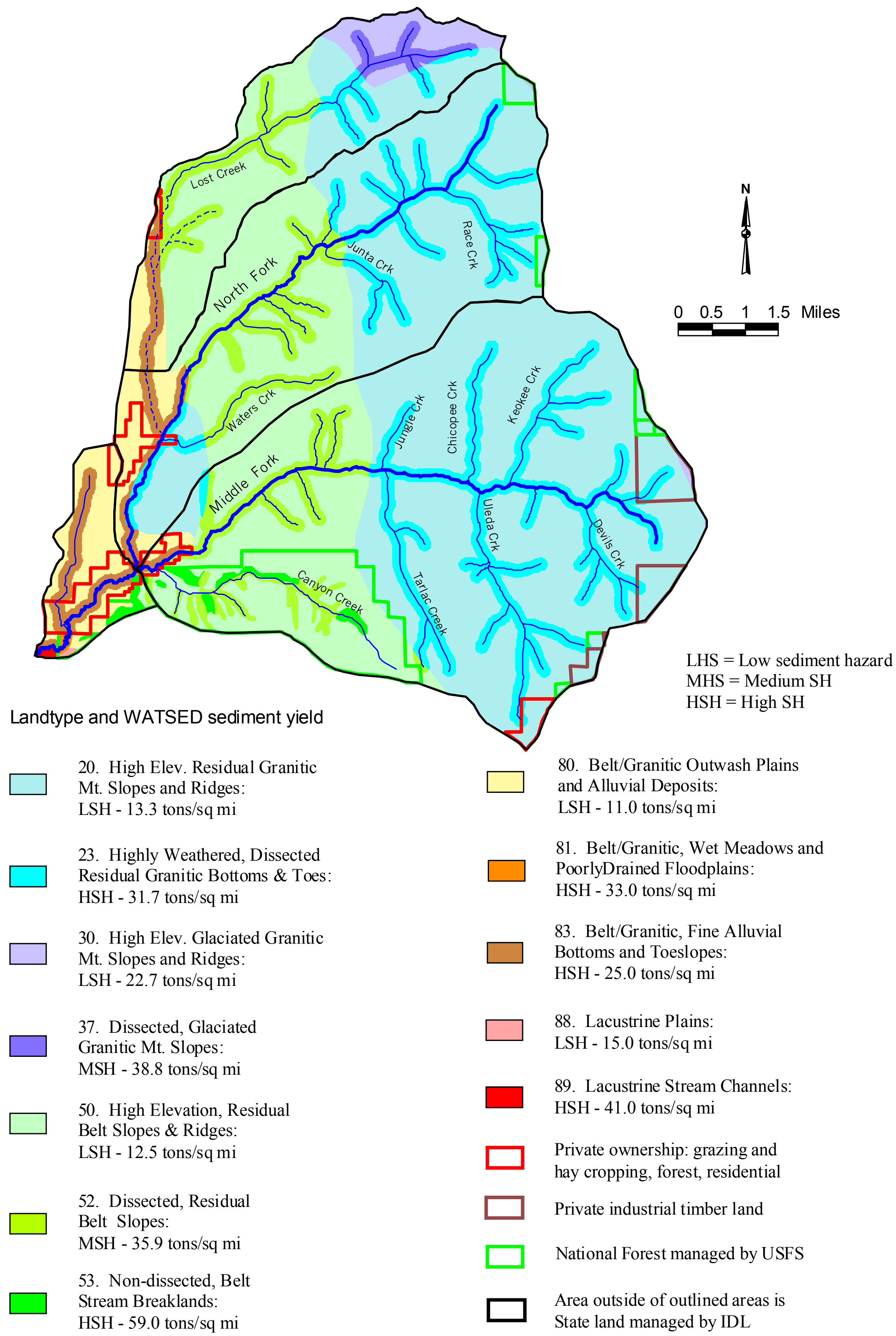


Figure 18. East River landtype map and associated WATSED sediment yield coefficients (from USFS).

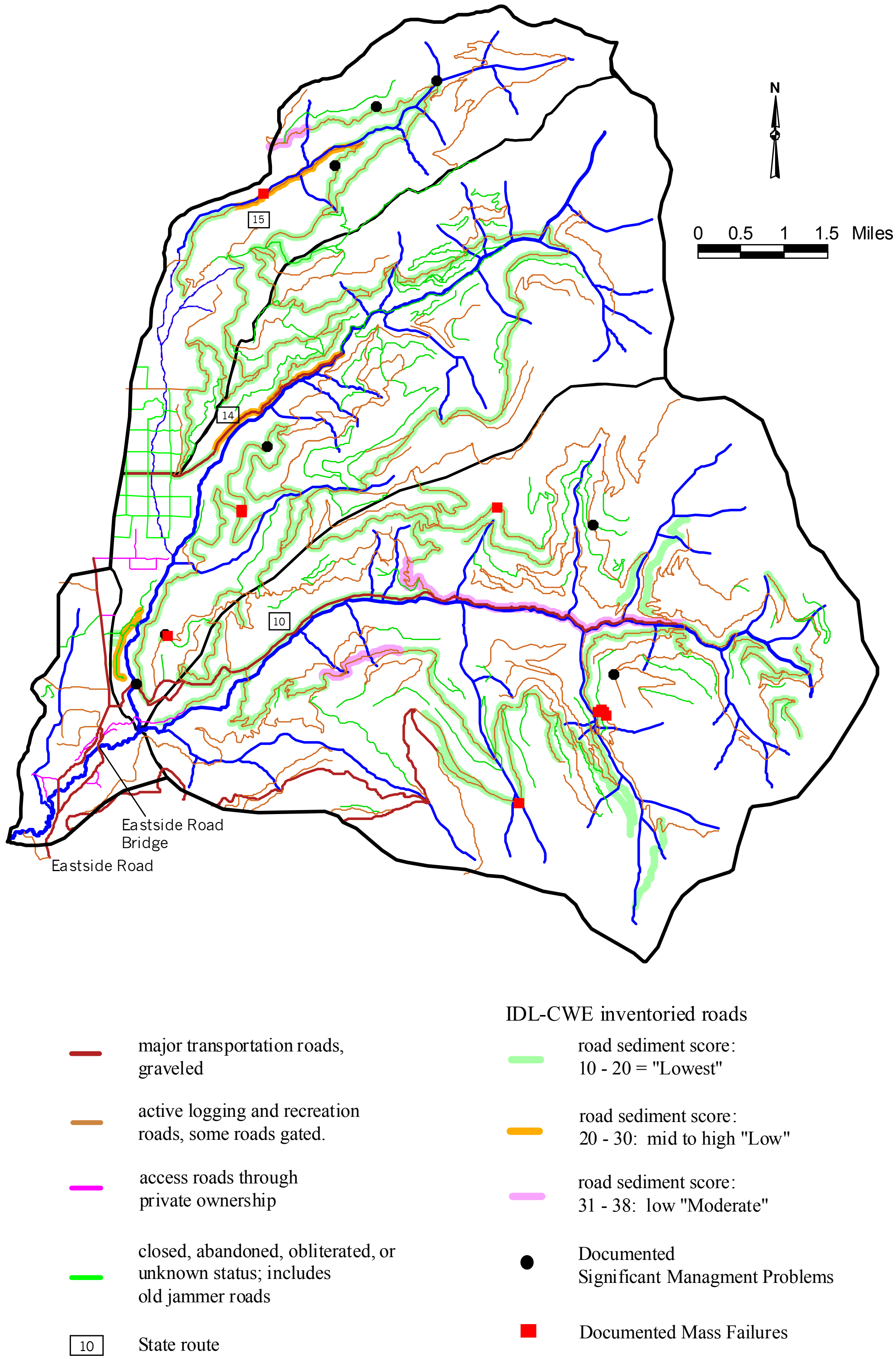


Figure 19. East River road network and IDL – CWE road survey.

Through observations it is known that some main stem sections do not have the same severity of erosion, although many other sections do. The prorated annual load was thus reduced by 20% to 434 tons/yr. This load was partitioned out to the various ownership/management groups.

The private agricultural and ranchette sector along the main stem was assigned 30% of the streambank erosion load. This relates to riparian disturbance including large animal grazing. The Bonner County maintained Eastside Road bridge was assigned 5% for suspected flow constriction and elevated peak flow velocities downstream from the bridge. The above two assigned allocations have no established quantified basis. Assignment of 35% of total load from the above two factors leaves 282 tons/yr. This streambank load was assumed to be caused or related to elevated peak flow from the Middle Fork subwatershed as implicated by the CWE - Hydrologic Risk Rating score of “high end of moderate” (see Section 2.3.3 Conclusions). The Middle Fork subwatershed minus a small segment of private residential land has the following ownership proportions: state land = 82%, federal land = 14.5%, and Industrial Timber land = 3.7%. These proportions were applied to the 282 tons/yr as an assignment of main stem streambank erosion load. This portion of the streambank erosion allocation also has no established quantified basis.

5.3.4 Load Allocation

The nonpoint source sediment pollutant allocation in this TMDL is equal to the load capacity. The load capacity of 50% above natural background is considered to include a margin of safety (see below). This TMDL treats background sediment yield as part of the load capacity and is allocated as part of the load capacity. The load allocation is assigned to the five ownership/management groups (Table 25). Note that sediment allocations in percent come close to ownership/management percentages. Since there are no known point sources in the East River watershed, there is no wasteload allocation in the TMDL.

Table 25. Percentage of the East River Watershed Owned and/or Managed by Various Entities, and the Sediment Load Allocated to each Ownership/Management Group

Ownership/Management	Acres	Percent of ownership/ management acres	Sediment Allocation (tons/yr)[a]	Percent of sediment allocation
Idaho State	31,373	85.1%	1,318	85.2%
Federal	3,552	9.6%	157	10.2%
Industrial Timber Lands	787	2.1%	28	1.8%
Private Agricultural, Forest and Ranchette Lands	1,115	3.0%	43	2.8%
Bonner County Maintained Roads	30	0.1%	1.1	0.1%
Totals	36,857	100%	1,548	100%

a = Sediment allocation includes natural background sediment load from forested acres.

Margin of Safety

As developed in Section 4.2.2, pages 172 – 175 of the *Priest River SBA and TMDL*, a load capacity of 50% above background for Priest River Subbasin watersheds is considered a sufficiently conservative target such that an additional margin of safety reduction is not warranted (Rothrock 2001).

Seasonal Variation

Sediment from nonpoint sources is loaded episodically, primarily during high discharge events. 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 Subbasin, 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 load capacities are most reasonably described in yearly increments, even though this quantification may be artificial.

Background

Background sediment yield is presented for each subwatershed (Table 23), and then for the entire watershed for lands of each ownership/management group (Table 24). The background is treated as part of the load capacity and is allocated as part of the load capacity. The reason for this inclusion is that the calculation method of current existing sediment load begins by applying the WATSED landtype coefficients to forested acreage minus the area of the road system and land converted to hay cropping and grazing (initial entry under Current Load in the Tables). As discussed in Appendix A, this "forested area" portion of the existing sediment load is essentially land given a background load with the assumption of minimal land use activity and sediment contribution above background.

Reserve

No part of the load allocation is held for additional load. All new earth disturbing activities should be conducted or mitigated to allow no net increase in sediment yield to the watershed.

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 26. Private agricultural and ranchette lands have a significantly higher percent reduction than ownership percentage (9.6% load reduction to 3.0% land ownership). This primarily reflects the allocation of 30% of the main stem streambank erosion to this ownership category (Section 5.3.3). Bonner County maintained roads is also out of proportion with management area (2.7% load reduction versus maintained roads that only encompass 0.1% of total land area). This land area however has been converted to a 100% road system, and thus received 100% of the road

Table 26. Sediment Load Reductions Required to meet TMDL Goals for East River

Ownership/ Management	Sediment allocation (tons/yr)	Calculated current sediment load (tons/yr)	Sediment reduction required (tons/yr)	Percent of total sediment reduction	Time frame for meeting allocations
Idaho State	1,318	2,479	1,161	83.5	15 years
Federal	157	208	51	3.6	15 years
Industrial Timber	28	36	7	0.5	15 years
Private Agricultural, Ranchette, and Forest Lands	43	176	134	9.6	15 years
Bonner County Maintained Roads	1.1	38	37	2.7	15 years
Totals	1,548	2,937	1,389	100%	--

system sediment calculations. Also, because of suspected constriction of the Eastside Road bridge, 5% of the streambank erosion was assigned to County roads. There have been documented erosion and structural problems at the stream crossing bridge.

On federal land the calculated load reduction is less than ownership percentage (3.6% reduction to 9.6% ownership). Within the Middle Fork drainage, road and stream crossing density on federal lands (primarily the Experimental Forest) is less than state land. Also, there were no CWE documented stream crossing washouts or mass failures on federal lands.

Pollution Control Strategies

The existing Priest Lake Watershed Advisory Group (WAG) could serve as the local TMDL advisory group. There would however, need to be further representation and input from the agricultural and residential community within the East River watershed.

In comment to the draft *Priest River SBA and TMDL*, IDL submitted the following statement in relation to management efforts in the East River drainage: "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" (IDL 2000b).

As developed in a TMDL Implementation Plan, the ongoing efforts by IDL toward remediation and improvements on the state lands timber road system would continue. The amount of sediment reduction achieved by implementation of reduction measures would need to be tracked and documented on a yearly basis.

On private agricultural lands there are only a few ownerships, including one large hay cropping and cattle grazing operation adjacent to the lower main stem. Programs such as the USDA Conservation Reserve Program would be appropriate. The CRP program provides cost share opportunities to cattle ranchers for fencing off stream segments to cattle, for developing off-site water sources, and for planting riparian vegetation.

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 enforce the FPA when there are violations.

For county and private roads and stream crossings, there would be additional expenses to landowners and the county to ensure that water runoff management measures are adequate. The stream crossing at Eastside Road bridge should be reevaluated to assess whether there is flow constriction and subsequent streambank erosion due to elevated velocity.

Monitoring Provisions

Instream monitoring of CWAL 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 5.3.1, should be completed a minimum of every five years at randomly selected sites within the East River main stem. Baseline data are available at the DEQ BURP site 0.3 stream miles from the mouth and at the DEQ electro-fishing site 0.7 stream miles from the mouth. 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, habitat assessment, and electro-fishing. Monitoring data collected should be BURP compatible so that the DEQ - WBAG II can be used to evaluate beneficial use support. Surrogate targets established in the TMDL Implementation Plan by the WAG will also be monitored in a manner determined in the plan.

Additional Improvements not Directly Related to Sediment Delivery

Low salmonid abundance measured in the East River main stem are not solely the result of current sediment delivery to watershed streams. Current sediment load may not even be the major related cause. There appears to be poor to mediocre fish habitat features not directly linked to current sediment load. This may be related to: historic timber removal of riparian conifers, removal of shrubs and streambank damage by grazing animals, bank damage and widening possibly related to accelerated peak flows, and lack of LWD recruitment.

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 East River main stem. The TMDL Implementation Plan, as guided by the WAG, might consider a fisheries management approach with an objective of establishing a more favorable rearing habitat for juvenile cutthroat trout and bull trout. This will certainly require an interagency approach and agreement among the local area stakeholders.

Feedback Provisions

Data from which the Subbasin Assessment and TMDL for East River 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 CWAL 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.

5.3.5 Conclusions

Given the assessed beneficial use status of Not Fully Supporting for CWAL, it is nearly impossible to assign the degree of cause to sediment load from land use activities. There appear to be problems with elevated water temperatures, stream widening, and lack of quality fish habitat. However, there are ample opportunities for reduction of the current sediment load from all ownership/management groups operative within the East River drainage. The TMDL Implementation Plan should identify and target areas that proportionally yield the highest sediment to watershed streams, and identify other improvement projects not directly related to sediment load.

5.4 East River Temperature TMDL

Introduction to Methods Used

The East River temperature TMDL assumes that heat loading is directly related to stream temperature. Analyses have established that the primary environmental factors affecting stream temperature are local air temperature, stream depth, ground water inflow, and the extent to which riparian canopy cover and topography shade the stream (Sullivan and Adams 1990, Theurer *et al.* 1984, Beschta and Weatherred 1984). In forested environments, stream shading and local air temperature are widely recognized as the major environmental determinants of stream temperature (Brown 1971, IDL 2000a). Of these two primary factors, canopy cover or shade is the one modified by human use.

This temperature TMDL utilizes the IDL Cumulative Watershed Effects (CWE) Canopy Closure – Stream Temperature protocol (IDL 2000a). This method determines increases in stream shade needed to achieve temperatures that approach the EPA bull trout juvenile rearing and spawning criteria for July – mid September. Existing riparian canopy cover and increased canopy cover needed, are thus surrogate measures of heat loading per unit area per time. DEQ's use of the CWE method for temperature TMDLs has been accepted by EPA for the Upper North Fork Clearwater River (Dechert *et al*. 2001). EPA considers subsequent temperature TMDLs using the CWE methods as producing only interim TMDL targets, and has placed some sideboards on the interim predicted targets (EPA 2001b), as will be explained later.

There are process-based stream temperature models such as *Heat Source* (Boyd 1996) or SSTEMP (Theurer *et al.* 1984, Bartholow 1989) for analyzing stream temperatures by quantifying the heat transfer processes. However, these models tend to require extensive inputs, many of which are not easily available for mountain streams. Use of processed-based models was deemed unworkable for the Upper NF Clearwater temperature TMDL (Dechert *et al*. 2001), as well as the for the East River TMDL presented here. As discussed later, heat loading values developed from SSTEMP are calculated as ancillary or comparative data to the primary TMDL target measurement of percent canopy cover.

The Idaho Forest Practices Act Coordinating Committee has developed an empirical model of stream temperature based on continuous water temperature measurements, elevation, and percent canopy cover data collected throughout northern Idaho. This is the model used in the CWE process to evaluate the canopy closure – stream temperature relationship (IDL 2000b), and is calculated as follows:

equation (1) $MWMT = 29.1 - 0.00262\,E - 0.0849\,C$

where $MWMT$ = maximum weekly maximum temperature (^{o}C)
E = stream reach elevation (feet)
C = riparian canopy cover (%)

This model utilizes percent stream canopy cover and elevation to predict the maximum weekly mean maximum stream temperature (MWMT) of the hottest week of the year for forest lands. Elevation and percent shading are easy to acquire: elevation from topographic maps, and percent shade from aerial photography. Percent shade from aerial photos should be compared to selected transects of in-the-field canopy cover collected by using a densiometer. The CWE model accounts for the two primary environmental factors affecting stream temperature: local air temperature as it varies by elevation and microclimatic modification by the canopy, and shade of the stream surface by the riparian canopy. The utility of the CWE model is that it can be solved for percent canopy cover, the one major environmental factor that can be managed to affect stream temperature.

In order to satisfy an analysis of heat loading due to insolation (solar radiation directly striking the stream surface), methods are used from the Upper NF Clearwater temperature TMDL (Dechert *et al*. 2001). Their approach used SSTEMP (Bartholow 1997) derived data for August 1, 2000 (median hottest day) for insolation rates, and calculated the heat loading for different levels of percent shade. The amounts of solar radiation incident on the stream at different shadings for three stream orientations are presented in Table 27. Fixed conditions used in SSTEMP to develop the solar radiation numbers for Upper NF Clearwater were 47 degrees latitude, 5000 feet elevation, a stream width of 10 feet, buffer height of 60 feet, buffer width of 30 feet, and topographic shade of 30 degrees (Dechert *et al*. 2001). Under these conditions incident solar radiation decreases regularly by 21 – 26 watts/m^2 (depending on orientation) for every 10 percent increase in canopy density. East River watershed conditions do differ somewhat from the Upper NF Clearwater River. In particular, most of the East River perennial stream segments are between 2,200 – 4000 feet elevation.

Table 27. Average Daily Solar Radiation Incident on a Stream Related to Canopy Closure as Developed for the Upper North Fork Clearwater River[a]

	Stream Orientation		
Canopy Density (percent)	**North - South (watts/m^2)**	**East - West (watts/m^2)**	**SENW or SWNE (watts/m^2)**
0	226	274	250
10	205	248	227
20	185	223	204
30	164	197	181
40	143	172	197
50	122	146	134
60	101	120	111
70	80	95	87
80	59	69	64
90	38	43	41
100	17	18	17.5

a = SSTEMP model output, Dechert *et al*. 2001

based on the following calculations:
N-S = (100 – target canopy %) * 2.1 + 17
E-W = (100 – target canopy %) * 2.56 + 18
SENW or SWNE = (100 – target canopy %) * 2.33 + 17.5

5.4.1 Instream Water Quality Targets

The measurable instream target is East River water temperatures that approach the EPA bull trout juvenile rearing and adult spawning criteria for June through September. This criteria is 10 °C expressed as a moving average of daily maximum temperatures over a seven-day period. The Idaho standards criteria for bull trout juvenile rearing is 13 °C MWMT for the warmest

7 day period of summer. An additional criteria would be the Idaho bull trout spawning criteria for September – October of 9 °C daily average. Spawning activity of bull trout appears to be in the 1st and 2nd order feeding tributaries to the Middle Fork, and perhaps also the upper one-half of the 3rd order Middle Fork main stem (DuPont *pers comm*). Based on a limited number of juvenile bull trout captured in electro-fishing surveys, the entire Middle Fork system and the East River main stem would be considered as juvenile rearing habitat. While bull trout have not been captured in the North Fork within recent times, this system is currently suspected of supporting bull trout spawning and juvenile rearing (Panhandle Basin Bull Trout TAT 1998).

For cutthroat trout the applicable instream target would be the Idaho spawning and incubation criteria of 9 °C daily average for the month of July. Spawning areas for cutthroat would be similar to that of bull trout described above.

The target load capacity will be expressed as percent stream canopy cover, a measurable target that can be tracked along with stream temperature as management actions are implemented. As detailed in following discussions, it is unlikely that the target canopy cover identified in this TMDL can be fully achieved. It is just as unlikely that stream temperature can be reduced to match the EPA bull trout criteria. The TMDL Implementation Plan will need to define the maximum potential vegetative cover for East River streams (background or historic natural cover and effective shade), and corollary optimum thermal potential of the water.

The recovery time to reduce stream temperatures will be extremely long. Conifer growth in northern Idaho climate and soils is slow. However, management actions to increase canopy cover, the increase of the canopy cover itself, and water temperatures can be tracked and measured rather accurately with only a moderate amount of resources. Therefore, time-line goals can be set, monitored, and revised.

Target Selection

This TMDL selects percent stream canopy cover by stream reach elevation as the target for load capacity goals, or defined targets for reducing heat load. Allocations for increasing canopy cover are assigned to watershed land owners, with management actions to be defined in the TMDL Implementation Plan. Canopy cover is a surrogate for a more traditional TMDL approach that would set load capacity goals and load reductions in heat energy per unit area per time.
Dates for target milestones could be set at 10 years to coincide with the normal frequency of aerial photography flights over northern Idaho forests. Shade producing growth of newly planted or existing young trees will take decades. Once mature trees provide measurable increased shade, there should be a quick corresponding response in decreased water temperatures.

Applicable reference streams for temperature and canopy cover comparisons within the Priest River Subbasin are difficult to identify because of the rather long history of timber harvesting in the basin. Prior to enactment of the Idaho FPA in 1974 there were minimal or no restrictions of harvesting timber within the riparian zones of streams. Historic accounts clearly show cases of a significant amount of large tree removal in this zone. Even in current times under the FPA, there is an allowable take within the stream protection zone (SPZ). In addition, clearing of land for agricultural purposes in basin lowlands has resulted in significant removal of riparian cover. The most applicable streams to examine for reference and comparison are east side streams north of East River that originate in the Selkirk Mountains and drain into Priest Lake (Figure 1). These streams are considered historic bull trout spawning and rearing habit. Temperature data loggers placed in Soldier Creek, Two Mouth Creek, Lion Creek, and Trapper Creek all show significant exceedances of the EPA bull trout criteria. Only in Hunt Creek have temperatures been near the 10 °C criteria in August.

<u>Monitoring Points</u>

For water temperature measurements, three points of compliance are set for bull trout juvenile rearing. These points are at lower reaches of the Middle Fork and North Fork, and a point on the main stem East River. For monitoring of bull trout spawning temperatures in September and cutthroat spawning in July, points of compliance would be the main stem Middle Fork above Tarlac Creek inflow, in selected Middle Fork tributaries such as Uleda Creek and Keokee Creek, and an upper reach of the North Fork.

Increase of stream canopy cover over time with management actions would primarily be measured through aerial photography. IDL typically schedules aerial flights over timber-managed lands every ten years, which is a sufficient time period for canopy evaluation. It is also important to obtain subsample ground-truth measurements of riparian density and canopy cover.

5.4.2 Load Capacity

In terms of a temperature TMDL utilizing CWE methods of percent canopy cover, load capacity would be the canopy cover needed at stated elevations to result in a 10 °C MWMT throughout the stream system. Equation (1) above is rearranged to be solved for target canopy cover (for northern Idaho) at stated elevations and 10 °C MWMT, and becomes:

equation (2) $$C = (29.1/0.085) - (E * 0.0026/0.085) - (10\ °C\ MWMT/0.085)$$

where C = riparian canopy cover (%)
E = stream reach elevation at 200 foot intervals
MWMT = maximum weekly maximum temperature

Each elevation reach has a predicted shading requirement, and shade requirements increase with decreasing elevation as would be expected to account for increasing air temperatures. The model assumes that water temperature has been protected upstream.

Table 28 presents the resulting CWE calculations at 200 foot elevation intervals, as well as the corresponding heat capacity insolation rates for three stream orientations (from Table 27). Note that below about 4,000 feet elevation the CWE model predicts canopy cover greater than 100%.

For these lower elevations the target cover is set at the maximum 100% possible. The model thus predicts that the EPA temperature standard for bull trout is unattainable below 4,000 feet elevation. This was corroborated by data from the Upper NF Clearwater River Subbasin where only one stream, Birch Creek, among 75 streams for which temperature data have been collected, meets the bull trout temperature standard (Dechert *et al*. 2001). Birch Creek is above 4,000 feet

Table 28. CWE Calculated Canopy Cover at Stated Elevations Required to Maintain 10 °C MWMT, and Corresponding Heat Loading Capacity Insolation Rates

Elevation Zones (feet)	Target canopy cover (%)	Insolation Rate North – South oriented stream (watts/m^2)	Insolation Rate East – West oriented stream (watts/m^2)	Insolation Rate SWNE or SENW oriented stream (watts/m^2)
5,400 - 5,600	52	117	141	129
5,200 - 5,400	58	105	125	115
5,000 - 5,200	64	92	109	100
4,800 - 5,000	71	79	93	86
4,600 - 4,800	77	66	77	71
4,400 - 4,600	83	53	62	57
4,200 - 4,400	89	40	46	43
4,000 - 4,200	95	27	30	28
3,800 - 4,000	101*	17.0	18.0	17.5
3,600 - 3,800	108*	**	**	**
3,400 - 3,600	114*	**	**	**
3,200 - 3,400	120*	**	**	**
3,000 - 3,200	126*	**	**	**
2,800 - 3,000	132*	**	**	**
2,600 - 2,800	139*	**	**	**
2,400 - 2,600	145*	**	**	**
2,200 - 2,400	151*	**	**	**
2,000 - 2,200	157*	**	**	**

* Below about 4000 feet elevation, the CWE model predicts a need for greater than 100% canopy closure to protect a maximum stream temperature of 10^{o}C MWMT. Since this is not possible, 100% canopy closure is set as the surrogate heat loading capacity. In some cases 100% canopy closure may not be achievable, in which case it should be noted in the implementation plan.

** SSTEMP predicts insolation rates of 17 - 18 watts/m^2 for 100% canopy closure

elevation. Many of the Upper NF Clearwater streams for which temperature data exist are unroaded and unentered, but still do not meet the temperature standards at lower elevations near their mouths where the continuous temperature data are collected.

The resulting canopy covers of Table 28 are not considered the background or natural canopy cover. It is unlikely that 100% cover uniformly existed historically between 2,200 – 4,000 feet elevation due to factors such as: large rock formations, landslides, marsh conditions that prohibit conifer growth, wide stream widths, and a recurring wildfire cycle. It is just as unlikely that a 100% canopy cover between these elevations can be achieved through active riparian zone management because of the above factors, and also including man-induced factors such as adjacent transportation roads. Thus, Table 28 represents an interim load capacity until sufficient research can be done to define and map the potential maximum vegetation density and stream canopy cover that could be achieved under current stream and adjacent watershed conditions.

An example of unachievable 100% stream shade is the main stem East River (elevation 2,230 – 2,275 feet). BURP measurements show bankfull widths around 11 m along with a high wetted width/depth ratio of 45. There is evidence that the main stem channel has experienced accelerated widening. This evidence comes from a streambank erosion survey conducted in 2000, where it was documented that the main stem East River has severe bank erosion (see section 5.3.3). The main stem may simply be too wide to experience effective shade over the entire stream surface even with dense, tall conifer growth within the adjacent riparian zone.

Critical conditions are part of the analysis of loading capacity. EPA bull trout temperature standards from elevations 2,200 to about 4,000 feet are not being met from July – mid September presumably because of insufficient canopy shade and thus, excess heat loading from solar insolation. This mid summer acute problem of excess heat may become, or already has become, part of a chronic problem in relation to bull trout population viability in the East River system. The proposed TMDL increases in canopy cover and corresponding decreases in mid summer water temperatures is meant as one of the management options to keep existing bull trout populations stabilized and prevent further decline.

5.4.3 Estimates of Existing Pollutant Loads

There are no point sources of heat being added to the East River system, and therefore an analysis of point source existing loads is not applicable.

For nonpoint sources of heat the CWE method is used. This method begins by examining the most current set of aerial photographs under a stereoscope. Perennial stream courses are divided into segments with similar canopy covers based on the CWE General Canopy Cover Estimate Guide (Table 29 below and Table C-4 in IDL 2000a). Initially the canopy cover is assigned from seven descriptive categories within 15% canopy cover ranges, and then a single percent cover is estimated within the range. Canopy cover segments are transferred onto topographical maps. Segments spanning 200 foot contour elevations are generally divided at the 200 ft contour line, although the dividing line may be at an elevation other than the 200 ft multiple. Multiple cover segments within 200 foot contours are often assigned a weighted (by length) mean canopy cover, but with significantly different covers the segments may not be grouped and averaged. In the field, several single point measurements with a canopy densiometer should be obtained to compare with the estimates from evaluation of aerial photographs.

A CWE aerial photography evaluation by IDL crews was conducted on the East River system in 1998 (from 1996 photos). Segments of 200 foot contour elevations for the main stem, Middle Fork and tributaries, and North Fork and tributaries are listed in Table 30. CWE-determined existing percent canopy cover is entered for each segment. Percent stream canopy cover within the seven ranges of Table 29 are shown in map form on Figure 20a.

Using CWE equation (2), the target canopy is calculated for the highest elevation of each segment (Table 30). For elevations 4,000 feet and less the calculation produces canopy cover greater than 100%. The target canopy cover for these segments is adjusted to 100%. Existing canopy cover is compared to the target cover. If existing canopy is less than target, the percent of canopy cover needed to match the target is calculated by subtraction (e.g., target cover is 100% and existing cover is 30%, there is a gap of 70% cover between existing and target). The increase of percentage canopy cover needed to reach target is shown in map form on Figure 20b. A management assumption is built into the tables and maps that canopy increase needed between 0 – 5% meets target canopy since CWE assigned maximum cover was 95%.

Table 29. General Canopy Cover Estimate Guide for Aerial Photo Interpretation[a]

Visibility on Aerial Photographs	Percent Canopy
Stream surface not visible	>90%
Stream surface slightly visible	76 – 90%
Stream surface visible in patches	61 – 75 %
Stream surface visible, but banks are mostly not visible	46 - 60%
Stream surface visible and banks visible in places	31 – 45%
Stream surface and banks visible in most places	16 – 30 %
Stream surface and banks visible	0 – 15%

a = Table C-4 from IDL 2000

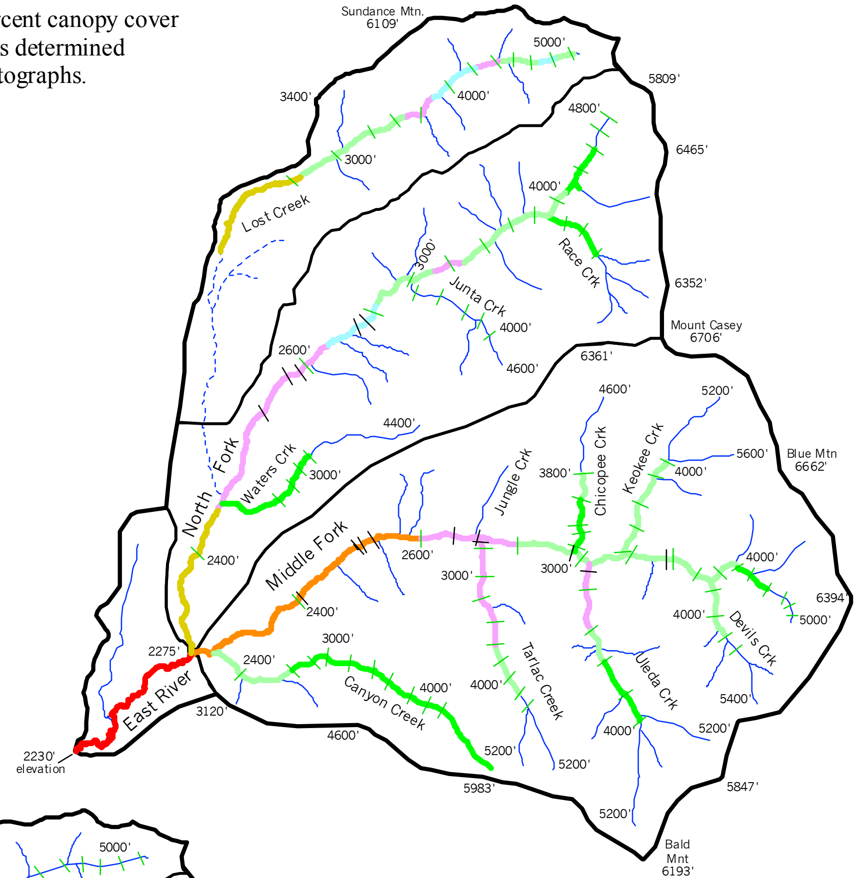
Next in Table 30, stream orientation for each segment is determined. Target heat load capacity in watts/m^2 is calculated by the equations of Table 27 using the adjusted target canopy at each segment's upper elevation. Again, these equations are based on a SSTEMP model run for the Upper NF Clearwater River for the median hottest day in August. The equations of Table 27 are then calculated using the existing CWE determined canopy cover resulting in current heat loading. Finally, the percentage heat load reduction between current and target is calculated.

Ground Truth of Aerial Photos

In mid July 2002, DEQ conducted a field survey to compare ground measurements of canopy cover with the CWE interpretation of aerial photographs for percent canopy cover (1996 flight). Eight transects were randomly selected (Excel® random number generator) between 200 foot contour stream segments from 2400 to 3400 ft on the Middle Fork; and five random transects between 2520 – 2800 ft on the North Fork (Figure 20a). Random transect mile posts were located and marked while driving State Roads 10 (Middle Fork) and 14 (North Fork). At each road mile mark, the assessor walked perpendicular or so (maneuvering through dense shrub growth) toward the stream.

At each stream transect, canopy cover was measured with a concave spherical densiometer (17 point grid). One measurement was taken 1 foot in from the left and right bank wetted edge, and then upstream and downstream at the stream's center. These methods followed DEQ protocol for evaluating stream/riparian vegetation (Cowley 1992). The same four measurement locations were also taken 10 m upstream and 10 m downstream of the transect line, resulting in 12 individual measurements of canopy cover. These measurements were averaged into percent canopy cover for the transect area.

Figure 20a. CWE-determined percent canopy cover for East River streams determined from 1996 aerial photographs.



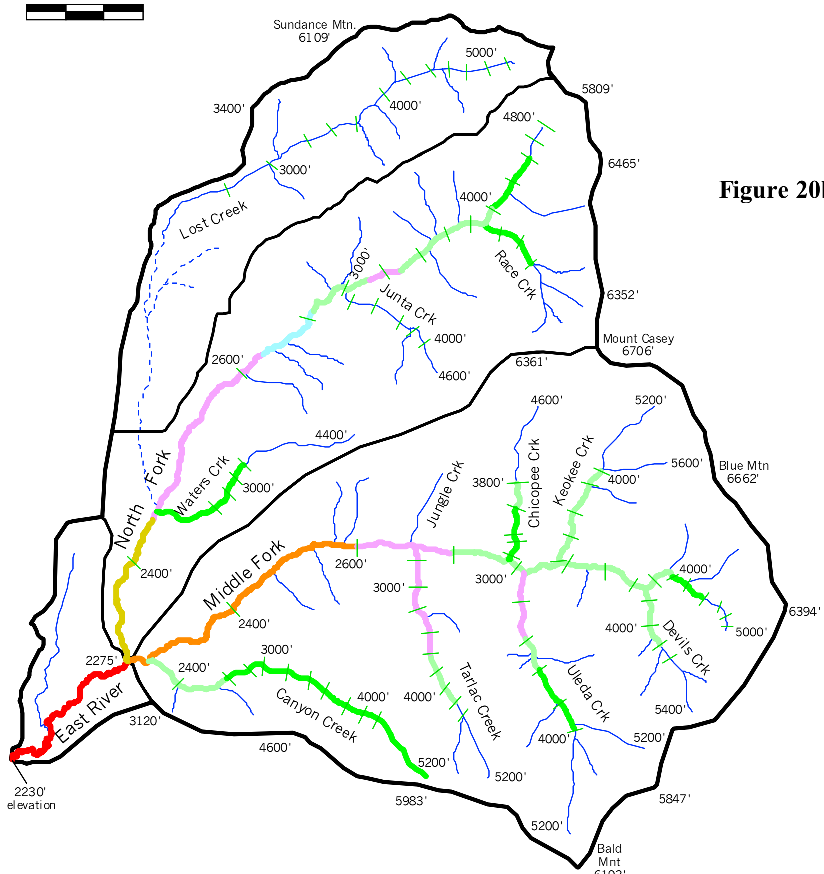


Figure 20b. Difference between existing percent canopy cover and CWE-calculated target canopy cover (predicted increase in shade needed).

Figure 20. (a) CWE-determined percent canopy cover for East River streams, and (b) difference between existing percent canopy cover and CWE-calculated target canopy cover.

Table 30. East River Watershed Temperature TMDL – CWE Calculated Percent Canopy Cover and Heat Loading

Stream Segment Name	Stream Segment elevation (ft)	Stream segment length (ft)	CWE existing canopy cover (%)	CWE target canopy prediction (%)	Adjusted target canopy cover (%)	Canopy increase to meet target (%)	Stream orienta-tion	Target heat load capacity (watts/m^2)	Current heat loading (watts/m^2)	Target heat load reduction (%)	Land ownership
East River Main Stem	2230 - 2275	14,784	5	154.7	100	95	SWNE	18	239	93	Private-State-Fed
Middle Fork East R.											
Main Stem	2280 - 2400	9,805	30	151	100	70	SWNE	18	181	90	Private - State
Main Stem	2400 - 2600	10,670	30	145	100	70	SWNE	18	181	90	State
Main Stem	2600 - 2800	6,665	55	139	100	45	EW	18	133	86	State
Main Stem	2800 - 3000	5,025	80	132	100	20	EW	18	69	74	State
Main Stem	3000 - 3200	3,920	80	126	100	20	EW	18	69	74	State
Main Stem	3200 - 3400	2,780	80	120	100	20	EW	18	69	74	State
Main Stem	3400 - 3600	2,300	80	114	100	20	EW	18	69	74	State
Main Stem	3600 - 3800	1,690	80	108	100	20	EW	18	69	74	State
Main Stem	3800 - 4000	1,700	80	101	100	20	EW	18	69	74	State
Main Stem	4000 - 4200	945	95	95	95	0	SENW	28	29	--	State
Main Stem	4200 - 4400	1,585	95	89	89	0	SENW	43	29	--	State
Main Stem	4400 - 5000	3,395	NAss	83 - 71	83 - 71	--	SENW	57 - 86	--	--	State - Private
Middle Fork Tribs											
Canyon Creek	2300 - 2400	2,745	90	151	100	10	EW	18	43.6	58.7	Federal
Canyon Creek	2400 - 2600	3,840	90	145	100	10	EW	18	43.6	58.7	Federal
Canyon Creek	2600 - 2800	1,710	95	139	100	5	EW	18	30.8	*41.6	Federal
Canyon Creek	2800 - 3000	1,055	95	132	100	5	EW	18	30.8	*41.6	Federal
Canyon Creek	3000 - 3200	1,740	95	126	100	5	EW	18	30.8	*41.6	Federal
Canyon Creek	3200 - 3400	1,660	95	120	100	5	SENW	18	30.8	*41.6	Federal
Canyon Creek	3400 - 3600	1,360	95	114	100	5	SENW	18	30.8	*41.6	Federal
Canyon Creek	3600 - 3800	1,815	95	108	100	5	SENW	18	30.8	*41.6	Federal
Canyon Creek	3800 - 4000	1,360	95	101	100	5	SENW	18	30.8	*41.6	Federal
Canyon Creek	4000 - 4200	1,045	95	95	95	0	SENW	28	29.2	--	Federal
Canyon Creek	4200 - 5200	5,425	95	89 - 64	89 - 64	<0	SENW	43 - 100	--	--	Federal

Table 30 continued – Middle Fork East River Tributaries

Stream Segment Name	Stream Segment elevation (ft)	Stream segment length (ft)	CWE existing canopy cover (%)	CWE target canopy prediction (%)	Adjusted target canopy cover (%)	Canopy increase to meet target (%)	Stream orienta-tion	Target heat load capacity (watts/m²)	Current heat loading (watts/m²)	Target heat load reduction (%)	Land ownership
Tarlac Creek	2720 - 2800	975	55	139	100	45	NS	17	112	85	State
Tarlac Creek	2800 - 3000	1,700	55	132	100	45	NS	17	112	85	State
Tarlac Creek	3000 - 3200	1,805	55	126	100	45	NS	17	112	85	State
Tarlac Creek	3200 - 3400	1,840	55	120	100	45	NS	17	112	85	State
Tarlac Creek	3400 - 3600	1,490	55	114	100	45	NS	17	112	85	State
Tarlac Creek	3600 - 3800	1,290	80	108	100	20	NS	17	59	71	State
Tarlac Creek	3800 - 4000	1,335	80	101	100	20	NS	17	59	71	State
Tarlac Creek	4000 - 4200	1,210	80	95	95	15	NS	27	59	55	State
Tarlac Creek	4200 - 4400	1,005	NAss	89	89	--	NS	40	--	--	State
Tarlac Creek	4400 - 5200	4,685	NAss	83 - 65	83 - 65	--	NS	53 - 92	--	--	State
Uleda Creek	3000 - 3200	2,040	55	126	100	45	NS	17	112	85	State
Uleda Creek	3200 - 3400	2,560	55	120	100	45	NS	17	112	85	State
Uleda Creek	3400 - 3600	2,325	80	114	100	20	NS	17	59	71	State
Uleda Creek	3600 - 3800	2,705	95	108	100	5	NS	17	28	*38	State
Uleda Creek	3800 - 4000	2,100	95	101	100	5	NS	17	28	*38	State
Uleda Creek	4000 - 5200	7,560	NAss	95 - 65	95 - 65	--	NS	27 - 92	--	--	State
Devils Creek	3720 - 4000	2,545	80	101	100	20	NS	17	59	71	State
Devils Creek	4000 - 4200	1,590	80	95	95	15	NS	27	59	55	State
Devils Creek	4200 - 4400	1,220	NAss	89	89	--	NS	40	--	--	State
Devils Creek	4400 - 5400	4,220	NAss	83 - 58	83 - 58	--	NS	52 - 105	--	--	State
Keokee Creek	3200 - 3400	2,145	80	120	100	20	NS	17	59	71	State
Keokee Creek	3400 - 3600	1,790	90	114	100	10	NS	17	38	55	State
Keokee Creek	3600 - 3800	2,270	80	108	100	20	NS	17	59	71	State
Keokee Creek	3800 - 4000	1,260	80	101	100	20	NS	17	59	71	State
Keokee Creek	4000 - 4200	1,455	NAss	95	95	--	NS	27	--	--	State
Keokee Creek	4400 - 5200	4,912	NAss	89 - 65	89 - 65	--	NS	40 - 92	--	--	State
Chicopee Creek	3000 - 3200	1,440	95	126	100	5	NS	17	28	*38	State
Chicopee Creek	3200 - 3400	558	95	120	100	5	NS	17	28	*38	State
Chicopee Creek	3400 - 3600	1,880	95	114	100	5	NS	17	28	*38	State
Chicopee Creek	3600 - 3800	1,840	80	108	100	20	NS	17	59	71	State
Chicopee Creek	3800 - 4000	1,925	NAss	101	100	--	NS	17	--	--	State
Chicopee Creek	4000 - 4600	4,060	NAss	95 - 83	95 - 83	--	NS	27 - 53	--	--	State

Table 30 continued – North Fork East River

Stream Segment Name	Stream Segment elevation (ft)	Stream segment length (ft)	CWE existing canopy cover (%)	CWE target canopy prediction (%)	Adjusted target canopy cover (%)	Canopy increase to meet target (%)	Stream orienta-tion	Target heat load capacity (watts/m^2)	Current heat loading (watts/m^2)	Target heat load reduction (%)	Land ownership
North Fork East River											
Main Stem	2280 - 2440	11,315	38	150	100	62	NS	17.0	147	88	State - Private
Main Stem	2440 - 2640	14,925	50	143	100	50	SWNE	17.5	134	87	State
Main Stem	2640 – 2840	5,035	70	137	100	30	SWNE	17.5	87	80	State
Main Stem	2840 – 3120	5,115	80	129	100	20	SWNE	17.5	64	73	State
Main Stem	3120 - 3280	2,280	50	124	100	50	EW	18.0	146	88	State
Main Stem	3280 - 3400	1,790	80	120	100	20	SWNE	17.5	64	73	State
Main Stem	3400 - 3600	2,325	80	114	100	20	SWNE	17.5	64	73	State
Main Stem	3600 - 3800	1,900	80	108	100	20	EW	18.0	69	74	State
Main Stem	3800 - 4000	2,115	80	101	100	20	SWNE	17.5	64	73	State
Main Stem	4000 - 4200	2,750	95	95	95	0	SWNE	28.0	29	--	State
Main Stem	4200 - 4400	1,675	95	89	89	0	SWNE	43.0	29	--	State
Main Stem	4400 - 4800	2,445	NAss	83 - 77	83 - 77	--	SWNE	57 - 72	--	--	State
North Fork Tribs											
Race Creek	3880 - 4000	1,320	95	101	100	5	SENW	17.5	29	*40	State
Race Creek	4000 - 4200	1,555	95	95	95	0	SENW	28.4	29	--	State
Race Creek	4200 - 4400	1,665	95	89	89	0	SENW	42.8	29	--	State
Race Creek	4400 - 5200	5,165	NAss	83 - 65	83 - 65	--	SENW	57 - 100	--	--	State
Waters Creek	2440 - 2600	4,470	95	145	100	5	SWNE	17.5	29	*40	State - Private
Waters Creek	2600 - 2800	1,415	95	139	100	5	SWNE	17.5	29	*40	State
Waters Creek	2800 - 3000	1,160	95	132	100	5	SWNE	17.5	29	*40	State
Waters Creek	3000 - 3200	1,130	95	126	100	5	SWNE	17.5	29	*40	State
Waters Creek	3200 - 4480	6,230	NAss	120 - 88	100 - 88	--	EW	18 - 46	--	--	State
Junta Creek	3040 - 3200	NAss	--	126	100	--	SENW	17.5	--	--	State
Junta Creek	3200 - 3400	NAss	--	120	100	--	SENW	17.5	--	--	State
Junta Creek	3400 - 3600	NAss	--	114	100	--	SENW	17.5	--	--	State
Junta Creek	3600 - 3800	NAss	--	108	100	--	SENW	17.5	--	--	State
Junta Creek	3800 - 4600	NAss	--	101 - 83	101 - 83	--	SENW	17.5 - 57	--	--	State

Nass = stream segment not assessed for canopy cover
*Target heat load reduction % = no reduction required when canopy cover is 95% compared to 100% target.

Table 31. Comparison of Ground Truth Measurements at Selected Transects of East River Streams (July 2002) with CWE Evaluated Canopy Cover from Aerial Photographs (1996 Flight)

Stream name of transects	Contour elevation range (ft)	Wetted width at each transect (m)	Densiometer percent canopy cover at each transect	Mean densiom. percent cover	CWE range of percent cover	CWE percent canopy cover
Random: Middle Fork #1 - #4	2400 – 2600	8.4, 6.1, 6.3, 11.0	20%, 35%, 40%, 40%	34%	16 – 30%	30%
Random: Middle Fork #5 - #6	2600 – 2800	10.3, 10.0	65%, 54%,	60%	46 – 60%	55%
Random: Middle Fork #7	2800 – 3000	7.0	82%	82%	76 – 90%	80%
Random: Middle Fork #8	3200 – 3400	4.1	90%	90%	76 – 90%	80%
Nonrandom: Tarlac Crk #1	2710 – 2800	7.2	100%	100%	46 – 60%	55%
Nonrandom: Uleda Crk #1	3020 – 3080	6.0	68%	68%	46 – 60%	55%
Random: North Fork[a] #1 - #3	2520 – 2640	8.0, 5.8, 5.5	37%, 31%, 66%	45%	46 – 60%	50%
Random: North Fork #4 - #5	2640 – 2800	5.7, 5.8,	53%, 65%,	59%	61 – 75%	70%

a = North Fork transects #2 and #3 were at braided stream sections, and measurements were on the main braid.

Other information gathered at each ground truth transect included: GPS location, water temperature, wetted width, mean water depth, channel type, a written description of vegetation type and density from stream side to 75 feet back (FPA stream protection zone) on both banks, and photographs of streamside vegetation.

Two other transects were measured on Middle Fork tributaries, one each on Tarlac Creek and Uleda Creek. These locations were not selected randomly. They were areas near the mouth where random access from a road was difficult.

The results of the ground truth measurements are presented in Table 31. With one exception on Middle Fork streams, the contour group means of ground measurements ranged from 2 to 13% higher than the CWE-determined percent canopy cover. Near the mouth of Tarlac Creek the ground measured cover was dense cedar/hemlock at 100% cover, while the CWE-assessed cover between the 2720 – 3600 ft contours was 55%. Either the ground measurement transect was not representative of cover further up the stream, or an error was made in the CWE assessment. For the North Fork, the contour group means of ground measurements were 5 and 11% less than the

CWE-determined percent canopy cover. Overall, the ground measurements and CWE assessments were satisfactorily close.

Some general observations from measurements on the main stem Middle Fork were first of all, a fairly wide wetted width between the 2400 – 2800 ft contours (Rosgen C3 or B3b channel type). At four transects the wetted widths ranged from 8.4 to 11 m, preventing significant effective shade from the south bank based on the existing vegetation type. The generalized vegetation type in the 75 ft stream side zone was: dense shrubs around 6 – 8 ft tall, scattered to moderately dense deciduous trees (e.g. alder) approximately 10 – 25 feet tall, and scattered to moderately dense conifers (mostly tall cedar/hemlock at low density). From 2800 ft upstream, channel type was B3, wetted width narrowed, and the south bank had denser tall conifers.

Observed human impacts included: a few old harvested cedar/hemlock stumps of large diameter next to the stream on both banks and, in some locations, the north bank Road 10 system was quite close to the stream (within 25 ft) where the road surface and cut bank eliminated effective late afternoon shade. On an old closed road right next to the east bank of Tarlac Creek, the compacted road system had mainly low shrubs with only a few small conifers offering little in the way of effective shade. It appeared that the road surface was not suitable for vigorous vegetative growth.

On the assessed section of the North Fork, the vegetation type was similar to the Middle Fork. There was a major wet meadow section between 2560 – 2680 ft where the stream was braided into two or more separate channels (transects #2 and #3). This condition likely makes aerial photo interpretation of average canopy cover difficult. Ground measurements were taken in the largest channel, and also at a smaller braid at transect #2. Road 14 is quite close to the North Fork between 2680 – 2920 ft, again eliminating some north bank late afternoon shade.

Transect measurements were not taken on the East River main stem, although several ground photographs were taken in the vicinity of the Eastside Road bridge (around 11 – 12 m wetted width). These photos show that the CWE-determined average canopy cover of 5% sufficiently describes this area.

5.4.4 Load Allocation

There are no point sources of heat being added to the East River system, and therefore a point source load allocation is not applicable.

A typical nonpoint source pollutant allocation is comprised of the load capacity minus the margin of safety and natural background. For this TMDL, heat is the pollutant with stream canopy cover as the surrogate measurement for management purposes. The load capacity was defined in Section 5.4.2. The margin of safety is addressed below, and it is proposed that a margin of safety is built into the calculated load capacity. Background is not used in its defined sense for this TMDL. Instead, the CWE calculated canopy cover predicted to allow 10 °C MWMT is used (target canopy cover). Along many stream segments this is likely a greater percent canopy cover than natural background. Load capacity is equivalent to target canopy cover since the EPA 10 C° criteria is the explicit target. The defined load capacity is allocated to land owners of the East River watershed (Table 30).

Margin of Safety

Since target canopy cover is 100% cover between 2,200 – 4,000 feet elevation, a margin of safety is not appropriate for these elevations. A high percentage of the East River perennial stream system falls below 4,000 feet (Figure 20). Above 4,000 feet elevation, the temperature data logger at station Middle Fork #3 (Figure 11) shows temperatures below the EPA numeric criteria. The headwater stream segments were estimated to be mostly at >90% existing cover. For streams protected for bull trout, EPA has set a conservative standard when compared to the Idaho bull trout juvenile rearing standard (13 °C MWMT) which the state deems as adequate. The above discussion establishes that a margin of safety need not be incorporated into this temperature TMDL.

Background

Background or historic natural canopy cover is not estimated in this TMDL. From 4,000 feet elevation and below, CWE equation (2) results are adjusted down to 100% target cover. Target heat load capacities (watts/m^2) are calculated from the 100% cover. These targets in Table 30 are likely greater than background. Between 4,200 – 5,200 feet elevation (highest reaches of East River perennial streams), calculated target cover ranges from 95 – 65% cover. While this cover may be less than background, analysis suggests that current cover is mostly equal or greater than the calculated target. EPA sideboards to this TMDL call for no reduction of canopy when existing cover is greater than the target (EPA 2001b). As previously discussed, a reasonable estimate of true background would require a rather detailed analysis leading to historic maximum potential vegetative cover.

Seasonal Variation

Heat loading capacity applicable to the East River watershed in relation to the EPA bull trout temperature standard is primarily a consideration during the months of July and August. Because of the regular seasonal progression in stream temperature, if a stream's annual temperature peak is targeted, and this peak is brought down to within criteria limits, then it can safely be assumed that the criteria will also be met at cooler times of the year. This is the basis of using the MWMT metric for criteria. The 10 °C MWMT criteria calculations for bull trout translates closely to the 9 °C daily average criteria for cutthroat (IDL 2000a).

Reserve

No part of the load allocation is held for additional load. For the majority of stream segments the existing canopy cover is less than the target, so no further reduction or removal of cover would be allowed.

Following EPA sideboards, in their agreement to allow DEQ to use CWE methods for interim temperature TMDLs (EPA 2001b), if any of the 200 foot stream segments have current shade greater than the predicted or target canopy, then the TMDL target is set at current shade levels. This translates to no reduction or removal of existing cover.

Remaining Available Load

This TMDL identifies the general locations and magnitudes of the shading problems, and sets the targets for percent shade increases. The increase in current canopy cover needed to match the CWE-calculated target cover for 10 °C MWMT for each 200 foot elevation interval is allocated to the land ownership shown in Table 30. Each ownership/land management entity would be responsible for management actions to increase stream canopy cover and ensure no further reduction in shade. This assumes that canopy cover has been lessened over time from human activities such as timber harvesting and road building in the riparian zone, and riparian clearing for agriculture purposes. The land managers will develop and implement specific plans to attain the shading targets as defined in a TMDL Implementation Plan.

5.4.5 Conclusions

For the East River system between elevations 2,300 – 4,000 feet, temperature data loggers indicate that a high percentage of stream segments are exceeding (greeter than 10% exceedance rate) the following temperature criteria: EPA juvenile bull trout rearing and adult spawning standard from July through mid September; Idaho state bull trout rearing criteria during the summer week of MWMT; state bull trout spawning criteria for most of September; and state cutthroat spawning and incubation criteria in July. Comparison of current stream canopy cover with the CWE predicted 100% target cover between 2,200 – 4,000 feet elevation shows that current cover of most stream segments range from 10 – 90% less shade than the target. Management actions to increase shade over time would include prohibition of timber harvesting within the FPA-defined stream protection zone, along with shrub and conifer plantings where appropriate. Since calculated target canopy cover is likely overall a greater percent cover than historic background, and since it is also unlikely that current conditions can be fully returned to background, the stream temperature criteria currently in place are probably unattainable.

5.5 Lower Priest River Sediment TMDL

Introduction

Lower Priest River remains on the §303(d) list with sediment as a listed pollutant of concern for two primary reasons: 1) the River Fish Index scores from the USGS and IDFG electro-fishing surveys were quite low, Condition Rating = Minimum Threshold (indicating an impaired fishery), and 2) an identified moderate to high sediment input from three of the major drainage watersheds, along with a documented condition of significant riverbank erosion. Although sedimentation has not been determined as a relating cause to fishery impairment in the Subbasin Assessment, it also cannot be discounted as a contributing cause.

The sediment TMDL for Lower Priest River has four separate components:

1. A completed and EPA approved sediment TMDL for the Lower West Branch Priest River watershed (56,705 acres), as presented in the *Priest River Subbasin Assessment and TMDL* (Rothrock 2001). Current efforts are underway to formulate a TMDL Implementation Plan for this watershed. Current sediment load was estimated at 7,416 tons/yr.

2. A sediment TMDL for the East River watershed (36,860 acres) as presented in this *Addendum* report (Section 5.3). EPA will likely approve this TMDL by spring 2003, followed by the development of an Implementation Plan. Current sediment load was estimated at 2,937 tons/yr.

3. The draft, 2002/03 DEQ §303(d) List, due for release in January 2003, will include Upper West Branch Priest River as a newly listed water quality impaired stream. This listing will initiate a Subbasin Assessment for the Upper West Branch watershed (45,201 acres), and likely development of a sediment TMDL. Current sediment load has yet to be determined.

4. A sediment TMDL addressing riverbank erosion presented in this Section of the *Addendum* report. Current sediment load is estimated at 16,030 tons/yr.

The above structure for a Lower Priest River TMDL is somewhat unconventional and might appear as disjointed and perhaps incomplete. However, the combined acreage of the watersheds in 1 – 3 equal 138,765 acres, 63% of the total area draining into the §303(d) listed segment of the river (see Table 11). These watersheds have been identified as having significant nonpoint sources of sediment flowing into the river. This sediment load was cited in comments to the draft *Addendum* as a reason for not removing sediment from the river §303(d) listing (Appendix D). Also, separate TMDLs for these drainages was initially established by Lower West Branch back in 2001, with development of the other TMDLs at different stages in time.

Other watersheds of the river drainage not included in the TMDL include Quartz Creek and Big Creek (Figure 12), where BURP surveys result in WBAG II Full Support status calls. The sidewall drainage areas adjacent to the river total 51,034 acres, or 23% of the total drainage. These are relatively flat drainage areas of small 1st and 2nd order streams. There has been insufficient information collected in these areas to include in TMDL calculations at this time, including the absence of CWE road inventories. However, ownerships within these sidewall drainages that are adjacent to the river will be involved in the riverbank erosion part of the TMDL. Improvement projects within hay cropping and grazing lands of the sidewall drainages may also be targeted in the TMDL Implementation Plan process.

5.5.1 Instream Water Quality Targets

The instream water quality target for Lower Priest River is Full Support of cold water aquatic life (CWAL) beneficial use. Full Support would be signaled by WBAG II field measures leading to integrated scores of RMI, RDI, and RFI which produce an average Condition Rating (CR) score of ≥ 2.0. The BURP macroinvertebrate and periphyton samples did produce excellent scores for RMI and RDI (CR = 3). The poor RFI scores point to a biological target of an improved fishery condition, primarily an improved fluvial cutthroat fishery, and perhaps also bull trout. Specific fishery targets for the river will not however be set by DEQ in this report. Fishery targets and other fish management issues will have to be established by the IDFG. This will entail an ecological evaluation of existing and potential fisheries in relation to factors such as flow regime, water temperature, spawning habitat in tributaries, non-native salmonid species, and nonpoint source sedimentation. This level of ecological evaluation is not available for this report.

Unlike the BURP protocol in wadable streams, the river BURP protocol does not develop a river habitat index score for the WBAG II determination of beneficial use support. Certainly a primary target would be increased riverbank vegetative cover and stability since this is the goal of the riverbank erosion TMDL. Other targets may include increased LWD along the river edges, and improvement of pool frequency and quality by lessening bedload deposition into pools. As directed by the listing of heat as a pollutant of concern for the river on the 2002/03 DEQ §303(d) List, a decrease in summer water temperatures will also become a target.

A water quality indicator target related to sediment reduction efforts may be a decrease in total suspended sediment (TSS), a constituent measured at the USGS lower river sampling station. The various soils in the lower basin, while tending to be course with a high sand to cobble content that does not suspend, do have a significant content of silt and clay particles that remain suspended with water flow. Along with samples of TSS, the USGS gaging station allows calculations of TSS discharge in tons/day. From WY 1990 to 2000, with sampling every other year, TSS samples have ranged 5 – 116 mg/L from March – June. Based on a very coarse estimate developed from extrapolation, annual TSS discharge has ranged from 4,700 – 52,600 tons/yr. If TSS concentration and estimated monthly suspended discharge were to become a parameter to track sediment reduction efforts, there would have to be increased sampling frequency for the spring months of peak flow.

<u>Target Selection</u>

The Lower Priest River sediment TMDL applies sediment allocations in tons per year and calculates sediment reduction goals. Lower Priest River does not meet the WBAG II criteria for Full Support of CWAL, with the implication of impairment being in part sediment related. Sediment reduction is targeted for the 5th field watersheds Lower West Branch Priest River, East River, and Upper West Branch East River, along with banks along the river course.

The established load capacity for the Priest River Subbasin is 50% above background (Rothrock 2001). This load capacity is and will be applied to the TMDLs of the three 5th field watersheds above. Load Capacity for the riverbank TMDL is established at a 90% bank stability regime, as described in Section 5.5.2.

While management actions to reduce sediment load can be documented and tracked, TMDL Implementation Plans may apply an instream surrogate measurement of success. One candidate would be a long-term reduction in the TSS concentration and suspended sediment discharge measured at the lower river USGS gaging station. Another possibility is improvement of residual pool volume as a critical habitat feature for fluvial cutthroat and bull trout. However, there are no evaluations on record of pool characteristics within Lower Priest River. Proper surrogate parameters to measure success will need to be established by a WAG during formulation of TMDL Implementation Plans.

There are no appropriate reference rivers in the Priest River Subbasin for comparison to Lower Priest River. The Upper Priest River watershed has near-reference conditions, but this is a 4th order stream with a drainage size one-fourth of the lower river segment.

Monitoring Points

A minimum of two points of compliance are set. One point would be the existing BURP site at river mile 16.2 (Figure 12a). This site could represent the river from this point upstream to the confluence of Upper West Branch (river mile 34.4). Within the area of the BURP site, or somewhere upstream, there needs to be a reach identified with in-and-out access points for IDFG electro-fishing. A second BURP site needs to be established within a lower-most reach to represent the lower 16.2 river miles. A logical area would be in the vicinity of the USGS gaging station at river mile 3.8. The 1998 USGS electro-fishing survey was in this area, and the 2002 IDFG fish survey was within the lower 7 miles.

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 CWAL 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 future assessments. The current guidance, WBAG II, utilizes a river index scoring system from BURP sampling metrics comprised of a River Macroinvertebrate Index (RMI), River Diatom Index (RDI), and a River Fish Index (RFI). Under the current guidance of WBAG II and additional considerations for Lower Priest River, the appropriate measures of Full Support are:

- scores of RMI, RDI, and RFI which integrated together produce an average Condition Rating score ≥ 2.0,

- cold water fishery targets as established by the IDFG and presented in a TMDL Implementation Plan. This should include an ecological evaluation of existing and potential fisheries in relation to factors such as flow regime, water temperature, spawning habitat in tributaries, non-native salmonid species, and nonpoint source sedimentation. If interagency decisions and agreements are made to attempt an improvement of the cutthroat and bull trout native salmonid populations, then monitoring for the effect of sediment reduction efforts should also include measurements of habitat parameters that are related to sedimentation, water temperature, summer flow rate, and instream habitat quality.

! as established by a Watershed Advisory Group (WAG), appropriate instream targets for surrogate habitat characteristics.

5.5.2 Load Capacity for Riverbank Erosion

For 5th field watersheds in the Priest River Subbasin, the load capacity or interim sediment TMDL goal has been established at 50% above natural background (Rothrock 2001). The calculated background is derived from USFS supplied base geology and landtype maps (Appendix A). This approach for a loading capacity does not seem realistic for the riverbank TMDL. When WATSED sediment yield coefficients (in tons/mi^2/yr) are applied for landtypes adjacent to the river (with a square area of bank length times a 10 ft average bank height), sediment load into the river is around 5 tons/yr for the 34.4 miles of listed river reach. This compares to the estimated current sediment loading of 16,030 tons/yr (Table 32). The background loading from riverbanks that is derived from landtype coefficients seems to highly underestimate the natural condition of progressive meander processes, and bank failures which result from a common condition of gravelly silt or sandy loam overlaying a dense clay layer, a condition with a propensity toward slides (Niehoff *pers comm*).

In TMDLs developed by DEQ for southeastern Idaho, an interim loading capacity for streambanks and riverbanks is a condition of 80% bank stability regime. This states that a minimum 80% of the bank lengths show good stability with covered perennial vegetation and widespread root structure, along with minimal signs of bank breakdown, slumping, or fractures. The 80% bank stability load capacity has for example been utilized in the Pahsimeroi River Subbasin TMDL (Herron *et al*. 2001).

For Lower Priest River the interim loading capacity will be set at a 90% bank stability regime. As developed in Section 5.5.4, this equates to 5,946 tons/yr from riverbank erosion. The 2000 streambank survey along 9.3 miles of river showed that 28% of the bank length (considering both east and west banks) had a current eroding condition. Future projects to stabilize bank erosion from a 28% unstable condition to a 20% unstable condition does not sufficiently lower sediment loading. Also, it seems reasonable to conclude that 80% bank stability for Lower Priest River does not resemble what the natural bank stability was. If various erosive forces related to human activities over more than a century (Section 5.5.3) has resulted in 28% bank instability, then the natural starting point was likely less than 20% instability.

Critical Conditions are to be considered as part of the analysis of load capacity. The beneficial uses in this watershed are impaired, in part, 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.

5.5.3 Estimates of Existing Pollutant Load from Riverbank Erosion

There are no point sources of sediment to Lower Priest River, and therefore an analysis of point source existing loads is not applicable.

Results of the 2000 streambank erosion survey over 9.3 miles of the Lower Priest River is summarized in Table 32. Estimated total sediment load into the river for 34.4 miles, extrapolated from the subsample data, was 16,030 tons/yr. This assumes 100% delivery from the banks to the river.

Table 32. Summary of the 2000 Streambank Erosion Survey within Lower Priest River

Reach	Total river length surveyed (miles)	Total river length with eroding banks (miles)	Percent eroding banks of total length (2 banks)	Mean eroded bank height (feet)	Mean lateral recession rate (ft/yr)	Sediment load within eroding banks (tons/mile)	Sediment load over miles surveyed (tons/mile)	Sediment load over river reach repres. (tons/yr)
Lower: miles 7 – 13.	4.6	3.1	34%	8.2 (5.5-14.5')	0.44	820	539	8,084 for 15.0 miles
Upper: miles 18 – 23.	4.7	2.1	22%	9.7 (5.2-23.0')	0.36	916	410	7,946 for 19.4 miles
Comb-ined	9.3	5.2	28% weighted	8.9 wt	0.40 wt	859 wt	474 wt	16,030 for 34.4 miles

The percent of bank length with a current eroding condition for the two reaches combined was a weighted 28% of total bank length, and this calculation combines length of both east and west banks. Of the 30 bank length segments considered as having an eroding condition, only one river segment had eroding banks on both sides of the river. Most commonly, the single eroding bank was on an outside meander curve. The cumulative sum of the scored, six bank condition factors (Appendix A) averaged 8.6. This cumulative erosion rating is considered severe with corresponding lateral recession rates of 0.3+ feet per year (Sampson *pers comm*). A severe erosion rating along with a mean bank height of 8.9 ft translated to a substantial weighted average of 859 tons/mile/yr within eroding bank segments. When extrapolated to the length of the total subsample reaches that included non-eroding banks, the mean sediment load remains significant at 474 tons/river mile/yr. The lower subsample reach had a greater occurrence of eroding bank condition than the upper subsample reach.

A point presented in Appendix A that needs to be emphasized, is that load estimates from the streambank erosion protocol have an inherent high degree of error. The assigned error rate from the NRCS is a confidence interval of 60% (Sampson *pers comm*). 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.

Soil types adjacent to the river that are common and have been classified (SCS 1982), include: 1) Bonner silt loam, glacial outwash origin, with a gravelly silt loam subsoil, very gravelly loamy sand substratum, and A-1 and A-2 AASHTO classification, 2) Capehorn silt loam, similar in characteristics to the Bonner soil except a higher fines content in the subsoil, and 3) Mission silt loam, a silty glacial lake-laid sediment, with a silt loam and clay loam subsoil, very fine sandy loam substratum, and A-4 to A-7 AASHTO classification. While conducting the erosion survey during summer low flow, it was common to see a very deep soil, gravelly loamy sand, overlying a gray-blue clay layer just above the wetted edge. Riverbank soil types translate to an eroded material that is a combination of cobbles to sand that form a non-suspended bedload, and silt to clay fines which remain suspended during high flow and measured as TSS at the USGS gaging station.

The measured and observed eroding bank condition is believed to be in part related to human land use activities. These activities and their relation to bank erosion include:

- Between the late 1800s and mid 1900s it was common to float timbered logs from Priest Lake and some lower river tributaries down Lower Priest River to saw mills at the city of Priest River. Historic photos show bank to bank logs rafting at high velocity down the river. This surely had to cause bank damage and scouring of the riverbanks.

- Along some of the eroding banks surveyed, perennial trees and shrubs had been completely removed for the purpose of building an adjacent unpaved road, or land clearing for hay cropping. There are also reaches where cattle have had access to the river. As suspected in some cases, there has been vegetation clearing to afford a view and yard for ranchettes along the river.

- Based on current aerial photos which show scars of historic oxbows that are now partially filled, there possibly has been a decrease in lateral dissipation of river flow energy translating to an increase in vertical river energy against the riverbanks. This filling in of lateral waterways may have included some wetland filling.

- In 1951 the Priest Lake outlet dam went into operation. Analysis of historic USGS flow records by IDWR (IWRB 1995) show a change in river flow regime from pre-dam (1920 – 1950 records) and post-dam (1951 – 1994 records). In summary, the primary change in flow regime has been less summer flow rate now than pre-dam, and an October or November surge of water to release stored lake water, a surge that did not occur pre-dam. Examination of flow curves show post-dam having only a slightly higher spring peak flow pattern than pre-dam. This *Addendum* report cannot speculate on the relation of modified river flow rate with bank erosion.

5.5.4 Load Allocation for Riverbank Erosion

In 5th field watershed TMDLs, the nonpoint source sediment allocation is equal to the load capacity. For the Lower Priest River bank erosion TMDL, the interim load capacity of 90% bank stability translates to a sediment load allocation coming from 10% of the riverbank length in an eroding condition. Unlike the calculated load capacity from 5th field watersheds, which is 50% above the estimated natural background load, there are no background estimates for riverbank load. Instead, the sediment allocation is a backward calculation as shown in Table 33. The lower 15.0 miles of the river course (just above McAbee Falls to the mouth), and upper 19.4 miles are treated separately in the calculation because of different erosion rates and different ownership patterns. For the two reaches, a percent decrease is calculated from the current percent bank instability (extrapolated from the subsample streambank survey) to 10% bank instability (90% bank stability). This percent decrease is applied to the estimated current sediment load from the eroding bank lengths. What remains is the sediment load coming off 10% bank instability (90% bank stability load allocation or load capacity).

Table 33. Back Calculation of 90% Bank Stability Load Allocation for Lower Priest River Based on the Current Eroding Condition Measured by the 2000 Streambank Survey

River Reach	Extrapolated miles of eroding bank	Percent eroding bank to total bank	Extrapolated current sediment load (tons/yr)	Percent decrease from current %eroding to 10% instability (90% target cover)	Remaining sediment load from 10% instability, or load allocation/ load capacity (tons/yr)
Lower 15.0 miles	10.1	33.7%	8,084	70.3%	2,399
Upper 19.4 miles	8.7	22.4%	7,946	55.4%	3,547
Total 34.4 miles	18.8	--	16,030	--	5,946

For watershed TMDLs, the interim load capacities are allocated or assigned to ownership/ management groups based on natural background loads calculated within the acreage of each group. For the riverbank TMDL, Table 34 shows percentages of land ownership adjacent to the 34.4 miles of §303(d) listed river course. Three ownership categories are listed; federal land managed by the USFS, state of Idaho land managed by IDL, and land within private ownership. The ownership/management percentages are separated into lower and upper river segments, with calculations based on ownership on both sides of the river. Also shown in Table 34 is ownership patterns, and bank erosion patterns within ownerships, for the subsample reaches surveyed in 2000.

For the 15.0 mile lower river reach, the vast majority of land is in private ownership (91%). The percent ownership of private land in the subsample reach was over represented at 97% of the banks surveyed, and federal land was under represented (0%). All eroding banks in the survey were adjacent to private land. A 90% bank stability regime is an identifiable allocation for private lands. The bank stability condition of banks along state and federal land remains unknown.

For the 19.4 mile upper river reach, ownership is led by federal land at 44%, and then state and private land at 28% each. Federal land was over represented in the subsample at 70% of total

Table 34. Percentage of Adjacent Land along the §303(d) Listed Lower Priest River Owned and Managed by Three Groups (both River Banks).

Ownership/ Management	Total bank miles	Percent ownership	Percent ownership in surveyed subsample reaches	Percent of eroding banks within ownership miles surveyed
Lower 15.0 miles	30.0		9.2 miles of bank surveyed	34% of total banks eroding
Idaho State	1.6	5%	3%	0%
Federal	1.1	4%	0%	0%
Private - all categories	27.3	91%	97%	34%
Upper 19.4 miles	38.8		9.4 miles of bank surveyed	22% of total banks eroding
Idaho State	10.7	28%	24%	27%
Federal	17.1	44%	70%	18%
Private - all categories	11.0	28%	6%	54%

bank length. Only 18% of banks along federal land were found in an eroding condition. Private land was under represented in the subsample at 6%, but of these banks 54% were found to be eroding. Until further bank surveys are done in preparation for stabilization projects, a 90% bank stability target for banks within each ownership seems reasonable.

One difficulty of assigning allocation and current sediment loads to ownership groups based solely on percent land ownership is the uncertainty of contributing causes. For example, what degree of bank erosion in the lower reach may be traced back to historic log drives down the river, with many of the logs originating from timber operations on lands around Priest Lake? It does seem evident though, that vegetation clearing to the banks edge for roads and hay cropping in the lower river segment has had some effect in bank instability.

Margin of Safety

The load capacity of 90% bank stability is considered a sufficiently conservative target such that an additional margin of safety reduction is not warranted. While the 2000 streambank survey subsample provides only a coarse estimate of sediment load, it does provide a rather accurate percentage of bank length that is in a current eroding condition (i.e., 34% for the lower reach subsample, 22% for the upper reach subsample). Thus, improvement towards 90% bank stability can be accurately tracked and measured. When and if 90% bank stability is achieved, the load capacity can be reevaluated in relation to beneficial use support status.

Seasonal Variation

Sediment from nonpoint sources is loaded episodically, primarily during high discharge events. 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). Figure 13 shows the mean daily hydrograph of Lower Priest River for WY 1995. The months of March - June produced 68% of the annual flow at the lower river gaging station. By using the sample data for TSS collected by USGS every other year at the lower gaging station, an extrapolated table was made giving a coarse estimate of annul load comprised of TSS discharge in tons/month. The TSS discharge for April – June averages 87% of the annual load for data collection years between 1994 – 2000.

Background

For the riverbank TMDL, a background sediment yield has not been developed. Using USFS landtype WATSED coefficients, the sediment load for 34.4 miles of river course was 4 tons/year. This value appears to be unreasonably low in light of the results from the 2000 streambank erosion survey. For DEQ TMDLs in southeastern Idaho streams and rivers, a natural background sediment production from stream banks has been equated to 80% stream bank stability (Herron *et al*. 2001). This background stability value, based on evaluations by Overton *et al.* (1995), is however in a much different climate and geology setting than northern Idaho. The 90% bank stability and loading capacity rate for Lower Priest River was set to be a more conservative value than southeastern Idaho, yet a potentially reachable target. The 90% stability value also avoids a perceived unrealistic and unreachable target as developed from the landtype natural background calculation.

Reserve

No part of the load allocation is held for additional load. All new riverbank disturbing activities should be conducted or mitigated to allow no net increase in sediment yield to the watershed.

Sediment Load Reduction Allocation

Table 35 presents sediment load reduction estimates from the current eroding condition to the target of 90% bank stability for the lower 15.0 mile river segment, and upper 19.4 mile segment. The load reductions may be partitioned according to the ownership percentages of Table 34. For the lower reach, by default, bank improvement projects will primarily be adjacent to private land (with 91% ownership). However, in regards to financing improvement projects, it is unknown how much of the current condition is attributed to upstream activities such as historic log drives, and how much of the current condition is related to land use activities directly adjacent to the river.

For the upper reach, percent ownership is about equally divided among the three ownership groups, with federal land having a somewhat higher proportion. Again, current condition may in part reflect log drives originating from the Priest Lake area and lower river tributaries. Also, improvement projects will likely be focused and prioritized following a comprhensive technical evaluation of historical and current river dynamics, channel condition, and riverbank condition. Identified priorities for bank erosion control may not follow the ownership patterns.

Table 35. Sediment Load Reductions Required to meet TMDL Goals for Lower Priest River Banks

River Reach	Extrapo-lated miles of eroding bank	Percent eroding bank to total bank	Extrapo-lated current sediment load (tons/yr)	%Decrease from current %eroding to 10% instability (90% target cover)	Miles of eroding bank reduced to match 90% stability	Sediment load reduced to meet 90% stability (tons/yr)
Lower 15.0 miles	10.1	33.7%	8,084	70.3%	6.5	5,685
Upper 19.4 miles	8.7	22.4%	7,946	55.4%	5.6	4,399
Combined 34.4 miles	18.8	28.0%	16,030	--	12.1	10,084

Pollution Control Strategies

It is suggested that a Watershed Advisory Group (WAG) be formed for all TMDL related issues within the Lower Priest River basin (around 250,000 acres including land in the state of Washington). A core group that could comprise a WAG already exists as a group that is putting together the Lower West Branch TMDL Implementation Plan. WAG representation needs to be broad because of very diverse ownership and land management jurisdictions. A WAG representation would include: USFS, NRCS, IDL, IDFG, Bonner County Road Department, Bonner Soil and Water District, the governmental counterparts in Washington state, Kalispell Tribe, industrial timber, private ownership from agriculture and non-industrial timber within the basin, and environmental groups.

Remediation efforts aimed at stabilizing eroding banks will be difficult and time consuming, and importantly, expensive. Methods of bank stabilization will not be expounded on in this report. These strategies will have to be developed by experts during the Implementation Plan phase. The challenge for the WAG will probably be less the technical aspects but more the financing issues.

Monitoring Provisions

Instream monitoring of CWAL 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 5.5.1, should be completed a minimum of every five years at randomly selected sites within Lower Priest River.

Baseline data for macroinvertebrates and periphyton are available at the DEQ BURP site, river mile 16.2. There are also two recent fish surveys conducted by the USGS and IDFG (Table 15). Monitoring data collected should be BURP compatible so that the DEQ - WBAG II can be used to evaluate beneficial use support. The WBAG II River Index Scoring is comprised of three multimetric indexes: River Macroinvertebrate Index (RMI), River Fish Index (RFI), and River Diatom Index (RDI). The Idaho Rivers Ecological Assessment Framework is the supporting document for description of the metrics and calculation methods used (Grafe 2002b). Surrogate targets established in the TMDL Implementation Plan by the WAG will also be monitored in a manner determined in the plan.

Additional Improvements not Directly Related to Sediment Delivery

The indication of low abundance of fluvial cutthroat trout, bull trout, and rainbow trout (introduced into the river system during the 1970s), as suggested by the recent electro-fishing surveys, is not solely the result of current sediment delivery to the river. Current sediment load from drainage tributaries and riverbanks may not even be the major related cause. Summer water temperatures within the river are high, with an exceedance of the 19 °C daily mean cold water aquatic life standards criteria (Figure 14). Summer flow rate since construction and operation of the Priest Lake outlet dam in 1950 is less than the historic summer flow rate prior to the dam (IWRB 1995). Evaluations of fish habitat features such a pool frequency and quality have been minimal within the river, but during the streambank erosion survey it was clear that there was a lack of large wood structure along the rivers edge. IDFG believes that part of the decline of the fluvial cutthroat fishery can be attributed to habitat degradation within spawning tributaries. There is also the factor of competition and predation from the introduced lake trout in Priest Lake, and brook trout within the tributaries.

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 salmonid density in Lower Priest River (other than mountain whitefish, which seems to have a viable population). The TMDL Implementation Plan, as guided by the WAG, might consider a fisheries management approach with an objective of establishing a more favorable habitat for cutthroat trout and bull trout. This will certainly require an interagency approach and agreement among the local area stakeholders.

Feedback Provisions

Data from which the Subbasin Assessment and TMDL for Lower Priest River 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 CWAL 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.

5.5.5 Conclusions

It appears clear that there has been a significant decline in the fluvial cutthroat fishery based on historic accounts of a once thriving fishery. While it is not known what degree sedimentation into the river has played in this decline, sedimentation cannot be discounted as a related cause. While the sediment load estimates from the 2000 streambank survey have an associated high degree of standard error, this data indicates a significant sediment load from eroding riverbanks. The 16,030 tons/yr estimate from riverbanks is more than twice the annual load estimated for the 57,000 acre watershed of Lower West Branch. What the streambank survey rather accurately demonstrated, is that on the average around 28% of the bank lengths encountered had a severe eroding condition with high raw banks and slumping bank edges (Figure 15). And unlike watershed TMDLs, there is no doubt that this is a 100% sediment delivery to a waterbody. There is also little doubt that the current condition in part relates to over a century of various land use activities.

While eroding banks can be easily identified, the challenge will be technical solutions and financing the remediations. The TMDL Implementation Plan should identify and target riverbank areas that proportionally yield the highest sediment to the river and have technically feasible and cost effective solutions. Other improvement projects not directly related to sediment load may also be identified.

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Glossary

305(b) Refers to section 305 subsection "b" of the Clean Water Act. 305(b) generally describes a report of each state's water quality, and is the principle means by which the U.S. Environmental Protection Agency, congress, and the public evaluate whether U.S. waters meet water quality standards, the progress made in maintaining and restoring water quality, and the extent of the remaining problems.

303(d) Refers to section 303 subsection "d" of the Clean Water Act. 303(d) requires states to develop a list of water bodies that do not meet water quality standards. This section also requires total maximum daily loads (TMDLs) be prepared for listed waters. Both the list and the TMDLs are subject to U.S. Environmental Protection Agency approval.

Acre-Foot A volume of water that would cover an acre to a depth of one foot. Often used to quantify reservoir storage and the annual discharge of large rivers.

Adsorption The adhesion of one substance to the surface of another. Clays, for example, can adsorb phosphorus and organic molecules.

Aeration A process by which water becomes charged with air directly from the atmosphere. Dissolved gases, such as oxygen, are then available for reactions in water.

Aerobic Describes life, processes, or conditions that require the presence of oxygen.

Assessment Database (ADB) The ADB is a relational database application designed for the U.S. Environmental Protection Agency for tracking water quality assessment data, such as use attainment and causes and sources of impairment. States need to track this information and many other types of assessment data for thousands of water bodies, and integrate it into meaningful reports. The ADB is designed to make this process accurate, straightforward, and user-friendly for participating states, territories, tribes, and basin commissions.

Adfluvial Describes fish whose life history involves seasonal migration from lakes to streams for spawning.

Adjunct In the context of water quality, adjunct refers to areas directly adjacent to focal or refuge habitats that have been degraded by human or natural disturbances and do not presently support high diversity or abundance of native species.

Alevin	A newly hatched, incompletely developed fish (usually a salmonid) still in nest or inactive on the bottom of a waterbody, living off stored yolk.
Algae	Non-vascular (without water-conducting tissue) aquatic plants that occur as single cells, colonies, or filaments.
Alluvium	Unconsolidated recent stream deposition.
Ambient	General conditions in the environment. In the context of water quality, ambient waters are those representative of general conditions, not associated with episodic perturbations, or specific disturbances such as a wastewater outfall (Armantrout 1998, EPA 1996).
Anadromous	Fish, such as salmon and sea-run trout, that live part or the majority of their lives in the salt water but return to fresh water to spawn.
Anaerobic	Describes the processes that occur in the absence of molecular oxygen and describes the condition of water that is devoid of molecular oxygen.
Anoxia	The condition of oxygen absence or deficiency.
Anthropogenic	Relating to, or resulting from, the influence of human beings on nature.
Anti-Degradation	Refers to the U.S. Environmental Protection Agency's interpretation of the Clean Water Act goal that states and tribes maintain, as well as restore, water quality. This applies to waters that meet or are of higher water quality than required by state standards. State rules provide that the quality of those high quality waters may be lowered only to allow important social or economic development and only after adequate public participation (IDAPA 58.01.02.051). In all cases, the existing beneficial uses must be maintained. State rules further define lowered water quality to be 1) a measurable change, 2) a change adverse to a use, and 3) a change in a pollutant relevant to the water's uses (IDAPA 58.01.02.003.56).
Aquatic	Occurring, growing, or living in water.
Aquifer	An underground, water-bearing layer or stratum of permeable rock, sand, or gravel capable of yielding of water to wells or springs.

Assemblage (aquatic) An association of interacting populations of organisms in a given waterbody; for example, a fish assemblage, or a benthic macroinvertebrate assemblage (also see Community) (EPA 1996).

Assimilative Capacity The ability to process or dissipate pollutants without ill effect to beneficial uses.

Autotrophic An organism is considered autotrophic if it uses carbon dioxide as its main source of carbon. This most commonly happens through photosynthesis.

Batholith A large body of intrusive igneous rock that has more than 40 square miles of surface exposure and no known floor. A batholith usually consists of coarse-grained rocks such as granite.

Bedload Material (generally sand-sized or larger sediment) that is carried along the streambed by rolling or bouncing.

Beneficial Use Any of the various uses of water, including, but not limited to, aquatic biota, recreation, water supply, wildlife habitat, and aesthetics, which are recognized in water quality standards.

Beneficial Use Reconnaissance Program (BURP) A program for conducting systematic biological and physical habitat surveys of water bodies in Idaho. BURP protocols address lakes, reservoirs, and wadeable streams and rivers.

Benthic Pertaining to or living on or in the bottom sediments of a waterbody.

Benthic Organic Matter The organic matter on the bottom of a waterbody.

Benthos Organisms living in and on the bottom sediments of lakes and streams. Originally, the term meant the lake bottom, but it is now applied almost uniformly to the animals associated with the lake and stream bottoms.

Best Management Practices (BMPs) Structural, nonstructural, and managerial techniques that are effective and practical means to control nonpoint source pollutants.

Best Professional Judgment A conclusion and/or interpretation derived by a trained and/or technically competent individual by applying interpretation and synthesizing information.

Biochemical Oxygen Demand (BOD) The amount of dissolved oxygen used by organisms during the decomposition (respiration) of organic matter, expressed as mass of oxygen per volume of water, over some specified period of time.

Biological Integrity 1) The condition of an aquatic community inhabiting unimpaired water bodies of a specified habitat as measured by an evaluation of multiple attributes of the aquatic biota (EPA 1996). 2) The ability of an aquatic ecosystem to support and maintain a balanced, integrated, adaptive community of organisms having a species composition, diversity, and functional organization comparable to the natural habitats of a region (Karr 1991).

Biomass The weight of biological matter. Standing crop is the amount of biomass (e.g., fish or algae) in a body of water at a given time. Often expressed as grams per square meter.

Biota The animal and plant life of a given region.

Biotic A term applied to the living components of an area.

Clean Water Act (CWA) The Federal Water Pollution Control Act (Public Law 92-500, commonly known as the Clean Water Act), as last reauthorized by the Water Quality Act of 1987 (Public Law 100-4), establishes a process for states to use to develop information on, and control the quality of, the nation's water resources.

Coliform Bacteria A group of bacteria predominantly inhabiting the intestines of humans and animals but also found in soil. Coliform bacteria are commonly used as indicators of the possible presence of pathogenic organisms (also see Fecal Coliform Bacteria).

Colluvium Material transported to a site by gravity.

Community A group of interacting organisms living together in a given place.

Conductivity The ability of an aqueous solution to carry electric current, expressed in micro (μ) mhos/cm at 25 °C. Conductivity is affected by dissolved solids and is used as an indirect measure of total dissolved solids in a water sample.

Cretaceous The final period of the Mesozoic era (after the Jurassic and before the Tertiary period of the Cenozoic era), thought to have covered the span of time between 135 and 65 million years ago.

Criteria In the context of water quality, numeric or descriptive factors taken into account in setting standards for various pollutants. These factors are used to determine limits on allowable concentration levels, and to limit the number of violations per year. EPA develops criteria guidance; states establish criteria.

Cubic Feet per Second A unit of measure for the rate of flow or discharge of water. One cubic foot per second is the rate of flow of a stream with a cross-section of one square foot flowing at a mean velocity of one foot per second. At a steady rate, once cubic foot per second is equal to 448.8 gallons per minute and 10,984 acre-feet per day.

Cultural Eutrophication The process of eutrophication that has been accelerated by human-caused influences. Usually seen as an increase in nutrient loading (also see Eutrophication).

Culturally Induced Erosion Erosion caused by increased runoff or wind action due to the work of humans in deforestation, cultivation of the land, overgrazing, and disturbance of natural drainages; the excess of erosion over the normal for an area (also see Erosion).

Debris Torrent The sudden down slope movement of soil, rock, and vegetation on steep slopes, often caused by saturation from heavy rains.

Decomposition The breakdown of organic molecules (e.g., sugar) to inorganic molecules (e.g., carbon dioxide and water) through biological and nonbiological processes.

Depth Fines Percent by weight of particles of small size within a vertical core of volume of a streambed or lake bottom sediment. The upper size threshold for fine sediment for fisheries purposes varies from 0.8 to 6.5 mm depending on the observer and methodology used. The depth sampled varies but is typically about one foot (30 cm).

Designated Uses Those water uses identified in state water quality standards that must be achieved and maintained as required under the Clean Water Act.

Discharge The amount of water flowing in the stream channel at the time of measurement. Usually expressed as cubic feet per second (cfs).

Dissolved Oxygen (DO) The oxygen dissolved in water. Adequate DO is vital to fish and other aquatic life.

Disturbance Any event or series of events that disrupts ecosystem, community, or population structure and alters the physical environment.

E. coli Short for *Escherichia Coli*, *E. coli* are a group of bacteria that are a subspecies of coliform bacteria. Most *E. coli* are essential to the healthy life of all warm-blooded animals, including humans. Their presence is often indicative of fecal contamination.

Ecology	The scientific study of relationships between organisms and their environment; also defined as the study of the structure and function of nature.
Ecological Indicator	A characteristic of an ecosystem that is related to, or derived from, a measure of a biotic or abiotic variable that can provide quantitative information on ecological structure and function. An indicator can contribute to a measure of integrity and sustainability. Ecological indicators are often used within the multimetric index framework.
Ecological Integrity	The condition of an unimpaired ecosystem as measured by combined chemical, physical (including habitat), and biological attributes (EPA 1996).
Ecosystem	The interacting system of a biological community and its non-living (abiotic) environmental surroundings.
Effluent	A discharge of untreated, partially treated, or treated wastewater into a receiving waterbody.
Endangered Species	Animals, birds, fish, plants, or other living organisms threatened with imminent extinction. Requirements for declaring a species as endangered are contained in the Endangered Species Act.
Environment	The complete range of external conditions, physical and biological, that affect a particular organism or community.
Eocene	An epoch of the early Tertiary period, after the Paleocene and before the Oligocene.
Eolian	Windblown, referring to the process of erosion, transport, and deposition of material by the wind.
Ephemeral Stream	A stream or portion of a stream that flows only in direct response to precipitation. It receives little or no water from springs and no long continued supply from melting snow or other sources. Its channel is at all times above the water table. (American Geologic Institute 1962).
Erosion	The wearing away of areas of the earth's surface by water, wind, ice, and other forces.
Eutrophic	From Greek for "well nourished," this describes a highly productive body of water in which nutrients do not limit algal growth. It is typified by high algal densities and low clarity.

Eutrophication — 1) Natural process of maturing (aging) in a body of water. 2) The natural and human-influenced process of enrichment with nutrients, especially nitrogen and phosphorus, leading to an increased production of organic matter.

Exceedance — A violation (according to DEQ policy) of the pollutant levels permitted by water quality criteria.

Existing Beneficial Use or Existing Use — A beneficial use actually attained in waters on or after November 28, 1975, whether or not the use is designated for the waters in Idaho's *Water Quality Standards and Wastewater Treatment Requirements* (IDAPA 58.01.02).

Exotic Species — A species that is not native (indigenous) to a region.

Extrapolation — Estimation of unknown values by extending or projecting from known values.

Fauna — Animal life, especially the animals characteristic of a region, period, or special environment.

Fecal Coliform Bacteria — Bacteria found in the intestinal tracts of all warm-blooded animals or mammals. Their presence in water is an indicator of pollution and possible contamination by pathogens (also see Coliform Bacteria).

Fecal Streptococci — A species of spherical bacteria including pathogenic strains found in the intestines of warm-blooded animals.

Feedback Loop — In the context of watershed management planning, a feedback loop is a process that provides for tracking progress toward goals and revising actions according to that progress.

Fixed-Location Monitoring — Sampling or measuring environmental conditions continuously or repeatedly at the same location.

Flow — See Discharge.

Fluvial — In fisheries, this describes fish whose life history takes place entirely in streams but migrate to smaller streams for spawning.

Focal — Critical areas supporting a mosaic of high quality habitats that sustain a diverse or unusually productive complement of native species.

Fully Supporting	In compliance with water quality standards and within the range of biological reference conditions for all designated and exiting beneficial uses as determined through the *Waterbody Assessment Guidance* (Grafe et al. 2002).
Fully Supporting Cold Water	Reliable data indicate functioning, sustainable cold water biological assemblages (e.g., fish, macroinvertebrates, or algae), none of which have been modified significantly beyond the natural range of reference conditions (EPA 1997a).
Fully Supporting but Threatened	An intermediate assessment category describing water bodies that fully support beneficial uses, but have a declining trend in water quality conditions, which if not addressed, will lead to a "not fully supporting" status.
Geographical Information Systems (GIS)	A georeferenced database.
Geometric Mean	A back-transformed mean of the logarithmically transformed numbers often used to describe highly variable, right-skewed data (a few large values), such as bacterial data.
Grab Sample	A single sample collected at a particular time and place. It may represent the composition of the water in that water column.
Gradient	The slope of the land, water, or streambed surface.
Ground Water	Water found beneath the soil surface saturating the layer in which it is located. Most ground water originates as rainfall, is free to move under the influence of gravity, and usually emerges again as stream flow.
Growth Rate	A measure of how quickly something living will develop and grow, such as the amount of new plant or animal tissue produced per a given unit of time, or number of individuals added to a population.
Habitat	The living place of an organism or community.
Headwater	The origin or beginning of a stream.
Hydrologic Basin	The area of land drained by a river system, a reach of a river and its tributaries in that reach, a closed basin, or a group of streams forming a drainage area (also see Watershed).

Hydrologic Cycle The cycling of water from the atmosphere to the earth (precipitation) and back to the atmosphere (evaporation and plant transpiration). Atmospheric moisture, clouds, rainfall, runoff, surface water, ground water, and water infiltrated in soils are all part of the hydrologic cycle.

Hydrologic Unit One of a nested series of numbered and named watersheds arising from a national standardization of watershed delineation. The initial 1974 effort (USGS 1987) described four levels (region, subregion, accounting unit, cataloging unit) of watersheds throughout the United States. The fourth level is uniquely identified by an eight-digit code built of two-digit fields for each level in the classification. Originally termed a cataloging unit, fourth field hydrologic units have been more commonly called subbasins. Fifth and sixth field hydrologic units have since been delineated for much of the country and are known as watershed and subwatersheds, respectively.

Hydrologic Unit Code (HUC) The number assigned to a hydrologic unit. Often used to refer to fourth field hydrologic units.

Hydrology The science dealing with the properties, distribution, and circulation of water.

Impervious Describes a surface, such as pavement, that water cannot penetrate.

Influent A tributary stream.

Inorganic Materials not derived from biological sources.

Instantaneous A condition or measurement at a moment (instant) in time.

Intergravel Dissolved Oxygen The concentration of dissolved oxygen within spawning gravel. Consideration for determining spawning gravel includes species, water depth, velocity, and substrate.

Intermittent Stream 1) A stream that flows only part of the year, such as when the ground water table is high or when the stream receives water from springs or from surface sources such as melting snow in mountainous areas. The stream ceases to flow above the streambed when losses from evaporation or seepage exceed the available stream flow. 2) A stream that has a period of zero flow for at least one week during most years.

Interstate Waters Waters that flow across or form part of state or international boundaries, including boundaries with Indian nations.

Irrigation Return Flow Surface (and subsurface) water that leaves a field following the application of irrigation water and eventually flows into streams.

Key Watershed A watershed that has been designated in Idaho Governor Batt's *State of Idaho Bull Trout Conservation Plan* (1996) as critical to the long-term persistence of regionally important trout populations.

Knickpoint Any interruption or break of slope.

Land Application A process or activity involving application of wastewater, surface water, or semi-liquid material to the land surface for the purpose of treatment, pollutant removal, or ground water recharge.

Limiting Factor A chemical or physical condition that determines the growth potential of an organism. This can result in a complete inhibition of growth, but typically results in less than maximum growth rates.

Limnology The scientific study of fresh water, especially the history, geology, biology, physics, and chemistry of lakes.

Load Allocation (LA) A portion of a waterbody's load capacity for a given pollutant that is given to a particular nonpoint source (by class, type, or geographic area).

Load(ing) The quantity of a substance entering a receiving stream, usually expressed in pounds or kilograms per day or tons per year. Loading is the product of flow (discharge) and concentration.

Loading Capacity (LC) A determination of how much pollutant a waterbody can receive over a given period without causing violations of state water quality standards. Upon allocation to various sources, and a margin of safety, it becomes a total maximum daily load.

Loam Refers to a soil with a texture resulting from a relative balance of sand, silt, and clay. This balance imparts many desirable characteristics for agricultural use.

Loess A uniform wind-blown deposit of silty material. Silty soils are among the most highly erodible.

Lotic An aquatic system with flowing water such as a brook, stream, or river where the net flow of water is from the headwaters to the mouth.

Luxury Consumption A phenomenon in which sufficient nutrients are available in either the sediments or the water column of a waterbody, such that aquatic plants take up and store an abundance in excess of the plants' current needs.

Macroinvertebrate	An invertebrate animal (without a backbone) large enough to be seen without magnification and retained by a 500µm mesh (U.S. #30) screen.
Macrophytes	Rooted and floating vascular aquatic plants, commonly referred to as water weeds. These plants usually flower and bear seeds. Some forms, such as duckweed and coontail (*Ceratophyllum sp.*), are free-floating forms not rooted in sediment.
Margin of Safety (MOS)	An implicit or explicit portion of a waterbody's loading capacity set aside to allow the uncertainly about the relationship between the pollutant loads and the quality of the receiving waterbody. This is a required component of a total maximum daily load (TMDL) and is often incorporated into conservative assumptions used to develop the TMDL (generally within the calculations and/or models). The MOS is not allocated to any sources of pollution.
Mass Wasting	A general term for the down slope movement of soil and rock material under the direct influence of gravity.
Mean	Describes the central tendency of a set of numbers. The arithmetic mean (calculated by adding all items in a list, then dividing by the number of items) is the statistic most familiar to most people.
Median	The middle number in a sequence of numbers. If there are an even number of numbers, the median is the average of the two middle numbers. For example, 4 is the median of 1, 2, 4, 14, 16; and 6 is the median of 1, 2, 5, 7, 9, 11.
Metric	1) A discrete measure of something, such as an ecological indicator (e.g., number of distinct taxon). 2) The metric system of measurement.
Milligrams per Liter (mg/l)	A unit of measure for concentration in water, essentially equivalent to parts per million (ppm).
Million gallons per day (MGD)	A unit of measure for the rate of discharge of water, often used to measure flow at wastewater treatment plants. One MGD is equal to 1.547 cubic feet per second.
Miocene	Of, relating to, or being an epoch of, the Tertiary between the Pliocene and the Oligocene periods, or the corresponding system of rocks.
Monitoring	A periodic or continuous measurement of the properties or conditions of some medium of interest, such as monitoring a waterbody.

Mouth	The location where flowing water enters into a larger waterbody.
National Pollution Discharge Elimination System (NPDES)	A national program established by the Clean Water Act for permitting point sources of pollution. Discharge of pollution from point sources is not allowed without a permit.
Natural Condition	A condition indistinguishable from that without human-caused disruptions.
Nitrogen	An element essential to plant growth, and thus is considered a nutrient.
Nodal	Areas that are separated from focal and adjunct habitats, but serve critical life history functions for individual native fish.
Nonpoint Source	A dispersed source of pollutants, generated from a geographical area when pollutants are dissolved or suspended in runoff and then delivered into waters of the state. Nonpoint sources are without a discernable point or origin. They include, but are not limited to, irrigated and non-irrigated lands used for grazing, crop production, and silviculture; rural roads; construction and mining sites; log storage or rafting; and recreation sites.
Not Assessed (NA)	A concept and an assessment category describing water bodies that have been studied, but are missing critical information needed to complete an assessment.
Not Attainable	A concept and an assessment category describing water bodies that demonstrate characteristics that make it unlikely that a beneficial use can be attained (e.g., a stream that is dry but designated for salmonid spawning).
Not Fully Supporting	Not in compliance with water quality standards or not within the range of biological reference conditions for any beneficial use as determined through the *Waterbody Assessment Guidance* (Grafe et al. 2002).
Not Fully Supporting Cold Water	At least one biological assemblage has been significantly modified beyond the natural range of its reference condition (EPA 1997a).
Nuisance	Anything which is injurious to the public health or an obstruction to the free use, in the customary manner, of any waters of the state.

Nutrient Any substance required by living things to grow. An element or its chemical forms essential to life, such as carbon, oxygen, nitrogen, and phosphorus. Commonly refers to those elements in short supply, such as nitrogen and phosphorus, which usually limit growth.

Nutrient Cycling The flow of nutrients from one component of an ecosystem to another, as when macrophytes die and release nutrients that become available to algae (organic to inorganic phase and return).

Oligotrophic The Greek term for "poorly nourished." This describes a body of water in which productivity is low and nutrients are limiting to algal growth, as typified by low algal density and high clarity.

Organic Matter Compounds manufactured by plants and animals that contain principally carbon.

Orthophosphate A form of soluble inorganic phosphorus most readily used for algal growth.

Oxygen-Demanding Materials Those materials, mainly organic matter, in a waterbody which consume oxygen during decomposition.

Parameter A variable, measurable property whose value is a determinant of the characteristics of a system; e.g., temperature, dissolved oxygen, and fish populations are parameters of a stream or lake.

Partitioning The sharing of limited resources by different races or species; use of different parts of the habitat, or the same habitat at different times. Also the separation of a chemical into two or more phases, such as partitioning of phosphorus between the water column and sediment.

Pathogens Disease-producing organisms (e.g., bacteria, viruses, parasites).

Perennial Stream A stream that flows year-around in most years.

Periphyton Attached microflora (algae and diatoms) growing on the bottom of a waterbody or on submerged substrates, including larger plants.

Pesticide Substances or mixtures of substances intended for preventing, destroying, repelling, or mitigating any pest. Also, any substance or mixture intended for use as a plant regulator, defoliant, or desiccant.

pH The negative $\log_{10}$ of the concentration of hydrogen ions, a measure which in water ranges from very acid (pH=1) to very alkaline (pH=14). A pH of 7 is neutral. Surface waters usually measure between pH 6 and 9.

Phased TMDL A total maximum daily load (TMDL) that identifies interim load allocations and details further monitoring to gauge the success of management actions in achieving load reduction goals and the effect of actual load reductions on the water quality of a waterbody. Under a phased TMDL, a refinement of load allocations, wasteload allocations, and the margin of safety is planned at the outset.

Phosphorus An element essential to plant growth, often in limited supply, and thus considered a nutrient.

Physiochemical In the context of bioassessment, the term is commonly used to mean the physical and chemical factors of the water column that relate to aquatic biota. Examples in bioassessment usage include saturation of dissolved gases, temperature, pH, conductivity, dissolved or suspended solids, forms of nitrogen, and phosphorus. This term is used interchangeable with the terms "physical/chemical" and "physicochemical."

Plankton Microscopic algae (phytoplankton) and animals (zooplankton) that float freely in open water of lakes and oceans.

Point Source A source of pollutants characterized by having a discrete conveyance, such as a pipe, ditch, or other identifiable "point" of discharge into a receiving water. Common point sources of pollution are industrial and municipal wastewater.

Pollutant Generally, any substance introduced into the environment that adversely affects the usefulness of a resource or the health of humans, animals, or ecosystems.

Pollution A very broad concept that encompasses human-caused changes in the environment which alter the functioning of natural processes and produce undesirable environmental and health effects. This includes human-induced alteration of the physical, biological, chemical, and radiological integrity of water and other media.

Population A group of interbreeding organisms occupying a particular space; the number of humans or other living creatures in a designated area.

Pretreatment The reduction in the amount of pollutants, elimination of certain pollutants, or alteration of the nature of pollutant properties in wastewater prior to, or in lieu of, discharging or otherwise introducing such wastewater into a publicly owned wastewater treatment plant.

Primary Productivity The rate at which algae and macrophytes fix carbon dioxide using light energy. Commonly measured as milligrams of carbon per square meter per hour.

Protocol A series of formal steps for conducting a test or survey.

Qualitative Descriptive of kind, type, or direction.

Quality Assurance (QA) A program organized and designed to provide accurate and precise results. Included are the selection of proper technical methods, tests, or laboratory procedures; sample collection and preservation; the selection of limits; data evaluation; quality control; and personnel qualifications and training. The goal of QA is to assure the data provided are of the quality needed and claimed (Rand 1995, EPA 1996).

Quality Control (QC) Routine application of specific actions required to provide information for the quality assurance program. Included are standardization, calibration, and replicate samples. QC is implemented at the field or bench level (Rand 1995, EPA 1996).

Quantitative Descriptive of size, magnitude, or degree.

Reach A stream section with fairly homogenous physical characteristics.

Reconnaissance An exploratory or preliminary survey of an area.

Reference A physical or chemical quantity whose value is known, and thus is used to calibrate or standardize instruments.

Reference Condition 1) A condition that fully supports applicable beneficial uses with little affect from human activity and represents the highest level of support attainable. 2) A benchmark for populations of aquatic ecosystems used to describe desired conditions in a biological assessment and acceptable or unacceptable departures from them. The reference condition can be determined through examining regional reference sites, historical conditions, quantitative models, and expert judgment (Hughes 1995).

Reference Site A specific locality on a waterbody that is minimally impaired and is representative of reference conditions for similar water bodies.

Representative Sample A portion of material or water that is as similar in content and consistency as possible to that in the larger body of material or water being sampled.

Resident A term that describes fish that do not migrate.

Respiration A process by which organic matter is oxidized by organisms, including plants, animals, and bacteria. The process converts organic matter to energy, carbon dioxide, water, and lesser constituents.

Riffle A relatively shallow, gravelly area of a streambed with a locally fast current, recognized by surface choppiness. Also an area of higher streambed gradient and roughness.

Riparian Associated with aquatic (stream, river, lake) habitats. Living or located on the bank of a waterbody.

Riparian Habitat Conservation Area (RHCA) A U.S. Forest Service description of land within the following number of feet up-slope of each of the banks of streams:
- 300 feet from perennial fish-bearing streams
- 150 feet from perennial non-fish-bearing streams
- 100 feet from intermittent streams, wetlands, and ponds

in priority watersheds.

River A large, natural, or human-modified stream that flows in a defined course or channel, or a series of diverging and converging channels.

Runoff The portion of rainfall, melted snow, or irrigation water that flows across the surface, through shallow underground zones (interflow), and through ground water to creates streams.

Sediments Deposits of fragmented materials from weathered rocks and organic material that were suspended in, transported by, and eventually deposited by water or air.

Settleable Solids The volume of material that settles out of one liter of water in one hour.

Species 1) A reproductively isolated aggregate of interbreeding organisms having common attributes and usually designated by a common name. 2) An organism belonging to such a category.

Spring Ground water seeping out of the earth where the water table intersects the ground surface.

Stagnation The absence of mixing in a waterbody.

Stenothermal	Unable to tolerate a wide temperature range.
Stratification	An Idaho Department of Environmental Quality classification method used to characterize comparable units (also called classes or strata).
Stream	A natural water course containing flowing water, at least part of the year. Together with dissolved and suspended materials, a stream normally supports communities of plants and animals within the channel and the riparian vegetation zone.
Stream Order	Hierarchical ordering of streams based on the degree of branching. A first-order stream is an unforked or unbranched stream. Under Strahler's (1957) system, higher order streams result from the joining of two streams of the same order.
Storm Water Runoff	Rainfall that quickly runs off the land after a storm. In developed watersheds the water flows off roofs and pavement into storm drains that may feed quickly and directly into the stream. The water often carries pollutants picked up from these surfaces.
Stressors	Physical, chemical, or biological entities that can induce adverse effects on ecosystems or human health.
Subbasin	A large watershed of several hundred thousand acres. This is the name commonly given to 4th field hydrologic units (also see Hydrologic Unit).
Subbasin Assessment (SBA)	A watershed-based problem assessment that is the first step in developing a total maximum daily load in Idaho.
Subwatershed	A smaller watershed area delineated within a larger watershed, often for purposes of describing and managing localized conditions. Also proposed for adoption as the formal name for 6th field hydrologic units.
Surface Fines	Sediments of small size deposited on the surface of a streambed or lake bottom. The upper size threshold for fine sediment for fisheries purposes varies from 0.8 to 605 mm depending on the observer and methodology used. Results are typically expressed as a percentage of observation points with fine sediment.
Surface Runoff	Precipitation, snow melt, or irrigation water in excess of what can infiltrate the soil surface and be stored in small surface depressions; a major transporter of nonpoint source pollutants in rivers, streams, and lakes. Surface runoff is also called overland flow.

Surface Water	All water naturally open to the atmosphere (rivers, lakes, reservoirs, streams, impoundments, seas, estuaries, etc.) and all springs, wells, or other collectors that are directly influenced by surface water.
Suspended Sediments	Fine material (usually sand size or smaller) that remains suspended by turbulence in the water column until deposited in areas of weaker current. These sediments cause turbidity and, when deposited, reduce living space within streambed gravels and can cover fish eggs or alevins.
Taxon	Any formal taxonomic unit or category of organisms (e.g., species, genus, family, order). The plural of taxon is taxa (Armantrout 1998).
Tertiary	An interval of geologic time lasting from 66.4 to 1.6 million years ago. It constitutes the first of two periods of the Cenozoic Era, the second being the Quaternary. The Tertiary has five subdivisions, which from oldest to youngest are the Paleocene, Eocene, Oligocene, Miocene, and Pliocene epochs.
Thalweg	The center of a stream's current, where most of the water flows.
Threatened Species	Species, determined by the U.S. Fish and Wildlife Service, which are likely to become endangered within the foreseeable future throughout all or a significant portion of their range.
Total Maximum Daily Load (TMDL)	A TMDL is a waterbody's loading capacity after it has been allocated among pollutant sources. It can be expressed on a time basis other than daily if appropriate. Sediment loads, for example, are often calculated on an annual bases. TMDL = Loading Capacity = Load Allocation + Wasteload Allocation + Margin of Safety. In common usage, a TMDL also refers to the written document that contains the statement of loads and supporting analyses, often incorporating TMDLs for several water bodies and/or pollutants within a given watershed.
Total Dissolved Solids	Dry weight of all material in solution in a water sample as determined by evaporating and drying filtrate.
Total Suspended Solids (TSS)	The dry weight of material retained on a filter after filtration. Filter pore size and drying temperature can vary. American Public Health Association Standard Methods (Greenborg, Clescevi, and Eaton 1995) call for using a filter of 2.0 micron or smaller; a 0.45 micron filter is also often used. This method calls for drying at a temperature of 103-105 °C.

Toxic Pollutants Materials that cause death, disease, or birth defects in organisms that ingest or absorb them. The quantities and exposures necessary to cause these effects can vary widely.

Tributary A stream feeding into a larger stream or lake.

Trophic State The level of growth or productivity of a lake as measured by phosphorus content, chlorophyll *a* concentrations, amount (biomass) of aquatic vegetation, algal abundance, and water clarity.

Turbidity A measure of the extent to which light passing through water is scattered by fine suspended materials. The effect of turbidity depends on the size of the particles (the finer the particles, the greater the effect per unit weight) and the color of the particles.

Vadose Zone The unsaturated region from the soil surface to the ground water table.

Wasteload Allocation (WLA) The portion of receiving water's loading capacity that is allocated to one of its existing or future point sources of pollution. Wasteload allocations specify how much pollutant each point source may release to a waterbody.

Waterbody A stream, river, lake, estuary, coastline, or other water feature, or portion thereof.

Water Column Water between the interface with the air at the surface and the interface with the sediment layer at the bottom. The idea derives from a vertical series of measurements (oxygen, temperature, phosphorus) used to characterize water.

Water Pollution Any alteration of the physical, thermal, chemical, biological, or radioactive properties of any waters of the state, or the discharge of any pollutant into the waters of the state, which will or is likely to create a nuisance or to render such waters harmful, detrimental, or injurious to public health, safety, or welfare; to fish and wildlife; or to domestic, commercial, industrial, recreational, aesthetic, or other beneficial uses.

Water Quality A term used to describe the biological, chemical, and physical characteristics of water with respect to its suitability for a beneficial use.

Water Quality Criteria Levels of water quality expected to render a body of water suitable for its designated uses. Criteria are based on specific levels of pollutants that would make the water harmful if used for drinking, swimming, farming, or industrial processes.

Water Quality Limited	A label that describes water bodies for which one or more water quality criterion is not met or beneficial uses are not fully supported. Water quality limited segments may or may not be on a 303(d) list.
Water Quality Limited Segment (WQLS)	Any segment placed on a state's 303(d) list for failure to meet applicable water quality standards, and/or is not expected to meet applicable water quality standards in the period prior to the next list. These segments are also referred to as "303(d) listed."
Water Quality Management Plan	A state or area-wide waste treatment management plan developed and updated in accordance with the provisions of the Clean Water Act.
Water Quality Modeling	The prediction of the response of some characteristics of lake or stream water based on mathematical relations of input variables such as climate, stream flow, and inflow water quality.
Water Quality Standards	State-adopted and EPA-approved ambient standards for water bodies. The standards prescribe the use of the waterbody and establish the water quality criteria that must be met to protect designated uses.
Water Table	The upper surface of ground water; below this point, the soil is saturated with water.
Watershed	1) All the land which contributes runoff to a common point in a drainage network, or to a lake outlet. Watersheds are infinitely nested, and any large watershed is composed of smaller "subwatersheds." 2) The whole geographic region which contributes water to a point of interest in a waterbody.
Waterbody Identification Number (WBID)	A number that uniquely identifies a waterbody in Idaho ties in to the Idaho water quality standards and GIS information.
Wetland	An area that is at least some of the time saturated by surface or ground water so as to support with vegetation adapted to saturated soil conditions. Examples include swamps, bogs, fens, and marshes.
Young of the Year	Young fish born the year captured, evidence of spawning activity.

Appendix A. Sediment Model Assumptions and Documentation

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 are calculated for Priest River Subbasin watersheds where a TMDL is warranted: an estimated natural or background loading rate prior to Euroamerican settlement and land use activities within the basin, and the current sediment loading rate. Figure A1 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 aquatic life (CWAL) beneficial use. Current sediment load in all Priest River 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 Fully Supporting of CWAL. In the latter case an estimation is made as to whether the current sediment load has played a significant part in CWAL impairment. There may be other reasons for impairment such as poor instream cover and lack of quality pools associated with low amounts of LWD (linked perhaps to historic riparian harvests). Other factors may be water temperature and fishery management issues such as introduction of non-native species.

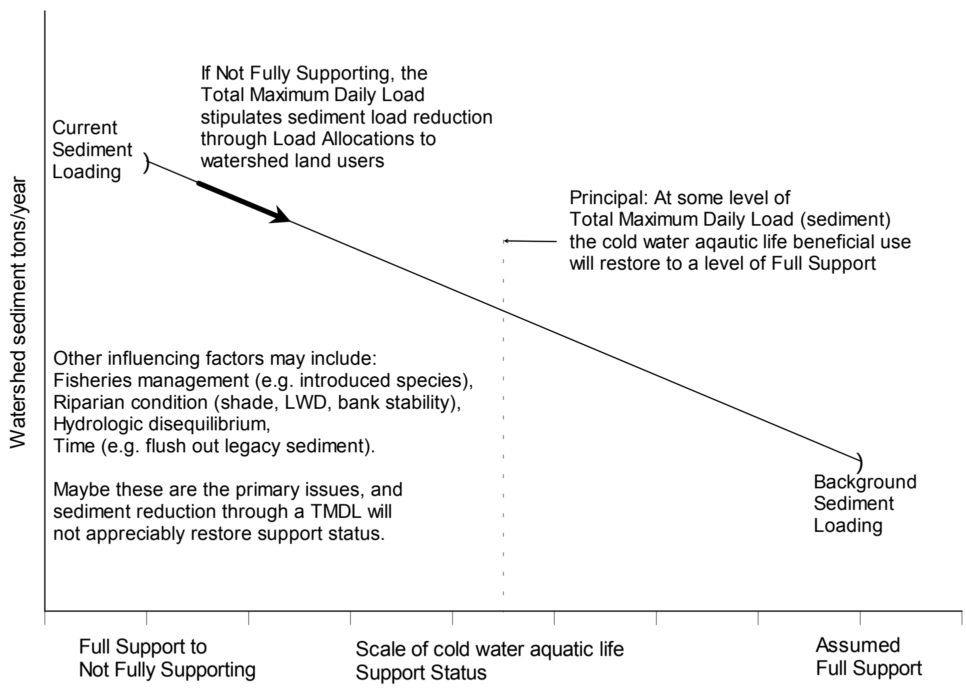

Figure A1. Conceptual diagram of sediment TMDL in association with cold water aquatic life beneficial use.

For a sediment TMDL, the goal is to reduce the current watershed load to a point where cold water aquatic life 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.

A.1 Natural or Background Sediment Load

Forest Land

The USFS supplied to DEQ a GIS base geology and landtype map of the Priest River Subbasin in order to calculate background sediment load (Figure A2, 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 Priest River Subbasin TMDLs. The WATSED model provides useful information to identify sources of sediment and compare management alternatives (EPA 2001a). 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 *Priest River SBA and TMDL* (EPA 2001a), it was cited that the development origin of WATSED and related R1/R4 models was for the Idaho Batholith (USFS 1981), and that extrapolation outside of the Idaho Batholith should be made with extreme caution. Also cited was 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 subbasin: Belt/Granitic Outwash Plain and Alluvial Deposits (typically gentle sloped, Bonner soils) at 11 tons/mi^2/yr; High Elevation, Residual Belt Mt. Slopes and Ridges at 13 tons/mi^2/yr; and High Elevation, Glaciated Granitic Mt. Slopes and Ridges at 23 tons/mi^2/yr (Figure A2). The base map was overlain 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 at 32 tons/mi^2/yr; Dissected, Residual Belt Mt. Slopes at 36 tons/mi^2/yr; Lacustrine Stream Channels at 41 tons/mi^2/yr; and Non-Dissected, Belt Stream Breaklands at 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/management groups, and then land use subgroups such as improved hay land within private ownership. The WATSED sediment yield coefficients were applied to square miles of each partition resulting in tons/yr. 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.

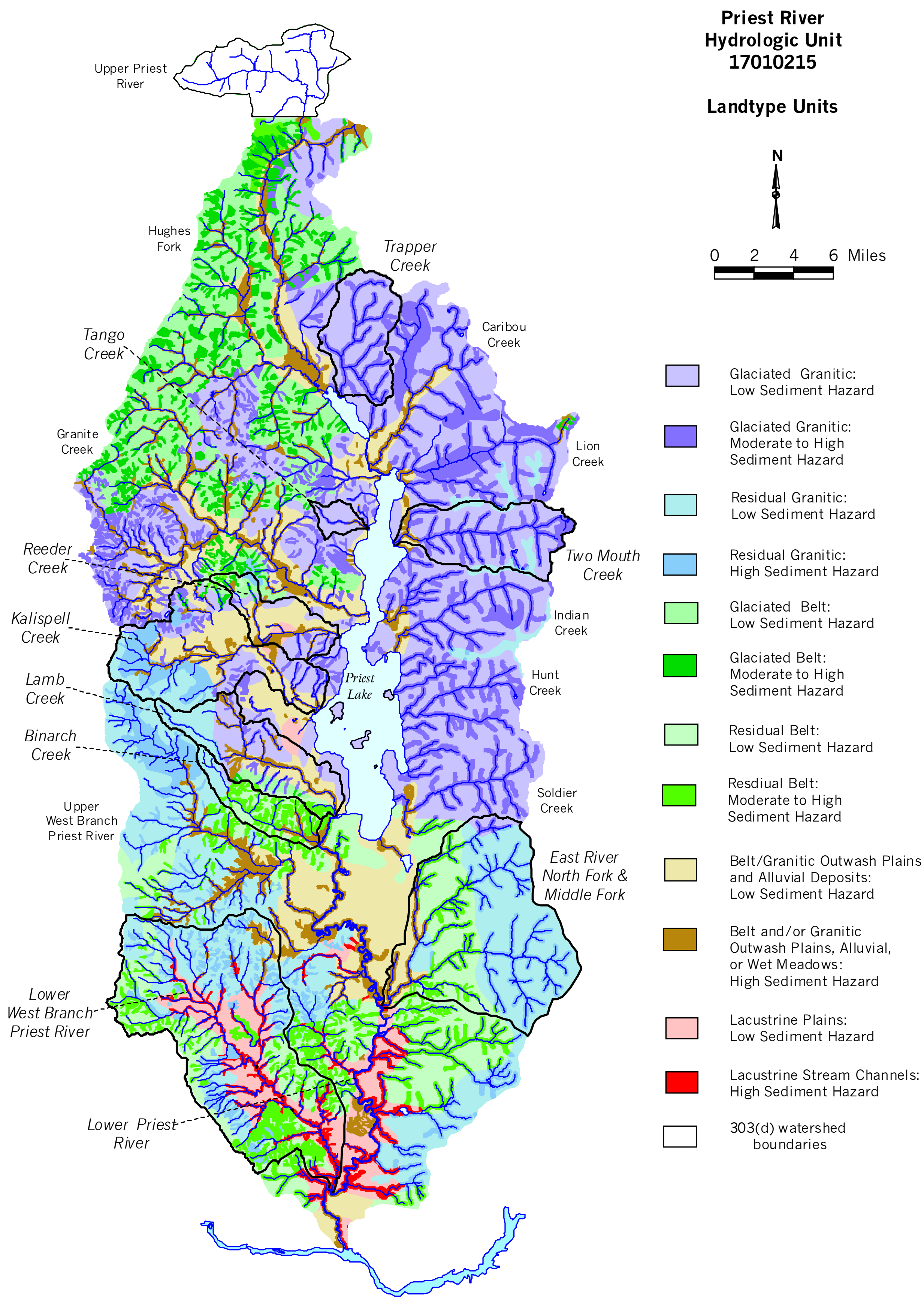

Figure A2. Landtype units in the Priest River Subbasin (data supplied by the USFS).

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. Sediment load calculations for most DEQ - TMDL documents have used the assumption of 100% delivery to streams (Harvey 2000b). Priest River Subbasin TMDLs will take the same approach.

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 the *Priest River SBA and TMDL*, Section 2 and 3, including large areas of western watersheds with intense multiple burns (Rothrock 2001). 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 (USFS 1999).

Mass Failures

The basin wide IDL - CWE analysis produced mass failure hazard ratings mostly averaging from moderate to high. This analysis is based on GIS maps related to a matrix table of slope categories and predominant bedrock/parent material. But, CWE mass failure scores within watershed sections observed in field surveys were generally "low." From observations by USFS and IDL personnel, the natural or historic occurrence of landslides would appear to have been minor with exceptions such as the canyon walls of Lower West Branch and Lower Priest River. The WATSED methods for sediment coefficients do not calculate landslides separately, but the landtype sediment coefficients do incorporate landslide estimates. Thus, a separate estimate for slides in the TMDL sediment load calculations would result in an overestimation 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.

A.2 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 Subbasin. 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 Subbasin (Harvey 2000a and 2000b), and the

Pend Oreille Subbasin (Bergquist 2000). Areas where methods for the Priest River Subbasin are different or modified from other northern Idaho TMDLs are noted. A summary listing of sediment sources considered and methods of yield calculations 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 streambank erosion survey of 2000, and from aerial photographs.
- *Agricultural land*: Revised Universal Soil Loss Equation (RUSLE).
- *Streambank erosion*: data from bank erosion survey in 2000, converted to estimate of lateral recession rate by analysis from National Resources Conservation Service.
- *Residential storm water*: calculation methods followed Minnesota Pollution Control Agency (1989).

Forested Acres

From total acreage of each watershed analyzed, acreage was subtracted for land developed as hay cropping and grazing, and the total road prism network. Surface area for roads was determined by GIS road length times width estimates of various road categories (road prism width of 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 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 Subbasin 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.

Sediment calculation for forested acreage in Priest River Subbasin TMDLs 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 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. Also, 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 the TMDLs. These in-the-field assessments should be incorporated into TMDL Implementation Plans to assure appropriate priorities for sediment reduction efforts.

Unpaved Road Surface Sediment

Forest road fine sediment loading was estimated using a relationship between CWE scores and sediment delivered per mile of road (Figure A3), 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 likely overestimates sediment yields from these systems. However, as described later, sediment loading developed from Priest River Subbasin 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 A3 predicts delivered road sediment to streams in tons/mile/yr. Other methods first predict sediment yield followed by various estimates of delivery.

Unpaved road sediment calculations are done initially 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 that were rated within each watershed.

There are other road sediment calculation methods that suggest an underestimation of load using the CWE method. A high end CWE score at stream crossings for watersheds assessed in the Priest River Subbasin was CWE = 28 (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

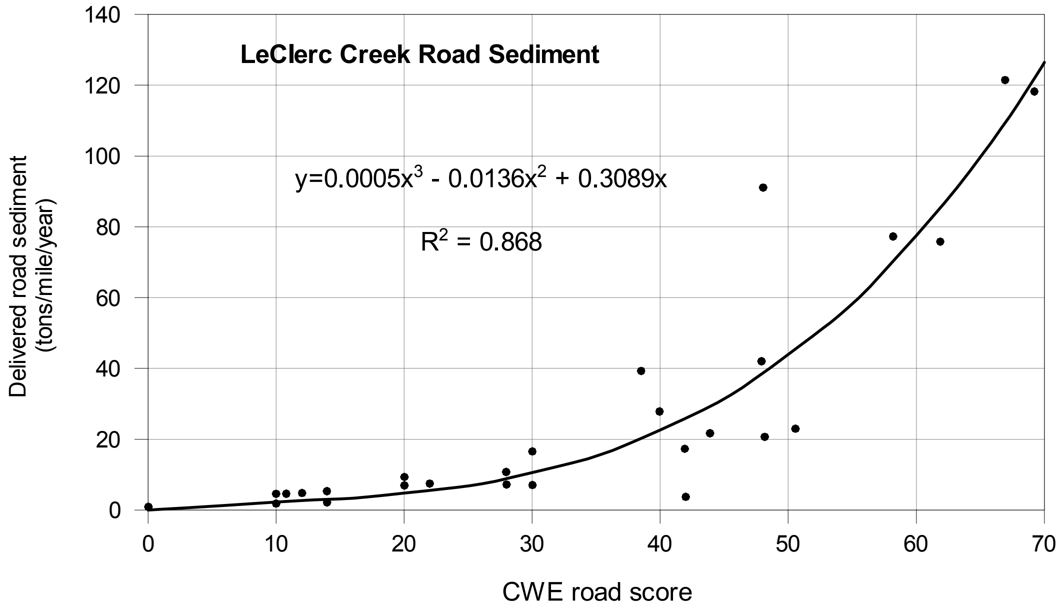

Figure A3. Sediment export of roads based on Cumulative Watershed Effects scores in the LeClerc Creek watershed, Washington (McGreer *et al*. 1997).

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.

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 Priest River Subbasin TMDLs.

In the GIS analysis of Priest River Subbasin §303(d) watersheds, the mileage of roads within a 200 ft buffer on each side of streams was calculated. However, 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, Priest River Subbasin TMDLs use 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). CWE scores 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 and abandoned roads, the minimum CWE score of 10 was applied to total mileage of these 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.

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 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. 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 Subbasin soils). Delivery to streams was assumed at 100%.

For watersheds where USFS maintenance experiences and failure estimates were not available, failures at stream crossings were based on IDL - CWE recorded observations of Significant Management Problems and mass failures at crossings. CWE observations include estimates of sediment volume delivered to a stream. CWE inventories only cover a portion of the road network in a watershed. For the East River watershed, CWE recorded failures at crossings were prorated to the entire road network.

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, and volume was multiplied by 2.16 tons/yrd^3. For watersheds where USFS maintenance experiences and failure estimates were not available, yearly loading from failures were strictly based on IDL - CWE recorded observations and estimates of cubic yards delivered to streams. CWE recorded road prism failures were 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 prorated failures gave unrealistic numbers based on maintenance experiences.

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 (Lower West Branch watershed), 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 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 within the Lower West Branch TMDL.

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, Renard *et al*. 1991). Streambank 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 (Hogen *pers comm*).

RUSLE is: $A = (R)(K)(LS)(C)(P)$

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.

For most RUSLE calculations in the basin watersheds, sediment yield was around 0.04 tons/acre/year.

Encroaching Roads and Streambank 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 at either the road bed, or within the streambanks and streambed (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 streambanks and the streambed. As explored in Section 3 of the *Priest River SBA and TMDL* (Rothrock 2001), the only appreciable length of encroaching forest road (excluding stream crossings) within the TMDL determined watersheds, is a 0.9 mile stretch of Forest Road 308 along a low gradient middle reach of Kalispell Creek. Since the streambank erosion survey (see below) included a portion of Kalispell Creek adjacent to the encroaching road, it seems preferable to include the encroaching road effect as part of the streambank 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 streambank 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. Streambank condition scores and measurements were stored in a 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. The Lower Priest River survey reaches were around 5 miles each. Most streams surveyed had two inventories, within a lower and middle reach. Within the Priest River Subbasin, 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 streambank 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 feet/yr, and 3) soil type and soil particle size. Standard methodology and parameters measured that have been developed by NRCS were modified for conditions specific to northern Idaho (Sampson *pers comm*).

A stream section with evidence of a current eroding condition is rated as having either one bank or both as eroding. Within the eroding bank length, the six bank condition factors that are evaluated and scored are:

Bank condition and degree of bank erosion evident
Bank stability
Vegetation cover on banks
Bank and channel shape and stability
Channel bottom characteristics
Deposition of sediment from banks to channel

Maximum cumulative score of the six bank condition factors is 15. Cumulative scores from 8+ are considered severe to very severe bank erosion with an associated LRR of 0.3+ ft/yr. Stream or river 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 was made available for the Priest River Subbasin TMDL analysis (Sampson *pers comm*). The average erosion rate within stream segments surveyed ranged from 15 - 193 tons/mi/yr. For Lower Priest River the erosion rate was 475 tons/mi/yr. The assigned error rate is high, 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. Streambank erosion yields 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. While estimated erosion rates are presented in tons/mile/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*).

Streambank 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 streambank damage and loss of riparian vegetation by grazing cattle and horses. It is mostly very difficult to partition out these causes except in a few places where local effects such as undersized crossings or cattle access has clearly resulted in damage.

Residential Storm Water Runoff

The were only a few cases where sediment laden storm water runoff from a residential/ commercial area was taken into consideration for TMDL calculations (i.e., lower Lamb Creek and lower-most Reeder Creek). The lower 4 miles of Lamb Creek winds 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 streambanks. The Lamb Creek residential area is mostly flat terrain with permeable soils which mitigates some of the effect of storm water runoff. For Reeder Creek, the entrance road, driveway, and parking area at Elkins Resort is a known contributor of sediment laden storm water runoff both to the mouth of Reeder Creek and Priest Lake.

An estimate of fine sediment loading from storm water runoff of residential areas 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 attributed to an area as measured or estimated upstream and downstream of the area.

Appendix B. Unit Conversion Chart

Table B1. Metric - English unit conversions.

	English Units	Metric Units	To Convert	Example
Distance	Miles (mi)	Kilometers (km)	1 mi = 1.61 km 1 km = 0.62 mi	3 mi = 4.83 km 3 km = 1.86 mi
Length	Inches (in) Feet (ft)	Centimeters (cm) Meters (m)	1 in = 2.54 cm 1 cm = 0.39 in 1 ft = 0.30 m 1 m = 3.28 ft	3 in = 7.62 cm 3 cm = 1.18 in 3 ft = 0.91 m 3 m = 9.84 ft
Area	Acres (ac) Square Feet (ft^2) Square Miles (mi^2)	Hectares (ha) Square Meters (m^2) Square Kilometers (km^2)	1 ac = 0.40 ha 1 ha = 2.47 ac 1 ft^2 = 0.09 m^2 1 m^2 = 10.76 ft^2 1 mi^2 = 2.59 km^2 1 km^2 = 0.39 mi^2	3 ac = 1.20 ha 3 ha = 7.41 ac 3 ft^2 = 0.28 m^2 3 m^2 = 32.29 ft^2 3 mi^2 = 7.77 km^2 3 km^2 = 1.16 mi^2
Volume	Gallons (g) Cubic Feet (ft^3)	Liters (l) Cubic Meters (m^3)	1 g = 3.78 l 1 l = 0.26 g 1 ft^3 = 0.03 m^3 1 m^3 = 35.32 ft^3	3 g = 11.35 l 3 l = 0.79 g 3 ft^3 = 0.09 m^3 3 m^3 = 105.94 ft^3
Flow Rate	Cubic Feet per Second (ft^3/sec)[1]	Cubic Meters per Second (m^3/sec)	1 ft^3/sec = 0.03 m^3/sec 1 m^3/sec = ft^3/sec	3 ft^3/sec = 0.09 m^3/sec 3 m^3/sec = 105.94 ft^3/sec
Concentration	Parts per Million (ppm)	Milligrams per Liter (mg/l)	1 ppm = 1 mg/l[2]	3 ppm = 3 mg/l
Weight	Pounds (lbs)	Kilograms (kg)	1 lb = 0.45 kg 1 kg = 2.20 lbs	3 lb = 1.36 kg 3 kg = 6.61 kg
Temperature	Fahrenheit (°F)	Celsius (°C)	°C = 0.55 (F - 32) °F = (C x 1.8) + 32	3 °F = -15.95 °C 3 ° C = 37.4 °F

[1] 1 ft^3/sec = 0.65 million gallons per day; 1 million gallons per day is equal to 1.55 ft^3/sec.
[2] The ratio of 1 ppm = 1 mg/l is approximate and is only accurate for water.

Appendix C. Distribution List

Panhandle Basin Advisory Group (BAG - 10 members)

Priest Lake Watershed Advisory Group (WAG - 15 members including USFS, IDL, IDFG, Selkirk Conservation Alliance, Bonner County Commissioner, and representatives from local Industrial Timber, Agriculture, and Chamber of Commerce).

Department of Environmental Quality, Boise – Technical Review.

Environmental Protection Agency – EPA staff assigned to review Priest River Subbasin TMDLs.

Alliance for the Wild Rockies

Kalispel Tribe of Indians.

Kootenai Environmental Alliance.

Appendix D. Public Comment

The draft *Addendum* report was published in September 2002 with document distribution as shown in Appendix C. There was an advertised public comment period from October 7 through November 8, with the Notice of Request shown below listed in four newspapers: Priest River Times, Gem State Miner, Bonner County Daily Bee, and Spokesman Review. There was also a discussion of comments received and a public forum for further comments at a December 5th meeting of the Panhandle Basin Advisory Group (BAG).

Four comment packages were received and these were from: EPA, Kootenai Environmental Alliance, Alliance for the Wild Rockies, and IDL, along with a review by the DEQ Technical Services unit in Boise. Each comment letter followed by a DEQ response to comments are listed in Appendix D.

Based on comments to the draft *Addendum*, two major changes were made to the draft document. Because of changes in recommendations regarding the §303(d) list along with inclusion of two sediment TMDLs not presented in the original draft, DEQ decided to provide another 30 day public comment period for review of a revised draft (February 5 to March 7, 2003). One comment of significance was received, a letter from Stimson Lumber Company.

Notice of Request for Public Comment

The Idaho Department of Environmental Quality (DEQ) is seeking public comment on total maximum daily loads (TMDLs) and changes to Idaho's 303(d) list for the Priest River Subbasin. The TMDLs address water quality problems for waters on the 303(d) list and are designed to bring the waters into compliance with state and federal water quality standards.

Specifically, the draft TMDLs establish a sediment allocation for Reeder Creek and East River. There is also a draft water temperature TMDL and temperature allocation for East River. DEQ is also proposing that Binarch Creek be removed from Idaho's 303(d) list, and that sediment be removed as a pollutant of concern from the 303(d) listing of Lower Priest River.

The draft TMDLs and de-listings will be discussed at the December 5, 2002 Panhandle Basin Advisory Group (BAG) meeting to be held at the Idaho Department of Fish and Game, 2750 Kathleen Ave., Coeur d'Alene, Idaho. BAG meetings are open to the public.

Copies of the draft document *Addendum – Priest River Subbasin Assessment and TMDL*, which presents the proposed TMDLs and de-listings, will be available for review, Monday, October 7, 2002, through Friday, November 8, 2002, at DEQ's Coeur d'Alene Regional Office, the Priest River Library, and on DEQ's web page: www.deq.state.id.us. Written comments may be submitted through November 8, 2002, to:

Glen Rothrock
DEQ Coeur d'Alene Regional Office
2110 Ironwood Parkway, Suite 100
Coeur d'Alene, ID 83814
(208) 769-1422
Email: grothroc@deq.state.id.us

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 Sixth Avenue
Seattle, WA 98101

November 15, 2002

Reply To
Attn Of: OW-134

Mr. Glen Rothrock
DEQ Coeur d'Alene Regional Office
2110 Ironwood Parkway
Coeur d'Alene, ID 83814-2648

Dear Mr. Rothrock:

Thank you for the opportunity to review the draft Addendum Priest River Subbasin Assessment (SBA) and Total Maximum Daily Load (TMDL) that was released for public comment on October 7, 2002. Following are the U.S. Environmental Protection Agency (EPA) comments on this draft Addendum SBA and TMDL.

This draft document presents the SBA for portions of the Priest River Subbasin that required further data collection and analysis then was contained in the October 2001 submittal to EPA. This document also contains the Reeder Creek sediment TMDL, the East River sediment TMDL, and the East River temperature TMDL. EPA would like to acknowledge the significant effort that went into developing this SBA and TMDL. The following comments provide some suggestions on changes to help clarify the SBA and TMDLs.

Executive Summary

Page 5, Table B. Summary of Subbasin Assessment Outcomes

This table is helpful in understanding the outcomes of the SBA and the justifications for why a TMDL has not developed at this time or why a de-listing recommendation has been made. However, the appropriate avenue for de-listing is for DEQ to remove this water from the 303(d) list during the 2002 list process, following appropriate public notice and opportunity for comment, and present information to support their proposal. If EPA approves the removal of this water from the 303(d) list, Idaho would not be required to develop a TMDL for it. When evaluating whether to remove this water from the 2002 303(d) list, DEQ must assemble and evaluate all existing and readily available water quality-related data and information.

Key Findings

The Key Findings section (pgs. 4-13) gives a comprehensive overview of the waterbodies addressed in this document. The recommendations were extremely well presented and clearly articulated. DEQ is encouraged to present this information with the 2002 303(d) list to explain the reasons for listing and de-listing the waters covered in this SBA.

Binarch Creek

Page 36, Water Column Data

Given the "unusually diverse assemblage of aquatic plants and animals" in Binarch Creek, it seems that water quality and bacteria samples as well as pH or DO measurements should be taken to better evaluate this system.

Pages 40-41, Status of Beneficial Uses

It is stated that sediment loads for the Binarch Creek watershed are low to moderate on a basin wide comparison and it is being recommended that Binarch Creek be removed from the 303(d) list for sediment. However, the two mid-lower WBAG II Sites have an average CR that fails and the mid and upper sites have no data available for SMI and SHI. It is also stated on page 35 that two of the BURP sites were located within beaver complexes that were "sediment laden environments."

Please provide more information regarding the status of beneficial uses in Binarch Creek, because the information currently presented does not fully support the recommendation for sediment de-listing.

East River Main Stem for Sediment, and East River System for Dissolved Oxygen

Page 48, Status of Beneficial Uses

EPA agrees with the recommendation calling for the collection of bacteria data, given the primary contact recreation use status.

Lower Priest River

Pages 55-67

The Lower Priest River is currently listed for sediment, yet in the SBA there is little discussion about sediment except for the following. On page 58, it is stated that hay cropping and some cattle grazing is occurring along the river, as is some small-scale timber operations. Observations from the river bank surveys show that there are several segments of raw banks with signs of recent erosion and chucks of upper bank broken off and slumped into the high water zone. It is also suggested that in a couple of cases the bank slumping was associated with fill slopes of adjacent roads.

On page 67, it is recommended that the Lower Priest River be de-listed for sediment, but there is very little information presented in the SBA to support or counter this recommendation. Please provide more information regarding the status of beneficial uses in the Lower Priest River, because the information currently presented does not fully support the recommendation for sediment de-listing.

Sediment TMDL for Reeder Creek

Pages 73-82

Page 73, Target Selection

Based upon the information presented on pages 172-175 in the October 2001 Priest River SBA and TMDL, EPA agrees with the analysis that supports the loading capacity being set at 50% above background for the listed waters of the Priest River watershed.

Page 75, Table 17

Table 17 is a little confusing in that it is hard to conclude that the Natural Sediment Load calculated in the top portion of the table is also included in the Current Sediment Load portion of the table. Perhaps a note could be included at the bottom of the table that could direct the reader to the section of the TMDL that describes how the natural sediment load was included in the current sediment load.

Page 78, Table 18

The Sediment Allocation column in Table 18 should say "Includes Natural Background" to help clarify that this amount is not in addition to natural background.

Page 80, Table 19

It is a very disturbing precedent to allow a land ownership/management group to discharge additional sediment into a system that is requiring a sediment reduction of 120 tons/year, as is the case for the Industrial Timberlands. In the paragraph directly below this table, it is stated that there is a two-mile stretch of Forest Service road that accesses Stimson timberland which currently has sediment yield problems. It is suggested that the USFS and Stimson need to work together to correct this problem, but given that Industrial Timber Lands can actually discharge 13 additional tons/year of sediment, what incentive would Stimson have to fix this problem? It would seem to make more sense to give the Industrial Timberlands an allocation that equals their current sediment load, holding any additional load in reserve. The reserve could be used for future potential. Another option would be to incorporate this 13 tons/year into a greater margin of safety that could allow the system to meet reductions more quickly.

East River Sediment TMDL

Pages 83-95

Pages 86-87, Tables 20 and 21

Similar to Table 17, Tables 20 and 21 are a little confusing in that it is hard to conclude that the Natural Sediment Load calculated in the top portion of the table is also included in the Current

Sediment Load portion of the table. Perhaps a note could be included at the bottom of the table that could direct the reader to the section of the TMDL that describes how the natural sediment load was included in the current sediment load.

Page 91, Table 22

The Sediment Allocation column in Table 22 should say "Includes Natural Background" to help clarify that this amount is not in addition to natural background.

East River Temperature TMDL

Pages 96-113

Page 98, Target Selection

For clarity, please include a map that shows the location of the reference site in relation to East River.

EPA appreciates the opportunity to comment on the draft Addendum Priest River Subbasin Assessment (SBA) and TMDL and looks forward to the final submission. If you have any questions regarding the comments on the draft TMDL, please contact me at 206-553-6326.

Sincerely,

Tracy Chellis
TMDL Project Manager

January 24, 2003

Tracy Chellis
TMDL Project Manager
U.S. Environmental Protection Agency, Region 10
1200 Sixth Avenue
Seattle, WA 98101

Dear Tracy:

Thank you for providing comments on the draft report, *Addendum – Priest River Subbasin Assessment and Total Maximum Daily Load*. Four letters of comment were received by the end of the extended public comment period. The comments received resulted in two major changes to the draft *Addendum* as incorporated in a revised draft document (enclosed): 1) sediment was retained as a pollutant of concern for the Binarch Creek §303(d) listing, and a sediment TMDL was prepared (pages 89-96), and 2) sediment was retained as a pollutant of concern for the Lower Priest River §303(d) listing, and a sediment TMDL was prepared (pages 125-136). There will be an additional public comment period for this revised draft. If your organization has any further comments, please supply them to me by March 7, 2003.

The comments as we understood them from EPA are listed below, followed by DEQ's response. If a revision was made to the draft *Addendum* report, this is noted. All comment letters received and DEQ's response letters are included in Appendix D of the revised draft subbasin assessment and TMDL document.

Comment 1. Table B lists stream segments recommended for 303(d) de-listing. However, the appropriate avenue for de-listing is for DEQ to remove this water from the 303(d) list during the 2002 list process, following appropriate public notice and opportunity for comment.

Response 1. DEQ is aware of the procedure for §303(d) de-listing. The draft 2002 DEQ §303(d) list will be available in early 2003 for public comment. Stream segments removed from the §303(d) list from the Priest River Subbasin will have the backing of subbasin assessments that evaluate all existing and readily available water-quality related data and information.

Comment 2. EPA suggests that given the "unusually diverse assemblage of aquatic plants and animals" in Binarch Creek, it would seem that water quality and bacteria samples as well as pH or DO measurements should be taken to evaluate this system.

Response 2. This suggestion will passed on to the US Forest Service as part of their stream evaluation within the Research Natural Area. At this point in time, DEQ has completed its reconnaissance monitoring for beneficial use support in Binarch Creek.

Comment 3. In reference to the recommended removal of Binarch Creek from the 303(d) list, EPA cites from the *Addendum* that "the two mid-lower WBAG II sites have an average CR that fails and the mid and upper sites have no data available for SMI and SHI. It is also stated on page 35 that two of the BURP sites were located within beaver complexes that were sediment laden environments." EPA's comment is to provide more information regarding the status of beneficial uses in Binarch Creek, because the information currently presented does not fully support the recommendation for sediment de-listing.

Response 3. There are no additional water-quality related sources of information for Binarch Creek outside that presented in the subbasin assessment. As stated in the introduction of this letter, the final report retains Binarch Creek on the §303(d) list and a sediment TMDL has been prepared.

Comment 4. In reference to the recommended removal of sediment from the Lower Priest River 303(d) listing, EPA states that there is very little discussion about sediment except for some references on page 58. EPA comments that there is very little information presented in the SBA to support or counter the recommendation of sediment de-listing. EPA requests that DEQ provide more information regarding the status of beneficial uses in the Lower Priest River, because the information currently presented does not fully support the recommendation for sediment de-listing.

Response 4. The *Addendum* section on Lower Priest River refers the reader to additional land use and sediment source information presented in the initial *Priest River Subbasin Assessment and TMDL* (published October 2001). The *Addendum* report also refers the reader to report sections of Lower West Branch Priest River and East River, two major watersheds draining into Lower Priest River which both had comprehensive sediment source information presented, as well as sediment TMDLs.

There are no additional water-quality related sources of information for Lower Priest River outside that presented in the subbasin assessment. As stated in the introduction of this letter, the final report retains sediment as a pollutant of concern on the Lower Priest River §303(d) listing, and a sediment TMDL has been prepared.

Comment 5. Tables 17, 20, and 21 are a little confusing in that it is hard to conclude that the Natural Sediment Load calculated in the top portion of the table is also included in the Current Sediment load portion of the table.

Response 5. These tables have been modified for clarity.

Comment 6. This EPA comment refers to Table 19, Reeder Creek TMDL, in which the calculated current sediment load from Industrial Timber lands is 12 tons/year less than the sediment allocation (1.5 times natural background load). EPA states their concern of setting a precedent to allow land ownership/management groups to discharge additional sediment into a system which requires a sediment reduction TMDL. EPA offers a solution of giving the Industrial Timber lands an allocation that equals their current load.

Response 6. The reason that Industrial Timber lands received a calculated –12 tons/year sediment reduction is that within the 0.9 mi^2 of these private lands, there are no documented roads, and thus no sources of current sediment load (current = background). The TMDL calculations were modified to give Industrial Timber lands a sediment allocation of 25 tons/year, equal to the calculated current sediment load. This assigns a “no net sediment increase” to future land use activities on these private lands. The gain in sediment load reduction of 12 tons/year was explained and is held in reserve.

Sincerely,

Glen Rothrock
DEQ Watershed Coordinator

RECEIVED
NOV 0 8 2002
DEQ-Coeur d'Alene
Regional Office

Kootenai Environmental Alliance

November 6, 2002

Glen Rothrock, DEQ Watershed Coordinator
Department of Environmental Quality
2110 Ironwood Parkway,
Coeur d'Alene, ID 83814-2648

Dear Mr. Rothrock:

The following comments are submitted on behalf of the Kootenai Environmental Alliance on the draft report, *Addendum-Priest River Subbasin Assessment and Total Maximum Daily Load.* The report recommends that Binarch Creek and Lower Priest River be removed from 303(d) list and that sediment is no longer the pollutant of concern in these waters. We believe that these streams should not be de-listed.

A. Binarch Creek:

The analysis on pages eight and 41 of the draft indicate DEQ and USFS electro-fishing results show a dominance of westslope cutthroat trout except near the mouth of the Creek. The final report for Binarch Creek should include information that would indicate whether the populations of cutthroat trout in the watershed are increasing or decreasing.

The analysis on pages eight and 41 also indicate sediment load calculations in the watershed are low. The analysis on page 40 described a 1998 USFS habitat survey over much of the Creek. The following statement is included in the analysis on page 40. "Where gravel substrate was discovered in B3, B4, and E4 channel types (including pool tailouts), measured fines in these channel types tended to be high, greater than 50% of 1 - 8 mm size grains."

The final report should indicate whether the sediment calculations performed in the watershed include areas where the B3, B4, and E4 channel types were located. The final report should also indicate whether the estimated (not measured) peak flows of 55 to 60 cfs in the watershed could result in channel instability and negatively impact streambeds and fisheries habitat in any sections of Binarch Creek.

The following is an excerpt from a February 13, 2001 letter from Barry Rosenberg to Glen Rothrock regarding the status of Binarch Creek. We have included it in this letter because we believe that these concerns have not been adequately addressed in the *Addendum Priest River Subbasin Assessment and Total Maximum Daily Load*, September 2002.

> "Binarch Creek should not be de-listed. According to the IPNF WATSED model it is experiencing very high peak flows of 15% over

PO Box 1598, Coeur d'Alene, ID 83816-1598 • phone/fax (208) 667-9093 • kea@kealliance.org

natural. The Douglas fir Beetle timber sale (DFB) will increase these flows to 17% according to WATSED. The Project files for the DFB Project describes Binarch Creek and the amount of logging that has occurred in the last 25 years.

> With the exception of reach 1, the B channel type reaches [Binarch Creek] have extremely poor pool habitat due to the aggradation of sediment." Project files P-FI_9.
>
> The Binarch Creek drainage is a complicated drainage that has a Forest Service Designated Research Natural Area (RNA) in the top 1/3 of the drainage and also has had considerable harvesting in the last 25 years over the other 2/3 of the drainage (the majority of the harvesting was regeneration harvesting)." Project files P-WA_4

The DFB Project proposes to obliterate only 0.5 mile of road out of the 50.4 miles of road currently in the drainage while building 1.3 miles of temporary road (0.5 on high-risk soils) and logging 496 acres. FEIS Project Files, P-WA_4. Like Lamb Creek, most of the logging is occurring in the headwater tributaries.

Most of the logging will be clearcut type regeneration logging, and also like Lamb Creek, is not limited to the removal of dead and dying Douglas fir. In fact in many of the units more live non-Douglas fir will be logged than beetle attacked Douglas fir. The impacts of this timber sale should be quantitatively assessed before this stream is considered for de-listing. It would be foolish to jeopardize a genetically pure population of westslope cutthroat trout and a chance of stream recovery by de-listing this stream."

The following is an excerpt from a February 23, 2001 letter from EPA official, Lee Woodruff to Glen Rothrock. Again, we are including this excerpt because we feel that the *Addendum* fails to adequately address Mr. Woodruff's concerns.

" **Binarch Creek**

Although there is conflicting information, it would appear that Binarch Creek does not fully support its uses, and should not be de-listed. The MBI scores within the beaver complex are admittedly difficult to interpret, but the IDEQ fish survey results in 2000 did not meet full support of salmonid spawning, and the USFS indicates that poor habitat exists in B channels due to sediment aggradation, due in part to fairly extensive timber harvest and the associated road network. On the other hand anecdotal information from the USFS suggests that brook trout and cutthroat are "self-propagating," though it is unclear whether these populations are just hanging on, or are fully supported. We recommend retaining this water on the 303(d) list and writing a sediment TMDL, or revising the TMDL schedule and collecting additional information to better assess beneficial use support status." P. 1

B. Lower Priest River:

The analysis on page 13 of the draft mentioned habitat degradation of historical tributary spawning beds of fluvial and adfluvial cutthroat trout and bull trout. The fisheries analysis on page 59 included the following sentences. "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. Local anglers state that on occasion a bull trout is caught. The river is considered of high importance in bull trout recovery plans (Panhandle Basin

Bull Trout TAT 1998)." On page 65 it was stated the River is a migratory corridor for adult bull trout that spawn in the East River drainage.

The final report for Lower Priest River should provide information on the quantities of sediment, fine and/or coarse, that enter the river system as a result of rain-on-snow and spring runoff events described on page 60 of the draft.

I (Barry Rosenberg) have personally witnessed consistent, extremely high levels of turbidity in the Upper West Branch and Lower West Branch of the Priest River during rain-on-snow events and spring runoff. The turbidity levels are so high in Goose Creek, a tributary to the Upper West Branch, that its consistency appears to be more like chocolate soup than water. This sediment is being deposited into the lower Priest River.

During the 2000 spring runoff I went to the confluence of the Lower West Branch and the Priest River. I witnessed a large turbid plume flowing from the Lower West Branch into the Priest River. The assessment also acknowledges that large quantities of sediment are being deposited in the lower Priest River from streambank erosion and from sediment producing activities in the drainages of the east side tributaries.

Introductions of such large quantities of sediment into the river system are likely to have resulted in cumulative degradation to fisheries habitat. Due to the importance of the River in bull trout recovery plans, and it being a bull trout migratory corridor, the effect on sediment in the River should be re-evaluated in terms of it being considered as a pollutant of concern. A more detailed study is warranted.

Thank you for your consideration of these comments.

Respectfully submitted,

Barry Rosenberg

Barry Rosenberg, Executive Director and for

B.R.

Mike Mihelich, Forest Watch Coordinator

Cc: Christine Psyk

Lee Woodruff

January 24, 2003

Barry Rosenberg, Executive Director
Kootenai Environmental Alliance
P.O. Box 1598
Coeur d'Alene, ID 83816-1598

Dear Barry:

Thank you for providing comments on the draft report, *Addendum – Priest River Subbasin Assessment and Total Maximum Daily Load*. Four letters of comment were received by the end of the extended public comment period. The comments received resulted in two major changes to the draft *Addendum* as incorporated in a revised draft document (enclosed): 1) sediment was retained as a pollutant of concern for the Binarch Creek §303(d) listing, and a sediment TMDL was prepared (pages 89-96), and 2) sediment was retained as a pollutant of concern for the Lower Priest River §303(d) listing, and a sediment TMDL was prepared (pages 125-136). There will be an additional public comment period for this revised draft. If your organization has any further comments, please supply them to me by March 7, 2003.

The comments as we understood them from the Kootenai Environmental Alliance are listed below, followed by DEQ's response. If a revision was made to the draft *Addendum* report, this is noted. All comment letters received and DEQ's response letters are included in Appendix D of the revised draft subbasin assessment and TMDL document.

Comment 1. The analysis on pages 8 and 41 for Binarch Creek indicate that DEQ and USFS electro-fishing results show a dominance of westslope cutthroat trout except near the mouth. The final report should include information that would indicate whether the populations of cutthroat trout in the watershed are increasing or decreasing.

Response 1. There are insufficient historic fish surveys to determine the population trend of cutthroat trout.

Comment 2. The analysis on pages 8 and 41 indicate the sediment load calculations in the Binarch Creek watershed are low. The analysis on page 40 described a 1998 USFS habitat survey over much of the creek. The following statement was included in the analysis, "where gravel substrate was discovered in B3, B4, and E4 channel types (including pool tailouts), measured fines in these channel type tended to be high, greater than 50% of 1 – 8 mm size grains." The final report should indicate whether the sediment calculations performed in the watershed include areas where the B3, B4, and E4 channel types were located.

Response 2. Sediment calculations included the entire road network of the Binarch Creek watershed. Analysis of measured percent fines has been changed in recent DEQ protocol (Water Body Assessment Guidance, Second Edition, 2002). Percent fines are now grain sizes ≤2 mm. Percent fines from the 1998 USFS survey are considered moderate.

Comment 3. The final report should also indicate whether the estimated (not measured) peak flows of 55 to 60 cfs in the watershed could result in channel stability and negatively impact streambeds and fisheries habitat in any sections of Binarch Creek.

Response 3. There is insufficient hydrologic analysis from the USFS to determine impact on channel stability and impact to fisheries habitat.

Comment 4. KEA cites excerpts from a letter sent to DEQ on February 13, 2001 as comment to the original *Priest River Subbasin Assessment and TMDL* (October 2001). KEA believes these comments are still relevant to the *Addendum* document because the concerns in the comments have not been adequately addressed. The comments are as follows:

a. Binarch Creek should not be de-listed. According to the IPNF WATSED model it is experiencing very high peak flows of 15% over natural. The Douglas fir Beetle (DFB) timber sale will increase these flows to 17% according to WATSED.

b. With the exception of reach 1, the B channel type reaches have extremely poor pool habitat due to the aggradation of sediment, as cited in Project files P-FI_9.

c. Outside of the Research Natural Area, the Binarch Creek drainage has had considerable timber harvesting in the last 25 years (the majority of the harvesting was regeneration harvesting), as cited in Project files P-WA_4.

d. The DFB Project proposes to obliterate only 0.5 mile of road out of the 50.4 miles of road currently in the drainage while building 1.3 miles of temporary road (0.5 miles on high-risks soils) and logging 496 acres, as cited in Project files P-WA_4.

e. Most of the DFB logging will be clearcut type regeneration logging, and not limited to the removal of dead and dying Douglas fir. The impacts of this timber sale should be quantitatively assessed before this stream is considered for de-listing. It would be foolish to jeopardize a genetically pure population of westslope cutthroat trout and a chance of stream recovery by de-listing this stream.

Response 4. After reexamining the Douglas-fir beetle EIS, the cited runoff modification was 11% over natural, but this was a table combining Lamb Creek and Binarch Creek. The 17% referred to current hydrologic openings. In regards to references made of the Douglas-fir beetle timber sales, this timber activity did not occur within the Binarch Creek watershed, and there is no current USFS effort to reissue an EIS for proposed cuts in this watershed. The current active road density is around 2.2 mi/mi^2 compared to a historic active road density of 5.9 mi/mi^2. Much of the historic network has been closed and has reestablished vegetative stability. Road 639N adjacent to the lower half of the stream has been converted to a hiking trail.

Comment 5. The KEA comment package cites excerpts from a February 23, 2001 letter from Lee Woodruff, EPA. The EPA comment letter includes reference to: MBI scores being difficult to interpret; DEQ fish surveys in 2000 did not meet full support of salmonid spawning; and USFS indicates that poor habitat exists in B channels due to sediment aggradation, due in part to fairly extensive timber harvests and the associated road network. The EPA letter concludes by recommending that Binarch Creek be retained on the 303(d) list and writing a sediment TMDL, or revising the TMDL Schedule and collecting additional information to better assess beneficial use support status.

Response 5. As stated in the introduction of this letter, the final report retains Binarch Creek on the §303(d) list and a sediment TMDL has been prepared.

Comment 6. The final report for Lower Priest River should provide information on the quantities of sediment, fine and/or course, that enter the system as a result of rain-on-snow and spring runoff events described on page 60 of the draft.

Response 6. The sediment TMDL for Lower Priest River (see response 7) shows estimated annual sediment input from the Lower West Branch watershed, the East River watershed, and from eroding riverbanks. A sediment TMDL will be developed for Upper West Branch following the listing of this stream on the 2002 DED §303(d) list.

***Comment** 7*. Personnel accounts are given on observed high amounts of turbidity in the Upper West Branch, Goose Creek, and Lower West Branch during rain-on-snow events and spring runoff. This sediment is being deposited into Lower Priest River. Introductions of such large quantities of sediment into the river system are likely to have resulted in cumulative degradation to fisheries habitat. Due to the importance of the river in bull trout recovery plans, and it being a bull trout migratory corridor, the effect on sediment in the river should be re-evaluated in terms of it being considered as a pollutant of concern. A more detailed study is warranted.

***Response** 7*. As stated in the introduction of this letter, the final report retains sediment as a pollutant of concern on the Lower Priest River §303(d) listing, and a sediment TMDL has been prepared.

Sincerely,

Glen Rothrock
DEQ Watershed Coordinator

RECEIVED

DEC 0 2 2002

DEQ-Coeur d'Alene
Regional Office

November 28, 2002

Liz Sedler
Alliance for the Wild Rockies
PO Box 1203
Sandpoint, ID 83864

Glen Rothrock
DEQ Watershed Coordinator
IDEQ
2110 Ironwood Parkway
Coeur d'Alene, ID 83814

RE: Comments on the draft Addendum - Priest River Subbasin Assessment and TMDL

Dear Glen,

I am submitting these comments on the draft Addendum - Priest River Subbasin Assessment and TMDL (Addendum) on behalf of the Selkirk Conservation Alliance (SCA) and Idaho Sporting Congress (ISC) as well as the Alliance for the Wild Rockies (AWR).

We appreciate the comprehensive body of available information that you have collected in your effort to arrive at a well-informed conclusion regarding the beneficial use status of the four 303(d) listed water bodies in the Priest River Basin that were delayed for determination in the final Priest River Subbasin Assessment and TMDL, October 2001.

Unfortunately, as we have stated in previous comments regarding the WBAG protocol and its successor WBAG II, we believe that strong evidence of impairment from sources other than BURP data collection as well as BURP is not considered in determining beneficial use support status due to flaws within the protocol. Data indicating impairment is meaningful only if considered during data processing in the WBAG. The fact that aquatic habitat degradation is not a major consideration in determination of beneficial use support continues to be a problem. We contend that WBAG results are biased toward full support as a result of that and other flaws. Had habitat been a prominent consideration, as well as other major flaws in the protocol corrected, we believe that Trapper Creek, Two Mouth Creek, Tango Creek, Lamb Creek and the North and Middle Forks of the East River would have been judged to Not Fully Support their beneficial uses; degraded water quality and aquatic habitat in these streams would have been improved as a result of development and implementation of TMDLs.

Conclusions in the Addendum

The determination that Reeder Creek is not fully supporting its beneficial uses due to sediment and preparation of a TMDL are a step forward in restoring one of the many impaired streams in the Priest River Basin (PRB). The preparation of a temperature

TMDL and its implementation will likewise be a step toward restoration of native fish in the PRB.

The determination that Binarch Creek is not impaired by sediment provides an example of a stream that fell through the cracks as a result of shortcomings in the BURP/ WBAG process. Habitat, macroinvertebrates and fish were apparently not assessed above the RNA by DEQ. However the Forest Service "comprehensive habitat survey" in 1998 found that "[w]here gravel substrate was discovered in B3, B4 and E4 channel types (including pool tailouts), measured percent fines tended to be high, greater than 50% of 1-8 mm size grains." Addendum at 40. This indicates that sediment is likely a problem in the stream reaches in Binarch Creek that are outside the marshy, slow water reaches dominated by beaver activity that BURP is not designed to assess.

The Forest Service information was apparently not used in support status determination because it didn't fit the exact criteria required for incorporating "outside" data. The failure to consider hard data collected by the Forest Service, that is likely as credible as BURP data, is one of the many flaws in the WBAG protocol. The Forest Service data should be re-considered and/or BURP surveys conducted outside the marshy, undefined channel reaches to determine whether Binarch Creek deserves a sediment TMDL.

Addressing the temperature problems in Binarch Creek through eventual implementation of a temperature TMDL will be a small step toward helping this stream recover from excessive logging (43% of the drainage) and a road density (2.2 mi/sqmi of active roads plus an unknown density of inactive roads) that is likely a source of higher than natural sediment delivery to the stream.

We concur with the decision to do sediment and temperature TMDLs for the Middle Fork, North Fork and mainstem of the East River.

The de-listing of Lower Priest River for sediment relies on the IREAF (Grafe 2002) protocol which, as pointed out in the Addendum, does not include a sediment monitoring protocol. The IREAF is comprised of the RMI (river macroinvertebrate index), the RDI (river diatom index) which rely on BURP data, the RFI (river fish index) and the RPI (river physicochemical index). Addendum at 59. None of the river indexes actually measure sediment.

The Addendum describes the results of a river bank erosion survey conducted in 2000. Observations indicate that there are many obvious, major sources of sediment delivery to the Lower Priest River: "...several segments of raw banks with signs of recent erosion and even chunks of upper bank broken off and slumped into the high water zone. ...high raw banks with a thick layer of gravelly sand and silt loam... This condition is susceptible to slippage and mass failure, and failures are commonly observed along the river course. In a few cases bank slumping was associated with fill slopes of adjacent roads."

Add to these sediment sources the sediment that flows into the river from the East River and Reeder Creek, as well as other tributaries that are not listed for sediment but nonetheless add to the sediment that flows into Lower Priest River, and there can be no doubt that sedimentation in this river segment greatly exceeds historic, natural levels. The massive amount of sediment is more than likely a source of impairment to beneficial uses.

Furthermore, there is only one BURP site on 35.3 miles of river, which is hardly an adequate sampling of the data that the IREAF does collect. Fish data was collected by USGS at river mile 3.8 in the fall of 1998 and by IDFG at selected reaches from river mile 7.5 to the mouth in April, 2002. Addendum at 64. Again this is hardly a representative sampling of fish presence in the river. Lower Priest River should not be removed from consideration for a sediment TMDL until a more comprehensive survey is completed. The survey should include actual measurement of fine sediment levels in the river.

Lower Priest River once supported a thriving native cutthroat fishery which is now apparently depressed. Bull trout still use it a migratory corridor. We agree with the Addendum's conclusion that cold water aquatic life is an appropriate designated use for the Lower Priest River. Addendum at 65, 66.

Thank you for the opportunity to comment.

Sincerely,

Liz Sedler

cc: EPA

January 24, 2003

Liz Sedler
Alliance for the Wild Rockies
P.O. Box 1203
Sandpoint, ID 83864

Dear Liz:

Thank you for providing comments on the draft report, *Addendum – Priest River Subbasin Assessment and Total Maximum Daily Load*. Four letters of comment were received by the end of the extended public comment period. The comments received resulted in two major changes to the draft *Addendum* as incorporated in a revised draft document (enclosed): 1) sediment was retained as a pollutant of concern for the Binarch Creek §303(d) listing, and a sediment TMDL was prepared (pages 89-96), and 2) sediment was retained as a pollutant of concern for the Lower Priest River §303(d) listing, and a sediment TMDL was prepared (pages 125-136). There will be an additional public comment period for this revised draft. If your organization has any further comments, please supply them to me by March 7, 2003.

The comments as we understood them from the Alliance for the Wild Rockies (AWR) are listed below, followed by DEQ's response. If a revision was made to the draft *Addendum* report, this is noted. All comment letters received and DEQ's response letters are included in Appendix D of the revised draft subbasin assessment and TMDL document.

Comment 1. The Forest Service habitat survey of Binarch Creek in 1998 was referenced, citing that "where gravel substrate was discovered in B3, B4 and E4 channel types (including pool tailouts), measured percent fines tended to be high, greater than 50% of 1 – 8 mm size grains." The AWR comment states that this indicates that sediment is likely a problem in the stream reaches in Binarch Creek that are outside the marshy, slow water reaches dominated by beaver activity that BURP is not designed to assess. The AWR comments that the Forest Service information was not used in support status determination because it did not fit the exact criteria required for incorporating "outside" data, and that use of this data should be reconsidered to determine whether Binarch Creek deserves a sediment TMDL.

Response 1. As stated in the introduction of this letter, the final report retains Binarch Creek on the §303(d) list and a sediment TMDL has been prepared. Part of this decision was based on reconsidering the 1998 USFS habitat survey as indicating that sediment is a problem.

Comment 2. The de-listing of Lower Priest River for sediment relies on the IREAF protocol that does not include a sediment monitoring protocol. None of the river indexes (RMI, RDI, RFI, and RPI) actually measure sediment.

Response 2. The measurements of certain habitat parameters related to sediment used in wadable streams are not practical or even possible in medium to large size rivers. The biological indexes of RMI and RDI do include metrics that incorporate sensitivity to sedimentation.

Comment 3. The *Addendum* describes the results of a river bank erosion survey conducted in 2000 where there are many obvious, major sources of sediment delivery from the banks into Lower Priest River. Add to this sediment source the sediment that flows into the river from tributaries and there can be no doubt that sedimentation in this river segment greatly exceeds historic, natural levels.

Response 3. The final report includes erosion estimates from the 2000 bank survey that were not available in the draft report. As stated in the introduction of this letter, the final report retains sediment as a pollutant of concern on the Lower Priest River §303(d) listing, and a sediment TMDL has been prepared. This TMDL includes riverbank erosion and watershed sediment input from Lower West Branch and East River.

Comment 4. There is only one BURP site on 35.5 miles of river which is hardly an adequate sampling of the data that the IREAF does collect. The fish data collected by USGS and IDFG is also a hardly representative sampling of fish presence in the river. Lower Priest River should not be removed from consideration for a sediment TMDL until a more comprehensive survey is completed. The survey should include actual measurement of fine sediment levels in the river.

Response 4. The sediment TMDL for Lower Priest River recommends additional BURP sites for monitoring during the TMDL Implementation phase. Fisheries evaluation is difficult within the river due to insufficient in-and-out points for river electro-fishing boats. The TMDL recommends that IDFG conduct ecological evaluations for Lower Priest River and establish cold water fisheries targets.

Sincerely,

Glen Rothrock
DEQ Watershed Coordinator

IDAHO DEPARTMENT OF LANDS
3780 Industrial Ave. South
Coeur d'Alene, ID 83815
Phone (208) 769-1525 Fax (208) 769-1524
WINSTON WIGGINS - DIRECTOR

November 8, 2002

Glen Rothrock
Idaho Department of Environmental Quality
2110 Ironwood Parkway
Coeur d'Alene, Idaho 83814-2648

Dear Glen,

Thank you for the opportunity to comment on the draft report, *Addendum – Priest River Subbasin Assessment and Total Maximum Daily Load.* This draft has been reviewed by personnel from the Idaho Department of Land's (IDL's) Priest Lake Supervisory Area and IDL's Interdisciplinary Team (ID Team). The ID Team has prepared a report of their comments which is attached (Attachment 1).

IDL would like to have the following points considered in the final report. Documentation and/or justification for these points are more fully presented in the ID Team report.

1. The *Addendum* cites data from *draft* Idaho Department of Lands Cumulative Watershed Effects (CWE) Reports. Reviews of these reports indicated some errors in the calculation of the Hazardous Risk Ratings for the North Fork and the Middle Fork of East River. These have been corrected and new data is shown in the ID Team comments.

2. IDL questions the need for a sediment TMDL process on the East River. The Middle Fork and North Fork of the East River represent 95% of the drainage area of the East River. The Middle Fork and North Fork have been determined to be in full support of beneficial uses. IDL acknowledges adverse conditions in the main stem of the East River, but believes the causes are attributable to land management activities directly adjacent to the main stem.

3. Page 49 of the *Addendum* states "There is also evidence of an accelerated spring peak flow from the Middle Fork East River due to watershed canopy removal". We do not believe this statement can be substantiated by existing documentation.

4. Recent fish surveys indicate that the Middle Fork of East River and its tributaries are supporting thriving populations of bull trout and other salmonids. The bull trout in particular appears to be increasing in numbers.

Glen Rothrock
November 8, 2002
Page 2 of 2

5. Figures 8b. and 12b do not accurately depict the state grazing lease area. There no longer is any active grazing in the Middle Fork and North Fork drainages. The legal description for the grazing lease within the main stem of East River drainage is provided in the ID Team report. Attachment 2 shows the correct lease boundary.

In conclusion, the IDL questions if a TMDL listing for sediment is warranted for the East River drainage. We recommend focusing time, energy and money on identifying and mitigating the land use activities that are having a direct impact on the main stem of the East River. IDL will be more than willing to participate in any cooperative projects directed towards fully supporting beneficial uses in the East River.

Sincerely,

Roger C. Jansson

Roger C. Jansson
Operations Chief – North

Attachment 1– ID Team Comments
Attachment 2 – Grazing Lease Boundary

Cc: Winston Wiggins, Director
Ron Litz, AD-Forestry & Fire
Mick Schanilec, AS-Priest Lake
Craig Foss, BC-Forestry Assistance
Scott Marshall, Engineering Geologist
Douglass Fitting, Forest Hydrologist
Chris Tretter, Fish Biologist

January 24, 2003

Roger Jansson
Operations Chief - North
Idaho Department of Lands
3780 Industrial Ave. South
Coeur d'Alene, ID 83815

Dear Roger:

Thank you for providing comments on the draft report, *Addendum – Priest River Subbasin Assessment and Total Maximum Daily Load*. Four letters of comment were received by the end of the extended public comment period. The comments received resulted in two major changes to the draft *Addendum* as incorporated in a revised draft document (enclosed): 1) sediment was retained as a pollutant of concern for the Binarch Creek §303(d) listing, and a sediment TMDL was prepared (pages 89-96), and 2) sediment was retained as a pollutant of concern for the Lower Priest River §303(d) listing, and a sediment TMDL was prepared (pages 125-136). There will be an additional public comment period for this revised draft. If your organization has any further comments, please supply them to me by March 7, 2003.

The comments as we understood them from IDL are listed below, followed by DEQ's response. Comments are addressed in the IDL cover letter as detailed within the *Attachment 1 – ID Team Comments*. If a revision was made to the draft *Addendum* report, this is noted. All comment letters received and DEQ's response letters are included in Appendix D of the revised draft subbasin assessment and TMDL document.

Comment 1. The *Addendum* cites data from draft IDL Cumulative Watershed Effects (CWE) Reports. Reviews of these reports indicated some errors in the calculation of the Hazardous Risk Ratings for the North Fork and Middle Fork of East River. These have been corrected and new data is shown in the ID Team comments.

Response 1. The revised HRRs, as described within pages 1 – 2 of Attachment 1, are duly noted, and the correction will be made in the *Addendum* report.

Comment 2. IDL questions the need for a sediment TMDL process on the East River. The Middle Fork and North Fork of the East River represents 95% of the drainage area of the East River. The Middle Fork and North Fork have been determined to be in full support of beneficial uses. IDL acknowledges adverse conditions in the main stem of the East River as well as lowermost Middle Fork, but believes the causes are primarily attributable to land management activities directly adjacent to the main stem and lowermost Middle Fork.

Response 2. The starting point is that both DEQ and IDL agree that measured and observed conditions within the main stem East River shows water quality impairment, or Not Full Support of beneficial uses. DEQ maintains that excess sediment load into the main stem cannot be discounted as a contributing cause to impairment. Thus, a sediment TMDL is required. It has been DEQ policy statewide that if a lower water body segment shows impairment, in part by sediment, then a sediment TMDL will encompass the entire watershed upgradient of the impaired segment regardless of whether upper segments are Full Support.

DEQ acknowledges that there are land uses adjacent to the main stem, i.e. large animal grazing on private property, that have caused severe stream bank damage and sediment load. The Idaho Soil Conservation Commission will address these land uses in the TMDL Implementation Plan. However, there is also a rather extensive road and stream crossing network on state and federal lands of the Middle Fork watershed, and on state lands in the North Fork watershed. The sediment load calculations of Table 23 and 24 (in the revised draft *Addendum*) for these watersheds primarily come from this road network. Because of the high-energy nature of the two Forks, sediment input will largely be transported to the lower reaches of the forks and the main stem. IDL has never supplied alternative calculations or documented assessments in regards to sediment load from the state road network. Therefore, our sediment calculations and load allocations will remain unchanged at this point.

Given the above explanation, it is emphasized that the TMDL Implementation Plan phase, with a Watershed Advisory Group, will give the opportunity to develop site and project specific plans for sediment reduction. Project specific plans will focus more on known and prioritized sediment sources rather than generalized TMDL calculations and load allocations. Past improvements that IDL has made within the road system of state lands can be documented and considered. Also, areas of the road system that are identified as a known sediment source problem can be documented, and placed on a priority list for improvement projects.

Comment 3. Page 49 of the Addendum states "There is also evidence of an accelerated spring peak flow from the Middle Fork River due to watershed canopy removal." We do not believe this statement can be substantiated by existing documentation, and we conclude that hydrologic adverse conditions do not exist sufficient to require the development of CWE drainage wide site-specific BMPs.

Response 3. The revised HRR for the Middle Fork, combining Channel Stability Index = 44 with Canopy Removal Index = 0.47, still results in a HRR with a "high-end moderate" rating. Of the twenty, 5th or 6th field watersheds assessed by the CWE protocol in the Priest River Subbasin between 1994 - 2000, the Canopy Removal Index of the Middle Fork is the highest recorded. To me, this raises a red flag.

However, after reviewing Attachment 1, pages 1 – 7 (CWE Hydrologic Risk Rating, relationship between hydrologic assessment and stream channel stability, East River geology, and other impacts), I agree that that there is insufficient quantitative information to substantiate the statement cited in Comment 3 above. I will revise the statements relating to Middle Fork spring peak flows and suspected impacts such as channel widening that appear on pages 9, 10, 49, 84, and 100. I would suggest though, that the observed HRR of the Middle Fork warrants on-the-ground hydrologic assessments by IDL, such as a gauge station for measured discharge, rather than relying solely on some of the theoretical narrative offered in Attachment 1 to explain the HRR.

Comment 4. Figures 8b and 12b of the *Addendum* do not accurately depict the state grazing lease area. There no longer is any active grazing in the Middle Fork and North Fork drainages.

Response 4. Changes to the GIS grazing lease areas will be made and reflected in revised report maps.

DEQ Technical Services Unit - Boise
Review of Binarch Creek and Lower Priest River Summaries

Binarch Creek

It seems logical to overturn WBAG when the BURP sites were in beaver complexes where you would not expect substrate and bugs to be as good as a higher gradient, flowing stream. (It does beg the question of why we are BURPing beaver complexes when we know the outcome, but I guess that is live and learn.) The next obvious question is "what evidence do we have that other, higher gradient, non-beaver areas, are in good shape?" Another way to phrase this might be "where do the cutthroat spawn and what condition is their spawning areas?"

You have good evidence that the cutthroat population is in good shape. The USFS data shows good SFI scores wherever they sampled. Strong evidence that they are at least spawning.

But, you also have a statement on page 40 that a USFS survey shows that fines were somewhat high in gravel areas. Taken on face value, this suggests that anywhere in the creek where they found gravel (i.e. spawning areas), they were not in good shape.

If that is true, then you have one line of evidence in support of your position (good SFI scores), and one line of evidence not supporting your position (heavy fines in gravels). And it would be wise to err on the conservative side and do the sediment TMDL.

If the statement regarding the USFS survey is out of context, then this statement needs to be revisited. In other words, if they were surveying gravels in beaver complex areas, then that is a different story. Because right now the statement implies that all gravel (potential spawning) areas are impacted by sediment.

Lower Priest River

Overall, the data support your decisions regarding temperature and sediment in Lower Priest River. All indicators suggest that low RFI scores are probably a result of temperature, and as you say, that may be irreversible.

On page 59, the second paragraph makes reference to streambank erosion surveys showing raw banks in some areas. It would help your argument if you could place that statement in the context of how much of the total bank length is in such a condition. In other words, if the raw areas represent less than 20% of the total bank length, then it is reasonable to assume that bank erosion is not well above background levels.

Also, is there anything that can be said about the sediment delivery from tributaries? If the tributaries are all listed for, and indeed impacted by sediment, then there may be a hole in your argument. However, if sediment delivery from tributaries is in general not out of whack, and the bank erosion is not extensive, then you have your argument covered from a source perspective as well.