Coeur d'Alene Lake and River Total Maximum Daily Load and Subbasin Assessment (Hydrologic Unit Code 17010303)

2011 Addendum and Update

Final

State of Idaho
Department of Environmental Quality

December 2011

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Acronyms, Abbreviations, 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
§305(b)	Refers to section 305 subsection (b) of the Clean Water Act, which requires reporting on the water quality status of all state waters
°C	degrees Celsius
AU	assessment unit
BANCS	Bank Assessment for Non-point source Consequences of Sediment
BEHI	bank erosion hazard index
BLM	Bureau of Land Management
BMP	best management practice
BURP	Beneficial Use Reconnaissance Program
Ca	calcium
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFU	colony forming unit
Cl	chloride
COLD	cold water aquatic life
CWA	Clean Water Act
CWAL	cold water aquatic life
CWE	cumulative watershed effects
DEQ	Idaho Department of Environmental Quality
DWS	domestic water supply
E. coli	*Escherichia coli*
EPA	US Environmental Protection Agency
GIS	geographic information system
GPS	Global Positioning System
HED	hydroelectric development
HUC	hydrologic unit code
IDAPA	Refers to citations of Idaho administrative rules
IDFG	Idaho Department of Fish and Game
IDL	Idaho Department of Lands
ITD	Idaho Transportation Department
KSSWCD	Kootenai-Shoshone Soil and Water Conservation District
Mg	magnesium

mL	milliliter
Na	sodium
NBS	near-bank stress
Ortho-P	a dissolved form of phosphorus
OU	operable unit
PCR	primary contact recreation
ROD	record of decision
SCR	secondary contact recreation
SFI	stream fish index
SHI	stream habitat index
SMI	stream macroinvertebrate index
SRW	special resource water
SS	salmonid spawning
TMDL	total maximum daily load
TP	total phosphorus
USFS	United States Forest Service
USGS	United States Geological Survey
WAG	watershed advisory group
WATSED	software for modeling hydrologic and sediment responses

Executive Summary

This 2011 addendum and update was completed in concert with the five-year review of the *Coeur d'Alene Lake and River (17010303) Sub-basin Assessment and Proposed Total Maximum Daily Loads* (DEQ 1999). The data collected as part of this subbasin assessment update were used to evaluate and make recommendations for beneficial use support status in Idaho's 2010 Integrated Report for the Coeur d'Alene River and tributaries to the lake. A summary of this evaluation is provided in Table A. While this effort does not include an evaluation of water quality and beneficial use support of Coeur d'Alene Lake, this document supports the *Coeur d'Alene Lake Management Plan* (DEQ and Coeur d'Alene Tribe 2009).

Table A. Beneficial use support status and recommended actions for streams evaluated under the 2011 Coeur d'Alene Lake subbasin assessment update.

Stream	Assessment Unit Number	§303(d) listing—2008 Integrated Report[1]	§303(d) listing—2010 Integrated Report	Recommended Action
Beauty Creek	ID17010303PN028_02 ID17010303PN028_03		Temperature	Temperature TMDL.
Bellgrove Creek	ID17010303PN005_02	*E. coli*	*E. coli* Sediment	Sediment TMDL. *E. coli* TMDL.
Blue Lake Creek	ID17010303PN024_02		Temperature	Temperature TMDL.
Carlin Creek	ID17010303PN026_02		Temperature	Temperature TMDL.
Cedar Creek	ID17010303PN030_02 ID17010303PN030_03	Sediment (4a)	Sediment Temperature	Sediment: no action needed until more implementation occurs. Temperature: TMDL.
Coeur d'Alene River – Latour Creek to the Mouth	ID17010303PN007_06	Temperature Sediment Habitat Alt. Lead Cadmium Zinc	Temperature Sediment Habitat Alt. Lead Cadmium Zinc	Metals: no action until rulemaking Sediment: Wait for record of decision under Operable Unit 3, and then possibly place in Category 4b of Integrated Report. Temperature TMDL. Habitat Alteration: move to Section 4c.
Coeur d'Alene River – SF Coeur d'Alene River to Latour Creek	ID17010303PN016_06	Temperature Lead Cadmium Zinc	Temperature Lead Cadmium Zinc	Metals: no action until rulemaking Temperature TMDL
Cougar Creek	ID17010303PN002_02	Habitat Alt. Sediment Temperature	Habitat Alt. Sediment Temperature	Sediment: no action needed until more implementation occurs. Temperature TMDL.
Fernan Creek	ID17010303PN032_03 ID17010303PN034_02 ID17010303PN034_02	Temperature	Temperature	Temperature TMDL.

Stream	Assessment Unit Number	§303(d) listing—2008 Integrated Report[1]	§303(d) listing—2010 Integrated Report	Recommended Action
	a ID17010303PN034_03			
Fourth of July Creek	ID17010303PN020_02 ID17010303PN020_03	Habitat Alt. Sediment	Habitat Alt. Temperature	Sediment removed from 2010 §303(d) list. Temperature TMDL.
Kid Creek	ID17010303PN003_02	Habitat Alt. Sediment	Habitat Alt. Sediment	Priority for BURP monitoring. Further sediment transport evaluation needed.
Killarney Lake tributaries	ID17010303PN022_02		Temperature	Temperature TMDL.
Latour Creek	ID17010303PN015_02	Sediment, Temperature	Sediment, Temperature	Sediment: no action needed until more implementation occurs. Temperature TMDL.
Marie Creek	ID17010303PN031_02	Habitat alteration, Sediment, Temperature	Habitat alteration, Sediment, Temperature	Sediment: no action needed. More time needed following implementation activities. Temperature TMDL.
Mica Creek	ID17010303PN004_02 ID17010303PN004_03	Habitat alteration, Sediment, Fecal coliform Temperature	Habitat alteration, Sediment, Fecal coliform Temperature	Sediment and *E. coli*: no action needed. More time needed following implementation activities. Temperature TMDL.
Rose Creek	ID17010303PN021_02		Temperature	Temperature TMDL.
Thompson Creek	ID17010303PN025_02	Sediment	None	Sediment removed from 2010 §303(d) list.
Willow Creek	ID17010303PN011_02	Sediment	None	Move to Category 3 of Integrated Report as an unassessed water body.
Upper Wolf Lodge Creek	ID17010303PN029_02	Sediment, Temperature	Sediment, Temperature	Sediment: no action needed. More time needed following implementation activities. Temperature TMDL.
Lower Wolf Lodge Creek	ID17010303PN029_03	Habitat alteration, Sediment, Temperature	Habitat alteration, Sediment, Temperature	Sediment: no action needed until more implementation occurs. Temperature TMDL.

Note: TMDL—total maximum daily load; BURP—Beneficial Use Reconnaissance Program

1 Introduction

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. 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 nation's 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). In addition, states and tribes must periodically publish a priority list (a "§303(d) list") of impaired waters. This list is currently published as the list of Category 5 waters in the biennial Integrated Report. 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.

Idaho Statute 39-3611(7) requires a five-year cyclic review process for Idaho TMDLs:

> The director shall review and reevaluate each TMDL, supporting subbasin assessment, implementation plan(s) and all available data periodically at intervals of no greater than five (5) years. Such reviews shall include the assessments required by section 39-3607, Idaho Code, and an evaluation of the water quality criteria, instream targets, pollutant allocations, assumptions and analyses upon which the TMDL and subbasin assessment were based. If the members of the watershed advisory group, with the concurrence of the basin advisory group, advise the director that the water quality standards, the subbasin assessment, or the implementation plan(s) are not attainable or are inappropriate based upon supporting data, the director shall initiate the process or processes to determine whether to make recommended modifications. The director shall report to the legislature annually the results of such reviews.

This report, an addendum to the subbasin assessment, is part of the five-year review process. It is intended to meet the intent and purpose of Idaho Statue 39-3611(7). The report considers the most current and applicable information in conformance with Idaho Statute 39-3607, which includes evaluating current watershed conditions, evaluating implementation activities that have taken place in the subbasin, and consulting with the watershed advisory group (WAG). An evaluation of the recommendations is provided in this update.

1.1 Coeur d'Alene Lake

This document does not directly address the water quality and beneficial use support of Coeur d'Alene Lake, which are addressed through a separate effort by the Idaho Department of Environmental Quality (DEQ) and the Coeur d'Alene Tribe. However, the document was written to support the efforts of the *Coeur d'Alene Lake Management Plan* developed in 2009 by the Coeur d'Alene Tribe and the DEQ (DEQ and Coeur d'Alene Tribe 2009). The goal of the *Coeur d'Alene Lake Management Plan* is to protect and improve lake water quality by limiting basin-wide nutrient inputs that impair lake water quality, which in turn influences the solubility of mining-related metals contamination contained in lake sediments. Limiting nutrient inputs into Coeur d'Alene Lake will slow the eutrophication process, which could otherwise lead to water quality conditions favorable to the release of metals from lake-bottom sediments. The nutrient of concern for the *Coeur d'Alene Lake Management Plan* is phosphorus.

1.2 About Assessment Units

The streams addressed in this update are described and identified by assessment units (AUs). Prior to 2002, impaired waters were defined as stream segments with geographical descriptive boundaries. In 2002, DEQ modified the structure and format of Idaho's §303(d) list by combining it with the §305(b) report, required by the CWA to inform Congress of the state of Idaho's waters, to create the Integrated Report. This modification included identifying stream segments by AUs instead of nonuniform stream segments and defining the use support of stream AUs by five categories in the Integrated Report. AUs now define all the waters of the state of Idaho. These units and the methods used to describe them can be found in the *Water Body Assessment Guidance* (Grafe et al. 2002).

AUs are groups of similar streams that have similar land use practices, ownership, or land management. Stream order, however, is the main basis for determining AUs—even if ownership and land use change significantly, an AU remains the same for the same stream order. Because AUs are an extension of water body identification numbers, there is now a direct tie to the water quality standards for each AU, so that beneficial uses defined in the water quality standards are clearly tied to streams on the landscape.

To facilitate comparisons between the 1998 §303(d) list and the 2002 Category 5 "impaired waters" category in the Integrated Report, a crosswalk from the 1998 §303(d) list to the new AUs was included in the 2002 Integrated Report. A copy of the report is available from the DEQ website at http://www.deq.idaho.gov/water-quality/surface-water/monitoring-assessment/integrated-report.aspx. The boundaries from the 1998 §303(d)-listed segments were transferred to the AU framework using an approach quite similar to how DEQ has been writing SBAs and TMDLs. All AUs contained in any §303(d)-listed segment were carried forward to the 2002 Category 5 listing in the Integrated Report (DEQ 2005). Any AU not wholly contained within a previously listed segment but partially contained (even minimally) was also included in Category 5. This inclusion was necessary to maintain the integrity of the 1998 §303(d) list and continuity with the TMDL program. The Coeur d'Alene Lake tributaries on the 2010 §303(d) list are included in this report.

When assessing new data that indicate full support, only the AU that the monitoring data represents will be removed (delisted) from the §303(d) list (Category 5 of the Integrated Report).

2 Subbasin at a Glance

The following is a summary of the major characteristics of the Coeur d'Alene Lake subbasin. A detailed discussion of physical and biological characteristics is provided in the *Coeur d'Alene Lake and River (17010303) Sub-basin Assessment and Proposed Total Maximum Daily Loads* (*Coeur d'Alene Lake and River TMDL*) (DEQ 1999).

The Coeur d'Alene Lake subbasin (represented by hydrologic unit code [HUC] 17010303) drains 650.5 square miles, which include the Coeur d'Alene Lake, Coeur d'Alene River, and waters that drain directly to the river and lake (Figure 1). The Coeur d'Alene Lake subbasin is located in Benewah, Bonner, Kootenai, and Shoshone Counties of northern Idaho. A portion of the subbasin is also within the boundaries of the Coeur d’Alene Reservation. The subbasin lies within the Northern Rocky Mountain physiographic region to the west of the Bitterroot Mountains.

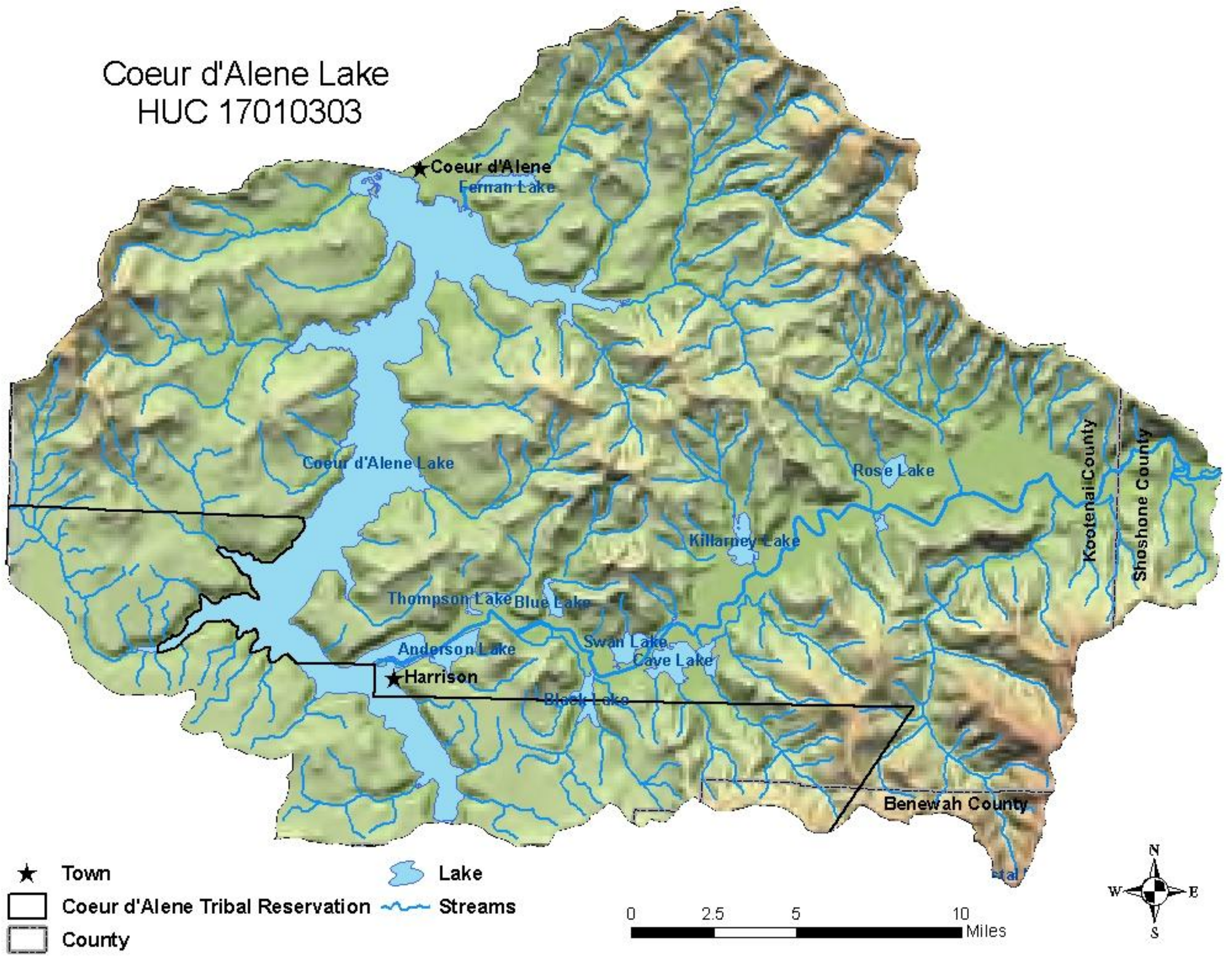

Figure 1. Extent of Coeur d’Alene Lake subbasin (hydrologic unit code 17010303).

The Coeur d’Alene River is the second largest tributary contributing flow to Coeur d’Alene Lake, second only to the St. Joe River. The Coeur d’Alene River flows from the confluence of the North and South Forks of the Coeur d’Alene River near Enaville, Idaho, westward to its mouth at Coeur d’Alene Lake near Harrison, Idaho. The river’s tributaries flow from the Coeur d’Alene Mountains on the north and from the St. Joe Mountains on the south. Tributaries to the lake from the west flow either from the Palouse Hills or from the most southerly mountains of the Selkirk Range. Major subwatersheds are illustrated in Figure 2.

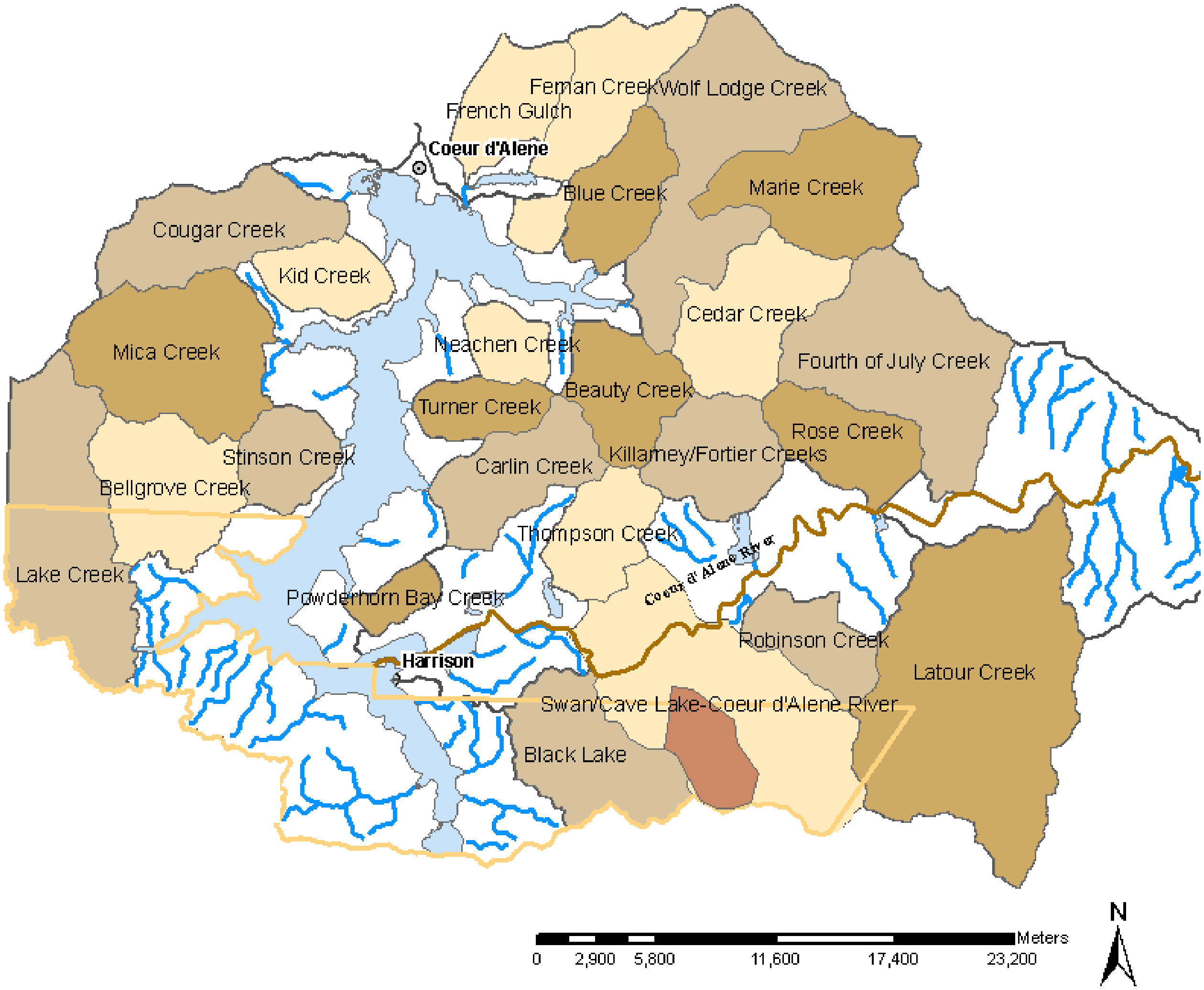

Figure 2. Major subwatersheds in the Coeur d'Alene Lake subbasin (in beige is the Coeur d'Alene Reservation boundary line).

The Coeur d'Alene River flows through a generally broad floodplain ranging from 0.25 to 1.75 miles wide. Eleven lakes and numerous wetlands are located laterally to the river below Rose Lake. The lakes and wetlands are extensions of the high water table of the lower river valley. The lakes are hydrologically connected to the river by natural and man-made surface channels in all but three cases, where the connection is through the valley ground water.

Streams from the mountains have watersheds predominantly in the elevation range between 3,000–4,500 feet and are subject to winter "rain-on-snow" discharge events. The relatively low elevation of these watersheds causes earlier maximum discharge compared to the majority of the watersheds of the North and South Forks of the Coeur d'Alene River. Backwater conditions exist during May through September on the Coeur d'Alene River from Cataldo to the mouth due to surface elevation control of Coeur d'Alene Lake by the Post Falls Hydroelectric Development (HED). The inundated channel during May through September attracts seasonal recreational boaters. Backwater conditions during spring high flows are from a natural sill at the lake outlet, not due to the Post Falls HED.

Most of the subbasin is primarily underlain by schist and gneiss of the Belt Supergroup metasediments. On the lower floodplain toward the mouth of the Coeur d'Alene River, the valley is underlain by alluvium and lacustrine deposits. Many of the tributaries to the lake have a wedge of water-deposited alluvium (deltaic sediments) at the lowest portions of the subbasin between the 2,128- and 2,182-foot elevations (Figure 3). These wedges, which vary in length, influence hydrologic characteristics, and they result in subsurface flow into Coeur d'Alene Lake during the summer months. Perennial flow exists upstream of the deltaic sediments on most tributaries to the lake.

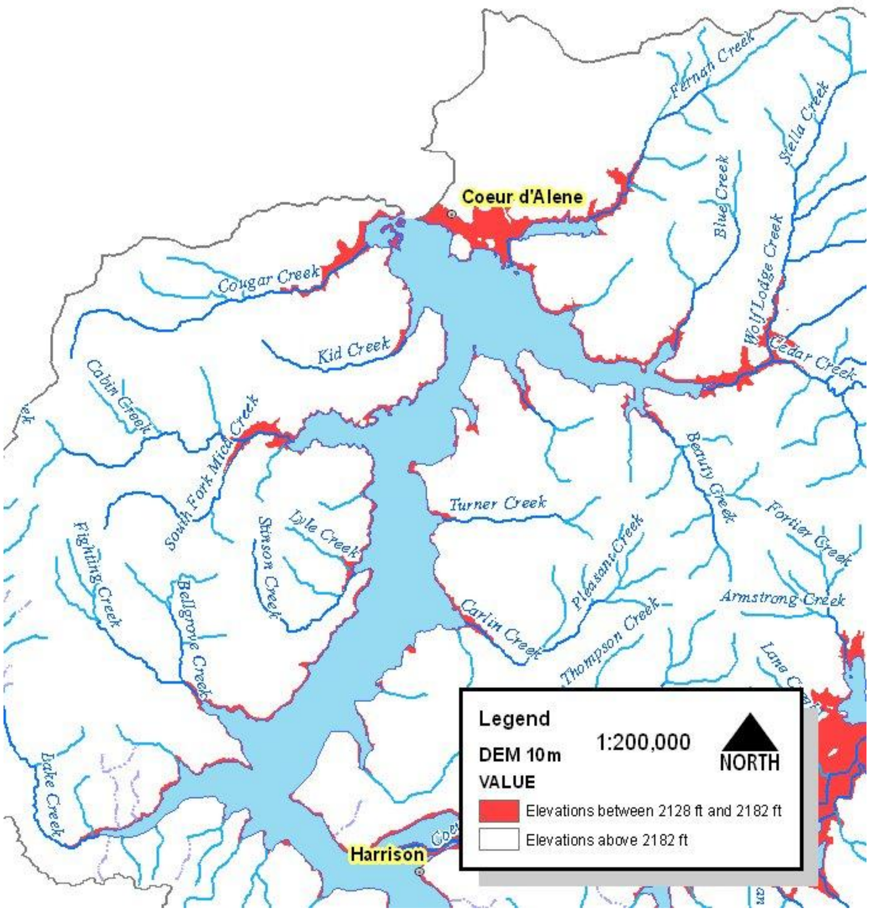

Figure 3. Map of deltaic sediment deposits around Coeur d'Alene Lake.

Native fishes of the subbasin are westslope cutthroat trout, bull trout, largescale sucker, longnose dace, mountain whitefish, northern pikeminnow, redside shiner, and mottled, torrent and shorthead sculpin (Jim Fredericks and Ryan Hardy [IDFG], Chris James [USFS], Ed Lider [retired USFS]). Population numbers of westslope cutthroat trout and bull trout have severely declined, and they occupy a fraction of their historic range (May 2009). Since 2005, the mainstem Coeur d'Alene River has been designated as critical habitat for bull trout. The Coeur d'Alene River was identified as a migratory corridor, which provides the primary constituent elements of critical habitat necessary for seasonal use for migrating bull trout (USFWS 2010).

The Coeur d’Alene River is an impaired water body with special challenges. Mining and ore processing activity in the past 100 years, primarily in the South Fork Coeur d’Alene River watershed, has resulted in extensive deposits of metals-contaminated sediments (lead, cadmium, zinc) along the bed, banks, and floodplain of the North and South Forks of the Coeur d’Alene River, the mainstem, the 11 lateral lakes, numerous wetlands along the lower Coeur d’Alene River, the lakebed of Coeur d’Alene Lake, and the headwaters of the Spokane River. Annual precipitation and spring snowmelt runoff events continue to redistribute these contaminated sediments throughout the entire system. As a result, aquatic, terrestrial, and avian biota has been negatively affected. In 1983, the US Environmental Protection Agency (EPA) listed the 21-square-mile Bunker Hill “box” area and the metals-contaminated areas in the Coeur d’Alene River corridor, adjacent floodplains, downstream water bodies, tributaries, and fill areas on the National Priorities List, qualifying them for Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) action (National Research Council 2005).

2.1 Changes to Subbasin Characteristics

The main human population center in the subbasin is the city of Coeur d’Alene at the north end of the lake. The beauty and recreational opportunities of Coeur d’Alene Lake and the surrounding area has resulted in a steady population increase since the 1990s. Since 2000, the Coeur d’Alene Lake subbasin has experienced significant changes—primarily as a result of residential development (Table 1). Kootenai County grew by 27.4% from 2000 to 2010. The US Census Bureau ranked Kootenai County the 69th-fastest growing metropolitan area in the country from July 1, 2004, to July 1, 2005 (US Census Bureau 2006).

Table 1. Kootenai County demographic information.

Geographic Area	1990 population	2000 population	% Increase 1990–2000	2010 population	% Increase 2000–2010
Coeur d’Alene	24,561	34,527	40.5	44,137[a]	27.8
Kootenai County	69,795	108,685	55.7	138,494[b]	27.4
State of Idaho	1,006,749	1,293,953	28.5	1,567,582[b]	20.9

[a] 2006 US Census Bureau data
[b] 2010 US Census Bureau data

Much of this development along the tributaries to Coeur d’Alene Lake is large homes. Also popular are ranchettes with small numbers of livestock, especially horses. To support the new communities, timber density has decreased, and the number roads have increased in almost every subwatershed. As a result, the streams are increasingly confined and routed through culverts.

3 Beneficial Uses

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 existing uses, designated uses, and presumed uses. The *Water Body Assessment Guidance* (Grafe et al. 2002) gives a detailed description of beneficial use identification for use-assessment purposes. Existing uses under the CWA are “those uses actually attained in the water body on or after November 28, 1975, whether or not they are included in the water quality standards.” Existing uses are also protected when data are available that suggest they are appropriate, such as multiple age classes and young of the year presence within a water body supporting the salmonid spawning existing use. Designated uses are specifically listed for water bodies in Idaho in tables in the Idaho water quality standards (see IDAPA 58.01.02.100-160 in addition to citations for existing and presumed uses).

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 “presumed uses,” DEQ will apply the numeric cold water aquatic life criteria and primary or secondary contact recreation criteria to undesignated waters.

Beneficial uses for water bodies in the Coeur d’Alene Lake subbasin include cold water aquatic life, salmonid spawning, primary contact recreation, secondary contact recreation, domestic water supply, and special resource waters (Table 2). Waters with designated beneficial uses specifically identified in the water quality standards are listed separately in Table 3 (IDAPA 58.01.02.110–.02.160). While data exists to support the cold water aquatic life and primary/secondary contact recreation uses on most of the streams, all water bodies within the Coeur d’Alene Lake subbasin are presumed to have cold water aquatic life and primary or secondary contact recreation beneficial uses.

Salmonid spawning is considered a beneficial use for all the streams identified as having westslope cutthroat trout in the subwatershed (see Fisheries Data section). Recently, local fisheries biologists met to consider current distribution, conservation populations, and historical range of westslope cutthroat trout. Results of this effort are documented in a geodatabase housed at the Idaho Department of Fish and Game (IDFG) and summarized in the *Westslope Cutthroat Trout Status Update Summary* published by May (2009). They indicate westslope cutthroat trout are currently present in most of the streams within the Coeur d’Alene Lake subbasin. Those tributaries with cutthroat trout most likely have some spawning occurring as well, whether it is adfluvial or resident fish (Ryan Hardy, IDFG, personal communication).

Beneficial use support status for all the water bodies in the Coeur d’Alene Lake subbasin is listed in Appendix A and illustrated in Figure .

Table 2. Selected beneficial uses defined.

Beneficial Use	Definition
Cold Water Aquatic Life	Water quality appropriate for the protection and maintenance of a viable aquatic life community for cold water species.
Salmonid Spawning	Waters that provide or could provide a habitat for active self-propagating populations of salmonid fishes.
Primary Contact Recreation	Water quality appropriate for prolonged and intimate contact by humans or for recreational activities when the ingestion of small quantities of water is likely to occur. Such activities include, but are not restricted to, swimming, water skiing, or skin diving.
Secondary Contact Recreation	Water quality appropriate for recreational uses on or about the water and that are not included in the primary contact recreation category. These activities may include fishing, boating, wading, infrequent swimming, and other activities where ingestion of raw water is not likely to occur.
Domestic Water Supply	Water quality appropriate for drinking water supplies. Public drinking water is treated before it enters the tap. A separate set of standards governs public drinking water.
Special Resource Water [a]	Those specific segments or bodies of water that are recognized as needing intensive protection to preserve outstanding or unique characteristics or to maintain current beneficial uses.

[a] Special resource water was recently removed from Idaho's water quality standards by the Idaho Legislature. DEQ will be conducting a subsequent rulemaking to formally remove special resource waters from the Idaho water quality standards in the 2012 legislative session.

Table 3. Waters in the Coeur d'Alene Lake subbasin with designated beneficial uses in Idaho water quality standards (IDAPA 58.01.02.110–.02.160).

Water Body	Assessment Unit(s)	Uses[a]
Coeur d'Alene River—Latour Creek to mouth	ID17010303PN007_06	COLD, PCR
Coeur d'Alene River—South Fork Coeur d'Alene River to Latour Creek	ID17010303PN016_06	COLD, PCR
Wolf Lodge Creek—source to mouth	ID17010303PN029_02 ID17010303PN029_03	COLD, SS, PCR, DWS, SRW
Fernan Creek—Fernan Lake to mouth	ID17010303PN032_03	COLD, SS, PCR, DWS
Fernan Lake	ID17010303PN033_03	COLD, SS, PCR, DWS

[a] COLD = cold water aquatic life, SS = salmonid spawning, PCR = primary contact recreation, DWS = domestic water supply, SRW = special resource water

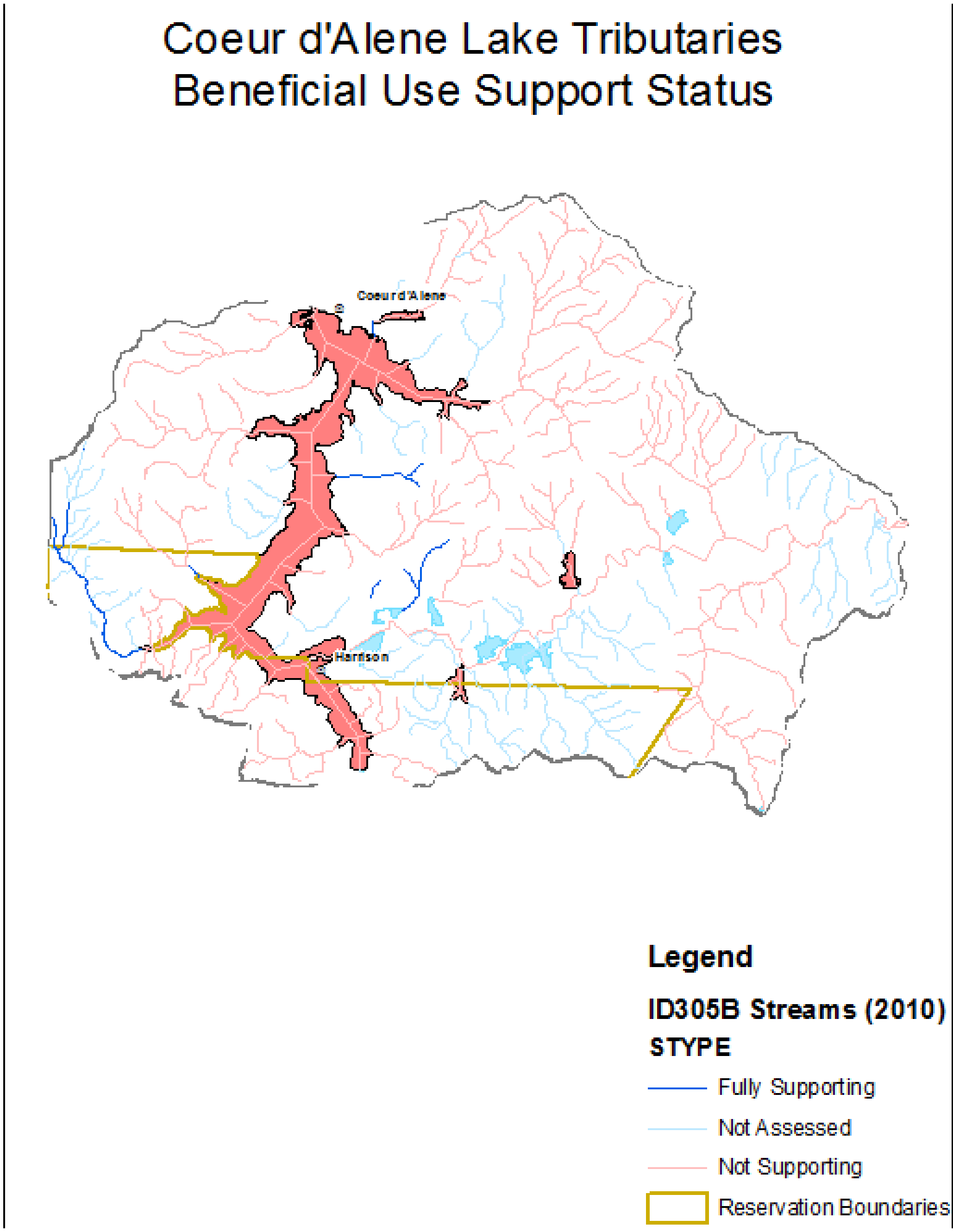

Figure 4. Coeur d'Alene Lake subbasin beneficial use support status (Idaho's 2010 Integrated Report).

4 Summary and Analysis of Monitoring Data

4.1 DEQ Beneficial Use Reconnaissance Program

DEQ’s Beneficial Use Reconnaissance Program (BURP) combines biological monitoring and habitat assessment data to determine the quality of Idaho's waters. BURP is used in determining the existing uses and beneficial use support status of Idaho's water bodies. The program was implemented statewide in 1994.

Each summer, the DEQ Coeur d’Alene Regional Office completes 30–60 BURP surveys in northern Idaho using temporary summer staff. Not every year is targeted for this subbasin. As discussed earlier, many of the tributaries to Coeur d’Alene Lake have a wedge of deltaic sediments at the lowest portions of the subbasin. These wedges influence hydrologic characteristics, and they allow water to enter Coeur d'Alene Lake through subsurface flow during the summer months. As such, summer monitoring crews have missed opportunities to collect BURP data from a number of streams in this subbasin. Since 2000, 12 BURP surveys have been completed within the Coeur d’Alene Lake subbasin. During these surveys, 7 streams were determined to be fully supporting beneficial uses (Table 4). An average BURP score of 2 and above is indicative of stream conditions fully supporting beneficial uses. At 10 other sites, data collection was attempted, but crews were unsuccessful due to subsurface flow or other complications. Scores at 5 streams indicated conditions not fully supporting beneficial uses.

Table 4. BURP data for streams within the Coeur d'Alene Lake subbasin.

Stream	Assessment Unit Number	BURP ID	Date	SMI	SMI Score	SFI	SFI Score	SHI	SHI Score	Avg. Score[a]
TMDL Streams										
Cedar Creek	ID17010303PN030_02	2007SCDAA051	08/02/2007	No data collected, stream was dry at location selected						
Cedar Creek	ID17010303PN030_03	2006SCDAA029	08/09/2006	41.3	1	--	--	65.0	2	1.5
Cedar Creek	ID17010303PN030_03	2004SCDAA051	08/23/2004	No data collected, stream was dry at location selected						
Cougar Creek	ID17010303PN002_02	2004SCDAA060	09/07/2004	No data collected, flow was subsurface at the site						
Cougar Creek	ID17010303PN002_02	2006SCDAA040	08/15/2006	No data collected, flow was subsurface at the site						
Latour Creek	ID17010303PN015_02	2006SCDAA041	08/15/2006	No data collected, flow was subsurface at the site						
Marie Creek	ID17010303PN031_02	2006SCDAA047	08/16/2006	49.9	1	--	--	63.0	2	1.5
NF Mica Creek	ID17010303PN004_02	2006SCDAA002	07/17/2006	No data collected, stream too deep for Hess sampler						
NF Mica Creek	ID17010303PN004_02	2006SCDAA003	07/17/2006	No data collected, stream too deep to wade						
Skitwish Creek	ID17010303PN031_02	2008SCDAA058	08/13/2008	84.2	3	86.7	3	72.0	3	3.0
Skitwish Creek	ID17010303PN031_02	2008SCDAA012	07/03/2008	72.2	3	--	--	74.0	3	3.0
Wolf Lodge Creek	ID17010303PN029_03	2006SCDAA045	08/16/2006	54.3	1	--	--	60.0	2	1.5
Wolf Lodge Creek	ID17010303PN029_02	2006SCDAA046	08/16/2006	Site was rejected, inaccessible						
Non-TMDL Streams										
Bellgrove Creek	ID17010303PN005_02	2008SCDAA025	07/15/2008	22.3	0	73.8	2	55.0	1	0.0
Bozard Creek	ID17010303PN006_03	2006SCDAA024	08/14/2006	70.6	3	--	--	64.0	2	2.5
Fourth of July Creek	ID17010303PN020_03	2006SCDAA001	07/13/2006	68.4	3	97.2	3	56.0	1	2.3
Fortier Creek	ID17010303PN022_02	2004SCDAA039	08/05/2004	68.5	3	--	--	72.0	3	3.0
Carlin Creek	ID17010303PN026_02	2008SCDAA021	07/09/2008	66.4	3	82.9	3	87.0	3	3.0
Carlin Creek	ID17010303PN026_02	2006SCDAA043	08/15/2006	No data collected, stream was dry						
Turner Creek	ID17010303PN027_02	2006SCDAA044	08/15/2006	No data collected, access denied						
Beauty Creek	ID17010303PN028_02	2008SCDAA009	07/02/2008	78.3	3	80.1	2	76.0	3	2.7
Fernan Creek	ID17010303PN032_03	2006SCDAA004	07/17/2006	No data collected, stream was dry						
Fernan Creek	ID17010303PN034_03	2005SCDAA010	07/14/2005	38.7	1	77.0	2	56.0	2	1.7

Note: SMI = stream macroinvertebrate index; SFI = stream fish index; SHI = stream habitat index.
[a] An average BURP score of 2 and above is indicative of stream conditions fully supporting beneficial uses.

4.2 Idaho Department of Lands Cumulative Watershed Effects Assessment

Cumulative watershed effects (CWE) assessments were conducted on a number of streams within the Coeur d'Alene Lake subbasin in 1999 by personnel from the Idaho Department of Lands (IDL) and in 2009 by TerraGraphics. The CWE process evaluates the extent to which forest practices affect sediment delivery to the stream and recommends management actions based on the evaluation. If the stream is not supporting its beneficial uses, additional analysis is completed. The CWE process consists of seven specific assessments for creeks within the Coeur d'Alene Lake subbasin:

- Erosion and mass failure hazards
- Canopy closure/stream temperature
- Channel stability
- Hydrologic risks
- Sediment delivery
- Nutrients
- Beneficial uses/fine sediment

The data from these assessments are then analyzed using the methodology described in the *Forest Practices Cumulative Watershed Effects Process for Idaho* (IDL 2000). Individual reports are referenced in IDL (2010), and CWE scores are summarized in Table 5.

Table 5. Cumulative watershed effects scores since 2000 for water bodies within the Coeur d'Alene Lake subbasin.

Subwatershed	Year	Surface Erosion Hazard	Mass Failure Hazard	Channel Stability Index	Canopy Removal Index	Hydrologic Risk	Roads	Skid Trails	Total Sediment Delivery
Cougar Creek	2002	Low	High	Moderate	0.62	High	Low	Low	Low
	2009	Low	High	Moderate	0.46	Moderate	Low	Low	Low
Kid Creek	2002	Moderate	Low	Moderate	0.30	Moderate	Low	Low	Low
Latour Creek (headwaters)	2002	Low	Low	Moderate	0.23	Low	Low	Low	Low
	2009	Low	Moderate	Moderate	0.28	Low	Low	Low	Low
Latour Creek (sidewalls)	2002	Low	Moderate	Moderate	0.35	Moderate	Low	Moderate	Low
Latour Creek (mouth)	2009	Low	Moderate	Moderate	0.48	Moderate	Low	Low	Low
Mica Creek	2002	Low	High	Moderate	0.30	Moderate	Low	Low	Low
	2009	Low	High	Moderate	0.49	High	Low	Low	Low
Upper Wolf Lodge Creek	2002	Low	Low	Moderate	0.18	Low	Low	Low	Low
	2009	Low	Moderate	Moderate	0.21	Low	Low	Low	Low

4.3 Fisheries Data

Fisheries data are important to determine if fish populations and other cold water biota are impaired by pollutants. DEQ consulted with local fisheries biologists regarding the fish species known to occupy the Coeur d'Alene Lake subbasin. A list of native and nonnative species is provided in Table 6.

Table 6. Fishes of the Coeur d'Alene Lake subbasin.

Native Species	
Common Name	**Scientific Name**
Bull trout	*Salvelinus confluentus*
Largescale sucker	*Catostomus macrocheilus*
Longnose dace	*Rhinichthys cataractae*
Mottled sculpin	*Cottus bairdii*
Mountain whitefish	*Prosopium williamsoni*
Northern pikeminnow	*Ptychocheilus oregonensis*
Redside shiner	*Richardsonius balteatus*
Shorthead sculpin	*Cottus confusus*
Torrent sculpin	*Cottus rhotheus*
Westslope cutthroat trout	*Oncorhynchus clarkii*
Nonnative Species	
Common Name	**Scientific Name**
Brook trout	*Salvelinus fontinalis*
Brown bullhead	*Ictalurus nebulosus*
Chinook salmon	*Oncorhynchus tshawytscha*
Kokanee salmon	*Oncorhynchus nerka*
Largemouth bass	*Micropterus salmoides*
Northern pike	*Esox lucius*
Rainbow trout	*Oncorhynchus mykiss*
Smallmouth bass	*Micropterus dolomieu*
Tench	*Tinca tinca*
Yellow perch	*Perca flavescens*

Sources: Jim Fredericks and Ryan Hardy (IDFG), Chris James (USFS), Ed Lider (retired USFS)

In January and March 2009, over 80 fisheries biologists and 12 ArcGIS technical experts from several state, federal, and tribal agencies and private firms attended 9 workshops to develop a status update for westslope cutthroat trout, which expands a database originally developed in 2002. The database is managed and maintained as a component of the westslope cutthroat trout interagency conservation working group. IDFG coordinates the working group in Idaho and manages the database. Experts considered current distribution, conservation populations, and historical range of the species. The collaborative effort indicated westslope cutthroat trout are currently present in most of the streams within the Coeur d'Alene Lake subbasin, and salmonid spawning is occurring, or has occurred since 1975, in most of the streams within the Coeur d'Alene Lake subbasin (May 2009; Ryan Hardy, IDFG, personal communication). Current westslope cutthroat trout distribution is illustrated in Figure . However, habitat quality for cold water salmonids is fair to poor in the majority of the subbasin (Figure). Habitat quality was based on professional judgment using visual surveys. Streams that do not appear in Figure are not known to be occupied by westslope cutthroat trout.

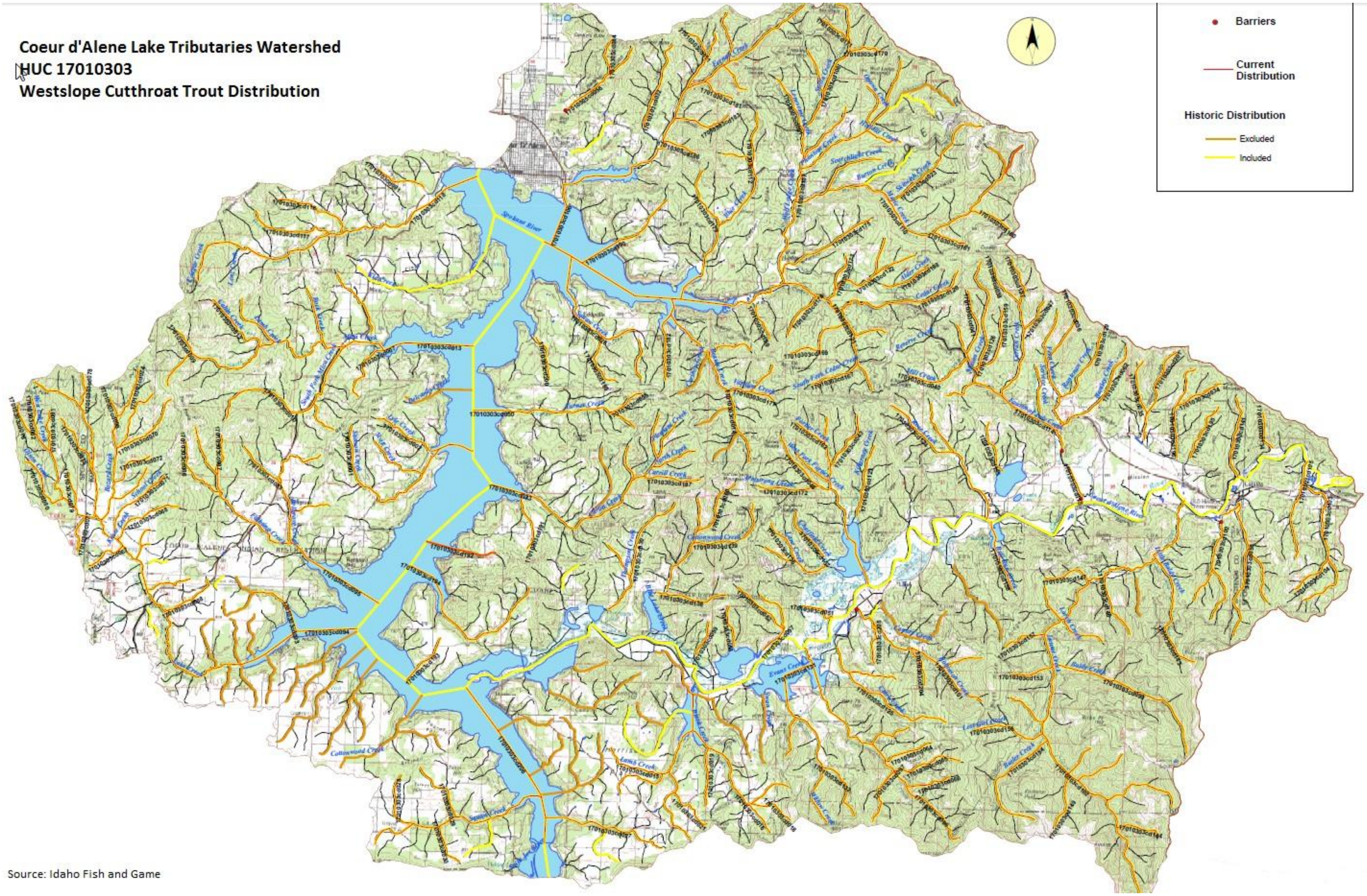

Figure 5. Westslope cutthroat trout distribution in the Coeur d'Alene Lake subbasin.

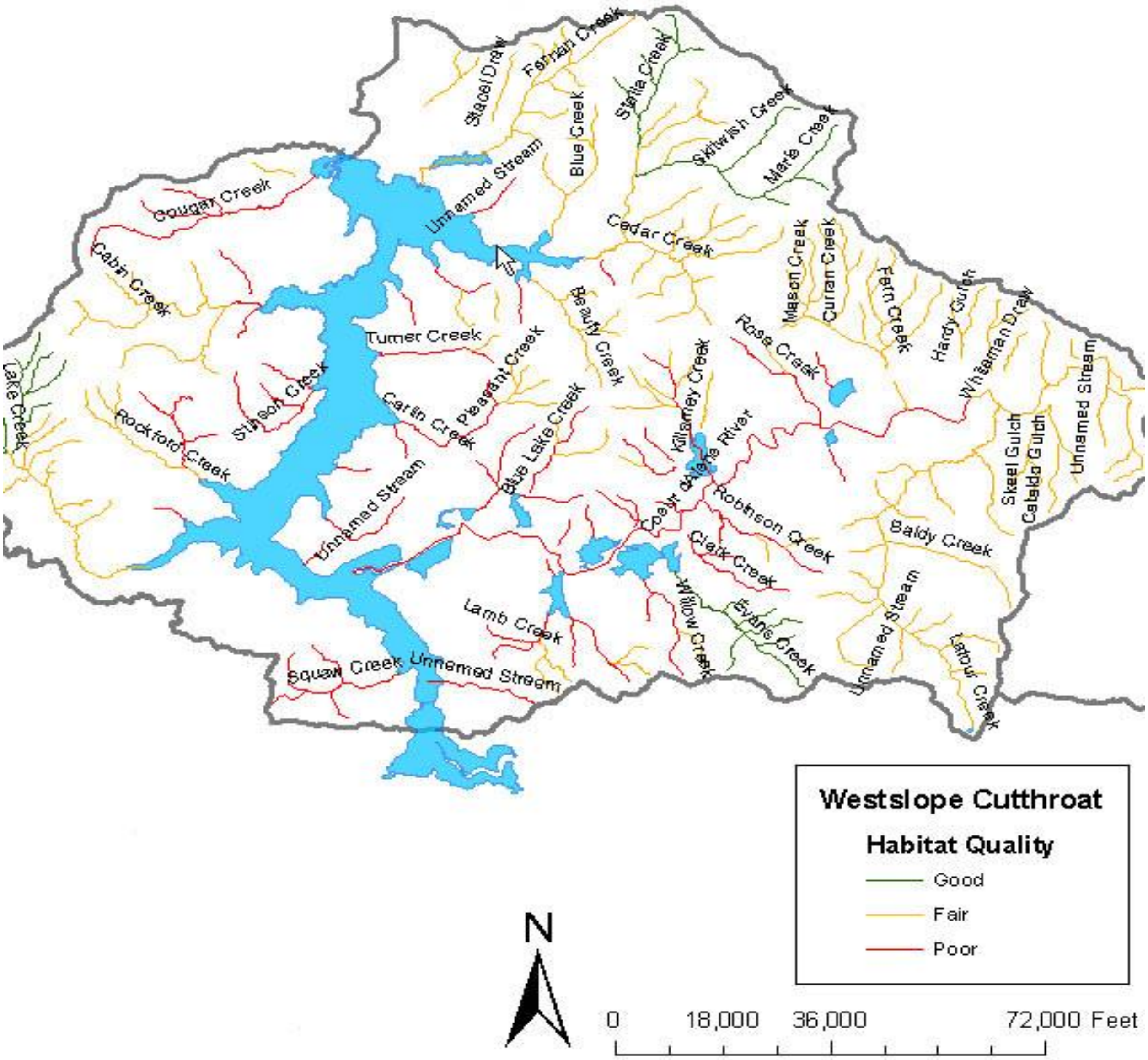

Figure 6. Habitat quality for westslope cutthroat trout (Source: May 2009).

A cutthroat trout telemetry study by IDFG was conducted in the Coeur d'Alene River (upstream from the Cataldo Mission boat ramp) and North Fork Coeur d'Alene River watersheds to determine why densities of westslope cutthroat trout with lengths equal to or greater than 300 millimeters had not increased at set snorkel transects in the Coeur d'Alene Lake subbasin in the past 30 years. Results suggested noncompliance with the fishing regulations, degraded or loss of habitat and cold water refugia, degraded or loss of overwinter habitat, and degraded summer rearing habitat—all of which suppress cutthroat trout equal to or greater than 300 millimeters in length—as causes for the lack of increase in longer fish (Dupont et al. 2008).

Migration of westslope cutthroat trout from upstream of the Cataldo Mission boat ramp downstream into the Coeur d'Alene River and its tributaries was not observed in this study. It is believed to be an avoidance response to the elevated heavy-metal concentrations in the mainstem

Coeur d'Alene River. Biologists suggest that continued work to reduce heavy-metal concentrations should increase migratory use of the river. The river has deeper pool and run habitat with abundant cover and a wide, undisturbed floodplain—conditions beneficial to overwinter survival and summer rearing of adult trout. Dupont et al. (2004) thought that cutthroat trout avoided the inundated reach of the Coeur d'Alene River, which is inundated as a result of water level management at the Post Falls HED. This shallow reach has conditions cutthroat trout tend to avoid—a high amount of fine-sediment imbedded substrate, little cover, and sloughing streambanks (Dupont et al. 2004).

Tracking efforts in this study indicated that cutthroat trout spawn in numerous tributaries throughout the study area, and their quick migration and short spawning period precluded discovery of exact spawning tributaries. Following spawning, rather than make long migrations, cutthroat trout in the Coeur d'Alene River subbasin tended to stay in one subwatershed for the entire summer, fall, and winter seasons. This same study emphasized the importance of cold water refugia during summer months when water temperatures rise above 22 °C and the importance of the floodplain, undercut banks, and large woody debris in maintaining water temperatures suitable during the warmest and coldest months (Dupont et al. 2004).

Since 2005, the mainstem Coeur d'Alene River (ID17010303PN007_06) has been designated as critical habitat for bull trout by the US Fish and Wildlife Service. In the final ruling, the Coeur d'Alene River was identified as a migratory corridor, which provides the primary constituent elements of critical habitat necessary for seasonal use for migrating bull trout (USFWS 2010).

4.4 Stream Erosion Surveys and Monitoring Summaries

As part of the five-year review process, DEQ summarized all known data collected regarding stream erosion within the Coeur d'Alene subbasin. The data is summarized by subwatershed below.

Cougar Creek

In 2000, the Kootenai-Shoshone Soil and Water Conservation District (KSSWCD) conducted a stream erosion survey along 998 feet of Cougar Creek (ID17010303PN002_02) just upstream from Highway 95 (Figure). The survey found the study reach densely foliated overall but entrenched. However, there were many areas of significant bank erosion as evidenced by bare, vertical streambanks and/or sod-root overhangs. Frequent mass wasting was evident at these sites (Flagor et al. 2002).

In 2009, DEQ and the Idaho Soil and Water Conservation Commission conducted a visual stream survey of Cougar Creek in an effort to evaluate changes in

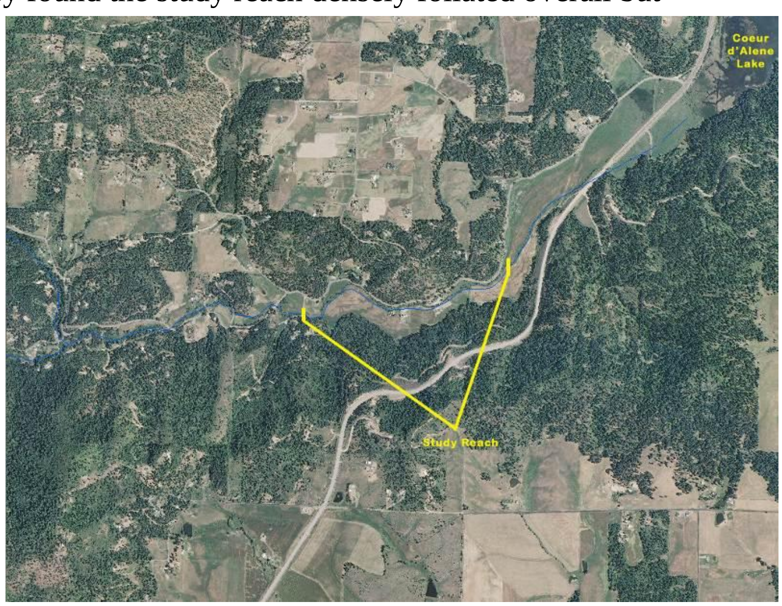

Figure 7. Site of 2000 and 2009 erosion surveys.

erosion characteristics of the stream since the 2000 survey. Sites that had significant erosion in 2000 were relocated by GPS.

Overall, sites that showed significant bank erosion in 2000 appeared to be recovering as a result of lack of livestock pressure on the streambanks. Streambanks that were vertical had side slopes of 40% or less with grassy/shrub cover covering greater than 70% of the bank (Figure). In some places, the channel was beginning to meander—although the road and hay field put constraints on this process. However, there was still excessive sediment deposition in the stream as a result of significant erosion occurring upstream of the survey reach. One sediment source was found at a site just upstream of the survey reach, where a culvert was failing and significant bank erosion was occurring downstream of the culvert (Figure 4). Above this site, Cougar Creek is channelized alongside numerous ranchettes. As a result, the channel is deeply incised in this reach with frequent bare, vertical banks (Figure 5). In addition, inspection of an unnamed tributary to Cougar Creek revealed significant streambank erosion and sedimentation as a result of heavy livestock pressure and failing culverts.

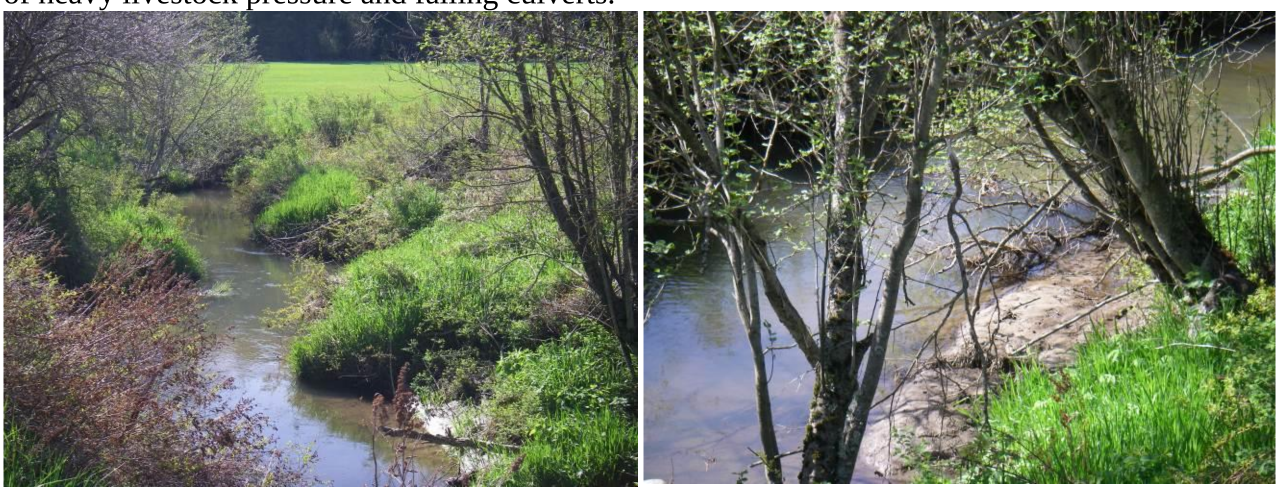

Figure 8. Incised channel recovery in Cougar Creek.

Figure 4. Failing culvert on Cougar Creek (left) with downstream channel instability (right).

Figure 5. Channel incision on Cougar Creek.

Fourth of July Creek

Coeur d'Alene Regional Office staff conducted several field visits in 2009–2011 along the length of the Fourth of July Creek AU ID17010303PN020_03. The visits were done at a number of accessible reaches along the creek during different times of the year to observe the channel during high flow, after high flow, and during low flow. On each visit, visual observations were made to determine channel condition with respect to sediment transport and deposition and aquatic life use support. The survey found the study reaches, despite being highly channelized due to their proximity to a major four-lane highway, to be densely foliated with good streambank stability, no channel embeddedness, and lots of habitat complexity. Very few areas had significant bank erosion as evidenced by bare, vertical streambanks and/or sod-root overhangs. Mass wasting was also not evident at these sites. On the lower-gradient reaches of the creek, some midstream depositional features were present after an extremely high-flow event in January 2011. However, they were not at an elevation within the channel that would cause any channel instability through redirection of flow during future high-flow events; therefore, there is no concern for increased erosion of the channel banks at these sites.

Kid Creek

In 2000, the KSSWCD conducted a stream erosion survey along the entire channel of Kid Creek (ID17010303PN003_02). The analysis started from the Worley Highway District Office and ended at the mouth. Results of the survey indicated much of the creek was in good condition with abundant riparian vegetation. In areas with erosion problems, adjacent land uses had much influence on the stream (Smith 2002).

In 2009, DEQ and the Idaho Soil and Water Conservation Commission conducted a visual stream survey of Kid Creek in an effort to evaluate changes in erosion characteristics of the stream since the 2000 survey. In general, the visual stream survey led to two conclusions: 1) there were numerous culverts along the creek that posed a challenge to fish passage and 2) although there were localized areas of concern, the stream condition was about the same as it was in 2000—with abundant riparian vegetation, good streambank stability, no excess fine sediment in the channel bed, and good access to the floodplain (Figure 6). As seen in 2000, however, there were still isolated areas of erosion concerns, such as in the headwaters, where there was no canopy cover and the stream was overwidened—suggesting this creek underwent lateral recession since 2000 (Figure 7). In the last 0.5 mile—although there was good canopy cover—the stream was incised, with bare, vertical banks and active bank erosion (Figure 8). Just upstream was a horse ranchette, where horses had full access to the creek. In this reach, there was no riparian vegetation, the stream was overwidened, and the banks were trampled. In addition to localized erosion problems, there was one large culvert near the mouth of the stream that had failed, and the streamflow was under the culvert (Figure 8).

Figure 6. Most of Kid Creek is in good condition with abundant riparian vegetation (left), no excess fine sediment in the channel bed, and good access to the floodplain (right).

Figure 7. Overwidened channel at the headwaters of Kid Creek.

Figure 8. Failed culvert near the mouth of Kid Creek (left) and incised channel near the mouth of Kid Creek (right).

Latour Creek

In June 2008, DEQ personnel conducted a visual stream stability survey of Latour Creek (ID17010303PN015_02) from the mouth upstream to the confluence with Butler Creek. DEQ identified three separate reaches, which appeared to display intermediate erosive conditions of streambanks along Latour Creek, to conduct a stream stability survey as described in *Watershed Assessment of River Stability and Sediment Supply* (Rosgen 2006). The total length of the streambanks surveyed was 785 feet of stream. Of this study reach, 141 feet (18%) were unstable. The streambank stability survey as described in Rosgen (2006) was done on the unstable banks.

The bank's susceptibility to erosion, or the bank erosion hazard index (BEHI), and the stress applied by near-shore water velocity erosion processes, or near-bank stress (NBS), are two streambank erosion factors referenced in Rosgen (2006). The BEHI was high in two reaches and very high in one reach. NBS was moderate in one reach and high in the other two. By establishing the relationship between BEHI and NBS, the bank erosion or recession rate (feet per year) can be estimated using the Bank Assessment for Non-point source Consequences of Sediment (BANCS) model (Rosgen 2006). The estimated erosion rate for the study reach was 0.4–0.6 feet/year or 217 cubic feet/year (10 tons/year).

On the same study reach, a Pfankuch channel stability assessment was done (Pfankuch 1975). This evaluation looks at factors such as landform slope and mass wasting in the upper watershed; bank rock content, obstructions to flow, and channel capacity in the channel; and scouring, deposition, and particle size distribution within the channel bottom. The Pfankuch channel stability rating for the study reach was poor.

Within the study reaches, the channel had excessively high bed load, which frequently manifested as instream depositional features above bankfull elevation. These features cause a high shear stress resulting in erosion, undercutting of streambanks, and large woody debris accumulation in the channel. The erosion and large woody debris accumulation into the channel can exacerbate the channel instability as pools behind the debris fill and channel migration occurs. Downstream of the study reach, the slope of Latour Creek decreased, the floodplain widened, and the channel slope and morphology was that of a Rosgen *C* channel. The change in channel morphology resulted in significant aggradation of channel substrate to levels above bankfull elevation. Continuing downstream to the mouth, it became more and more evident that Latour Creek did not have enough stream energy to competently move this excessive bed load material downstream. It was evident that the percent streambank instability also increased above the 18% observed in the study reach.

Wolf Lodge Creek

Upper Wolf Lodge Creek (AU ID17010303PN029_02) has its headwaters in US Forest Service (USFS) property and ends on private property about 0.5 miles downstream from the National Forest System boundary. This AU includes the tributaries to Wolf Lodge Creek in the defined reach, including Stella, Lonesome, and Phantom Creeks.

In September 2008, DEQ conducted a field visit of the upper Wolf Lodge Creek watershed. During the visit, it was apparent the forest canopy was recovering from historic logging activity through successional changes that have increased canopy closure. In addition, much of the riparian area of the watershed was forested and a number of USFS roads had either been decommissioned or put into storage (i.e., closed and minimally maintained). However, local areas with excessively high bed load in the stream channels were a concern throughout the watershed. For example, in Stella Creek the channel had excessively high bed load, which frequently manifested as instream depositional features above bankfull elevation. These features cause a high shear stress resulting in erosion when combined with a high BEHI, undercutting of the streambank, and large woody debris accumulation in the channel. The erosion and large woody debris accumulation into the channel can exacerbate the channel instability as pools behind the debris fill and channel migration occurs. On both streams, there was evidence of remnant channels. On lower Stella Creek toward the USFS boundary, there was a higher incidence of excessive bed load deposition, which resulted in channel aggradation. This aggradation was believed to be the cause for dry channel conditions during the summer in Stella Creek as flows infiltrate into aggraded areas during base flow conditions.

Another concern on Stella Creek was an estimated 1,400 feet of stream channel that was diked without a permit (Figure 14). Comparisons of aerial photos between 2006 and 2009 show visible channel widening as a result of the modification, restricted access to the floodplain, and subsequent streambank erosion. These modifications have changed the streamflow and sediment transfer regime of the creek, which will likely increase sediment loading to Wolf Lodge Creek downstream, particularly during high-flow events.

Figure 9. A 2008 photograph of Stella Creek showing significant channel modification.

In 2008, DEQ conducted a survey of lower Wolf Lodge Creek (ID17010303PN029_03), which included field observations and bank erosion evaluations using the BEHI and NBS characteristics as identified by Rosgen (2006). The lower Wolf Lodge Creek AU starts on private property below the confluence with Stella Creek about 0.5 mile downstream from USFS property. The AU ends just upstream of the Wolf Lodge Creek campground, and it does not include any tributaries to Wolf Lodge Creek. Survey results indicated localized areas where the channel is relatively unstable, with moderate/high BEHI and moderate NBS rankings, indicating significant bank erosion. The instability was most evident where the channel flows through private property. Along this reach, there are numerous homes in the floodplain, and lateral channel movement is restricted. Although excessive fine sediment was not observed in the channel substrate, excessive bed load existed within much of the channel as evidenced by instream depositional features. These features force lateral flow, causing streambank erosion, loss of riparian vegetation, and channel widening (Figure 10; Figure 11). This process was especially evident following the 2008 runoff season, where bankpin studies and field observations showed significant depositional features along lower Wolf Lodge Creek and a loss of at least 3 feet of streambank in some places. As the creek enters an alluvial fan further down the watershed, it has a stable, braided channel morphology. Riparian vegetation is abundant, and streambank stability is good.

Figure 10. Large point bar on lower Wolf Lodge Creek deposited during the 2008 runoff season (left). Depositional zone just above a bridge in lower Wolf Lodge Creek (right).

Figure 11. Instream depositional bars on lower Wolf Lodge Creek (left). Bank erosion on lower Wolf Lodge Creek during the 2008 runoff season (right).

Marie Creek

Marie Creek (ID17010303PN031_02) is a major tributary to Wolf Lodge Creek that drains 11,321 acres. In September 2008, DEQ conducted a field visit of the Marie Creek watershed. As was observed in the Wolf Lodge Creek watershed, on a watershed scale the forest canopy is recovering from historic logging activity, and riparian zones are free from recent logging activity. In addition, much of the riparian area of the watershed was forested. Along much of the stream, the streambanks were well vegetated and stable (Figure). However, instream depositional features above bankfull elevation were present, albeit less frequently than in Stella Creek. Associated with these features was lateral erosion, undercutting of the streambank, and large woody debris accumulation in the channel. No excessive fine sediment was observed.

Figure 17. Marie Creek September 2008. Instream depositional features in Marie Creek (right).

Thompson Creek

In October 2009, DEQ Coeur d'Alene Regional Office staff visited Thompson Creek (ID17010303PN025_02) to evaluate whether sediment is impairing beneficial uses. The portions of stream evaluated were those most likely to be impaired due to riparian vegetation removal or other land use activities. Most portions of the stream were fenced to exclude cattle and restrict public access. Cattle had limited access to the stream, and there was neither overgrazing nor bank trampling. Riparian vegetation was at or near full potential in 80–90% of the area observed. Where woody vegetation was lacking, grasses, sedges and forbs dominated (Figure 12). DEQ did not observe areas of streambank lacking vegetative cover resulting in exposed soil. The current conditions demonstrated low BEHI and NBS scores (Rosgen 2006). No large depositional features were noted and the substrate was not imbedded. These condition ratings support findings that sedimentation within the watershed is not impacting beneficial uses.

Figure 12. Thompson Creek streambanks and riparian vegetation.

Willow Creek

Field visits in 2009 to Willow Creek (ID17010303PN011_02) showed no land use practice contributing sediment to the stream (Figure 13). The pasture was in fallow, and approximately 180 feet existed between the road and stream channel.

Figure 13. Willow Creek in July 2009.

4.5 Nutrient and Suspended Sediment Monitoring

In 2008–2009, DEQ conducted instantaneous suspended sediment and nutrient monitoring of 13 tributaries to Coeur d'Alene Lake during winter rain-on-snow events, spring runoff, and the summer low-flow season. Results of this monitoring project are in the *Coeur d'Alene Lake Tributaries 2008–2009 Nutrient and Sediment Monitoring Final Report* (Appendix C). The study concluded that the highest instantaneous suspended sediment and nutrient concentrations were observed during early rain-on-snow events. Although these concentrations are a concern for total phosphorus (TP) loading to Coeur d'Alene Lake, the higher flows and colder temperature are not conducive to aquatic plant growth during the winter and early spring months. However, dissolved Ortho-P:TP concentrations during the base flow period in tributaries to Coeur d'Alene Lake are above those of reference streams in the region, suggesting bioavailable phosphorus may be a concern for beneficial uses for the streams and for loading to the lake. After a very high runoff year, field observations were inconclusive for excess aquatic vegetation growth—except on Blue Creek, where growth was abundant (Figure 14).

Figure 14. Excess visible slime growth on Blue Creek (photos taken June 23, 2009).

4.6 Temperature Monitoring

Following completion of the 1998 §303(d) list, additional streams in the Coeur d'Alene Lake subbasin were monitored and added to the §303(d) list for temperature. Listed in Table 7 are water bodies on Idaho's 2010 §303(d) list for temperature pollution. Temperature listings in Idaho's 2010 Integrated Report (DEQ 2011) were based on results from an analysis of temperature data collected from 1998 to 2008 by DEQ, and the USFS (Table 7). See Table 8 for additional information about assessments using USFS data. Temperature criteria for protection of cold water aquatic life were applied throughout the subbasin. Temperature criteria for protecting salmonid spawning beneficial uses were applied to those streams with current or historical data indicating the presence of westslope cutthroat trout as defined in May (2009). Criteria for protecting the bull trout beneficial use were applied in applicable watersheds as defined by state and federal criteria. Monitoring found widespread exceedances of Idaho numeric water temperature criteria, particularly for salmonid spawning. For more information on this data assessment, see Appendix B.

Table 7. Temperature data collection dates and sources.

Stream	Assessment Units	Temperature Data Collection Dates	Temperature Data Source
Beauty Creek and tributaries	ID17010303PN028_02	5/19/04–10/21/04	USFS
	ID17010303PN028_03	7/31/99–9/29/99; 6/25/01–10/2/01; 5/19/04–10/21/04	DEQ USFS
Carlin Creek and tributaries	ID17010303PN026_02	5/19/04–10/21/04; 6/4/08–6/5/08	USFS
Cedar Creek and tributaries	ID17010303PN030_02 ID17010303PN030_03	6/8/00–11/5/00; 6/7/01–9/18/01; 5/20/04–10/14/04; 5/17/06–10/9/06	USFS
Cougar Creek	ID17010303PN002_02	6/19/98–11/14/98	DEQ
Fernan Creek and tributaries	ID17010303PN032_03 ID17010303PN034_02 ID17010303PN034_02a ID17010303PN034_03	—	Original 1998 §303(d) listing
Fourth of July Creek and tributaries	ID17010303PN020_02 ID17010303PN020_03	5/20/04–10/14/04; 5/19/06–10/9/06	USFS
Killarney Lake tributaries	ID17010303PN022_02	5/24/04–10/21/04	USFS
Latour Creek and tributaries	ID17010303PN015_02	—	Original 1998 §303(d) listing
Marie Creek and tributaries	ID17010303PN031_02	6/22/01–11/18/01; 9/13/01–9/22/01; 5/17/06–10/9/06	DEQ USFS
Mica Creek and tributaries	ID17010303PN004_02 ID17010303PN004_03	6/19/98–11/14/98	DEQ
Rose Creek and tributaries	ID17010303PN021_02	6/2/04–10/25/04	USFS
Wolf Lodge Creek and tributaries	ID17010303PN029_02 ID17010303PN029_03	5/17/06–10/9/06	USFS

Table 8. Assessment results of temperature data collected by the US Forest Service in the Coeur d'Alene Lake subbasin, 1999–2008.
Note: O indicates pass of Idaho water quality standards, X indicates fail, and NA indicates data unavailable for assessment.

Assessment Unit Name	Assessment Unit	Stream Name	US Forest Service Site Description	Year	Criteria Evaluation			
					COLD[a]	SS—spring[b]	SS—fall[b]	ID Bull Trout
Coeur d'Alene River, Latour Creek to Harrison	ID17010303PN007_06	Coeur d'Alene River	CDA River at Cataldo (Bottom)	2003	X	X	X	X
			CDA River at Cataldo (Top)	2003	X	X	X	X
			Cataldo	2006	X	X	X	X
Coeur d'Alene River, South Fork Coeur d'Alene River to Latour Creek	ID17010303PN016_06	Coeur d'Alene River	CDA River below the South Fork	2005	O	X	X	X
			CDA River at Cataldo, off I-90	2005	O	NA	X	X
			Below SF	2007	O	NA	X	X
			Near Cataldo	2007	X	X	X	X
			Cataldo gauging station	2008	O	NA	X	X
Fourth of July Creek, headwaters and tributaries	ID17010303PN020_02	Curran Creek	Curran Creek above private land (Lower Reach)	2004	O	O	X	NA
			Mouth	2006	O	X	X	NA
		Fern Creek	Above private land	2006	O	X	X	NA
		Mason Creek	Mason near mouth (lower reach) near I-90	2004	O	X	X	NA
			Above I-90	2006	O	X	X	NA
		Mill Creek	Above I-90	2006	O	X	X	NA
		Rantenan Creek	Just above private land	2006	O	X	X	NA
Fourth of July Creek, lower	ID17010303PN020_03	Fourth of July Creek	Below Curran Creek	2006	O	X	X	NA
Rose Creek	ID17010303PN021_02	Rose Creek	Rose Creek (lower reach) on private land	2004	X	X	X	NA
Tributaries to Killarney Lake	ID17010303PN022_02	Armstrong Creek	Located on FS and private boundary	2004	O	X	X	NA
		Armstrong Creek tributary	70 m upstream from confluence with Armstrong	2004	O	X	X	NA
		Fortier Creek	Fortier Cr above private land (middle reach)	2004	O	X	X	NA

Assessment Unit Name	Assessment Unit	Stream Name	US Forest Service Site Description	Year	Criteria Evaluation			
					COLD[a]	SS—spring[b]	SS—fall[b]	ID Bull Trout
Cottonwood Creek	ID17010303PN024_02	Blue Lake Creek	None	2008	O	X	X	NA
		Cottonwood Creek	Cottonwood near confluence with Blue Lake Cr. off 614	2004	X	X	X	NA
			None	2008	O	X	X	NA
Carlin Creek	ID17010303PN026_02	Carlin Creek	Lower Carlin Creek	2004	O	X	X	NA
			None	2008	O	X	X	NA
		Carrill Creek	Lower Carrill at mouth (20 m upstream from Pleasant Cr.)	2004	O	X	X	NA
		Johns Creek	Mouth of Johns Creek just above trail 257	2004	O	X	X	NA
		No Creek	Lower No approx. 120 m from trail crossing	2004	O	X	X	NA
		Pleasant Creek	Lower Pleasant Cr. below Carrill Cr., above No	2004	O	X	X	NA
			Above mouth	2008	O	X	X	NA
Beauty Creek, headwaters and tributaries	ID17010303PN028_02	Beauty Creek	Right fork above road 438 up unnamed tributary	1999	O	X	X	NA
			Left fork above road 438 above unnamed tributary	1999	O	X	X	NA
			Upper Beauty, middle Sec 19 off 438	2004	O	X	X	NA
Beauty Creek, lower	ID17010303PN028_03	Beauty Creek	Beauty Cr. at confluence with Caribou Cr.	1999	O	X	X	NA
			Beauty Cr. at confluence with Caribou Cr.	2001	O	NA	X	NA
			Beauty Cr. at confluence with Caribou Cr.	2002	O	X	X	NA
			Lower Beauty Cr. below Caribou Cr.	2004	O	X	X	NA
			below Caribou Cr.	2008	O	X	X	NA

Assessment Unit Name	Assessment Unit	Stream Name	US Forest Service Site Description	Year	Criteria Evaluation			
					COLD[a]	SS—spring[b]	SS—fall[b]	ID Bull Trout
Wolf Lodge Creek, upper	ID17010303PN029_02	Lonesome Creek	Lonesome Creek below Stella Cr.	2001	O	NA	X	NA
			Lonesome Creek (upper reach) (2 readings)	2001	O	X	NA	NA
			Mouth	2006	O	X	X	NA
		Stella Creek	Above Lonesome Creek	2006	O	X	X	NA
Wolf Lodge Creek, lower	ID17010303PN029_03	Wolf Lodge Creek	Above Marie Cr. Just below Meyers Hill Road	2006	O	X	X	NA
			Under Funk's bridge	2006	O	X	X	NA
Cedar Creek, headwaters and tributaries	ID17010303PN030_02	Alder Creek	Lower Alder, 40 m upstream from I-90	2004	O	X	X	NA
			Lower Alder, 60 m upstream from I-90	2005	O	X	X	NA
			25-30 m upstream from I-90	2006	O	X	X	NA
		Cedar Creek	Upper reach above SF Cedar	2000	O	NA	X	NA
			Upper reach above SF Cedar	2001	O	X	X	NA
			Upper reach above SF Cedar	2004	X	X	NA	NA
			Cedar Cr. below the SF	2005	X	X	X	NA
			Cedar Cr. below the SF	2006	O	X	X	NA
		South Fork Cedar Creek	Lower to mid SF, up from I-90	2004	O	X	X	NA
Cedar Creek, lower	ID17010303PN030_03	Cedar Creek	Cedar Creek, lower reach north of I-90	2000	O	NA	X	NA
			Cedar Creek, lower reach north of I-90	2001	O	X	X	NA
			Lower Cedar Cr, near Strauss house	2005	O	X	X	NA
Marie Creek	ID17010303PN031_02	Marie Creek	Marie Cr. near bridge	2001	O	NA		
			Lower Marie off trail	2005	O	X	X	NA
			Trail 214 at Marie Cr. floodplain, Approx. 600 ft below Burton	2006	O	X	X	NA
		Searchlight Creek	Above Trail 241	2006	O	X	X	NA

[a] COLD = cold water aquatic life
[b] SS = salmonid spawning

4.7 US Forest Service Environmental Assessments

Since 2000, USFS has conducted two assessments in the Coeur d'Alene Lake subbasin, which were done prior to timber harvest and other forest treatment activity. The Horizon Moon site investigation was done in 2002 to characterize resource conditions near the Horizon Moon timber sale. The project area was entirely within the Wolf Lodge Creek watershed. The Blue Alder Environmental Assessment was done in 2007 to characterize resource conditions and concerns prior to management actions in the Blue Alder Resource area. The Blue Alder resource area is approximately 13,800 acres within the Blue Creek, Wolf Lodge Creek, and alder Creek watersheds.

Wolf Lodge Creek

In October 2002, TetraTech conducted a site investigation as part of the Horizon Moon project to evaluate stream conditions in upper Wolf Lodge Creek (ID17010303PN029_02), including its major tributary, Stella Creek (Tetra Tech 2003). Stream cross section and profile surveys and stream channel characterization were performed on Stella Creek approximately 200 feet upstream of its confluence with Wolf Lodge Creek. This monitoring site was established in 1978 by the USFS. Longitudinal/gradient surveys were performed along the length of the channel for approximately 200 feet upstream and downstream of the cross section, which was also just downstream of a bridge. Due to the proximity of the bridge and its influence on streamflow and sediment transport, survey results are not representative of the dimension, pattern, and profile of lower Stella Creek. Therefore, the conclusions will not be utilized in this analysis.

Two new stream monitoring reaches were established by TetraTech in 2002 on upper Wolf Lodge Creek and upper Stella Creek. Stream channel stability was rated at each site using the Pfankuch method. The Pfankuch method evaluates mass wasting potential adjacent to the channel, detachability of bank and bed materials, channel capacity, and evidence of excessive erosion and/or deposition (Pfankuch 1975). Results indicated Pfankuch stability ratings for upper Wolf Lodge and upper Stella Creeks were fair. Bank erosion potential was low/moderate for the upper Stella and upper Wolf Lodge Creek sites but high for upper Stella Creek. Both channels were classified as C3 channels using the Rosgen classification method. However, due to the slope of the channels, they are more likely B4 channels, in which case the Pfankuch stability rating for the two channels was poor.

As part of the *Blue Alder Resource Area Environmental Assessment,* the USFS conducted further studies within the upper Wolf Lodge Creek watershed. They determined that the average monthly peak flows in Wolf Lodge Creek increased from 3% above baseline between the early 1980s and the early 2000s to 7% following harvest activity in 2000 and 2001 (USFS 2008). They determined that stream hydrogeologic processes are responding slowly to harvest activity in the 1980s as vegetative recovery occurs.

One cross section on upper Wolf Lodge Creek was evaluated in 2002 and 2006. At this cross section, some channel filling had occurred, but no change in channel gradient was observed. Fisheries habitat inventories on upper Wolf Lodge Creek indicated fish density was relatively low, with a lower number of native than nonnative trout; the pool-to-riffle ratio was moderate; and abundant woody debris was present with scour pools significant for fish. Upper Wolf Lodge Creek survey data indicated fish density was relatively high, with a lower number of native trout;

pool-to-riffle ratio was good; channel stability at cross sections was in good condition; and single and aggregate large woody debris class was well distributed in length and diameter.

As part of the Blue Alder environmental assessment, the USFS conducted further studies within the Stella Creek watershed. They determined that the average monthly peak flows in Stella Creek increased from 6% above baseline between the early 1980s and the early 2000s to 8% following harvest activity in 2000 and 2001 (USFS 2008). They determined that stream hydrogeologic processes are still responding to this harvest activity as vegetative recovery occurs.

One cross section on upper Stella Creek was evaluated in 1997, 2002, and 2006. At this cross section, no major shifts in channel morphology were observed. Fisheries habitat inventories on upper Stella Creek indicated fish density was relatively low, with an equal number of native and nonnative trout; the pool-to-riffle ratio was moderate; and abundant woody debris was present with scour pools significant for fish. The same environmental assessment determined stable stream bed, streambanks, and large wood in Lonesome Creek, a small tributary to Stella Creek.

Marie Creek

In October 2002, TetraTech conducted a site investigation as part of the Horizon Moon site investigation to evaluate stream conditions in Marie Creek (ID17010303PN031_02) (Tetra Tech 2003). Stream cross section and profile surveys and stream channel characterization were performed on a lower reach of Marie Creek at a monitoring station established by the USFS in 1975. Longitudinal/gradient surveys were performed along the length of the channel for approximately 100 feet upstream and downstream of a cross section established approximately 10 feet downstream from the bridge crossing Marie Creek on Wolf Lodge Creek road. Due to the proximity of the bridge and its influence on streamflow and sediment transport, survey results are not representative of the dimension, pattern, and profile of lower Marie Creek. Therefore, the conclusions will not be utilized in this analysis.

As part of the 2008 Blue Alder environmental assessment, the USFS conducted studies within the Marie Creek watershed (USFS 2008). They determined that the average monthly peak flows were 6% above baseline from the late 1990s to the early 2000s. This increase was attributed to past harvest activity. Currently, average monthly peak flows are down to 3% over baseline, as vegetation continues to recover from past harvest activity. Stream surveys in 2006 indicated fish density was relatively low, with a lower number of native than nonnative trout; channel stability at cross sections was in good condition; pool-to-riffle ratio was good; and single and aggregate large woody debris class was well distributed in length and diameter.

As part of the Blue Alder environmental assessment, surveys of Skitwish Creek, a larger tributary to Marie Creek, determined the bed and banks are stable, large wood is stable, and good vegetative bank cover exists. Some undercutting of banks was present, but little active bank erosion was evident (USFS 2008).

In 1991, the USFS installed a sediment pond in lower Marie Creek. During 11 years of monitoring, starting in 1996, 2,175 cubic yards of sediment have been captured by the pond. It was uncertain whether this amount was a result of high-flow events only.

Cedar Creek

The Cedar Creek AUs (ID17010303PN030_02 and ID17010303PN030_03) include tributaries to Cedar Creek, such as South Fork Cedar Creek, Chinese Gulch, and Alder Creek. As part of the 2008 Blue Alder environmental assessment, the USFS conducted studies within the Cedar Creek watershed (USFS 2008). Due to the presence of I-90 near much of the middle reaches of this creek, the stream is severely constricted, with minimal meander bends, reduced pools, and reduced large wood. This development, combined with high road densities within the headwaters of Cedar Creek and lower upslope canopy density, has affected the hydrologic regime of Cedar Creek. The USFS determined that the average monthly peak flows were 10% above baseline from the 1980s to the mid-1990s. This increase was attributed to past harvest activity. Currently, average monthly peak flows are down to 8% over baseline, as vegetation continues to recover from past harvest activity. Near the mouth of the stream, channel aggradation and large amounts of sand were observed.

Past harvest activity in the headwaters and on private land has also altered the hydrologic regime within the Alder Creek subwatershed. Currently, average monthly peak flows are down to only 8% over baseline, as vegetation continues to recover from past activity. At base flow, sections of Alder Creek flow below the surface—it is unknown if this is a natural occurrence.

Stream surveys in 2006 indicated fish density was relatively high, comprised of native trout. The high densities may be due to population concentration due to limited habitat. The surveys also indicated channel stability at cross sections was in good condition; pool-to-riffle ratio was good, but sections of the stream were dry, limiting habitat; and single and aggregate large woody debris class was small in length and diameter.

4.8 *E. coli* Monitoring of Bellgrove Creek

In June 2005, DEQ took water quality samples from Bellgrove Creek (incorrectly called Fighting Creek in the 2008 Integrated Report) (ID17010303PN005_02) at two locations downstream from a commercial elk production facility just east of Highway 95 and tested them for *Escherichia coli* (*E. coli*). *E. coli* counts exceeded Idaho's water quality standard of 406 *E. coli* colony forming units (CFU) per 100 milliliters (mL) for primary contact recreation. DEQ took 5 samples at each site no more than a week apart over 30 days, which exceeded Idaho's water quality standard for a geometric mean of 126 *E. coli* CFU per 100 mL (Table 9). In May 2007, DEQ took water quality samples above and below the elk production facility. Samples from both locations downstream of the elk production facility exceeded Idaho's geometric mean criterion of 126 *E. coli* CFU per 100 mL (Table 9).

In May and June 2011, the University of Idaho took water quality samples above and below the elk production facility, and both locations downstream of the elk production facility exceeded the geometric mean criterion of 126 *E. coli* CFU per 100 mL (Table 10).

Table 9. *E. coli* enumeration results on Bellgrove (Fighting) Creek, 2005 and 2007.

Location	Date	CFU	Date	CFU	Date	CFU	Date	CFU	Date	CFU	Date	CFU	Geometric Mean
0.25 mile downstream of elk facility	6/15/05	3100	6/29/05	13800	7/6/05	5900	7/12/05	8400	7/26/05	1800	—	—	5204
0.33 mile downstream of elk facility	—	—	6/29/05	4200	7/6/05	320	7/12/05	390	7/26/05	1900	—	—	999
Above elk facility (but below Hwy 95 bridge)	5/10/07	40	5/15/07	19	5/18/07	54	5/22/07	88	5/25/07	120	5/29/07	61	53
0.25 mile downstream of elk facility	5/10/07	1600	5/15/07	400	5/18/07	250	5/22/07	930	5/25/07	450	5/29/07	450	923
Fighting Creek 0.2 miles below confluence with Bellgrove Creek	5/10/07	97	5/15/07	230	5/18/07	80	5/22/07	300	5/25/07	6	5/29/07	70	80

Table 10. University of Idaho *E. coli* enumeration results on Bellgrove (Fighting) Creek, 2011.

Location	Date	CFU	Date	CFU	Date	CFU	Date	CFU	Date	CFU	Geometric Mean
Above elk facility (but below Hwy 95 bridge)	5/16/11	649	5/23/11	18	5/31/11	34	6/6/11	135	6/13/11	121	92
Downstream of elk facility	5/16/11	2420	5/23/11	142	5/31/11	727	6/6/11	2419	6/13/11	1986	1037
0.33 mile downstream of elk facility	—	—	5/23/11	816	5/31/11	48	6/6/11	162	6/13/11	167	172
Fighting Creek 0.2 miles below confluence with Bellgrove	—	—	5/23/11	920	5/31/11	111	6/6/11	46	6/13/11	113	100

4.9 Road Deicing Agent Monitoring

The Idaho Transportation Department (ITD) began using sodium chloride to improve vehicle traction on north Idaho roadways on a limited basis in 2003. Since 2003, sodium chloride use has grown to include all 5 north Idaho counties. The widespread use of road salt is attributed to ITD’s attempts to provide the safest, least-expensive, and most-effective means of improving vehicle traction in winter.

DEQ monitored the effect of deicing agents on Cedar and Fourth of July Creeks to help address public concerns about possible aquatic impacts caused by road salt and to evaluate whether additional pollutants are impairing beneficial uses. Cedar and Fourth of July Creeks are failing to support cold water aquatic life beneficial use and are included on Idaho’s 2010 Integrated Report (DEQ 2011). Excess sediment and temperature are identified as impairing beneficial uses; however, due to the close proximity of each stream to I-90, additional pollutants could be altering the biological community. DEQ conducted monitoring from February 14 through June 3, 2008, to better determine if road salt is transported into Cedar and Fourth of July Creeks and at what concentration. During this monitoring campaign, specific conductivity was continuously monitored in Cedar and Fourth of July Creeks, and water samples were taken from both creeks and analyzed for sodium (Na), calcium (Ca), magnesium (Mg), and chloride (Cl) concentrations. As an experimental control, DEQ also collected water samples and measured specific conductance in Fern Creek, which is upstream of I-90 and not impacted by runoff from I-90. Based on the monitoring results, DEQ determined that sodium chloride used for roadway deicing is transported to adjacent streams. Sodium and chloride concentrations in streams adjacent to I-90 that drain Fourth of July Pass (Cedar and Fourth of July Creeks) are considerably higher than those measured in Fern Creek, a stream not impacted by highway runoff. However, the sodium and chloride concentrations measured and calculated during this monitoring effort in north Idaho were significantly lower than those found, through research, to be impacting aquatic life elsewhere in the country. Details of this study are provided in the 2009 report *A Preliminary Evaluation of Road Deicing Chemical Concentrations in North Idaho Streams Adjacent to Interstate 90 that Drain Fourth of July Pass* (DEQ, 2009).

5 Review of Implementation Plan and Activities

The *Coeur d’Alene Lake and River Total Maximum Daily Load Implementation Plan* (Colla et al. 2002) was developed in 2002 by DEQ and the following state management agencies for various land use activities:

- Idaho Department of Lands (IDL) for timber harvest activities
- Idaho Soil and Water Conservation Commission for agriculture
- Idaho Transportation Department (ITD) for roads

Each agency took the lead in identifying areas of concern for pollutant loading and selecting best management practices (BMPs) to reduce nonpoint source pollution and achieve pollutant load reductions and TMDL targets. It was agreed upon that all agencies would conduct initial field trips to list areas of known problems and produce an annual list of needed projects in the TMDL subwatersheds. Subwatersheds with specific implementation activities ongoing, or completed are addressed in the following sections.

5.1 Cougar Creek

Actions for sediment reduction in Cougar Creek were identified by the lead agencies in the implementation plan (Colla et al. 2002). Much implementation work has been done near the mouth of Cougar Creek. In the late 1990s, the Nature Conservancy purchased 88 acres of wetland property at the mouth of Cougar Creek with the purpose of restoring wetland function and wildlife habitat along the creek, while offering recreational and educational opportunities for the community. Consequently, the wetland function to filter sediment and nutrients before they reach Coeur d'Alene Lake has been restored. In addition, natural streambank protection and channel vegetation has been restored on that property. Just upstream of the Nature Conservancy property, grazing on 75 acres has been eliminated, providing conditions for regeneration of natural streambank protection and channel vegetation. The acreage is now used for hay production. Upstream of these projects, approximately 700 acres of forested property have been placed into conservation easements to restrict development and preserve wildlife habitat and sustainable timber production.

5.2 Kid Creek

Actions for sediment reduction in Kid Creek were identified by the lead agencies in the implementation plan (Colla et al. 2002). The Idaho Soil and Water Conservation Commission and the KSSWCD have completed a number of projects on the agricultural ground within the Kid Creek watershed. BMPs implemented in these projects include riparian buffers and sediment ponds to stop sediment transport from pastures to the creek and grade structures within the creek.

5.3 Latour Creek

Actions for sediment reduction in Latour Creek were identified by the lead agencies in the implementation plan (Colla et al. 2002). IDL acquired 5.7 miles of road from the US Bureau of Land Management (BLM). With funds from DEQ under section 319 of the CWA, the road was improved to provide proper road surface drainage, reduce the threat of fine sediment delivery to Latour Creek, and improve fish passage. The sediment reduction from this project was estimated to be 79 tons per year. The following work was done to improve the road:

- Bridgework was done to replace an old box cement bridge with a steel bridge over Lost Girl Creek and Butler Creek.
- Support structures and decking on the Latour Creek Bridge were improved.
- 5.7 miles of road were reconstructed using a process that grinds native rock within the roadbed. In the past, this process has been successfully used by IDL to improve road drainage. For 1 mile of road where there was not adequate rock, gravel was added to improve the road surface.
- Road reconstruction efforts also included installing 4 additional relief culverts, installing 5 undersized stream crossing culverts, pulling ditches and outside shoulders, rocking ditch lines, and aligning, crowning, and installing rolling dips.

5.4 Mica Creek

Actions for sediment reduction in Mica Creek were identified by the lead agencies in the implementation plan (Colla et al. 2002). Since 2000, much work has been done on Mica Creek. Much of the work was implemented through partnerships between DEQ, KSSWCD, the Natural Resources Conservation Service, and the SCC. Total estimates are 2168 feet of stream channel stabilized by planting and/or rock amounting to and annual load reduction of 718 pounds of total phosphorus.

5.5 Wolf Lodge Creek

In the 2002 implementation plan, designated management agencies took the lead in identifying areas of concern for pollutant loading and selecting BMPs to reduce nonpoint source pollution to the upper Wolf Lodge Creek watershed (Colla et al. 2002). Actions for sediment reduction in upper Wolf Lodge Creek were identified by the lead agencies. The projects were intended for implementation within the entire Wolf Lodge Creek watershed, including Marie and Cedar Creeks.

The USFS has done a significant amount of restoration work in the upper Wolf Lodge Creek watershed. Road decommissioning, road storage, and culvert removals in 2002–2003 in the Stella Creek watershed have reduced sediment yield by 14% (according to WATSED model output).[1] Road storage and culvert removal in 2003 in the Wolf Lodge Creek watershed has resulted in a modeled reduction in sediment yield of 8%.

No known implementation activities have occurred in the lower Wolf Lodge Creek watershed.

5.6 Marie Creek

The USFS has done a significant amount of restoration work in the Marie Creek watershed. Road decommissioning, road storage, culvert upgrades, and culvert removals in 2002–2003 have reduced sediment yield by an estimated 8% (USFS 2008).

5.7 Cedar Creek

The USFS has done some restoration work in the Cedar Creek watershed, primarily as road restoration within the South Fork Cedar Creek watershed. As a result of this work, road density has decreased from 7.3 miles/square mile to 5.2 miles/square mile, resulting in an estimated reduction in sediment yield of 25% (USFS 2008).

5.8 Blue Creek

Sunnyside Creek is a tributary to Blue Creek that is primarily confined between a county road and a cutslope in a steep canyon wall. Part of the creek was located adjacent to an active landslide, which was a significant sediment source to Blue Creek during rain-on-snow events and spring runoff. The road was moved, the channel was reconstructed, and the landslide was

[1] WATSED is software used for modeling hydrologic and sediment responses.

stabilized. Toward the mouth, the creek was diverted into floodplain property to slow flow and distribute sediment before it reaches Blue Creek.

6 Beneficial Use Support Status Evaluation

The data collected as part of this subbasin assessment update was used to evaluate beneficial use support of individual water bodies and make recommendations for beneficial use support status in Idaho's 2010 Integrated Report. A summary of this evaluation is provided in Table 11.

Table 11. Beneficial use support status and actions for streams evaluated under the 2011 Coeur d'Alene Lake subbasin assessment update.

Stream	Assessment Unit Number	§303(d) listing—2008 Integrated Report	§303(d) listing—2010 Integrated Report	Recommended Action
Beauty Creek	ID17010303PN028_02 ID17010303PN028_03		Temperature	Temperature TMDL.
Bellgrove Creek	ID17010303PN005_02	*E. coli*	*E. coli* Sediment	Sediment TMDL. *E. coli* TMDL.
Blue Lake Creek	ID17010303PN024_02		Temperature	Temperature TMDL.
Carlin Creek	ID17010303PN026_02		Temperature	Temperature TMDL.
Cedar Creek	ID17010303PN030_02 ID17010303PN030_03	Sediment	Sediment Temperature	Sediment: no action needed until more implementation occurs. Temperature: TMDL.
Coeur d'Alene River – Latour Creek to the Mouth	ID17010303PN007_06	Temperature Sediment Habitat Alt. Lead Cadmium Zinc	Temperature Sediment Habitat Alt. Lead Cadmium Zinc	Metals: no action until rulemaking Sediment: Wait for record of decision under Operable Unit 3, and then possibly place in Category 4b of Integrated Report. Temperature TMDL Habitat Alteration: move to Section 4c.
Coeur d'Alene River – SF Coeur d'Alene River to Latour Creek	ID17010303PN016_06	Temperature Lead Cadmium Zinc	Temperature Lead Cadmium Zinc	Metals: no action until rulemaking Temperature TMDL
Cougar Creek	ID17010303PN002_02	Habitat Alt. Sediment Temperature	Habitat Alt. Sediment Temperature	Sediment: no action needed until more implementation occurs. Temperature TMDL.
Fernan Creek	ID17010303PN032_03 ID17010303PN034_02 ID17010303PN034_02a	Temperature	Temperature	Temperature TMDL.

Stream	**Assessment Unit Number**	**§303(d) listing—2008 Integrated Report**	**§303(d) listing—2010 Integrated Report**	**Recommended Action**
	ID17010303PN034_03			
Fourth of July Creek	ID17010303PN020_02 ID17010303PN020_03	Habitat Alt. Sediment	Habitat Alt. Temperature	Sediment removed from 2010 §303(d) list. Temperature TMDL.
Kid Creek	ID17010303PN003_02	Habitat Alt. Sediment	Habitat Alt. Sediment	Priority for BURP monitoring. Further sediment transport evaluation needed.
Killarney Lake tributaries	ID17010303PN022_02		Temperature	Temperature TMDL.
Latour Creek	ID17010303PN015_02	Sediment, Temperature	Sediment, Temperature	Sediment: no action needed until more implementation occurs. Temperature TMDL.
Marie Creek	ID17010303PN031_02	Habitat alteration, Sediment, Temperature	Habitat alteration, Sediment, Temperature	Sediment: no action needed. More time needed following implementation activities. Temperature TMDL.
Mica Creek	ID17010303PN004_02 ID17010303PN004_03	Habitat alteration, Sediment, *E. coli*, Temperature	Habitat alteration, Sediment, *E. coli*, Temperature	Sediment and *E. coli*: no action needed. More time needed following implementation activities. Temperature TMDL.
Rose Creek	ID17010303PN021_02		Temperature	Temperature TMDL.
Thompson Creek	ID17010303PN025_02	Sediment	None	Sediment removed from 2010 §303(d) list.
Willow Creek	ID17010303PN011_02	Sediment	None	Move to Category 3 of Integrated Report as an unassessed water body.
Upper Wolf Lodge Creek	ID17010303PN029_02	Sediment, Temperature	Sediment, Temperature	Sediment: no action needed. More time needed following implementation activities. Temperature TMDL.
Lower Wolf Lodge Creek	ID17010303PN029_03	Habitat alteration, Sediment, Temperature	Habitat alteration, Sediment, Temperature	Sediment: no action needed until more implementation occurs. Temperature TMDL.

6.1 Bellgrove Creek

Bellgrove Creek (ID17010303PN005_02, incorrectly listed as Fighting Creek in Idaho's 2008 Integrated Report) drains a 6.1-square-mile watershed on the west side of Coeur d'Alene Lake (Figure 21). It is a 2nd-order stream at its confluence with Fighting Creek, which flows into Rockford Bay in Coeur d'Alene Lake. Most of the land through which Bellgrove Creek flows is privately owned, except near its mouth where it is within the Coeur d'Alene Reservation.

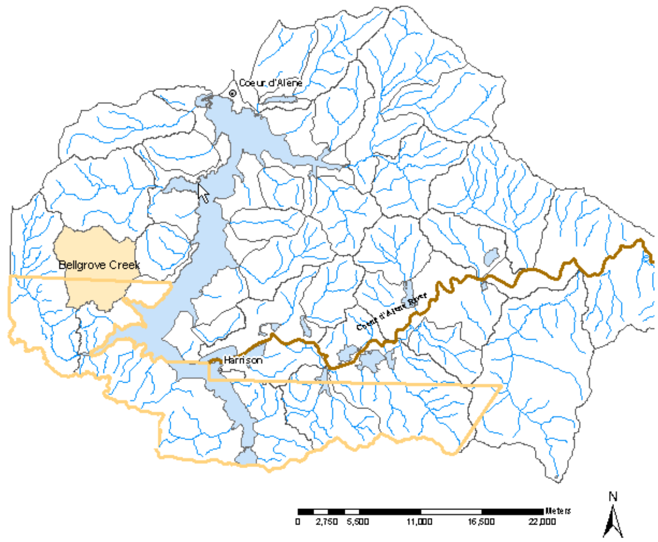

Figure 15. Bellgrove Creek subwatershed.

Bellgrove Creek was listed on Idaho's 2008 Integrated Report as impaired for *E. coli* due to violations of water quality standards in 2005 and 2007. Data indicate a confined elk feeding operation is the primary source of the high *E. coli*.

In 2008, Bellgrove Creek was assessed for beneficial use support using the BURP protocol, and the assessment concluded that beneficial uses are not supported. Substrate was measured at the 2008 BURP location using the modified Wolman pebble count method at 3 riffle cross sections, and fine particles (less than 6.35 millimeters) were 36.4% of the total distribution. This percentage is above the 24% threshold shown in granitic watersheds to reduce embryo survival and fry emergence (Bjornn and Reiser 1991). However, streambank stability was observed to be 89–93% covered/stable, suggesting the source of fine sediment may be upstream and/or upland. The monitoring site was just downstream of the elk farm.

Monitoring results from a 2009 DEQ study showed that total suspended solids and nutrient concentrations in Bellgrove Creek were consistently much higher than all other tributaries in the project area throughout the monitoring period. During a rain-on-snow event, nutrient and suspended solids concentrations were an order of magnitude above concentrations observed in other creeks (Appendix C). In addition, Idaho's turbidity water quality standard may have been exceeded when comparing data during the rain-on-snow events on Bellgrove Creek with other streams in the project area. During this same monitoring period, visual observations during the two rain-on-snow events confirmed gully erosion from the property into Bellgrove Creek. These observations suggest that the elk farm is contributing to *E. coli* and sediment exceedances observed during monitoring. No aquatic nuisance vegetation was observed during low-flow monitoring.

In conclusion, data collected since the *Coeur d'Alene Lake and River TMDL* presents substantial evidence that beneficial uses in Bellgrove Creek are impaired due to *E. coli* and excess sediment. Because no nuisance aquatic vegetation growth was observed during low flow in 2010, monitoring is inconclusive as to whether beneficial use impairment due to nutrients is occurring on Bellgrove Creek. As such, Bellgrove Creek is listed in Category 5 of Idaho's 2010 Integrated Report as impaired due to *E. coli* and sediment (DEQ 2011).

6.2 Coeur d'Alene River

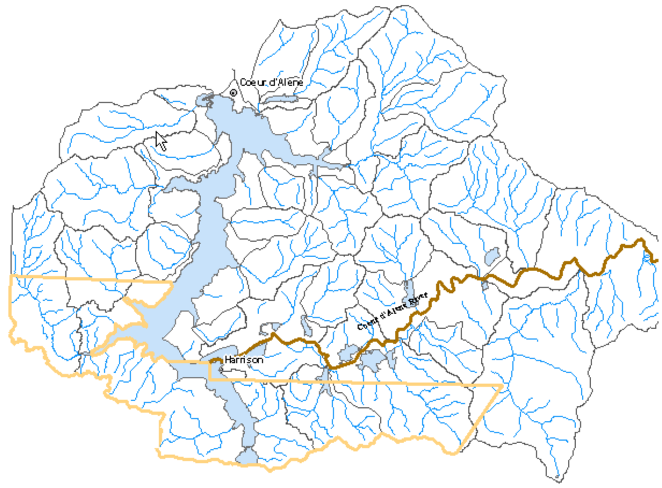

Figure 16. Coeur d'Alene River.

The Coeur d'Alene River from the headwaters at the South Fork Coeur d'Alene River to the confluence with Latour Creek (ID17010303PN016_06) is listed in Idaho's 2008 Integrated Report as not supporting cold water aquatic life beneficial use due to cadmium, lead, zinc, and temperature. Because it is an impounded reach, it does not support salmonid spawning. From the confluence of Latour Creek to the mouth at Coeur d'Alene Lake (ID17010303PN007_06), the river is listed as not supporting cold water aquatic life beneficial use due to cadmium, lead, zinc, habitat alteration, sediment, and temperature (Figure 22). This same AU is listed as not supporting salmonid spawning beneficial use due to temperature. These impairments date back to the 1998 §303(d) list.

The Coeur d'Alene River is an impaired water body that presents special challenges. Mining and ore processing activity in the past 100 years, primarily in the South Fork Coeur d'Alene River basin, has resulted in an estimated 54.5–70 million tons of mine tailings discharged into the Coeur d'Alene River, its tributaries, and floodplain (National Research Council 2005). Rain-on-snow events and spring snowmelt runoff continue to redistribute these sediments on the channel bed, banks, floodplain, and natural levees of the river. In addition, water elevations in Coeur d'Alene Lake are held up to 7.5 feet higher by the Post Falls HED during the months of June to mid-September, resulting in backwater conditions on the Coeur d'Alene River from Cataldo to the mouth. Due to these special challenges, DEQ has decided to take action other than a TMDL to address the impairments on the Coeur d'Alene River, as explained below.

Sediment and Metals Impairments

In the *Coeur d'Alene Lake and River TMDL*, it was determined that the beneficial uses of the Coeur d'Alene River below Cataldo are not impaired by sediment due to the channel being low gradient with its bed consisting of fine sand (DEQ 1999). These findings and conclusions are different from Dupont et al. (2008). The 1999 TMDL further states that the sediment impairment above Cataldo should be addressed within the source areas of the North and South Fork Coeur d'Alene Rivers. Despite these assessments, the lower reach of the river (ID17010303PN007_06) remains in Category 5 of Idaho's 2010 Integrated Report.

In 1983, EPA listed the 21-square-mile Bunker Hill "box" area—as well as the metals-contaminated areas in the Coeur d'Alene River corridor, adjacent floodplains, downstream water bodies, tributaries, and fill areas—on the National Priorities List, qualifying them for CERCLA action (National Research Council 2005). The focus of CERCLA activities within the Coeur d'Alene Basin is to reduce human and ecological exposures to metals contamination, primarily from lead, cadmium, and zinc. Due to the aquatic and soil conditions within the basin, lead is primarily present and transported as part of the sediment, and zinc is present primarily in its dissolved form (National Research Council 2005).

A tremendous amount of work is already being done under the EPA CERCLA process, and much progress has been made toward understanding the extent of contamination within the basin, key sources, and sinks and to understand metals and metals-contaminated sediment transport and deposition mechanisms. However, most of the CERCLA remediation focus to date has been within the 21-square-mile Bunker Hill “box” area (Operable Units 1 and 2), with a primary focus of reducing human exposure to metals in contaminated sediment and water.

In 1998, EPA extended Superfund activities and conducted a remedial investigation/feasibility study of contamination outside the “box” area. In doing so, they created Operable Unit 3 (OU3). In 2002, the EPA issued an interim record of decision (ROD) for OU3, which places more emphasis on reducing ecological exposures to mining contamination in the Coeur d’Alene Basin upstream and downstream of Coeur d’Alene Lake. The EPA is starting the process to amend the ROD for OU3 only for remediation action in the South Fork Coeur d’Alene River subwatershed. Targeted remediation will be toward mine and mill sites, ground and surface water, and ecological remediation. Once it is written, the amended ROD will be implemented.

In the future, EPA will move toward amending and implementing the ROD for OU3 in the lower Coeur d’Alene River. In the meantime, more site characterization is being done to understand metals transport and deposition mechanisms, key sources and sinks, and remaining data gaps in the lower river (CH2M Hill 2010). These studies, along with existing studies under CERCLA and the Post Falls HED §401 recertification process, will provide critical information for the amended ROD for OU3 in the lower Coeur d’Alene River.

Recommendation: Impairments on the Coeur d’Alene River should be classified under the “Extremely Difficult Problems” category identified in the *Report of the Federal Advisory Committee on the Total Maximum Daily Load (TMDL) Program* (EPA 1998), and the sediment and metals TMDLs on the lower river (ID17010303PN007_06) should be postponed. Once the ROD for OU3 is completed and if the project efforts will lead to achieving Idaho water quality standards, it may be prudent to work with EPA and responsible parties to determine if the cleanup plan would be a candidate for consideration as a Category 4b water quality plan.

Temperature Impairments

An analysis of historical temperature data collected from the Coeur d’Alene River indicates Idaho water quality standards for temperature were exceeded in the Coeur d’Alene River from its confluence with the South Fork Coeur d’Alene River to the mouth. Temperature impairments have been attributed to excess heat load from the tributaries (including the North and South Fork Coeur d’Alene Rivers), and backwater conditions caused by operation of the Post Falls HED. The water quality exceedances violate Idaho’s cold water aquatic life and salmonid spawning temperature criteria (DEQ 2012).

Recommendation:

While a TMDL is required to address temperature impairment on the Coeur d’Alene River, flow alteration and backwater conditions on the Coeur d’Alene River caused by Post Falls HED preclude the ability to fully mitigate temperature impairment caused by this condition. However, excessive heat loading to the Coeur d'Alene River will be reduced with the following measures: First, excess heat loading from tributaries to the Coeur d'Alene River will be reduced through progress toward TMDL shade targets on those tributaries (TMDL awaiting EPA approval). This includes progress toward TMDL shade targets as directed by temperature TMDLs for the North Fork and South Fork Coeur d'Alene Rivers (draft TMDLs are written for both rivers). Second, the temperature conditions in the Coeur d'Alene River will likely benefit from efforts implemented under Avista's water quality improvement plans as mandated under the settlement agreement between Avista, DEQ, and Idaho Department of Fish and Game (Avista 2008). Next, bull trout restoration efforts directed by the US Fish and Wildlife Service will likely focus on restoring cool-water refugia for migrating bull trout in the Coeur d'Alene River during the warmest summer months. Lastly, restoration efforts as set forth under the focus of CERCLA (superfund) activities within the Coeur d'Alene Basin are likely to improve temperature conditions in the watershed and the Coeur d'Alene River.

6.3 Cougar Creek

The Cougar Creek AU (ID1701033PN002_02) is included in Idaho's 2010 Integrated Report as not supporting cold water aquatic life and salmonid spawning beneficial uses. The cause of impairment is listed as habitat alteration, sediment, and temperature. The Cougar Creek watershed is located on the northwest side of Coeur d'Alene Lake (Figure 23).

Recent assessments by DEQ and IDL have provided insight as to the sediment sources to Cougar Creek and cold water aquatic life and salmonid spawning beneficial use support. Wetlands restoration near the mouth of Cougar Creek and the elimination of livestock grazing pressure adjacent to the stream channel just upstream of the wetlands restoration project has resulted in marked improvement to streambank stability at the mouth of the watershed and an overall reduction of sediment in that reach. These changes have also likely improved temperature conditions in that reach.

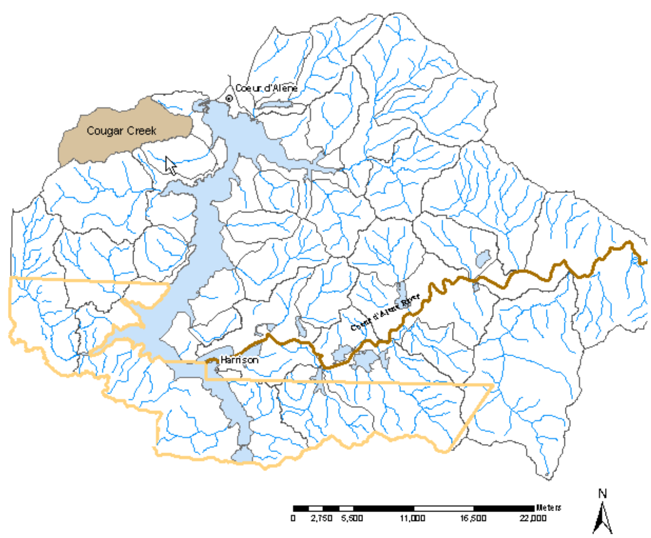

Figure 17. Cougar Creek subwatershed.

However, excessive sedimentation still exists in part of the watershed. Since 1999, the watershed has experienced substantial residential development, with a 70% increase in road miles within forested land of the watershed. The 2009 CWE evaluations identify a high hazard for mass wasting, moderate channel stability, and a moderate risk of sedimentation to Cougar Creek from forest canopy removal. Although the IDL CWE evaluations indicate low risk for sediment delivery to Cougar Creek from forested roads, several management problems were identified related to roads, ditch drainage, fill slopes, and culverts. In addition, DEQ surveyors recently observed excessive erosion and sedimentation on private land and in the channel throughout the watershed. This erosion and sedimentation is a factor in the poor cold water salmonid habitat documented by May (2009), and it is likely a factor in exceedances of Idaho temperature water quality standards.

Although much progress toward TMDL implementation has occurred near the mouth of Cougar Creek, the above factors present evidence that Cougar Creek is still functioning at a sediment transport/deposition rate not fully supportive of the cold water aquatic life and salmonid spawning beneficial uses. In addition, disturbance in the watershed may contribute to temperature impairment within the stream. Therefore, DEQ kept Cougar Creek in Category 4a of Idaho's 2010 Integrated Report as an impaired stream with a sediment TMDL; it will be subject to load reductions defined in the *Coeur d'Alene Lake and River TMDL*, and a temperature TMDL will be written for the stream.

As described in the *Coeur d'Alene Lake Tributaries Temperature TMDL* (DEQ 2012), excess heat loading existing on Cougar Creek on the mainstem near the mouth. The TMDL established effective shade targets for Cougar Creek based on the concept of maximum shading under potential natural vegetation (PNV) resulting in the lowest possible natural stream temperatures. The TMDL compares effective shade targets to estimates of existing shade to determine shade deficits and the amount of shade that must be restored to individual stream reaches.

6.4 Fourth of July Creek

Fourth of July Creek (AUs ID17010303PN020_02 and ID17010303PN020_03) is listed as not supporting cold water aquatic life and salmonid spawning beneficial uses in Idaho's 2010 Integrated Report (Figure 24). The cause of impairment is physical habitat alteration and temperature. The cause of the physical habitat alteration impairment is due to channelization of the creek due to its proximity to I-90, and a series of flood control structures in place at the mouth of the creek.

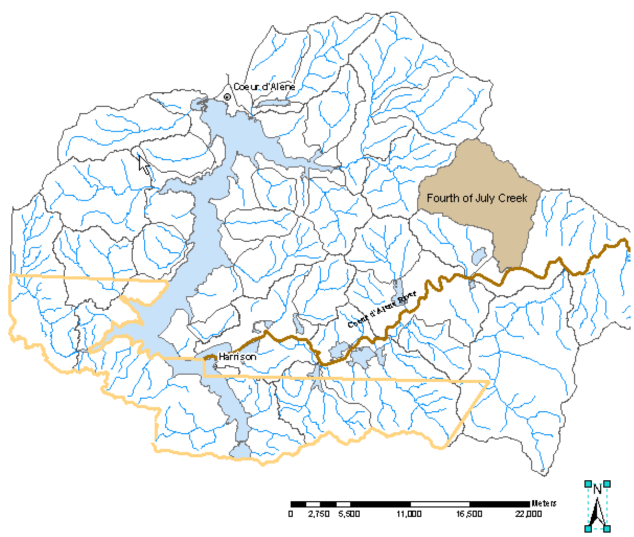

Figure 18. Fourth of July Creek subwatershed.

Fourth of July Creek (ID17010303PN020_03) was originally listed for sediment in the 1990s when the addition of traction sand to the highway resulted in excess sediment and impairment of beneficial uses in Fourth of July Creek near I-90. Justification for delisting the sediment cause in 2010 was based on modeling done in 1999 for the *Coeur d'Alene Lake and River TMDL*, channel substrate and streambank data collected in 2006 during BURP monitoring, IDL CWE data, and site visits in 2009–2011.

Sediment loading estimates completed for the 1999 TMDL were based primarily on sources of sediment from land use types and road characteristics, and the estimates assumed complete delivery of sediment to the stream channel. The TMDL prescribed an interim load capacity for each subwatershed equal to natural background conditions, and DEQ determined a TMDL for sediment was not needed on Fourth of July Creek because excessive sedimentation was not found. Sediment loading in the watershed was found to be at or near background conditions.

In 1999, a CWE assessment was conducted by personnel from IDL. The CWE process evaluates the extent to which forest practices impact sediment delivery to the stream and recommends management actions based on the evaluation. The CWE analysis gave an overall rating of sediment delivery to Fourth of July Creek as low. No CWE data have been collected since 1999.

The Fourth of July Creek AU ID17010303PN020_03 was monitored by DEQ on one day in 2006 using BURP protocol. However, the biological data collected on this day were questionable because flow was 0.16 cubic feet per second. At such a low flow, the Hess sampler is not designed to collect macroinvertebrates, and electrofishing wasn't done. Wolman pebble counts collected during this monitoring event demonstrated percent fines were 4.78%—well below the 20% fines threshold that reduces embryo survival and fry emergence. In addition, greater than 95% of streambanks were observed to be stable.

Coeur d'Alene Regional Office staff conducted several field visits in 2009–2011 along the entire length of Fourth of July Creek AU ID17010303PN020_03. The survey found the study reaches, despite being highly channelized due to their proximity to I-90, to be densely foliated with good streambank stability, no channel embeddedness, and lots of habitat complexity. There were few areas of bank erosion. Mass wasting was also not evident at these sites.

Fourth of July Creek AU ID17010303PN020_03 is a highly flow-altered system. The majority of this AU is channelized due to its proximity to I-90. In addition, a series of flood control structures are in place at the mouth of the creek. Although flow alteration presents its own complexities to the system, data analysis and site observations have provided evidence that aquatic life use on Fourth of July Creek is not impaired by sediment. Therefore, DEQ removed the sediment cause from Category 5 of the 2010 Integrated Report. Data from the USFS have demonstrated the cause of impairment is due to temperature. As such, effective shade targets were identified for Fourth of July Creek in the *Coeur d'Alene Lake Tributaries Temperature TMDL* (DEQ 2012).

6.5 Kid Creek

The Kid Creek AU (ID17010303PN003_02) is listed in Idaho's 2010 Integrated Report as not supporting cold water aquatic life and salmonid spawning beneficial uses (DEQ 2011) (Figure 25). The causes of the beneficial use impairment are habitat alteration and sediment.

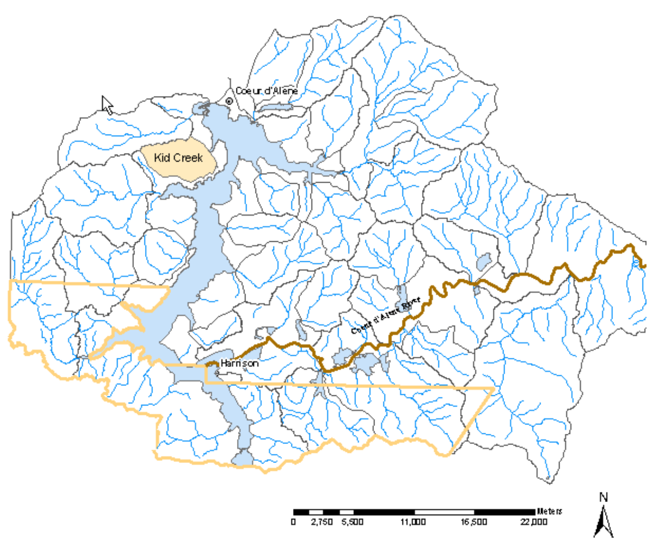

Figure 19. Kid Creek subwatershed.

Recent field surveys indicate localized areas of concern for erosion and sedimentation in Kid Creek, and numerous culverts along the creek pose a challenge to fish passage. The culverts may be the reason for the lack of westslope cutthroat trout documented by May (2009). Despite these localized problems, the stream generally has abundant riparian vegetation, good streambank stability, no excess fine sediment in the channel bed, and good access to the floodplain. In addition, there is no indication of excess bed load—as evidenced by large, instream depositional features—which may be attributed to the installation of riparian buffers, upland sediment ponds, and grade structures within the creek, all resulting in reduced sediment load to the creek. In light of this information, Kid Creek may be functioning at a sediment transport/deposition rate supportive of beneficial uses. Due to the numerous culverts and localized areas of concern, however, more analysis is needed before any assessment decisions are made for the Integrated Report. DEQ also recommends that Kid Creek be re-assessed for beneficial use support using BURP protocol. Until these assessments are made, Kid Creek will remain in Category 4a of Idaho’s 2010 Integrated Report as an impaired stream with a sediment TMDL, and it will be subject to load reductions defined in the *Coeur d’Alene Lake and River TMDL* (DEQ 1999).

6.6 Latour Creek

The Latour Creek AU (ID17010303PN015_02) is listed in Idaho’s 2010 Integrated Report as not supporting cold water aquatic life and salmonid spawning beneficial uses (DEQ 2011) (Figure 26). The causes of impairment are sediment and temperature.

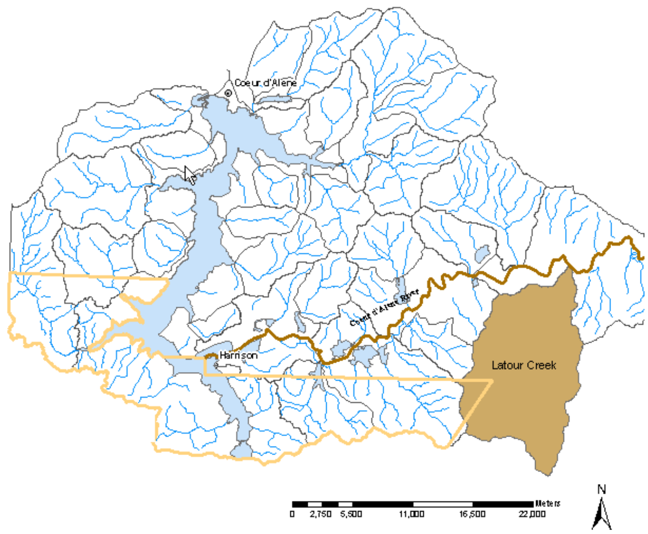

Figure 20. Latour Creek subwatershed.

As is the case with many streams within the Coeur d’Alene Lake subbasin, Latour Creek has an excess amount of bed load, which is consistent with the fair rating of habitat quality in May (2009). This excess was evident in the 2008 DEQ erosion study reach in the form of instream depositional features that have caused lateral migration of the stream channel resulting in streambank erosion and poor channel stability. DEQ estimated 10 tons of erosion per year from the study reach. Based on visual observations, this erosion rate may be higher downstream from the study reach as sediment transport conditions worsen—evidenced by greater aggradation/instream channel deposition and streambank erosion. This high bed-load process negatively affects beneficial use support—with channel widening, pool filling, and filling of interstitial spaces with fine sediment—and is likely a factor in exceedances of Idaho temperature water quality standards. In addition, aerial photographs appear to show possible mass wasting in the headwaters of the watershed. In 2009, IDL rated the risk of sedimentation from mass wasting as moderate. IDL also reported a 24% increase in road miles since 1999. With these sources of sediment to Latour Creek, it is likely that the excess bed load will remain in the system for a long time, and channel instability and erosion of streambanks from lateral displacement of flow will continue to be a concern.

Although much work has been done to mitigate sediment sources in the Latour Creek watershed, the above factors present substantial evidence that Latour Creek is functioning at a sediment transport/deposition rate well above natural background, there are still significant sources of excess sediment to the system, and significant land management changes need to occur before Latour Creek can process (attenuate through export and/or deposition) a sedimentation rate that supports the cold water aquatic life beneficial use. Therefore, DEQ kept Latour Creek in Category 4a of Idaho’s 2010 Integrated Report as an impaired stream with a TMDL for sediment. It will be subject to load reductions defined in the *Coeur d’Alene Lake and River TMDL* (DEQ 1999).

As described in the *Coeur d’Alene Lake Tributaries Temperature TMDL* (DEQ 2012), excess heat loading exists on Latour Creek and its tributaries. The TMDL established effective shade targets for the reaches where there are shade deficits.

6.7 Mica Creek

The Mica Creek AUs (ID17010303PN004_02 and ID17010303PN004_03) are listed in Idaho's 2010 Integrated Report as not supporting cold water aquatic life and salmonid spawning beneficial uses (DEQ 2011) (Figure 27). The cause of impairment is sediment, habitat alteration, temperature, and fecal coliform.

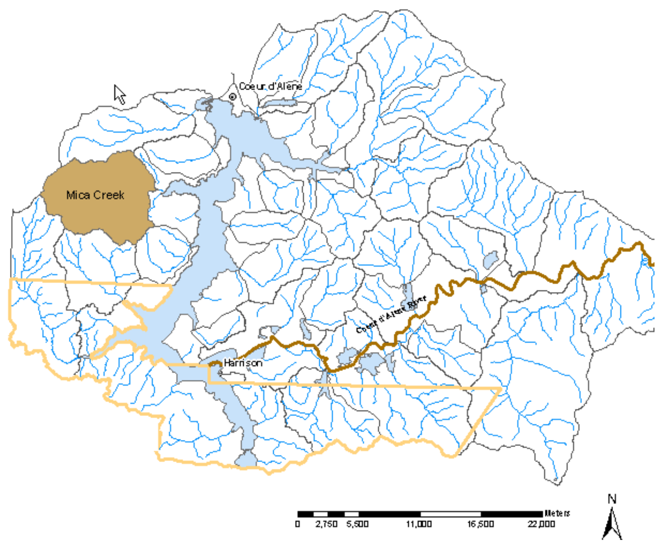

Figure 21. Mica Creek subwatershed.

Since 1999, there has been a 72% increase in road miles and an order of magnitude increase in the amount of acres under timber harvest in this subwatershed. The IDL hydrologic risk assessment rated Mica Creek as high risk for adverse impacts to stream channel stability from the potential increase in magnitude and frequency of peak-flow events in response to forest canopy removal. IDL also recently identified a number of culvert and road problems that could lead to sedimentation in the creek. In winter 2001–2002, ITD discharged stormwater from construction activity on Highway 95 into South Fork Mica Creek and its tributaries that violated Idaho water quality standards for turbidity (CH2MHill 2003). The increased sedimentation from this episode, and from roads, culverts, and forest canopy removal has probably contributed to the poor habitat quality in Mica Creek identified by May (2009).

Although many changes have occurred in the Mica Creek watershed, not all of these changes negatively affect beneficial uses. Much implementation activity has been occurring within the lower watershed—all of which is targeted toward decreasing sedimentation in Mica Creek. In addition, the riparian area exclusion and planting will increase shade, thereby decrease stream temperature. However, this work has just been completed within the last few years, and not enough time has elapsed to expect significant change. Future monitoring will provide useful information regarding any improvements that take place and will assist with beneficial use support evaluations. It is reasonable to assume Mica Creek is still functioning at a sediment transport/deposition rate not fully supportive of the cold water aquatic life and salmonid spawning beneficial uses. Therefore, DEQ has kept Mica Creek in Category 4a of Idaho's 2010 Integrated Report as impaired for sediment and *E. coli*. It will be subject to load restrictions defined in the *Coeur d'Alene Lake and River TMDL* (DEQ 1999).

Excess heat loading existing on Mica Creek has been identified primarily near the headwaters and on its tributaries (DEQ 2012). The *Coeur d'Alene Lake Tributaries Temperature TMDL* compares effective shade targets to estimates of existing shade to determine shade deficits and the amount of shade that must be restored to individual stream reaches.

6.8 Wolf Lodge Creek

The *Coeur d'Alene Lake and River TMDL* (DEQ 1999) set an interim load target for the entire Wolf Lodge Creek watershed (which includes Wolf Lodge, Marie, and Cedar Creeks and all their tributaries) (Figure 28). Wolf Lodge Creek (not Cedar or Marie Creek) is designated in Idaho's Water Quality Standards for cold water aquatic life, salmonid spawning, primary contact recreation, and drinking water beneficial uses. The TMDL concluded that the sediment interfering with the beneficial use within the Wolf Lodge Creek watersheds is most likely large bed load particles that are mobilized during large discharge events (return period of 10–15 years).

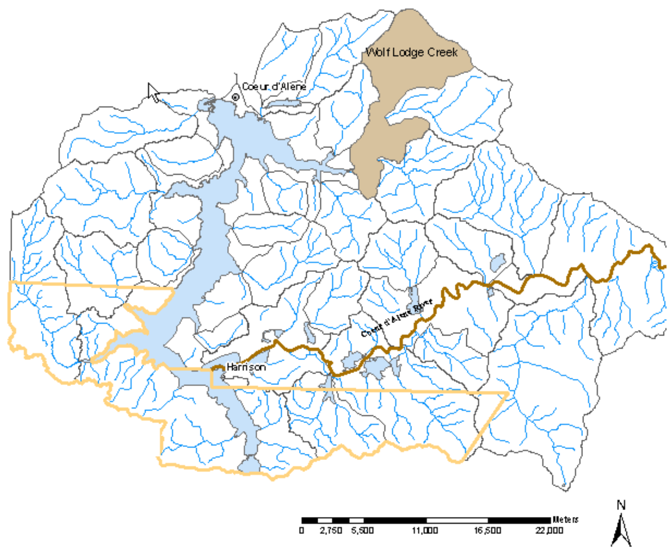

Figure 22. Wolf Lodge Creek subwatershed.

Upper Wolf Lodge Creek

The upper Wolf Lodge Creek AU (ID17010303PN029_02) is listed in Idaho's 2010 Integrated Report as fully supporting primary contact recreation but not supporting cold water aquatic life and salmonid spawning beneficial uses. The cause of impairment is due to temperature and sediment.

On a watershed scale, the forest canopy in upper Wolf Lodge Creek is recovering from historic logging activity, and riparian zones are free from recent logging activity. In addition, within the USFS property, a number of roads have been decommissioned or put into storage, culverts were replaced or removed, and riparian areas are well vegetated. USFS models show a 14% decrease in sediment load from their property. Results from the *Westslope Cutthroat Trout Status Update Summary* indicate westslope cutthroat trout are currently present in upper Wolf Lodge Creek, and habitat quality is good in the headwaters of Stella and Wolf Lodge Creeks (May 2009).

However, in the lower reaches of this subwatershed, there is indication that the upper Wolf Lodge Creek AU is functioning at a sediment transport/deposition rate well above natural background. Recent USFS channel stability and erosion studies suggest fair to moderate stability for upper Wolf Lodge and Stella Creeks and high erosion potential for lower Stella Creek. These findings are supported by the fair habitat quality for westslope cutthroat trout in the lower reaches of this subwatershed as reported by May (2009). Observations during recent DEQ field visits to Stella Creek indicate a large amount of bed load in the streams, which manifests as instream depositional features. These features deflect flow toward the streambank, causing an erosional process that leads to stream channel instability, channel widening, loss of large woody debris, pool filling, and fine sediment movement into interstitial spaces—all of which negatively affect beneficial use support. The channel widening and loss of riparian vegetation also is the basis for the temperature impairment in upper Wolf Lodge Creek.

The absence of significant sediment accumulation in the sediment basin on Stella Creek is not evidence of a decrease in sediment transport from the watershed above. Rather, much of the sediment, primarily in the form of bed load, is being deposited upstream of the sediment basin as evidenced by instream depositional features, channel aggradation, the on-going process of undercutting banks, and accumulation of trees in the stream. There is additional concern over the lower reaches of this AU, which are on private property. Levy installation on lower Stella Creek has significantly altered stream channel hydraulics in that reach, resulting in channel widening and an increase in the sediment load transported to lower Wolf Lodge Creek.

In conclusion, much implementation has occurred in this subwatershed to diminish the sediment sources to the stream channels. Yet, there still exists a high bed load influence on channel instability in Stella Creek and probably upper Wolf Lodge Creek. The excess bedload is likely due to the legacy effects of past management activities that continues to shape the physical habitat upper Wolf Lodge Creek. This, coupled with channel alteration on private property on lower Stella Creek, is contributing to sediment impairment of the beneficial uses within the watershed. Any change in land use activity may exacerbate the channel instability. Therefore, evidence suggests that the sediment transport/deposition rate in the upper Wolf Lodge Creek watershed is above the load capacity of the streams, and it is reasonable to believe the load reductions defined in the *Coeur d'Alene Lake and River TMDL* have not been met (DEQ 1999). Therefore, upper Wolf Lodge Creek was kept in Category 4a of Idaho's 2010 Integrated Report for sediment and is subject to load reductions defined in the TMDL.

Due to the excessive heat load to upper Wolf Lodge Creek, it is subject to the shade targets defined in the *Coeur d'Alene Lake Tributaries Temperature TMDL* (DEQ 2012).

Lower Wolf Lodge Creek

The lower Wolf Lodge Creek AU (ID17010303PN029_03) is listed on Idaho's 2010 Integrated Report as not supporting beneficial uses for cold water aquatic life and salmonid spawning due to habitat alteration, sediment, and temperature. This determination has been verified by failing BURP scores in 2006 on lower Wolf Lodge Creek.

As with upper Wolf Lodge Creek, high bed load is the cause for impairment of the beneficial uses. Instream depositional features deflect flow toward the streambank, causing an erosional process that leads to stream channel instability, channel widening, pool filling, loss of large woody debris, and fine sediment movement into interstitial spaces. To exacerbate the problem, localized areas of extreme erosion exist, which are likely caused by development, stream modification, and upstream dike construction. It is unknown whether the excess bedload is due to the legacy effects of past management activities in Wolf Lodge Creek and/or whether it is from a continuous source. More investigation is needed to answer this question.

In conclusion, evidence suggests that lower Wolf Lodge Creek is functioning at a sediment transport/deposition rate well above natural background; habitat quality and macroinvertebrate populations are poor; and significant land management changes need to occur before lower Wolf Lodge Creek can process (attenuate through export and/or deposition) a sedimentation rate that supports the cold water aquatic life beneficial use. Therefore, lower Wolf Lodge Creek remains in Category 4a of Idaho's 2010 *Integrated Report* as an impaired stream with a sediment TMDL, and it will remain under the restriction of the TMDL (DEQ 1999).

Temperature impairments on lower Wolf Lodge Creek are addressed in the *Coeur d'Alene Lake Tributaries TMDL* (DEQ 2012).

6.9 Marie Creek

The Marie Creek AU (ID17010303PN031_02) is listed in *Idaho's 2010 Integrated Report* as not supporting cold water aquatic life and salmonid spawning beneficial uses (DEQ 2011) (Figure). The causes of impairment are habitat alteration, sediment, and temperature. The basis for this listing was verified with failing BURP scores in 2006 on the mouth of Marie Creek.

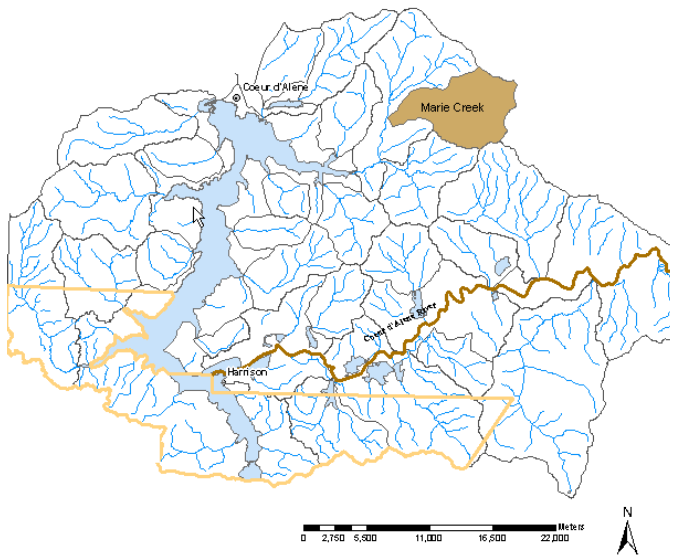

Figure 29. Marie Creek subwatershed.

Recent field visits found localized areas of excessive aggradation in Marie Creek, particularly at the mouth of Marie Creek where a decrease in channel slope has resulted in bed load deposition and hydrogeologic conditions conducive for subsurface base flow. Such conditions are not favorable for aquatic life support. Albeit less frequently than in Stella and upper Wolf Lodge Creeks, excessive bed load in Marie Creek does manifest as localized areas of instream depositional features above bankfull elevation. As described earlier, this condition ultimately negatively affects beneficial use support. Lateral erosion of streambanks and channel widening may also be a reason for the exceedances in temperature criteria observed by the USFS. Because only localized areas of channel instability were observed, it is reasonable to assume that Marie Creek is fairly efficient in moving the bed load downstream during high-flow events and may be on a trajectory toward full beneficial use support—as long as a new source of bed load does not materialize.

There is further evidence to support the assumption that Marie Creek may be on a trajectory toward full beneficial use support. The USFS implementation projects in the upper watershed have decreased sediment loading by 8%. Field visits on Marie Creek found well-vegetated riparian areas, good streambank stability, and low percent fines in the creek. Although fish density was relatively low, the 2006 USFS stream surveys indicate good channel stability at cross sections, good pool-to-riffle ratios, and large woody debris well distributed in length and diameter. Recent BURP data from Skitwish Creek, a tributary to Marie Creek, indicate this tributary is fully supporting the cold water aquatic life use.

In conclusion, although there is still evidence of localized areas of excessive bed load and channel instability, it is reasonable to assume that Marie Creek is on a trajectory toward reaching its load capacity for sediment—as long as a new source of bed load does not materialize. Any change in land use activity may exacerbate the existing channel instability/erosion problem and reverse the trajectory. Therefore, Marie Creek remains in Category 4a of Idaho's 2010 Integrated Report as an impaired stream with a sediment TMDL and is subject to the load reductions described in the 1999 TMDL (DEQ 1999). Temperature impairments in Marie Creek are be addressed in the *Coeur d'Alene Lake Tributaries Temperature TMDL* (DEQ 2012).

6.10 Cedar Creek

The Cedar Creek AUs (ID17010303PN030_02 and ID17010303PN030_03) are listed in Idaho's 2010 Integrated Report as not supporting cold water aquatic life and salmonid spawning beneficial uses (Figure). The causes of impairment are sediment and temperature. The basis for this listing was verified by failing BURP scores in 2006 at the mouth of Cedar Creek.

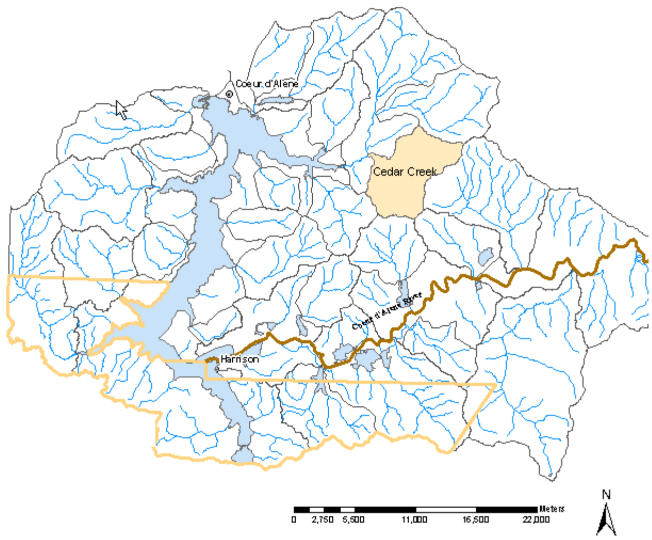

Figure 30. Cedar Creek subwatershed.

Similar to Fourth of July Creek the original listing for sediment on Cedar Creek was during the 1990s when heavy traction sand was applied to I-90 adjacent to the creek. BURP data and field visits has shown a significant reduction in fine sediment in Cedar Creek from 1996 to 2006, and this may be the result of the switch in 2003 from traction sand to de-icers on I-90. However, unlike Fourth of July Creek, it was determined that excessive sediment may still be a cause of beneficial use impairment on Cedar Creek.

The non-supporting status of Cedar Creek can be explained by recent data collected by Idaho Department of Lands and the US Forest Service. The high road density (5.2 mi/mi2) in the upper watershed of Cedar Creek may also be a source of excessive sediment as shown by Al-Chokhachy et al (2010). Although recent restoration work by the USFS has reduced the sediment load by 25% on their property, data from the US Forest Service indicated that hydrologic and land-use conditions may be a cause of excessive sand in low-gradient reaches and at the mouth of Cedar Creek (USFS 2008). It is uncertain what percentage of the excessive sand they observed was residual sand from road application or from an existing source of sediment to Cedar Creek. Additional in-stream evaluations are needed to answer this question.

The above observations are symptoms that the Cedar Creek is still functioning above its sediment load capacity. Therefore, Cedar Creek remains in Category 4a of the Integrated Report as an impaired stream with a sediment TMDL and is subject to the load reductions of the 1999 TMDL (DEQ 1999). It is also subject to the shade targets defined in the *Coeur d'Alene Lake Tributaries Temperature TMDL* (DEQ 2012)

6.11 Thompson Creek

Thompson Creek (AU ID17010303PN025_02) is identified as fully supporting beneficial uses in *Idaho's 2010 Integrated Report* (DEQ 2011) (Figure 31). On previous Integrated Reports, Thompson Creek was listed as not supporting beneficial uses as a result of excess sediment. The 2010 delisting was based on a watershed assessment that included an interpretation of existing monitoring data, a field visit, and a geographic information system (GIS) modeling exercise to validate beneficial use status of Thompson Creek from the effects of excess sediment. Details of this evaluation are in the February 2010 report, *Thompson Creek Watershed Assessment Coeur d'Alene Lake HUC 17010303* (Appendix D).

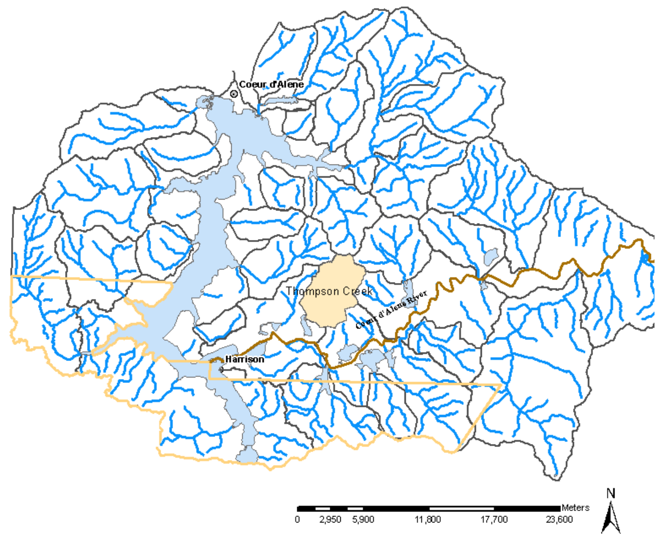

Figure 23. Thompson Creek subwatershed.

In addition to a modeling comparison with Carlin Creek, DEQ conducted a site visit of Thompson Creek to evaluate whether sediment is impairing beneficial uses. The portions of the stream that were evaluated were those most likely to be impaired due to riparian vegetation removal or other land use activities. DEQ observed that cattle were excluded from the stream (except for stream crossing sites), and neither overgrazing nor bank trampling were observed. Most portions of the stream were fenced to exclude cattle and restrict public access. Riparian vegetation was at or near full potential in 80–90% of the area observed. These observations and an evaluation of the stream erosive factors following the method outlined in Rosgen (2006) determined that sedimentation within the watershed is not affecting beneficial uses.

In summary, monitoring, field observations, and GIS modeling all show sediment is not in excess in Thompson Creek, and it is reasonable to assume full support of cold water aquatic life. As a result, Thompson Creek (AU ID17010303PN025_02) was moved to Category 2 in *Idaho's 2010 Integrated Report* (DEQ 2011).

6.12 Willow Creek

Willow Creek (ID17010303PN011_02) is a small watershed with headwaters in the Coeur d'Alene Reservation (Figure 32). Less than 1 mile of the stream is state waters before it flows into Cave Lake, a chain lake of the lower Coeur d'Alene River. The original listing for sediment was based on incomplete data. The 1996 BURP site was missing Wolman pebble counts, percent fines data,

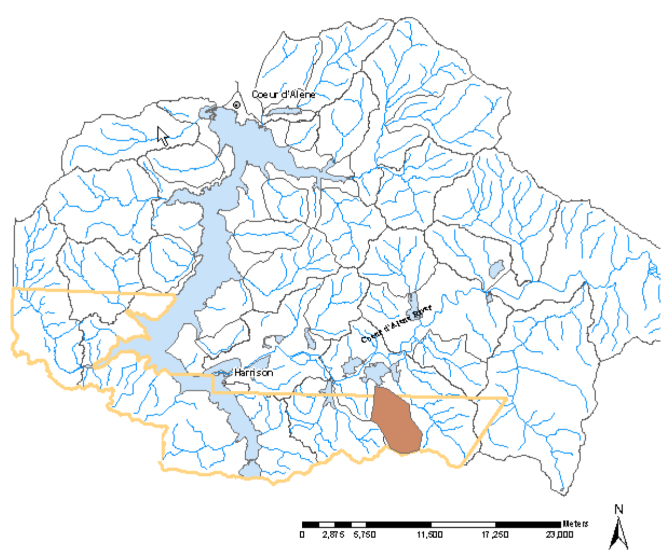

Figure 24. Willow Creek subwatershed.

width/depth ratio, undercut bank observations, wetted depth measurements, pool quality index, and fish parameters. Field visits in 2009 show no land use practice contributing sediment to the stream. The pasture was in fallow, and approximately 180 feet existed between the road and stream channel.

This short AU is immediately downstream from the Coeur d’Alene Reservation boundary. The Coeur d’Alene Tribe is proposing that EPA delist Willow Creek above this AU based on field visits by the tribe (Scott Fields, Coeur d’Alene Tribe, personal communication). However, due to incomplete BURP monitoring on Willow Creek in 1996, the stream is now considered “unassessed” for beneficial use support and is in Category 3 of the 2010 Integrated Report.

6.13 Other Tributaries Surrounding Coeur d’Alene Lake (Formerly Assessment Unit ID17010303PN001_02)

AU ID17010303PN001_02 was a single AU of approximately 35 small named and unnamed creeks that drain into Coeur d’Alene Lake (Figure 25). Consequently, they were initially evaluated as one AU for beneficial use support. Although they were listed on Idaho’s 2008 Integrated Report as impaired for sediment and for an unknown pollutant (nutrients suspected), this listing was incorrect, as it was based on 1996 failed BURP scores on Fernan Creek above Fernan Lake. Consequently, these streams have never been evaluated individually for beneficial use support status. Due to the variability of land use around Coeur d’Alene Lake, it is important that these streams be individually assessed for beneficial use support accordingly. Therefore, this AU was split, and those changes are reflected in the 2010 Integrated Report (DEQ 2011). Below is an explanation of the AU split that occurred in 2010. The splits are summarized in Table 12.

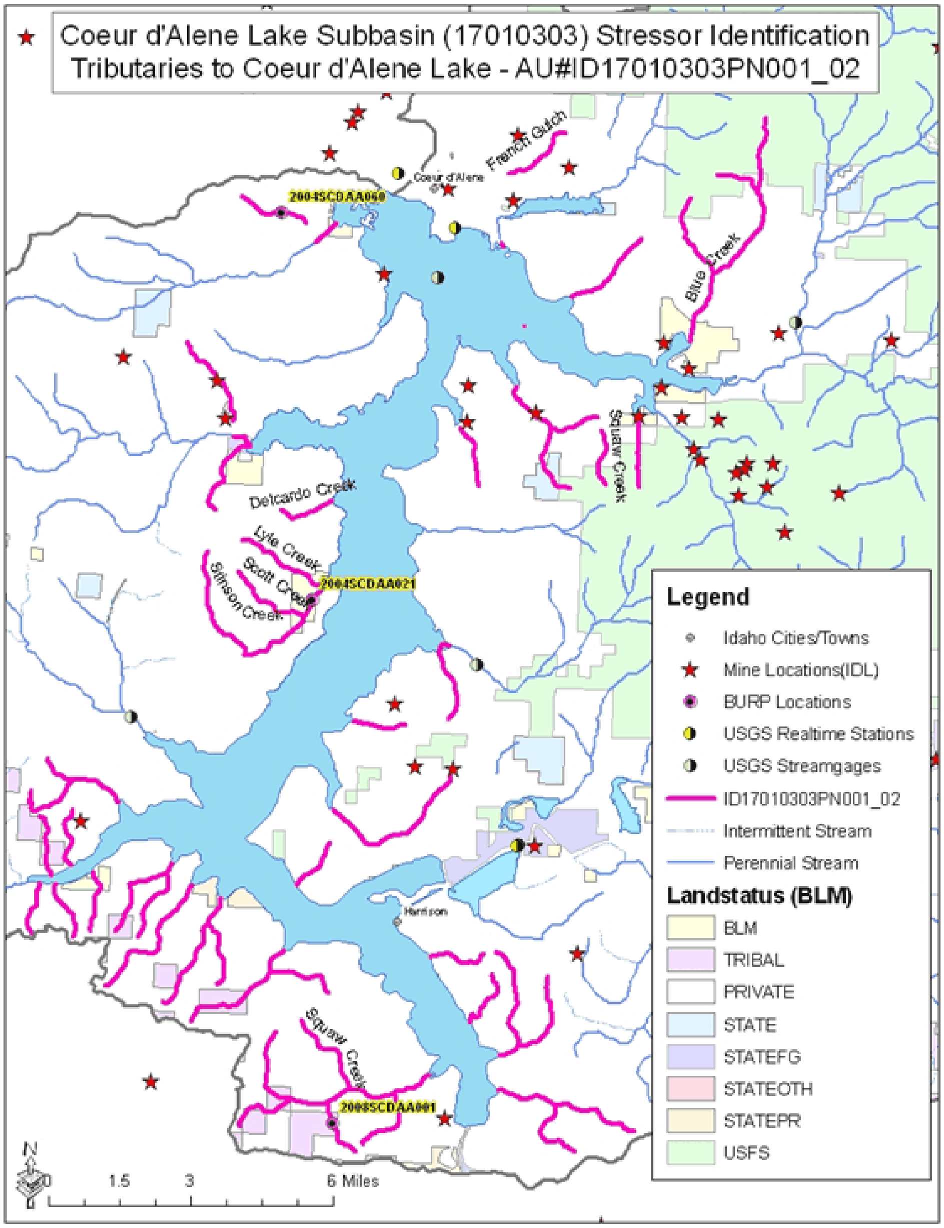

Figure 25. Historic assessment unit ID17010303PN001_02 (highlighted in pink).

Table 12. Summary of 2010 splits for assessment unit ID17010303PN001_02.

Stream Name	Assessment Unit Number Change	2010 Integrated Report Support Status[a]	Impairment (2010 Integrated Report)
A number of streams within the tribal boundaries	Keep original AU number (ID17010303PN001_02)	AU is within tribal boundaries	—
French Gulch	New AU number (ID17010303PN001_02a)	Not assessed	—
Unnamed tributary to Bennett Bay	New AU number (ID17010303PN001_02b)	Not assessed	—
Blue Creek	New AU number (ID17010303PN001_02c)	Not assessed	—
Neachen Creek (Squaw Creek); unnamed tributary to Echo Bay; unnamed tributary to Gotham Bay	New AU number (ID17010303PN001_02d)	Not assessed	—
Gotham Creek	(ID17010303PN001_02d)	Not assessed	—
Unnamed tributary to Powderhorn Bay	New AU number (ID17010303PN001_02e)	Not assessed	—
Delcaro, Lyle, Scott, and Stinson Creeks	New AU number (ID17010303PN001_02f)	Not assessed	—
Cougar Creek at mouth; Unnamed tributaries to Cougar Creek	Group with Cougar Creek upstream (ID17010303PN002_02)	Not supporting: CWAL, SS	Habitat alteration, sediment, temperature
Mica Creek at mouth	Group with Mica Creek upstream (ID17010303PN004_03)	Not supporting: CWAL, PCR, SCR	Habitat alteration, sediment, fecal coliform, temperature
Unnamed tributaries to Mica Creek	Group with North Fork Mica Creek (ID17010303PN004_02)	Not supporting: CWAL, PCR, SCR	Habitat alteration, sediment, fecal coliform, temperature
Unnamed tributary to Carlin Bay; unnamed tributary to Half Round Bay	Grouped with Carlin Creek (ID17010303PN026_02)	Not Supporting: CWAL	Temperature
Unnamed tributary to Beauty Bay	Group with other tributaries to Beauty Creek (ID17010303PN028_02)	Not Supporting: CWAL	Temperature
Fernan Creek at mouth	Group with Fernan Creek (ID17010303PN032_03)	Not Supporting: CWAL	Temperature

[a] CWAL = cold water aquatic life; PCR = primary contact recreation; SCR = secondary contact recreation; SS = salmonid spawning

French Gulch

French Gulch drains a 2.2-square-mile watershed on the north side of Coeur d'Alene Lake (Figure 34). The entire creek flows within private property. Housing densities in this watershed are up to 100 homes per square mile, which is much more developed than the neighboring two watersheds, Blue Creek and

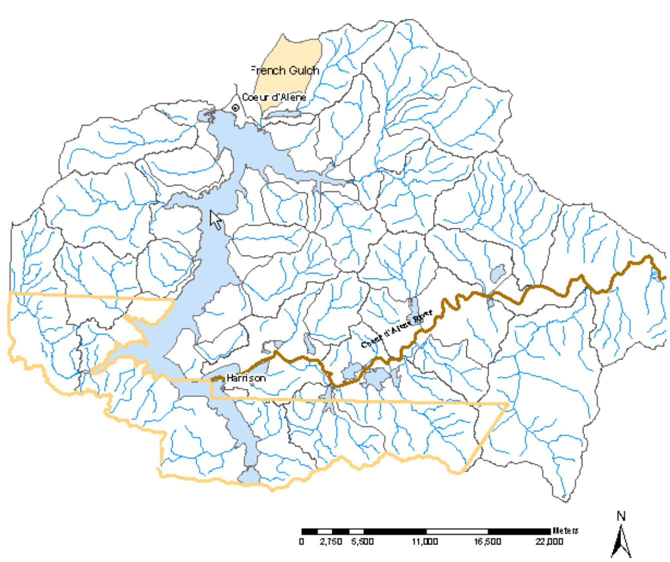

Figure 26. French Gulch subwatershed.

Fernan Creek. This tributary was part of the 2009 Coeur d'Alene Lake tributaries nutrient and sediment monitoring project. The results raise concern that nutrients may be a pollutant of concern on this creek. Although TP and total suspended sediments were monitored on French Gulch only during rain-on-snow and runoff events, these values were higher than many of the tributaries on the northern end of the lake. In 2009, visual observations of the creek during low flow showed an abundance of aquatic vegetation and fine sediment in the creek bed, concluding that excess nutrients and sediment are present, most likely from the developed area upstream and a series of storm drains that discharge to the creek. However, there has been no documentation of aquatic life beneficial use impairment. Therefore, French Gulch is a high priority for evaluation for beneficial use support, and it was listed as not assessed for beneficial use support under its own AU (ID17010303PN001_02a) in Category 3 of *Idaho's 2010 Integrated Report* (DEQ 2011).

Blue Creek

Blue Creek is a stream that drains a 7.9-square-mile watershed on the northeast side of Coeur d'Alene Lake (Figure 35). The headwaters of Blue Creek are within the Coeur d'Alene National Forest. Downstream of the national forest, the creek flows within private property. At its mouth, Blue Creek is a 2nd-order stream that flows within BLM property before it flows into Blue Creek Bay. While the channel upstream of the BLM property flows subsurface in early summer, recharge of the channel from the shallow aquifer within the BLM property provides flow in this reach of the channel year-round. Sunnyside Creek and Folsom Creek are two ephemeral tributaries to Blue Creek.

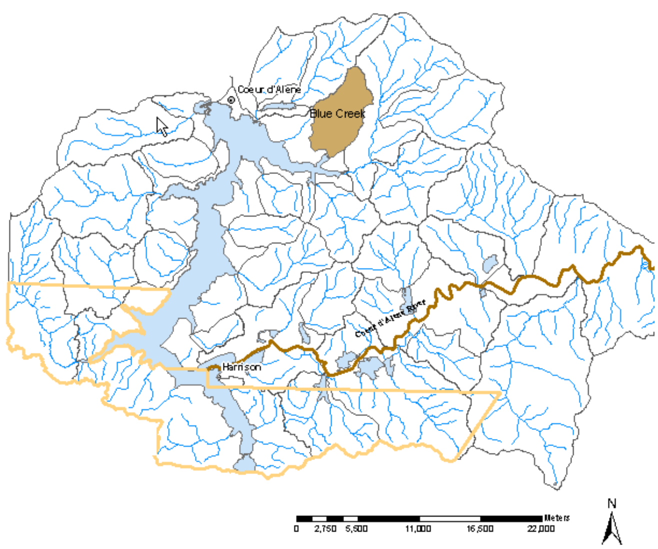

Figure 27. Blue Creek subwatershed.

This tributary was part of the 2009 Coeur d'Alene Lake tributaries nutrient and sediment monitoring project. The results showed nutrient concentrations in Blue Creek were not significantly high, but algae growth near the mouth of Blue Creek was observed. However, there has been no documentation of aquatic life beneficial use impairment. Therefore, Blue Creek was listed as not assessed for beneficial use support under its own AU (ID17010303PN001_02c) in Category 3 of *Idaho's 2010 Integrated Report* (DEQ 2011).

Unnamed Tributary to Beauty Bay

This tributary was grouped with other tributaries to Beauty Creek under AU ID17010303PN028_02 (Figure 36). In 2008, this AU was evaluated for beneficial use support using the BURP protocol, and DEQ determined that the AU was fully supporting its beneficial uses. However, the USFS monitoring data showed exceedances of Idaho's water quality standards for temperature. Therefore, this AU was listed in *Idaho's 2010 Integrated Report* as not supporting the cold water aquatic life and salmonid spawning beneficial uses due to temperature.

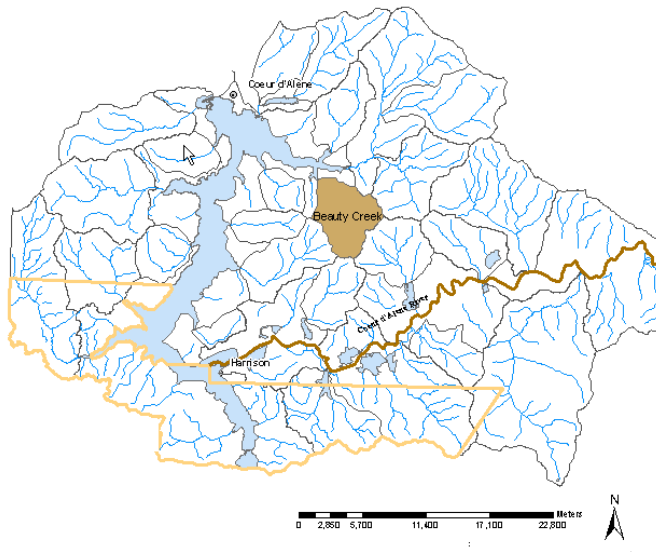

Figure 28. Beauty Creek subwatershed.

Unnamed Tributary to Bennett Bay

This stream drains a 2.2-square-mile watershed on the north side of Coeur d'Alene Lake (Figure 37). The entire creek flows within private property. Housing densities in this watershed are up to 100 homes per square mile, which is much more developed than the neighboring two watersheds, Blue Creek and Fernan Creek. This tributary was part of the 2009 Coeur d'Alene Lake tributaries nutrient and sediment monitoring project. The results raise concern that nutrients may be a pollutant of concern on this creek. Therefore, DEQ recommends that this creek be prioritized for beneficial use support status evaluation using the BURP protocol or another appropriate method for intermittent streams. Until this assessment is made, this stream is listed as not assessed for beneficial use support under its own AU (ID17010303PN001_02b) in Category 3 of *Idaho's 2010 Integrated Report* (DEQ 2011).

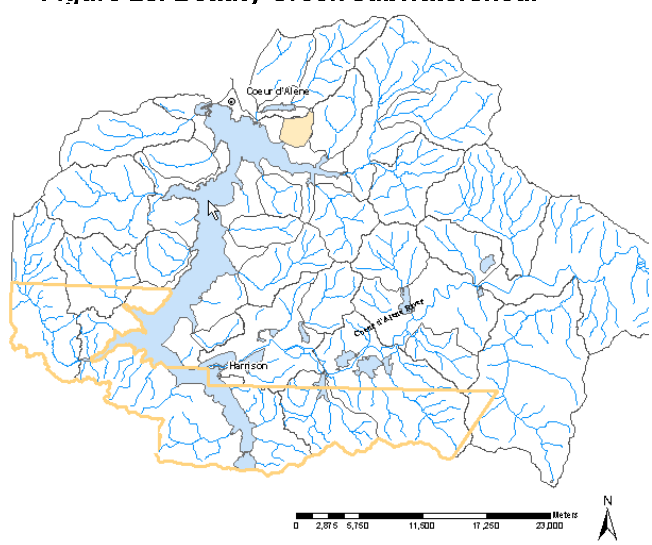

Figure 29. Unnamed tributary to Bennett Bay.

Neachen (Squaw) Creek, Unnamed Creek into Echo Bay, and Unnamed Creek into Gotham Bay

Neachen Creek is a 2nd-order stream that drains a 4.1-square-mile watershed into a bay on the northeast side of Coeur d'Alene Lake (Figure 38). The Neachen Creek subwatershed is primarily within private property, with a housing density of less than 10 homes per square mile.

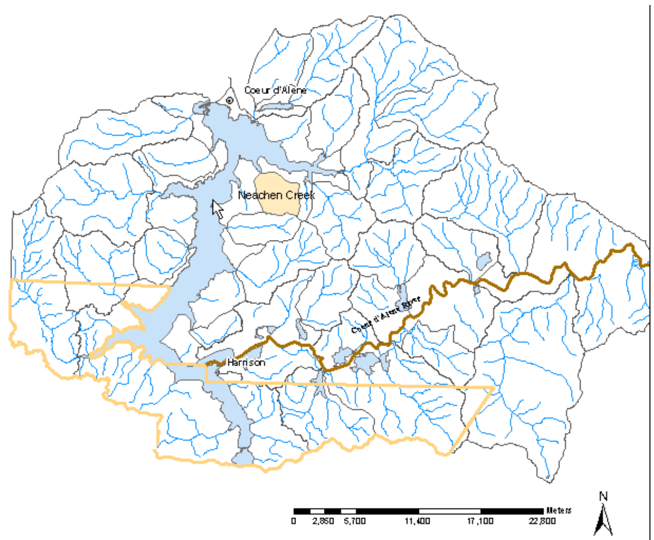

Figure 30. Neachen Creek subwatershed.

Neachen Creek and the unnamed creek into Gotham Bay were part of the 2009 Coeur d'Alene Lake tributaries nutrient and sediment monitoring project. The results raise concern that nutrients may be a pollutant of concern on these creeks. Because land use is so similar with these creeks and the unnamed creek into Echo Bay, it is reasonable to suspect the same water quality impairment on the unnamed creek into Echo Bay. Therefore, the creeks have been prioritized for beneficial use support evaluation using BURP protocol. However, until the evaluation can be conducted, the creeks were listed as not assessed for beneficial use support under their own AU (ID17010303PN001_02d) in Category 3 of *Idaho's 2010 Integrated Report* (DEQ 2011).

Fernan Creek at the Mouth

This stream segment is just downstream of the 3rd-order segment of Fernan Creek (ID17010303PN032_03) that starts at the outlet of Fernan Lake. This stream segment was originally listed for temperature by EPA on the 1998 §303(d) list. However, the *Coeur d'Alene Lake and River TMDL* (DEQ 1999) determined it to be fully supporting the cold water aquatic life beneficial use. Because both these stream segments flow through the Coeur d'Alene Resort golf course, and visual observations at the stream during 2008 and 2009 nutrient and sediment sampling gave no concern for excess sediment or aquatic vegetation along the creek to its mouth, this stream segment was grouped with the upstream 3rd-order segment of Fernan Creek (ID17010303PN032_03), which is listed as not supporting the cold water aquatic life beneficial use due to temperature on the 2010 Integrated Report (DEQ 2011). Until further analysis is completed, the salmonid spawning beneficial use will remain unassessed.

Unnamed Tributary to Carlin Bay and Unnamed Tributary to Half Round Bay

Although these creeks have never been assessed, they were grouped with Carlin Creek under AU ID17010303PN026_02 as they all share similar agricultural land use (Figure). In 2008, Carlin Creek was evaluated for beneficial use support using BURP protocol, and it was determined to be fully supporting of the uses. However, data collected by the USFS in 2004 and 2008 indicate exceedances of Idaho’s water quality standards for temperature. Therefore, this AU is listed in Category 5 of *Idaho’s 2010 Integrated Report* as not supporting cold water aquatic life and salmonid spawning beneficial uses due to temperature (DEQ 2011).

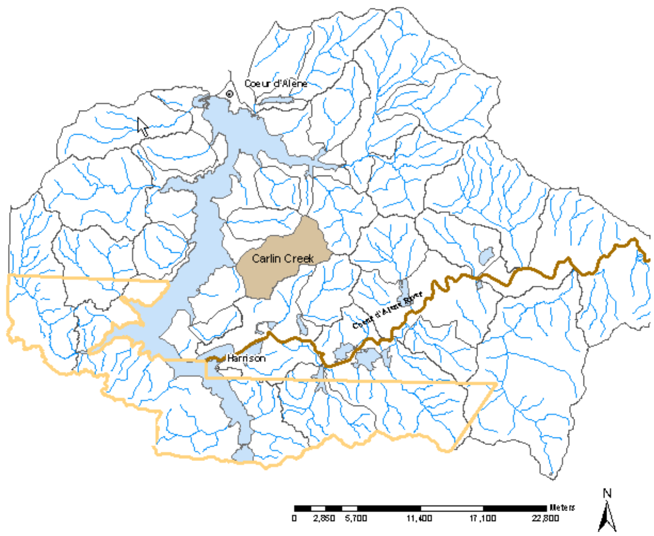

Figure 39. Carlin Creek subwatershed.

Unnamed Tributary to Powderhorn Bay and Unnamed Tributary to Bell Bay

The unnamed creek to Powderhorn Bay drains a 3.5-square-mile watershed on the southeast side of Coeur d’Alene Lake, and the entire creek flows within private property (Figure 40). The unnamed tributary to Bell Bay is just to the south of this creek.

The unnamed creek into Powderhorn Bay was part of the 2009 Coeur d’Alene Lake tributaries nutrients and sediment monitoring project. However, it has never been evaluated individually for beneficial use support. Therefore, this creek has been prioritized for beneficial use support status evaluation using the BURP protocol. Until the evaluation can be conducted, the creek was listed with the unnamed tributary to Bell Bay under AU ID17010303PN001_02e as not assessed in Category 3 of *Idaho’s 2010 Integrated Report* (DEQ 2011).

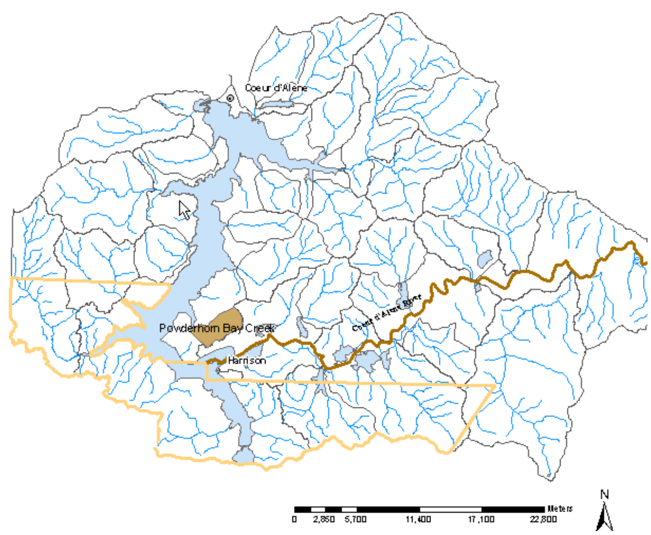

Figure 31. Powderhorn Bay Creek subwatershed.

Delcaro Creek, Lyle Creek, Scott Creek, and Stinson Creek

Stinson Creek drains a 5.4-square-mile watershed on the west side of Coeur d'Alene Lake (Figure 41). The upper reaches of the creek flow within private property. At its mouth, Stinson Creek is a 2nd-order stream that flows within BLM floodplain property, where it then flows into Loffs Bay in Coeur d'Alene Lake. Lyle and Scott Creeks are tributaries to Stinson Creek. Delcaro Creek is just to the north of Stinson Creek and shares the same land use as the Stinson Creek watershed. Therefore, they've been grouped together as one assessment unit. None of these creeks have been evaluated individually for beneficial use support.

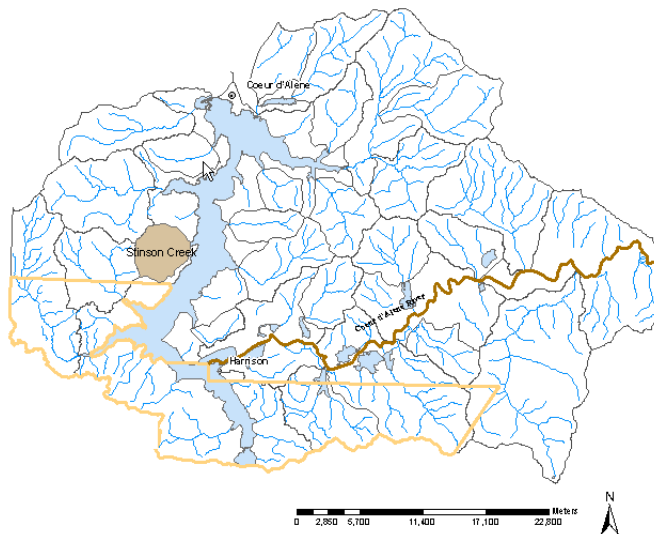

Figure 32. Stinson Creek subwatershed.

Stinson Creek was part of the 2009 Coeur d'Alene Lake tributaries nutrient and sediment monitoring project. The high total phosphorus values measured and the presence of a large golf course community at the headwaters of Stinson Creek raise concern that the creek may be impaired due to excess nutrients. Therefore, this creek along with the other creeks in this AU was prioritized for beneficial use support status evaluation using the BURP protocol. Until the evaluation can be conducted, the creeks were listed under AU ID17010303PN001_02f as not assessed in Category 3 of *Idaho's 2010 Integrated Report* (DEQ 2011).

Unnamed Tributaries to Mica Creek and Mica Bay

These tributaries were grouped with North Fork Mica Creek under AU ID17010303PN004_02. This AU is in Category 4a of the 2010 Integrated Report as an impaired stream (not supporting beneficial uses) due to habitat alteration, fecal coliform, temperature and sediment with a sediment TMDL (DEQ 2011).

Mica Creek at the Mouth

This stream segment was grouped with the 3rd-order segment of Mica Creek just upstream (ID17010303PN004_03). It is listed in Category 4a the 2010 Integrated Report as an impaired stream (not supporting beneficial uses) due to temperature and sediment with a sediment TMDL (DEQ 2011).

Unnamed Tributaries to Cougar Creek and Cougar Creek at the Mouth

These stream segments were grouped with Cougar Creek under AU ID17010303PN002_02. This AU is in Category 4a of the 2010 Integrated Report as an impaired stream due to temperature and sediment with a sediment TMDL.

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Appendix A. Beneficial Use Support Status of Streams

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Beneficial Use Support Status of Streams in the Coeur d'Alene Lake Tributaries Subbasin
December 1, 2010

Subwatershed	Stream Name(s)	Stream Miles/ Lake Acres	Assessment Unit	Beneficial Use[a]	Support Status	Pollutant (2010 Final Integrated Report)
Anderson Lake	Anderson Lake	541.4 acres	ID17010303PN008L_0L	COLD PCR	Not assessed Not assessed	
Anderson Lake tributaries	Unnamed tributaries to Anderson Lake	4.38 miles	ID17010303PN008_02	COLD SCR	Not assessed Not assessed	
Beauty Creek	Beauty Creek; Unnamed tributary	11.59 miles	ID17010303PN028_02 ID17010303PN028_03	COLD, SS SCR	Not supporting Full support	Temperature
Bellgrove Creek	Bellgrove Creek (Fighting Creek)	3.45 miles 5.02 miles	ID17010303PN005_02	COLD SCR	Not supporting Not supporting	Sediment; Fecal Coliform
Black Lake tributaries	Unnamed tributaries to Black Lake; Porter Creek	5.00 miles	ID17010303PN007_02 ID17010303PN009_02	COLD SCR	Not assessed Not assessed	
Black Lake	Black Lake in Idaho	376.6 acres	ID17010303PN009L_0L	COLD PCR	Not supporting Not assessed	Nutrients suspected, cause unknown
Blue Creek	Blue Creek; Unnamed tributary	5.44 miles	ID17010303PN001_02C	COLD SCR	Not assessed Not assessed	
Blue Lake	Blue Lake	227 acres	ID17010303PN024L_0L	COLD PCR	Not assessed Not assessed	
Blue Lake tributaries	Cottonwood Creek; Unnamed tributary	9.80 miles	ID17010303PN024_02	COLD, SS	Not supporting	Temperature
Bull Run Lake	Bull Run Lake	78.9 acres	ID17010303PN014L_0L	COLD PCR	Not assessed Not assessed	
Bull Run Lake tributaries	Blackrock Gulch; Bull Run Creek	4.54 miles	ID17010303PN013_02	COLD PCR	Not assessed Not assessed	
Carlin Creek	Carlin Creek; Carrill Creek; North Creek; Pleasant Creek; Unnamed tributary	16.88 miles	ID17010303PN026_02	COLD, SS SCR	Not supporting Full support	Temperature

Subwatershed	Stream Name(s)	Stream Miles/ Lake Acres	Assessment Unit	Beneficial Use[a]	Support Status	Pollutant (2010 Final Integrated Report)
Cataldo Gulch	Cataldo Gulch; Skeel Gulch	10.94 miles	ID17010303PN017_02	COLD SCR	Not assessed Not assessed	
Cave Lake tributaries	Willow Creek in Idaho	1.00 miles	ID17010303PN011_02	COLD SCR	Not assessed Not assessed	
Cave Lake/Medicine Lake	Cave Lake/Medicine Lake	990.0 acres	ID17010303PN010L_0L	COLD PCR	Not assessed Not assessed	
Cave Lake/Medicine Lake tributaries	Swan Creek; Canary Creek; Clark Creek; Unnamed tributary; Evans Creek	10.05 miles	ID17010303PN010_02 ID17010303PN010_03 ID17010303PN012_02	COLD SCR	Not assessed Not assessed	
Cedar Creek	Alder Creek; Cedar Creek; Chinese Gulch; Rutherford Gulch; SF Cedar Creek; Unnamed tributary	26.38 miles	ID17010303PN030_02 ID17010303PN030_03	COLD, SS SCR (030_02)	Not supporting Full support	Sediment; Temperature
Coeur d'Alene River	Coeur d'Alene River, Latour Creek to mouth	29.41 miles	ID17010303PN007_06	COLD PCR SS	Not supporting Not assessed Not supporting	Cadmium; Lead; Zinc; Habitat Alteration; Temperature; Sediment Temperature
Coeur d'Alene River tributary	Unnamed tributaries	3.93 miles	ID17010303PN016_02 ID17010303PN019_02	COLD SCR	Not assessed Not assessed	
Coeur d'Alene River	Coeur d'Alene River from the South Fork to Latour Creek	7.49 miles	ID17010303PN016_06	COLD PCR	Not supporting Full Support	Cadmium; Lead; Zinc; Temperature
Cougar Creek	Cougar Creek; NF Cougar Creek; Unnamed tributary	9.11 miles 2.60 miles 3.99 miles	ID17010303PN02_02	COLD SS SCR	Not supporting Not supporting Not assessed	Habitat Alteration; Temperature; Sediment Temperature

Subwatershed	Stream Name(s)	Stream Miles/ Lake Acres	Assessment Unit	Beneficial Use[a]	Support Status	Pollutant (2010 Final Integrated Report)
Fernan Creek	Fernan Creek from Fernan Lake to mouth	0.74 miles	ID17010303PN032_03	COLD PCR	Full support Full support	
	Fernan Creek; Jungle Gulch; Rondo Gulch; Smith Gulch; Stacel Draw; Unnamed tributary	15.74 miles	ID17010303PN034_02	COLD SCR	Not supporting Full support	Temperature
	Fernan Creek	1.27 miles	ID17010303PN034_02a	COLD DWS	Not assessed Not assessed	
	Fernan Creek	3.14 miles	ID17010303PN034_03	COLD	Not supporting	Temperature
Fernan Lake	Fernan Lake	340 acres	ID17010303PN033_03	COLD PCR	Full support Not supporting	 Nutrient/ Eutrophication
Fourth of July Creek	Bentley Creek; Curran Creek; Fern Creek; Fourth of July Creek; Mason Creek; Mill Creek; Rantenan Creek; Service Creek; Unnamed tributary	34.96 miles	ID17010303PN020_02 ID17010303PN020_03	COLD SS SCR	Not supporting Not supporting Not assessed	Habitat Alteration; Temperature Temperature
French Gulch	French Gulch	1.64 miles	ID17010303PN001_02c	COLD SCR	Not assessed Not assessed	
Kid Creek	Kid Creek	4.08 miles	ID17010303PN003_02	COLD SS SCR	Not supporting Not supporting Not assessed	Habitat Alteration; Sediment Sediment
Killarney Lake	Killarney Lake	499 acres	ID17010303PN022L_0L	COLD SCR	Not supporting Not supporting	Mercury

Subwatershed	Stream Name(s)	Stream Miles/ Lake Acres	Assessment Unit	Beneficial Use[a]	Support Status	Pollutant (2010 Final Integrated Report)
Killarney Lake tributaries	Armstrong Creek; Chatfield Creek; Fortier Creek; Killarney Creek; Lane Creek; McGinnis Creek; Unnamed tributary	10.92 miles	ID17010303PN022_02	COLD, SS	Not supporting	Temperature
	Fortier Creek	1.58 miles	ID17010303PN022_03	COLD PCR	Not assessed Not assessed	
Lake Creek	Lake Creek; Bozard Creek; Kruse Creek; School Creek; Unnamed tributaries	14.7 miles	ID17010303PN006_02 ID17010303PN006_03	COLD PCR SCR	Not assessed Not assessed Not assessed	
Latour Creek	Baldy Creek; Butler Creek; Higbee Draw; Larch Creek; Latour Creek; Little Baldy Creek; Lost Girl Creek; Unnamed tributaries	50.43 miles	ID17010303PN015_02	COLD SS SCR	Not supporting Not supporting Supporting	Sediment; Temperature Temperature
Latour Creek headwaters	Crystal Lake	8.9 acres	ID17010303PN015_02L	COLD PCR	Not assessed Not assessed	
Marie Creek	Burton Creek; Marie Creek; Searchlight Creek; Skitwish Creek	16.39 miles	ID17010303PN031_02	COLD SS	Not supporting Not supporting	Temperature; Sediment; Habitat Alteration Temperature

Subwatershed	Stream Name(s)	Stream Miles/ Lake Acres	Assessment Unit	Beneficial Use[a]	Support Status	Pollutant (2010 Final Integrated Report)
Mica Creek	Mica Creek at mouth; Unnamed tributary; Cabin Creek; Rock Creek; North Fork Mica Creek; South Fork Mica Creek	24.18 miles	ID17010303PN004_02 ID17010303PN004_03	COLD (04_02) SS (04_02) PCR SCR	Not supporting Not supporting Not supporting Not supporting	Habitat Alteration; Sediment Temperature Temperature Fecal Coliform; Fecal Coliform;
Neachen Creek	Neachen Creek; Unnamed tributary	6.67 miles	ID17010303PN001_02e	COLD SCR	Not assessed Not assessed	
Powderhorn Creek	Unnamed tributary to Coeur d'Alene Lake near Bell Bay; Powderhorn Creek	4.78 miles	ID17010303PN001_02e	COLD SCR	Not assessed Not assessed	
Robinson Creek	Robinson Creek; Canary Creek; Unnamed tributary	12.15 miles	ID17010303PN013_02	COLD SCR	Not assessed Not assessed	
Rose Creek	Rose Creek; Unnamed tributary	8.17 miles	ID17010303PN021_02	COLD SS	Not supporting Not supporting	Temperature Temperature
Rose Lake	Rose Lake	317 acres	ID17010303PN021L_0L	COLD PCR	Not assessed Not assessed	
Stinson Creek	Delcaro Creek; Lyle Creek; Scott Creek; Stinson Creek	1.24 miles 1.97 miles 1.87 miles 4.94 miles	ID17010303PN001_02f	COLD SCR	Not assessed Not assessed	
Swan Lake	Swan Lake	435 acres	ID17010303PN023L_0L	COLD PCR	Not assessed Not assessed	
Swan Lake tributaries	Unnamed tributaries	6.49 miles	ID17010303PN023_02	COLD SCR	Not assessed Not assessed	
Thompson Lake	Thompson Lake	174 acres	ID17010303PN024L_0L	COLD PCR	Not assessed Not assessed	
Thompson Lake tributaries	Thompson Creek; Unnamed tributary	6.13 miles	ID17010303PN025_02	COLD	Full support	

Subwatershed	Stream Name(s)	Stream Miles/ Lake Acres	Assessment Unit	Beneficial Use[a]	Support Status	Pollutant (2010 Final Integrated Report)
Turner Creek	Turner Creek; Unnamed tributary	5.12 miles	ID17010303PN027_02	COLD	Full support	
Wolf Lodge Creek	Blue Grouse Creek; Halladay Creek; Lonesome Creek; Onawa Creek; Phantom Creek; Stella Creek; Unnamed tributaries; Wolf Lodge Creek	29.52 miles	ID17010303PN029_02 ID17010303PN029_03	COLD (d) SS (d) PCR (d)	Not supporting Not supporting Full support	Temperature; Sediment; Habitat Alteration (029_03) Temperature Habitat Alteration (029_03)

[a] COLD = cold water aquatic life; PCR = primary contact recreation; SCR = secondary contact recreation; SS = salmonid spawning; DWS = domestic water supply
(d) = designated use

Appendix B. Temperature Assessments in the Coeur d’Alene Lake Subbasin

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Coeur d'Alene Lake Subbasin (HUC 17010303):
Coeur d'Alene Lake Subbasin (HUC 17010303):
Assessment of Compliance with Idaho Water Quality Standards for Temperature, US Forest Service Data

Kajsa Stromberg and Valena Berry
DEQ Coeur d'Alene Regional Office
July 17, 2009

From 1999 to 2008, the Coeur d'Alene River Ranger District of the US Forest Service (USFS) Idaho Panhandle National Forests collected stream temperature data on streams in the Coeur d'Alene Lake subbasin (hydrologic unit code 17010303). Temperature data were collected from 60 sites on 15 assessment units and 27 streams (Figure B-1; Table B-1). These data were supplied to the Idaho Department of Environmental Quality (DEQ) and analyzed for compliance with Idaho water quality standards.

Beneficial uses of stream surface waters in the Coeur d'Alene Lake subbasin include cold water aquatic life throughout the subbasin. Therefore, data were analyzed for compliance with Idaho water quality criteria for cold water aquatic life and salmonid spawning (IDAPA 58.01.02.250.02.b and 02.f; Table B-2). The coldwater aquatic community consists of both native and nonnative coldwater species. Native fishes of the subbasin streams are westslope cutthroat trout, bull trout, largescale sucker, longnose dace, mountain whitefish, northern pikeminnow, redside shiner, and mottled, torrent, and shorthead sculpin (Jim Fredericks and Ryan Hardy [IDFG], Chris James [USFS], Ed Lider [retired USFS]). Nonnative coldwater species include rainbow trout, eastern brook trout, and Chinook salmon. Together, these species support a popular sport fishery. Other components of the coldwater aquatic life community include amphibians, such as Pacific giant salamanders, and diverse invertebrates.

Population numbers of westslope cutthroat trout and bull trout have severely declined, and they occupy a fraction of their historic range (May 2009). In January and March 2009, over 80 fisheries biologists and 12 ArcGIS technical experts from several state, federal, and tribal agencies, along with personnel from private firms, attended 9 workshops to develop a status update for westslope cutthroat trout and expand a database originally developed in 2002. The database is managed and maintained as a component of the westslope cutthroat trout interagency conservation working group. Coordination of the working group in Idaho and management of the database is currently provided by the Idaho Department of Fish and Game. Experts considered current distribution, conservation populations, and historical range of the species. Results of this effort indicated westslope cutthroat trout are currently present in most of the streams in the subbasin (May 2009). Current westslope cutthroat trout distribution is illustrated in a map in Figure 1 in the Background section of the TMDL document. Those tributaries with cutthroat trout most likely have some spawning occurring as well, whether it is adfluvial or resident fish (Ryan Hardy, IDFG, personal communication). Therefore, salmonid spawning is considered a beneficial use for all the streams evaluated in this TMDL analysis.

Since 2005, the mainstem Coeur d'Alene River has been designated by the US Fish and Wildlife Service as critical habitat for bull trout. The Coeur d'Alene River was identified as a migratory corridor, which provides the primary constituent elements of critical habitat necessary for seasonal use for migrating bull trout (USFWS 2010).

Temperature data from all of the assessment units exceeded Idaho water quality standards (Table B-3). Data from 5 assessment units exceeded the criteria for cold water aquatic life; all assessment units exceeded criteria for salmonid spawning where applicable. Idaho bull trout criteria were assessed for the Coeur d'Alene River, which exceeded Idaho bull trout temperature criteria. Overall, the exceedances were not infrequent, brief, and small, and the air temperature exemptions did not affect compliance status. Therefore, the 15 assessment units evaluated with USFS data were listed in Section 5 of Idaho's draft 2010 Integrated Report for a temperature impairment (Table B-4).

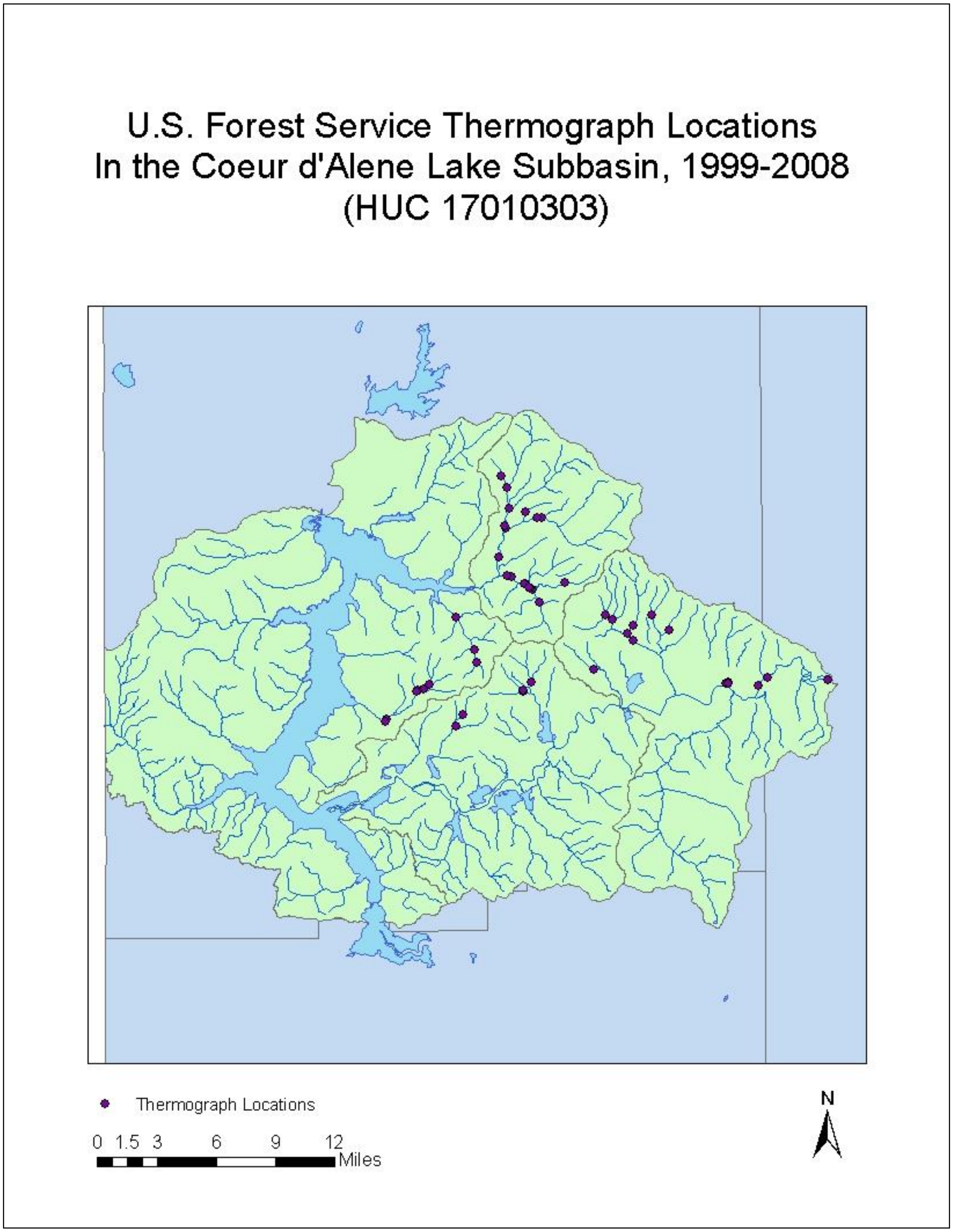


Figure B-1. Temperature data were collected from 60 sites and 15 assessment units.

Table B-1. Temperature monitoring locations in the Coeur d'Alene River subbasin for streams in this analysis, 1999–2008.

Assessment Unit Name	Assessment Unit Number	Stream Name	USFS Site Description	Year	Latitude	Longitude
Coeur d'Alene River, Latour Creek to Harrison	ID17010303PN007_06	Coeur d'Alene River	CDA River at Cataldo (Bottom)	2003	47.551647	-116.369345
		Coeur d'Alene River	CDA River at Cataldo (Top)	2003	47.552537	-116.367163
		Coeur d'Alene River	Cataldo	2006	47.551463	-116.367264
Coeur d'Alene River, South Fork Coeur d'Alene River to Latour Creek	ID17010303PN016_06	Coeur d'Alene River	CDA River below the South Fork	2005	47.553731	-116.259893
		Coeur d'Alene River	CDA River at Cataldo, off I-90	2005	47.549794	-116.334592
		Coeur d'Alene River	Below SF	2007	47.553731	-116.259893
		Coeur d'Alene River	Near Cataldo	2007	47.549794	-116.334592
		Coeur d'Alene River	Cataldo gauging station	2008	47.555007	-116.324444
Fourth of July Creek, headwaters and tributaries	ID17010303PN020_02	Curran Creek	Curran Creek above private land (Lower Reach)	2004	47.594420	-116.469252
		Curran Creek	Mouth	2006	47.588039	-116.476224
		Fern Creek	Above private land	2006	47.602204	-116.448816
		Mason Creek	Mason near mouth (lower reach) near I-90	2004	47.598839	-116.492091
		Mason Creek	Above I-90	2006	47.598839	-116.492091
		Mill Creek	Above I-90	2006	47.602120	-116.499049
		Rantenan Creek	Just above private land	2006	47.591090	-116.430907
Fourth of July Creek, lower	ID17010303PN020_03	Fourth of July Creek	Below Curran Creek	2006	47.583099	-116.469787
Rose Creek	ID17010303PN021_02	Rose Creek	Rose Creek (lower reach) on private land	2004	47.562570	-116.512027
Tributaries to Killarney Lake	ID17010303PN022_02	Armstrong Creek	Located on FS and private boundary	2004	47.546734	-116.588443
		Armstrong Creek tributary	70 m upstream from confluence with Armstrong	2004	47.547137	-116.589267
		Fortier Creek	Fortier Cr above private land (middle reach)	2004	47.553036	-116.580477
Cottonwood Creek	ID17010303PN024_02	Blue Lake Creek	None	2008	47.529674	-116.653463
		Cottonwood Creek	Cottonwood near confluence with Blue Lake Cr. off 614	2004	47.521154	-116.661805
		Cottonwood Creek	None	2008	47.521154	-116.661805

Assessment Unit Name	Assessment Unit Number	Stream Name	USFS Site Description	Year	Latitude	Longitude
Carlin Creek	ID17010303PN026_02	Carlin Creek	Lower Carlin Creek	2004	47.526696	-116.736731
		Carlin Creek	None	2008	47.525241	-116.738286
		Carrill Creek	Lower Carrill at mouth (20 m upstream from Pleasant Cr.)	2004	47.548256	-116.696566
		Johns Creek	Mouth of Johns Creek just above trail 257	2004	47.546715	-116.703948
		No Creek	Lower No approx. 120 m from trail crossing	2004	47.552182	-116.690496
		Pleasant Creek	Lower Pleasant Cr. below Carrill Cr., above No	2004	47.547535	-116.702450
		Pleasant Creek	Above mouth	2008	47.546597	-116.703552
Beauty Creek, headwaters and tributaries	ID17010303PN028_02	Beauty Creek	Right fork above road 438 up unnamed tributary	1999	47.568570	-116.638594
		Beauty Creek	Left fork above road 438 above unnamed tributary	1999	47.568264	-116.638430
		Beauty Creek	Upper Beauty, middle Sec 19 off 438	2004	47.576836	-116.641579
Beauty Creek, lower	ID17010303PN028_03	Beauty Creek	Beauty Cr. at confluence with Caribou Cr.	1999	47.601377	-116.660546
		Beauty Creek	Beauty Cr. at confluence with Caribou Cr.	2001	47.601377	-116.660546
		Beauty Creek	Beauty Cr. at confluence with Caribou Cr.	2002	47.601377	-116.660546
		Beauty Creek	Lower Beauty Cr. below Caribou Cr.	2004	47.601372	-116.660881
		Beauty Creek	below Caribou Cr.	2008	47.601388	-116.660722
Wolf Lodge Creek, upper	ID17010303PN029_02	Lonesome Creek	Lonesome Creek below Stella Cr.	2001	47.695623	-116.604885
		Lonesome Creek	Lonesome Creek (upper reach) (2 readings)	2001	47.704557	-116.610943
		Lonesome Creek	Mouth	2006	47.695719	-116.604972
		Stella Creek	Above Lonesome Creek	2006	47.695726	-116.604801
Wolf Lodge Creek, lower	ID17010303PN029_03	Wolf Lodge Creek	Above Marie Cr. Just below Meyers Hill Road	2006	47.668033	-116.607421
		Wolf Lodge Creek	Under Funk's bridge	2006	47.642197	-116.614255

Assessment Unit Name	Assessment Unit Number	Stream Name	USFS Site Description	Year	Latitude	Longitude
Cedar Creek, headwaters and tributaries	ID17010303PN030_02	Alder Creek	Lower Alder, 40 m upstream from I-90	2004	47.625535	-116.586320
		Alder Creek	Lower Alder, 60 m upstream from I-90	2005	47.625621	-116.586073
		Alder Creek	25-30 m upstream from I-90	2006	47.625518	-116.586449
		Cedar Creek	Upper reach above SF Cedar	2000	47.625560	-116.543267
		Cedar Creek	Upper reach above SF Cedar	2001	47.625560	-116.543267
		Cedar Creek	Upper reach above SF Cedar	2004	47.621169	-116.577986
		Cedar Creek	Cedar Cr. below the SF	2005	47.621804	-116.580878
		Cedar Creek	Cedar Cr. below the SF	2006	47.622710	-116.582157
		South Fork Cedar Creek	Lower to mid SF, up from I-90	2004	47.612052	-116.570028
Cedar Creek, lower	ID17010303PN030_03	Cedar Creek	Cedar Creek, lower reach north of I-90	2000	47.630413	-116.600462
		Cedar Creek	Cedar Creek, lower reach north of I-90	2001	47.630413	-116.600462
		Cedar Creek	Lower Cedar Cr, near Strauss house	2005	47.630995	-116.605288
Marie Creek	ID17010303PN031_02	Marie Creek	Marie Cr. near bridge	2001	47.665833	-116.607157
		Marie Creek	Lower Marie off trail	2005	47.673439	-116.572753
		Marie Creek	Trail 214 at Marie Cr. floodplain, Approx. 600 ft below Burton	2006	47.673541	-116.568078
		Searchlight Creek	Above Trail 241	2006	47.677455	-116.584984

Table B-2. Water temperature criteria applied in Coeur d'Alene Lake subbasin streams.

Beneficial Use	Location	Temperature Criteria[a]	Dates	
Cold Water Aquatic Life	Applies to entire subbasin	22 °C MDMT	All year	
		19 °C MDAT		
Salmonid Spawning	Applies to all water bodies addressed in this TMDL document	13 °C MDMT	<u>Spring</u> > 4,000ft Jun 1–July 31 3,000–4,000ft May 15–July 15 <3,000ft May 1–July 1	<u>Fall</u> Aug 15–Nov 15
		9 °C MDAT		
Idaho Bull Trout Criteria	Only applies to the Coeur d'Alene River	13 °C MWMT	<u>Rearing</u> Jun 1–Aug 31	N/A
		9 °C MDAT	N/A	<u>Spawning</u> Sep 1–Oct 31
EPA Bull Trout Criteria	Cougar Creek Fernan Creek Kid Creek Mica Creek South Fork Mica Creek Squaw Creek Turner Creek	10 °C MWMT	Jun 1–Sep 30	

[a] MDMT = maximum daily maximum temperature; MDAT = maximum daily average temperature; MWMT = maximum weekly maximum temperature

Table B-3. Temperature monitoring locations and assessment results for data collected by the US Forest Service in the Coeur d'Alene River subbasin streams in this analysis, 1999–2008.

Note: O indicates pass, X indicates fail, and NA indicates data unavailable for assessment.

Assessment Unit Name	Assessment Unit	Stream Name	USFS Site Description	Year	Criteria Evaluation			
					CWAL [a]	SS[b]—spring	SS[b]—fall	ID Bull Trout
Coeur d'Alene River, Latour Creek to Harrison	ID17010303PN007_06	Coeur d'Alene River	CDA River at Cataldo (Bottom)	2003	X	X	X	X
			CDA River at Cataldo (Top)	2003	X	X	X	X
			Cataldo	2006	X	X	X	X
Coeur d'Alene River, South Fork Coeur d'Alene River to Latour Creek	ID17010303PN016_06	Coeur d'Alene River	CDA River below the South Fork	2005	O	X	X	X
			CDA River at Cataldo, off I-90	2005	O	NA	X	X
			Below SF	2007	O	NA	X	X
			Near Cataldo	2007	X	X	X	X
			Cataldo gauging station	2008	O	NA	X	X
Fourth of July Creek, headwaters and tributaries	ID17010303PN020_02	Curran Creek	Curran Creek above private land (Lower Reach)	2004	O	O	X	NA
			Mouth	2006	O	X	X	NA
		Fern Creek	Above private land	2006	O	X	X	NA
		Mason Creek	Mason near mouth (lower reach) near I-90	2004	O	X	X	NA
			Above I-90	2006	O	X	X	NA
		Mill Creek	Above I-90	2006	O	X	X	NA
		Rantenan Creek	Just above private land	2006	O	X	X	NA
Fourth of July Creek, lower	ID17010303PN020_03	Fourth of July Creek	Below Curran Creek	2006	O	X	X	NA
Rose Creek	ID17010303PN021_02	Rose Creek	Rose Creek (lower reach) on private land	2004	X	X	X	NA
Tributaries to Killarney Lake	ID17010303PN022_02	Armstrong Creek	Located on FS and private boundary	2004	O	X	X	NA
		Armstrong Creek tributary	70 m upstream from confluence with Armstrong	2004	O	X	X	NA
		Fortier Creek	Fortier Cr above private land (middle reach)	2004	O	X	X	NA

Assessment Unit Name	Assessment Unit	Stream Name	USFS Site Description	Year	Criteria Evaluation			
					CWAL [a]	SS[b]—spring	SS[b]—fall	ID Bull Trout
Cottonwood Creek	ID17010303PN024_02	Blue Lake Creek	None	2008	O	X	X	NA
		Cottonwood Creek	Cottonwood near confluence with Blue Lake Cr. off 614	2004	X	X	X	NA
			None	2008	O	X	X	NA
Carlin Creek	ID17010303PN026_02	Carlin Creek	Lower Carlin Creek	2004	O	X	X	NA
			None	2008	O	X	X	NA
		Carrill Creek	Lower Carrill at mouth (20 m upstream from Pleasant Cr.)	2004	O	X	X	NA
		Johns Creek	Mouth of Johns Creek just above trail 257	2004	O	X	X	NA
		No Creek	Lower No approx. 120 m from trail crossing	2004	O	X	X	NA
		Pleasant Creek	Lower Pleasant Cr. below Carrill Cr., above No	2004	O	X	X	NA
			Above mouth	2008	O	X	X	NA
Beauty Creek, headwaters and tributaries	ID17010303PN028_02	Beauty Creek	Right fork above road 438 up unnamed tributary	1999	O	X	X	NA
			Left fork above road 438 above unnamed tributary	1999	O	X	X	NA
			Upper Beauty, middle Sec 19 off 438	2004	O	X	X	NA
Beauty Creek, lower	ID17010303PN028_03	Beauty Creek	Beauty Cr. at confluence with Caribou Cr.	1999	O	X	X	NA
			Beauty Cr. at confluence with Caribou Cr.	2001	O	NA	X	NA
			Beauty Cr. at confluence with Caribou Cr.	2002	O	X	X	NA
			Lower Beauty Cr. below Caribou Cr.	2004	O	X	X	NA
			below Caribou Cr.	2008	O	X	X	NA
Wolf Lodge	ID17010303PN029_02	Lonesome Creek	Lonesome Creek below Stella Cr.	2001	O	NA	X	NA

Assessment Unit Name	Assessment Unit	Stream Name	USFS Site Description	Year	Criteria Evaluation			
					CWAL [a]	SS[b]—spring	SS[b]—fall	ID Bull Trout
Creek, upper			Lonesome Creek (upper reach) (2 readings)	2001	O	X	NA	NA
			Mouth	2006	O	X	X	NA
		Stella Creek	Above Lonesome Creek	2006	O	X	X	NA
Wolf Lodge Creek, lower	ID17010303PN029_03	Wolf Lodge Creek	Above Marie Cr. Just below Meyers Hill Road	2006	O	X	X	NA
			Under Funk's bridge	2006	O	X	X	NA
Cedar Creek, headwaters and tributaries	ID17010303PN030_02	Alder Creek	Lower Alder, 40 m upstream from I-90	2004	O	X	X	NA
			Lower Alder, 60 m upstream from I-90	2005	O	X	X	NA
			25-30 m upstream from I-90	2006	O	X	X	NA
		Cedar Creek	Upper reach above SF Cedar	2000	O	NA	X	NA
			Upper reach above SF Cedar	2001	O	X	X	NA
			Upper reach above SF Cedar	2004	X	X	NA	NA
			Cedar Cr. below the SF	2005	X	X	X	NA
			Cedar Cr. below the SF	2006	O	X	X	NA
		South Fork Cedar Creek	Lower to mid SF, up from I-90	2004	O	X	X	NA
Cedar Creek, lower	ID17010303PN030_03	Cedar Creek	Cedar Creek, lower reach north of I-90	2000	O	NA	X	NA
			Cedar Creek, lower reach north of I-90	2001	O	X	X	NA
			Lower Cedar Cr, near Strauss house	2005	O	X	X	NA
Marie Creek	ID17010303PN031_02	Marie Creek	Marie Cr. near bridge	2001	O		NA	
			Lower Marie off trail	2005	O	X	X	NA
			Trail 214 at Marie Cr. floodplain, Approx. 600 ft below Burton	2006	O	X	X	NA
		Searchlight Creek	Above Trail 241	2006	O	X	X	NA

[a] CWAL = cold water aquatic life [b] SS = salmonid spawning

Table B-4. Temperature assessment status of selected Coeur d’Alene Lake subbasin streams. Italics indicate changes in status related to temperature.

Assessment Unit Name	Assessment Unit	2002 Water Quality Status (for Temp)	2008 Water Quality Status (for Temp)	2010 Water Quality Status
Coeur d’Alene River, Latour Creek to Harrison	ID17010303PN007_06	Impaired: Exceeds WQS for COLD and SS	Impaired: Exceeds WQS for CWAL and SS	Impaired: Exceeds WQS for CWAL and SS
Coeur d’Alene River, South Fork Coeur d’Alene River to Latour Creek	ID17010303PN016_06	Impaired: Exceeds WQS for COLD and SS	Impaired: Exceeds WQS for CWAL and SS	Impaired: Exceeds WQS for CWAL and SS
Fourth of July Creek, headwaters and tributaries	ID17010303PN020_02	Not Assessed	Not Assessed	*Impaired: Exceeds WQS for* [1]*CWAL and SS*
Fourth of July Creek, lower	ID17010303PN020_03	Not Assessed	Not Assessed	*Impaired: Exceeds WQS for SS*
Rose Creek	ID17010303PN021_02	Not Assessed	Not Assessed	*Impaired: Exceeds WQS for CWAL and SS*
Tributaries to Killarney Lake	ID17010303PN022_02	Not Assessed	Full Support	*Impaired: Exceeds WQS for SS*
Cottonwood Creek	ID17010303PN024_02	Not Assessed	Not Assessed	*Impaired: Exceeds WQS for CWAL and SS*
Carlin Creek	ID17010303PN026_02	Full Support	Full Support	*Impaired: Exceeds WQS for SS*
Beauty Creek, headwaters and tributaries	ID17010303PN028_02	Not Assessed	Not Assessed	*Impaired: Exceeds WQS for SS*
Beauty Creek, lower	ID17010303PN028_03	Impaired: Exceeds WQS for CWAL and SS	Impaired: Exceeds WQS for CWAL and SS	Impaired: Exceeds WQS for [1]CWAL and SS
Wolf Lodge Creek, upper	ID17010303PN029_02	Full Support	Full Support	*Impaired: Exceeds WQS for SS*
Wolf Lodge Creek, lower	ID17010303PN029_03	Impaired: Exceeds WQS for CWAL and SS	Impaired: Exceeds WQS for CWAL and SS	Impaired: Exceeds WQS for [1]CWAL and SS
Cedar Creek, headwaters and tributaries	ID17010303PN030_02	Not Assessed	Not Assessed	*Impaired: Exceeds WQS for CWAL and SS*
Cedar Creek, lower	ID17010303PN030_03	Not Assessed	Not Assessed	*Impaired: Exceeds WQS for SS*
Marie Creek	ID17010303PN031_02	Impaired: Exceeds WQS for CWAL and SS	Impaired: Exceeds WQS for CWAL and SS	Impaired: Exceeds WQS for [1]CWAL and SS

Note: WQS = water quality standards; CWAL = Cold Water Aquatic Life; SS = Salmonid Spawning
[1]*CWAL listing was prior to this assessment.*

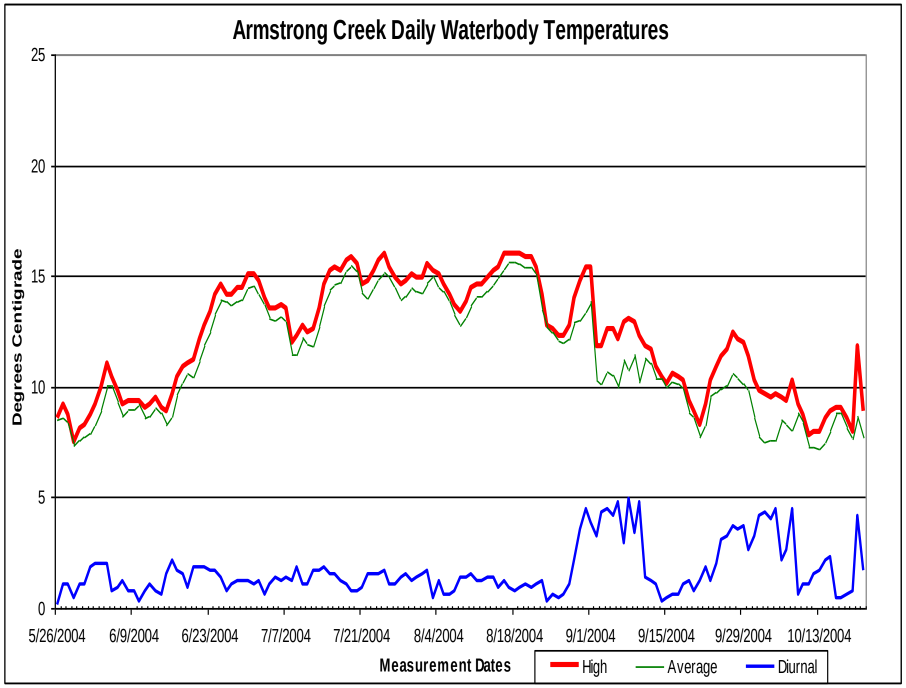
DATA SUMMARY

Data Source: USDA Forest Service
Water Body: Armstrong Creek (ID17010303PN022_02)
Data Collection Period: 5/26/2004–10/21/2004

Idaho Cold Water Aquatic Life Criteria Exceedance Summary			
Criteria	Exceedance Counts Number	Prcnt	
22 °C Instantaneous	0	0%	
19 °C Average	0	0%	
Days Evaluated & Date Range	92	22-Jun	21-Sep

Idaho Salmonid Spawning Criteria Exceedance Summary			
Criteria	Exceedance Counts Number	Prcnt	
13 °C Instantaneous Spring	18	35%	
9 °C Average Spring	35	69%	
Spring Days Eval'd w/in Dates	51	15-Apr	15-Jul
13 °C Instantaneous Fall	14	21%	
9 °C Average Fall	43	63%	
Fall Days Eval'd w/in Dates	68	15-Aug	15-Nov
13 °C Instantaneous Total *	32	27%	
9 °C Average Total *	78	66%	
Tot Days Eval'd w/in Both Dates *	119		

* If spring & fall dates overlap double counting may occur.

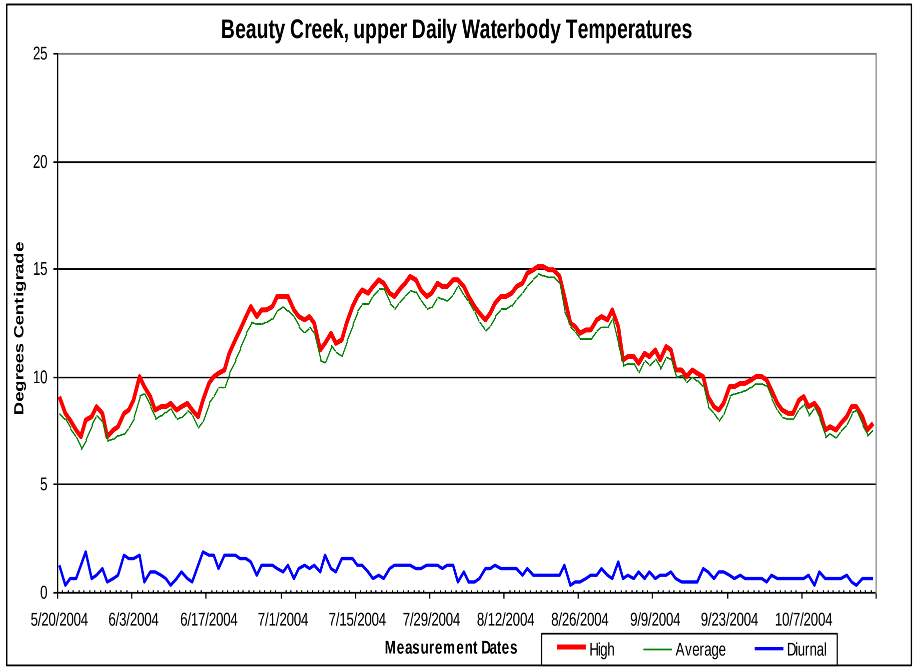


Data Source: USDA Forest Service
Water Body: Beauty Creek, upper, (ID17010303PN028_02)
Data Collection Period: 5/20/2004–10/20/2004

Idaho Cold Water Aquatic Life Criteria Exceedance Summary			
	Exceedance Counts		
Criteria	Number	Prcnt	
22 °C Instantaneous	0	0%	
19 °C Average	0	0%	
Days Evaluated & Date Range	0	22-Jun	21-Sep

Idaho Salmonid Spawning Criteria Exceedance Summary			
	Exceedance Counts		
Criteria	Number	Prcnt	
13 °C Instantaneous Spring	10	18%	
9 °C Average Spring	30	53%	
Spring Days Eval'd w/in Dates	57	15-Apr	15-Jul
13 °C Instantaneous Fall	10	15%	
9 °C Average Fall	43	64%	
Fall Days Eval'd w/in Dates	67	15-Aug	15-Nov
13 °C Instantaneous Total *	20	16%	
9 °C Average Total *	73	59%	
Tot Days Eval'd w/in Both Dates *	124		

* If spring & fall dates overlap double counting may occur.

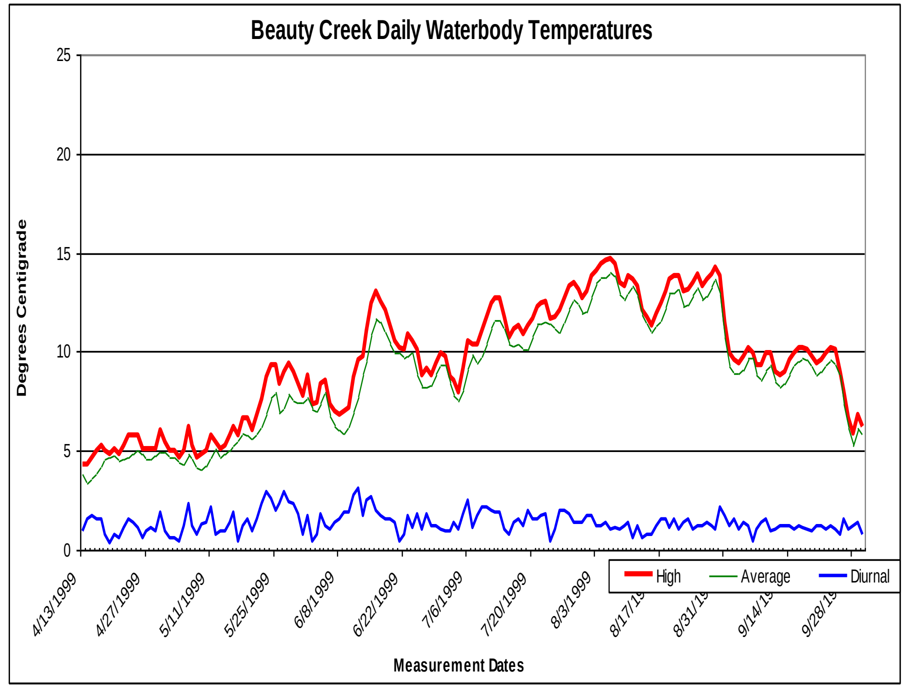


Data Source: USDA Forest Service
Water Body: Beauty Creek at confluence with Carabou Creek, (ID17010303PN028_03)
Data Collection Period: 4/13/1999–9/30/1999

Idaho Cold Water Aquatic Life Criteria Exceedance Summary			
	Exceedance Counts		
Criteria	Number	Prcnt	
22 °C Instantaneous	0	0%	
19 °C Average	0	0%	
Days Evaluated & Date Range	0	22-Jun	21-Sep

Idaho Salmonid Spawning Criteria Exceedance Summary			
	Exceedance Counts		
Criteria	Number	Prcnt	
13 °C Instantaneous Spring	1	1%	
9 °C Average Spring	23	25%	
Spring Days Eval'd w/in Dates	92	15-Apr	15-Jul
13 °C Instantaneous Fall	13	28%	
9 °C Average Fall	31	66%	
Fall Days Eval'd w/in Dates	47	15-Aug	15-Nov
13 °C Instantaneous Total *	14	10%	
9 °C Average Total *	54	39%	
Tot Days Eval'd w/in Both Dates *	139		

* If spring & fall dates overlap double counting may occur.



Data Source: USDA Forest Service
Water Body: Beauty Creek, near mouth, (ID17010303PN028_03)
Data Collection Period: 6/26/2001–10/1/2001

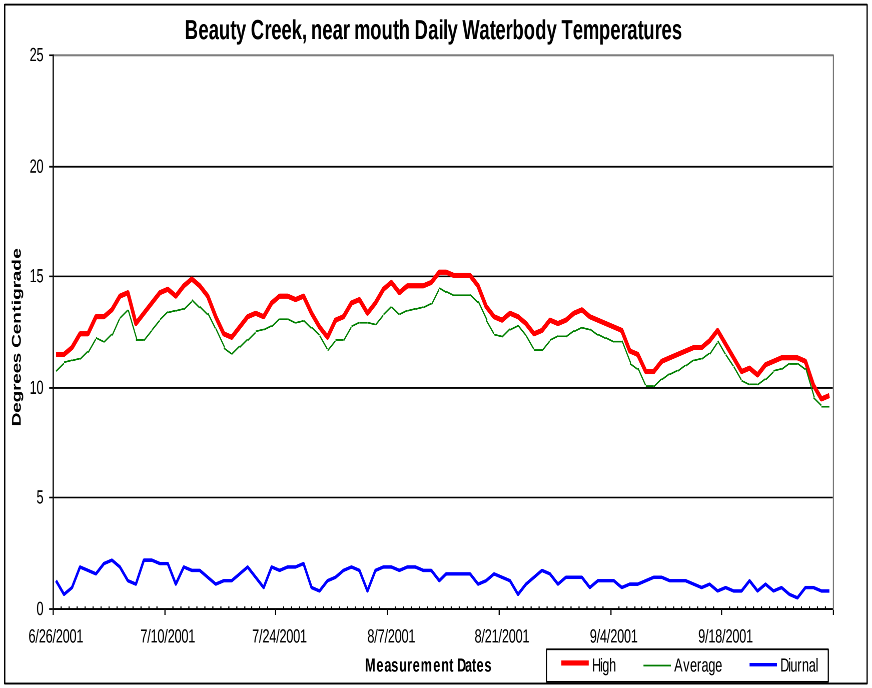
Idaho Cold Water Aquatic Life
Criteria Exceedance Summary

Criteria	Exceedance Counts Number	Prcnt	
22 °C Instantaneous	0	0%	
19 °C Average	0	0%	
Days Evaluated & Date Range	0	22-Jun	21-Sep

Idaho Salmonid Spawning
Criteria Exceedance Summary

Criteria	Exceedance Counts Number	Prcnt	
13 °C Instantaneous Spring	14	70%	
9 °C Average Spring	20	100%	
Spring Days Eval'd w/in Dates	20	15-Apr	15-Jul
13 °C Instantaneous Fall	11	23%	
9 °C Average Fall	48	100%	
Fall Days Eval'd w/in Dates	48	15-Aug	15-Nov
13 °C Instantaneous Total *	25	37%	
9 °C Average Total *	68	100%	
Tot Days Eval'd w/in Both Dates *	68		

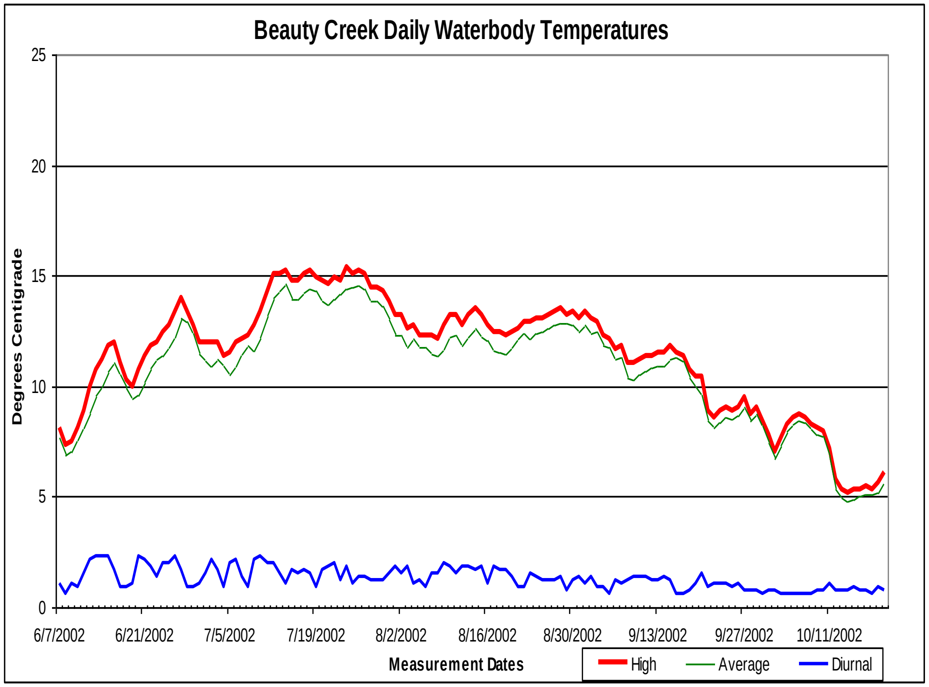
* If spring & fall dates overlap double counting may occur.



Data Source: USDA Forest Service
Water Body: Beauty Creek, near mouth, (ID17010303PN028_03)
Data Collection Period: 6/7/2002–10/20/2002

Idaho Cold Water Aquatic Life Criteria Exceedance Summary			
	Exceedance Counts		
Criteria	Number	Prcnt	
22 °C Instantaneous	0	0%	
19 °C Average	0	0%	
Days Evaluated & Date Range	92	22-Jun	21-Sep

Idaho Salmonid Spawning Criteria Exceedance Summary			
	Exceedance Counts		
Criteria	Number	Prcnt	
13 °C Instantaneous Spring	9	23%	
9 °C Average Spring	33	85%	
Spring Days Eval'd w/in Dates	39	15-Apr	15-Jul
13 °C Instantaneous Fall	11	16%	
9 °C Average Fall	38	57%	
Fall Days Eval'd w/in Dates	67	15-Aug	15-Nov
13 °C Instantaneous Total *	20	19%	
9 °C Average Total *	71	67%	
Tot Days Eval'd w/in Both Dates *	106		
* If spring & fall dates overlap double counting may occur.			

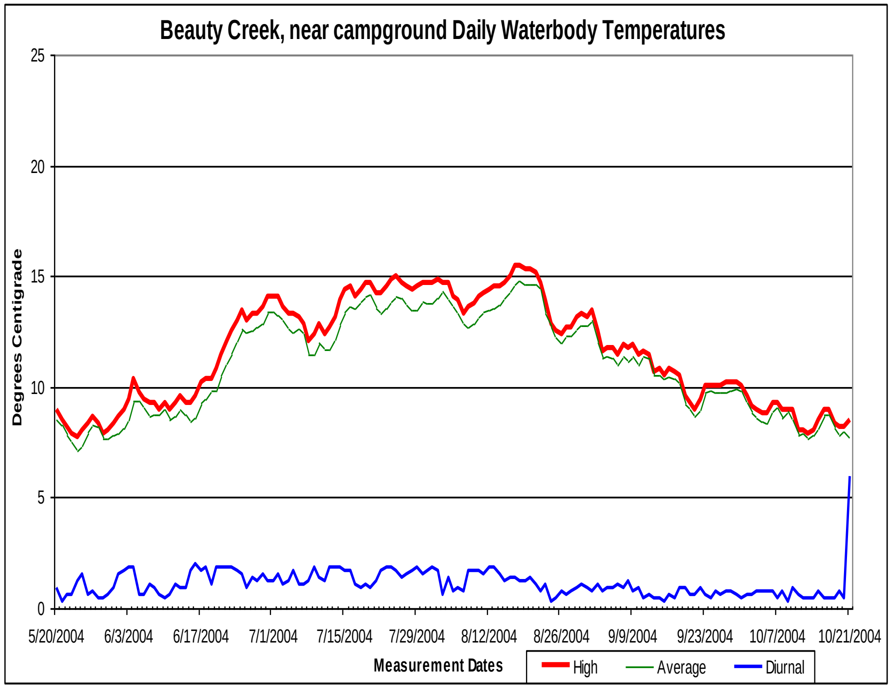


Data Source: USDA Forest Service
Water Body: Beauty Creek, at campground, (ID17010303PN028_03)
Data Collection Period: 5/20/2004–10/21/2004

Idaho Cold Water Aquatic Life Criteria Exceedance Summary			
	Exceedance Counts		
Criteria	Number	Prcnt	
22 °C Instantaneous	0	0%	
19 °C Average	0	0%	
Days Evaluated & Date Range	0	22-Jun	21-Sep

Idaho Salmonid Spawning Criteria Exceedance Summary			
	Exceedance Counts		
Criteria	Number	Prcnt	
13 °C Instantaneous Spring	14	25%	
9 °C Average Spring	32	56%	
Spring Days Eval'd w/in Dates	57	15-Apr	15-Jul
13 °C Instantaneous Fall	13	19%	
9 °C Average Fall	47	69%	
Fall Days Eval'd w/in Dates	68	15-Aug	15-Nov
13 °C Instantaneous Total *	27	22%	
9 °C Average Total *	79	63%	
Tot Days Eval'd w/in Both Dates *	125		

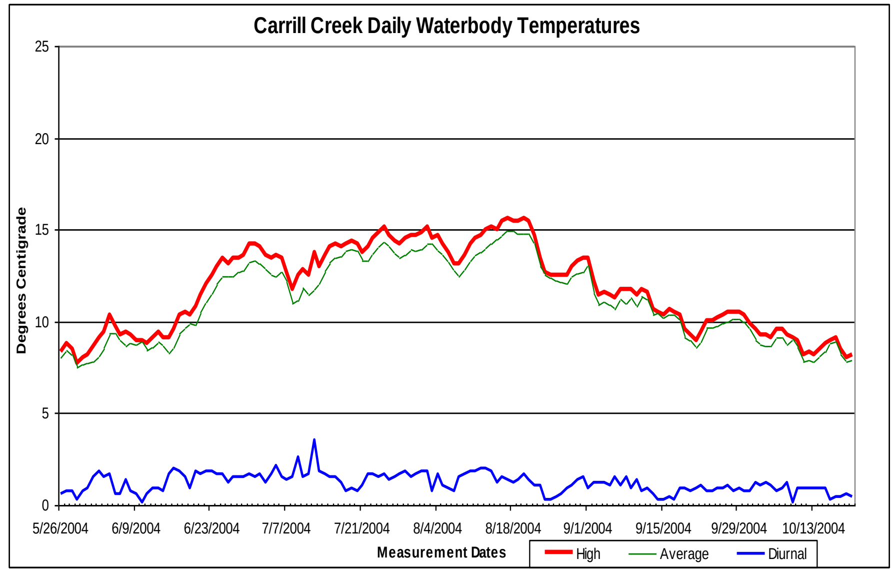
* If spring & fall dates overlap double counting may occur.



Data Source: USDA Forest Service
Water Body: Carrill Creek, near mouth, (ID17010303PN026_02)
Data Collection Period: 5/26/2004–10/20/2004

Idaho Cold Water Aquatic Life Criteria Exceedance Summary			
Criteria	Exceedance Counts Number	Prcnt	
22 °C Instantaneous	0	0%	
19 °C Average	0	0%	
Days Evaluated & Date Range	92	22-Jun	21-Sep

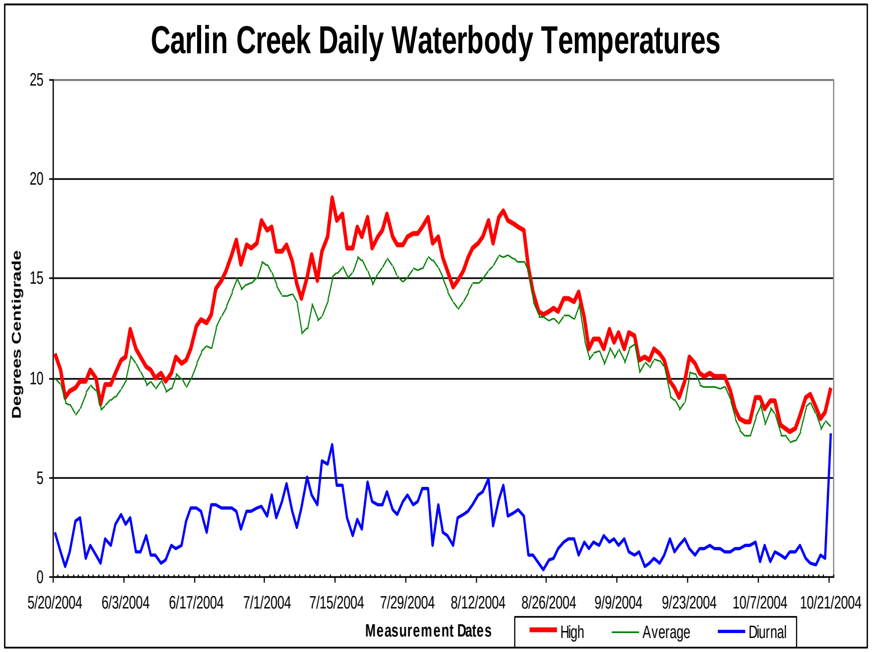
Idaho Salmonid Spawning Criteria Exceedance Summary			
Criteria	Exceedance Counts Number	Prcnt	
13 °C Instantaneous Spring	17	33%	
9 °C Average Spring	32	63%	
Spring Days Eval'd w/in Dates	51	15-Apr	15-Jul
13 °C Instantaneous Fall	13	19%	
9 °C Average Fall	48	72%	
Fall Days Eval'd w/in Dates	67	15-Aug	15-Nov
13 °C Instantaneous Total *	30	25%	
9 °C Average Total *	80	68%	
Tot Days Eval'd w/in Both Dates *	118		
* If spring & fall dates overlap double counting may occur.			



Data Source: USDA Forest Service
Water Body: Carlin Creek, (ID17010303PN026_02)
Data Collection Period: 5/20/2004–10/21/2004

Idaho Cold Water Aquatic Life Criteria Exceedance Summary			
	Exceedance Counts		
Criteria	Number	Prcnt	
22 °C Instantaneous	0	0%	
19 °C Average	0	0%	
Days Evaluated & Date Range	92	22-Jun	21-Sep

Idaho Salmonid Spawning Criteria Exceedance Summary			
	Exceedance Counts		
Criteria	Number	Prcnt	
13 °C Instantaneous Spring	26	46%	
9 °C Average Spring	50	88%	
Spring Days Eval'd w/in Dates	57	15-Apr	15-Jul
13 °C Instantaneous Fall	19	28%	
9 °C Average Fall	44	65%	
Fall Days Eval'd w/in Dates	68	15-Aug	15-Nov
13 °C Instantaneous Total *	45	36%	
9 °C Average Total *	94	75%	
Tot Days Eval'd w/in Both Dates *	125		
* If spring & fall dates overlap double counting may occur.			



Data Source: USDA Forest Service
Water Body: Cedar Creek at Mouth, (ID17010303PN030_03)
Data Collection Period: 6/8/2000–11/5/2000

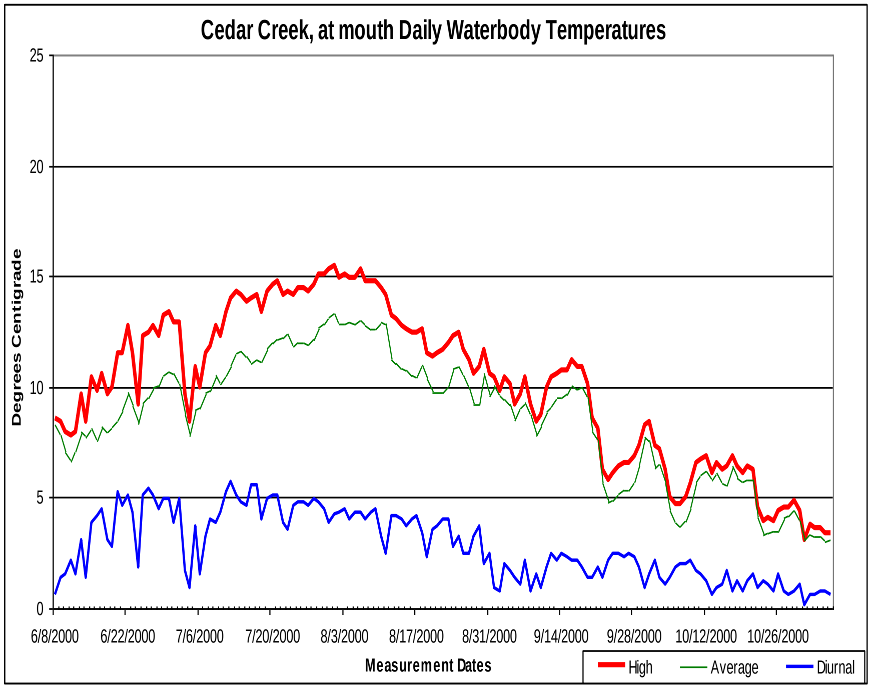
Idaho Cold Water Aquatic Life
Criteria Exceedance Summary

Criteria	Exceedance Counts: Number	Prcnt	
22 °C Instantaneous	0	0%	
19 °C Average	0	0%	
Days Evaluated & Date Range	92	22-Jun	21-Sep

Idaho Salmonid Spawning
Criteria Exceedance Summary

Criteria	Exceedance Counts: Number	Prcnt	
13 °C Instantaneous Spring	7	18%	
9 °C Average Spring	20	53%	
Spring Days Eval'd w/in Dates	38	15-Apr	15-Jul
13 °C Instantaneous Fall	0	0%	
9 °C Average Fall	31	37%	
Fall Days Eval'd w/in Dates	83	15-Aug	15-Nov
13 °C Instantaneous Total *	7	6%	
9 °C Average Total *	51	42%	
Tot Days Eval'd w/in Both Dates *	121		

* If spring & fall dates overlap double counting may occur.



Data Source: USDA Forest Service
Water Body: Cedar Creek at Mouth, (ID17010303PN030_03)
Data Collection Period: 5/20/2004–8/5/2004

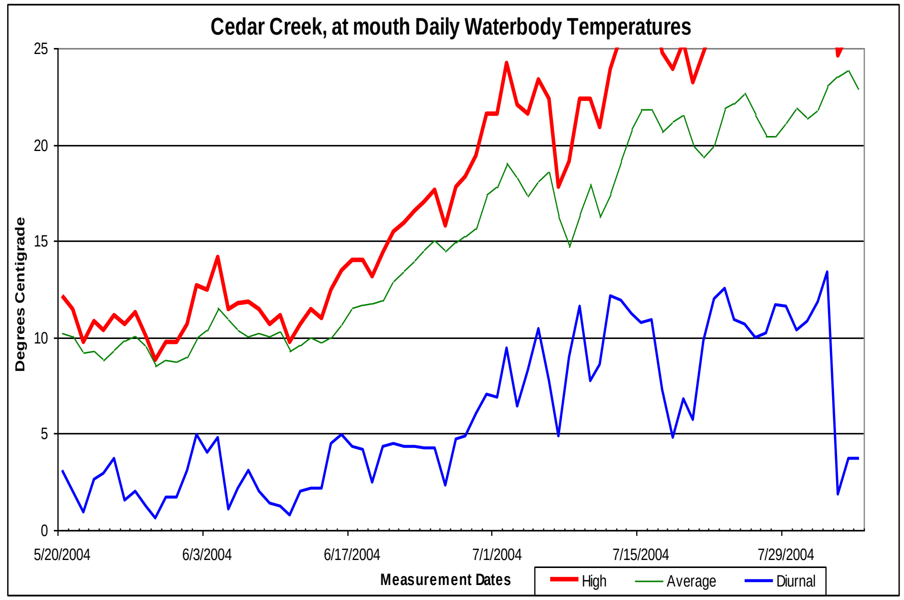
Idaho Cold Water Aquatic Life
Criteria Exceedance Summary

Criteria	Exceedance Counts Number	Prcnt	
22 °C Instantaneous	31	69%	
19 °C Average	25	56%	
Days Evaluated & Date Range	45	22-Jun	21-Sep

Idaho Salmonid Spawning
Criteria Exceedance Summary

Criteria	Exceedance Counts Number	Prcnt	
13 °C Instantaneous Spring	31	54%	
9 °C Average Spring	52	91%	
Spring Days Eval'd w/in Dates	57	15-Apr	15-Jul
13 °C Instantaneous Fall	0	0%	
9 °C Average Fall	0	0%	
Fall Days Eval'd w/in Dates	0	15-Aug	15-Nov
13 °C Instantaneous Total *	31	54%	
9 °C Average Total *	52	91%	
Tot Days Eval'd w/in Both Dates *	57		

* If spring & fall dates overlap double counting may occur.



Data Source: USDA Forest Service
Water Body: Cedar Creek, upper, (ID17010303PN030_02)
Data Collection Period: 7/18/2000–9/4/2000

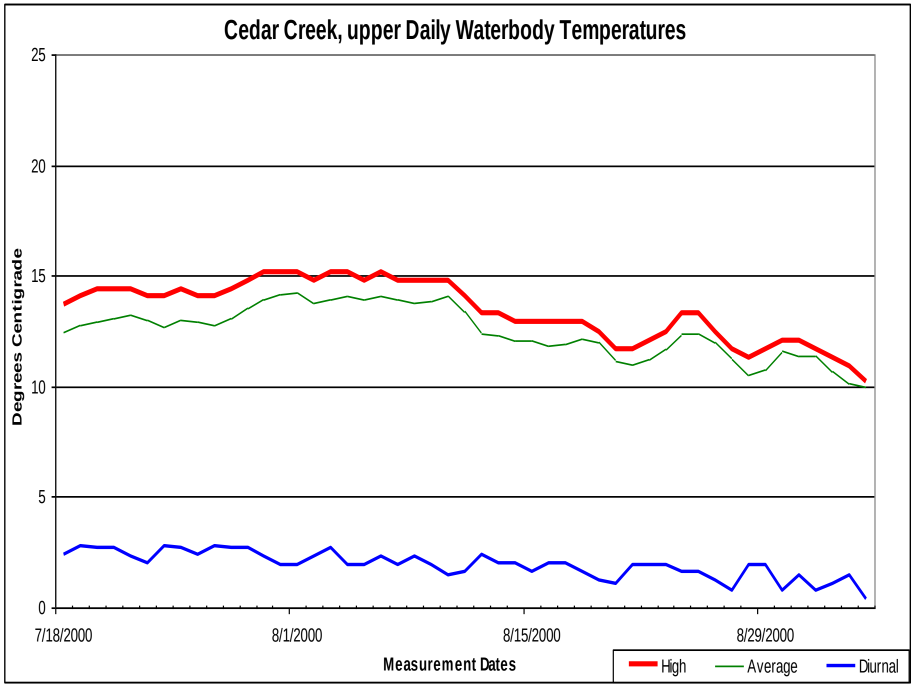
Idaho Cold Water Aquatic Life
Criteria Exceedance Summary

Criteria	Exceedance Counts Number	Prcnt	
22 °C Instantaneous	0	0%	
19 °C Average	0	0%	
Days Evaluated & Date Range	49	22-Jun	21-Sep

Idaho Salmonid Spawning
Criteria Exceedance Summary

Criteria	Exceedance Counts Number	Prcnt	
13 °C Instantaneous Spring	0	0%	
9 °C Average Spring	0	0%	
Spring Days Eval'd w/in Dates	0	15-Apr	15-Jul
13 °C Instantaneous Fall	2	10%	
9 °C Average Fall	21	100%	
Fall Days Eval'd w/in Dates	21	15-Aug	15-Nov
13 °C Instantaneous Total *	2	10%	
9 °C Average Total *	21	100%	
Tot Days Eval'd w/in Both Dates *	21		

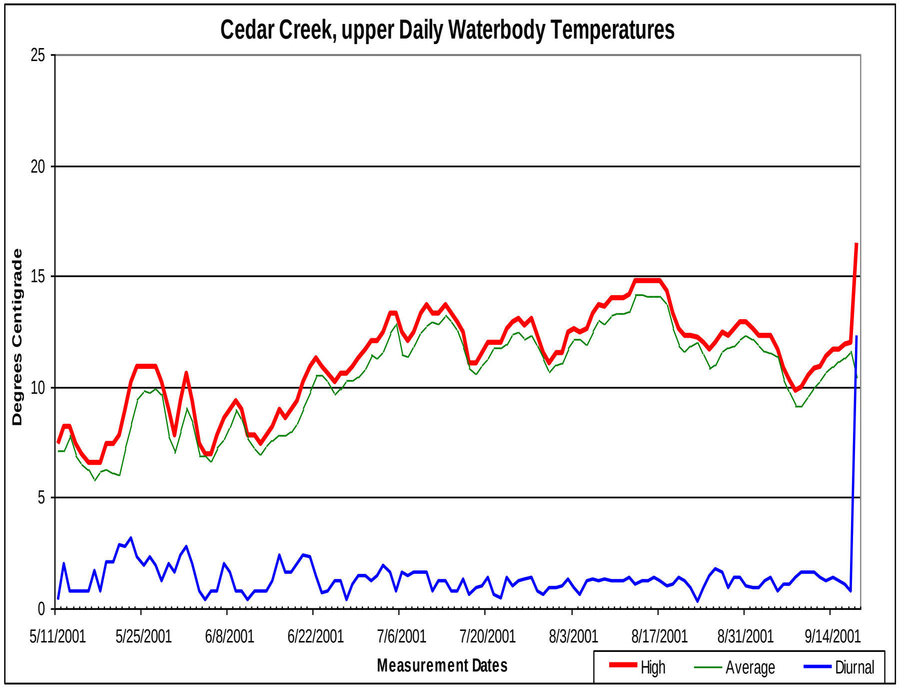
* If spring & fall dates overlap double counting may occur.



Data Source: USDA Forest Service
Water Body: Cedar Creek, upper site, (ID17010303PN030_02)
Data Collection Period: 5/11/2001–9/18/2001

Idaho Cold Water Aquatic Life Criteria Exceedance Summary			
	Exceedance Counts		
Criteria	Number	Prcnt	
22 °C Instantaneous	0	0%	
19 °C Average	0	0%	
Days Evaluated & Date Range	89	22-Jun	21-Sep

Idaho Salmonid Spawning Criteria Exceedance Summary			
	Exceedance Counts		
Criteria	Number	Prcnt	
13 °C Instantaneous Spring	8	12%	
9 °C Average Spring	32	48%	
Spring Days Eval'd w/in Dates	66	15-Apr	15-Jul
13 °C Instantaneous Fall	6	17%	
9 °C Average Fall	35	100%	
Fall Days Eval'd w/in Dates	35	15-Aug	15-Nov
13 °C Instantaneous Total *	14	14%	
9 °C Average Total *	67	66%	
Tot Days Eval'd w/in Both Dates *	101		
* If spring & fall dates overlap double counting may occur.			

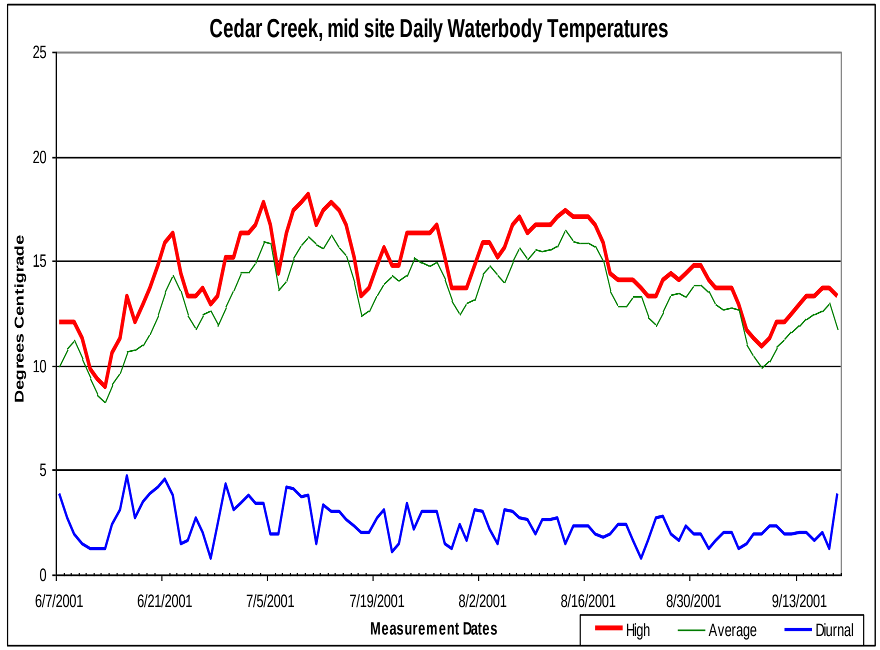


Data Source: USDA Forest Service
Water Body: Cedar Creek, mid site, (ID17010303PN030_02)
Data Collection Period: 6/7/2001–9/18/2001

Idaho Cold Water Aquatic Life Criteria Exceedance Summary			
Criteria	Exceedance Counts Number	Prcnt	
22 °C Instantaneous	0	0%	
19 °C Average	0	0%	
Days Evaluated & Date Range	89	22-Jun	21-Sep

Idaho Salmonid Spawning Criteria Exceedance Summary			
Criteria	Exceedance Counts Number	Prcnt	
13 °C Instantaneous Spring	27	69%	
9 °C Average Spring	37	95%	
Spring Days Eval'd w/in Dates	39	15-Apr	15-Jul
13 °C Instantaneous Fall	26	74%	
9 °C Average Fall	35	100%	
Fall Days Eval'd w/in Dates	35	15-Aug	15-Nov
13 °C Instantaneous Total *	53	72%	
9 °C Average Total *	72	97%	
Tot Days Eval'd w/in Both Dates *	74		

* If spring & fall dates overlap double counting may occur.

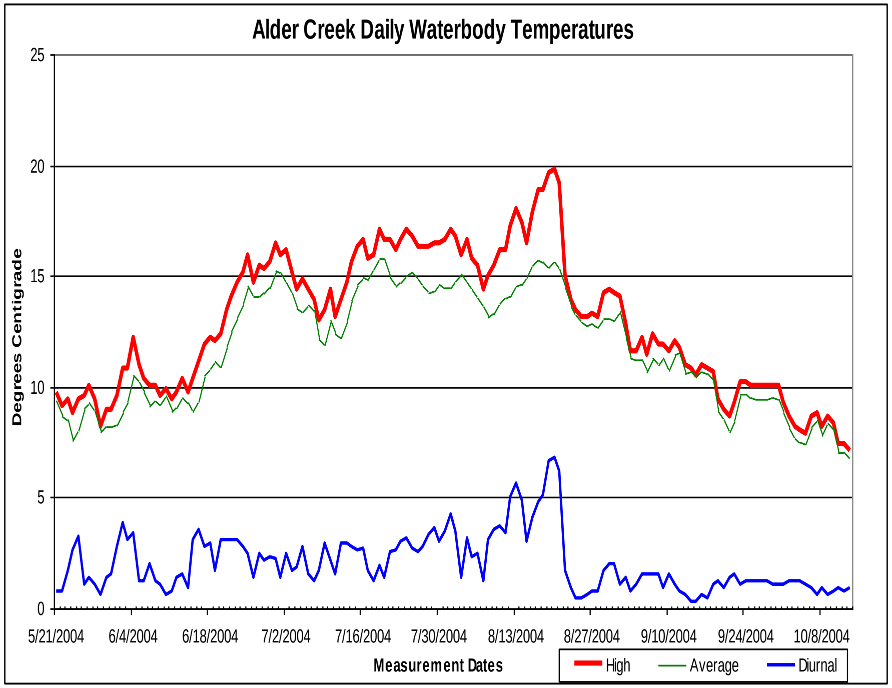


Data Source: USDA Forest Service
Water Body: Alder Creek – Tributary to Cedar Creek, (ID17010303PN030_02)
Data Collection Period: 5/21/2004–10/13/2004

Idaho Cold Water Aquatic Life Criteria Exceedance Summary			
Criteria	Exceedance Counts Number	Prcnt	
22 °C Instantaneous	0	0%	
19 °C Average	0	0%	
Days Evaluated & Date Range	92	22-Jun	21-Sep

Idaho Salmonid Spawning Criteria Exceedance Summary			
Criteria	Exceedance Counts Number	Prcnt	
13 °C Instantaneous Spring	25	45%	
9 °C Average Spring	44	79%	
Spring Days Eval'd w/in Dates	56	15-Apr	15-Jul
13 °C Instantaneous Fall	18	30%	
9 °C Average Fall	43	72%	
Fall Days Eval'd w/in Dates	60	15-Aug	15-Nov
13 °C Instantaneous Total *	43	37%	
9 °C Average Total *	87	75%	
Tot Days Eval'd w/in Both Dates *	116		

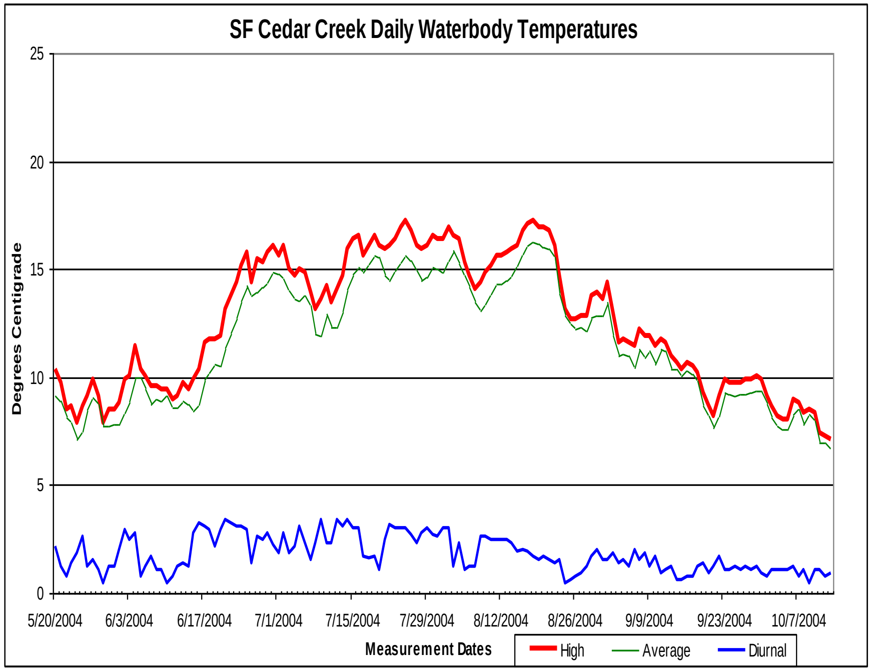
* If spring & fall dates overlap double counting may occur.



Data Source: USDA Forest Service
Water Body: SF Cedar Creek, mid site, (ID17010303PN030_03)
Data Collection Period: 5/20/2004–10/13/2004

Idaho Cold Water Aquatic Life Criteria Exceedance Summary			
	Exceedance Counts		
Criteria	Number	Prcnt	
22 °C Instantaneous	0	0%	
19 °C Average	0	0%	
Days Evaluated & Date Range	92	22-Jun	21-Sep

Idaho Salmonid Spawning Criteria Exceedance Summary			
	Exceedance Counts		
Criteria	Number	Prcnt	
13 °C Instantaneous Spring	25	44%	
9 °C Average Spring	35	61%	
Spring Days Eval'd w/in Dates	57	15-Apr	15-Jul
13 °C Instantaneous Fall	14	23%	
9 °C Average Fall	43	72%	
Fall Days Eval'd w/in Dates	60	15-Aug	15-Nov
13 °C Instantaneous Total *	39	33%	
9 °C Average Total *	78	67%	
Tot Days Eval'd w/in Both Dates *	117		
* If spring & fall dates overlap double counting may occur.			

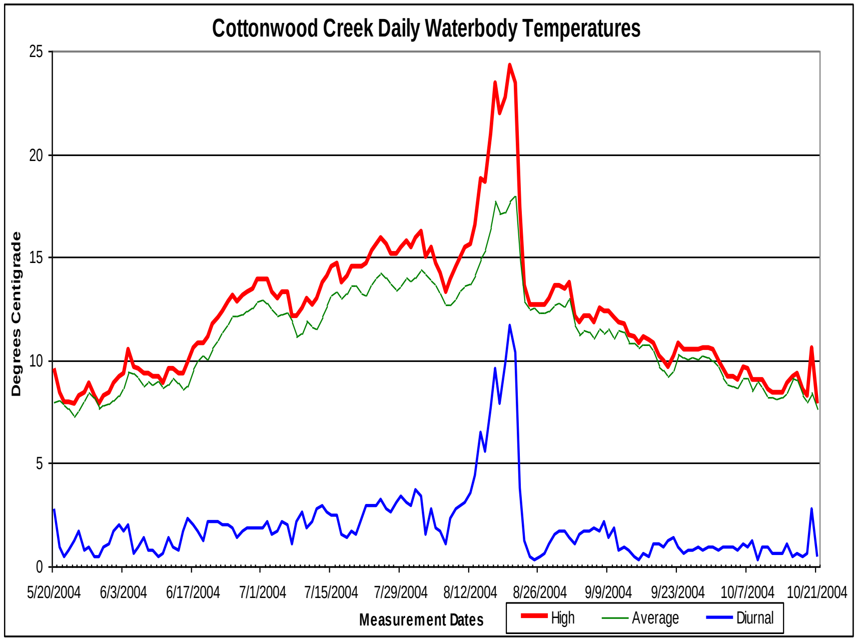


Data Source: USDA Forest Service
Water Body: Cottonwood Creek, (ID17010303PN024_02)
Data Collection Period: 5/20/2004–10/21/2004

Idaho Cold Water Aquatic Life Criteria Exceedance Summary			
	Exceedance Counts		
Criteria	Number	Prcnt	
22 °C Instantaneous	4	4%	
19 °C Average	0	0%	
Days Evaluated & Date Range	92	22-Jun	21-Sep

Idaho Salmonid Spawning Criteria Exceedance Summary			
	Exceedance Counts		
Criteria	Number	Prcnt	
13 °C Instantaneous Spring	13	23%	
9 °C Average Spring	33	58%	
Spring Days Eval'd w/in Dates	57	15-Apr	15-Jul
13 °C Instantaneous Fall	13	19%	
9 °C Average Fall	53	78%	
Fall Days Eval'd w/in Dates	68	15-Aug	15-Nov
13 °C Instantaneous Total *	26	21%	
9 °C Average Total *	86	69%	
Tot Days Eval'd w/in Both Dates *	125		

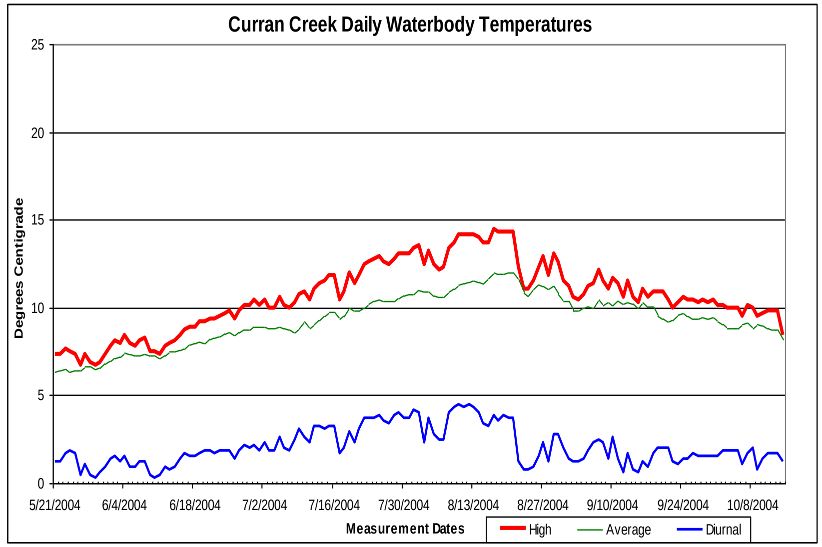
* If spring & fall dates overlap double counting may occur.



Data Source: USDA Forest Service
Water Body: Curran Creek, (ID17010303PN020_02)
Data Collection Period: 5/21/2004–10/14/2004

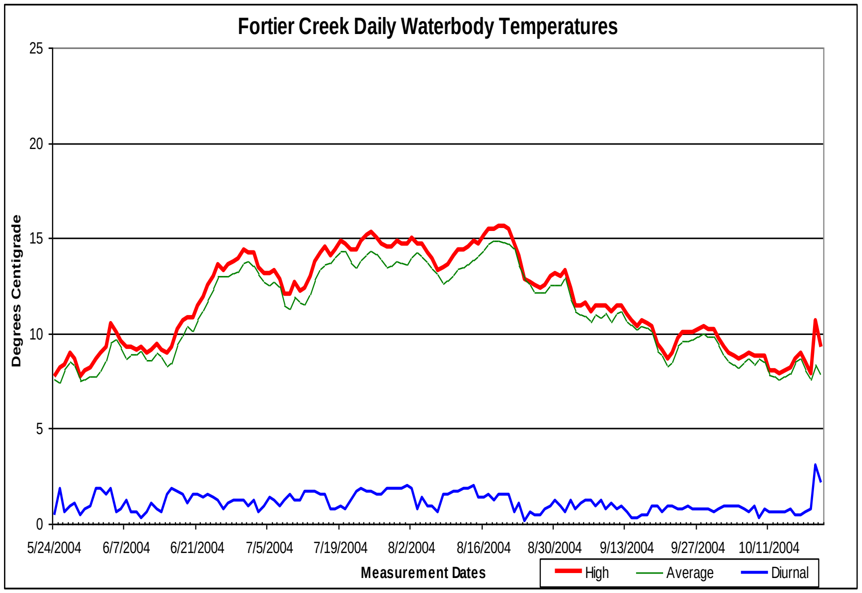
Idaho Cold Water Aquatic Life Criteria Exceedance Summary			
	Exceedance Counts		
Criteria	Number	Prcnt	
22 °C Instantaneous	0	0%	
19 °C Average	0	0%	
Days Evaluated & Date Range	92	22-Jun	21-Sep

Idaho Salmonid Spawning Criteria Exceedance Summary			
	Exceedance Counts		
Criteria	Number	Prcnt	
13 °C Instantaneous Spring	0	0%	
9 °C Average Spring	5	9%	
Spring Days Eval'd w/in Dates	56	15-Apr	15-Jul
13 °C Instantaneous Fall	8	13%	
9 °C Average Fall	52	85%	
Fall Days Eval'd w/in Dates	61	15-Aug	15-Nov
13 °C Instantaneous Total *	8	7%	
9 °C Average Total *	57	49%	
Tot Days Eval'd w/in Both Dates *	117		
* If spring & fall dates overlap double counting may occur.			



Data Source: USDA Forest Service
Water Body: Fortier Creek, (ID17010303PN022_02)
Data Collection Period: 5/24/2004–10/21/2004

Idaho Cold Water Aquatic Life Criteria Exceedance Summary			
	Exceedance Counts		
Criteria	Number	Prcnt	
22 °C Instantaneous	0	0%	
19 °C Average	0	0%	
Days Evaluated & Date Range	92	22-Jun	21-Sep



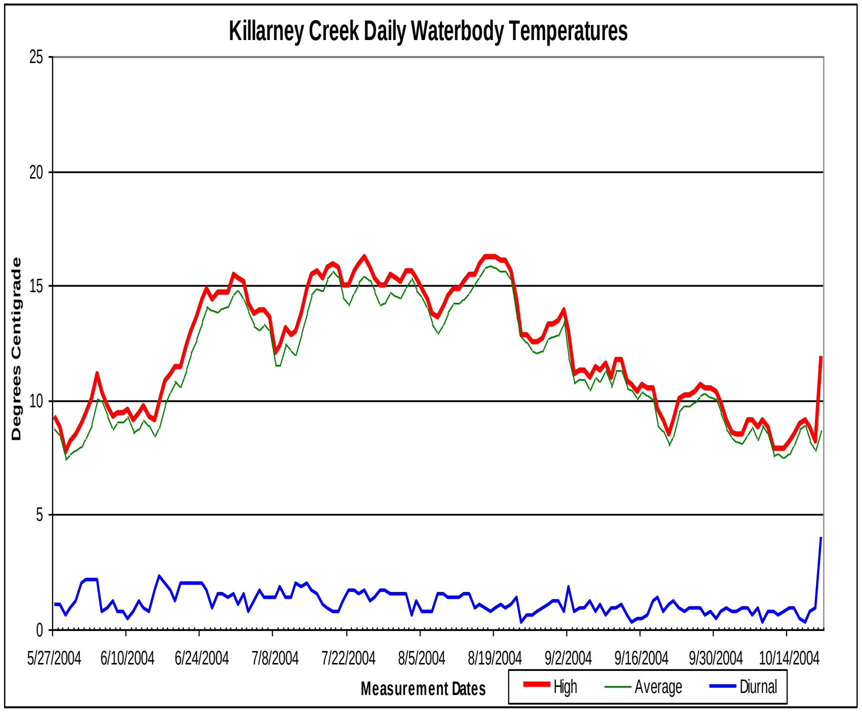
Idaho Salmonid Spawning Criteria Exceedance Summary			
	Exceedance Counts		
Criteria	Number	Prcnt	
13 °C Instantaneous Spring	14	26%	
9 °C Average Spring	33	62%	
Spring Days Eval'd w/in Dates	53	15-Apr	15-Jul
13 °C Instantaneous Fall	11	16%	
9 °C Average Fall	45	66%	
Fall Days Eval'd w/in Dates	68	15-Aug	15-Nov
13 °C Instantaneous Total *	25	21%	
9 °C Average Total *	78	64%	
Tot Days Eval'd w/in Both Dates *	121		

* If spring & fall dates overlap double counting may occur.

Data Source: USDA Forest Service
Water Body: Killarney Creek, (ID17010303PN022_02)
Data Collection Period: 5/27/2004–10/20/2004

Idaho Cold Water Aquatic Life Criteria Exceedance Summary			
	Exceedance Counts		
Criteria	Number	Prcnt	
22 °C Instantaneous	0	0%	
19 °C Average	0	0%	
Days Evaluated & Date Range	92	22-Jun	21-Sep

Idaho Salmonid Spawning Criteria Exceedance Summary			
	Exceedance Counts		
Criteria	Number	Prcnt	
13 °C Instantaneous Spring	19	38%	
9 °C Average Spring	37	74%	
Spring Days Eval'd w/in Dates	50	15-Apr	15-Jul
13 °C Instantaneous Fall	13	19%	
9 °C Average Fall	44	66%	
Fall Days Eval'd w/in Dates	67	15-Aug	15-Nov
13 °C Instantaneous Total *	32	27%	
9 °C Average Total *	81	69%	
Tot Days Eval'd w/in Both Dates *	117		
* If spring & fall dates overlap double counting may occur.			

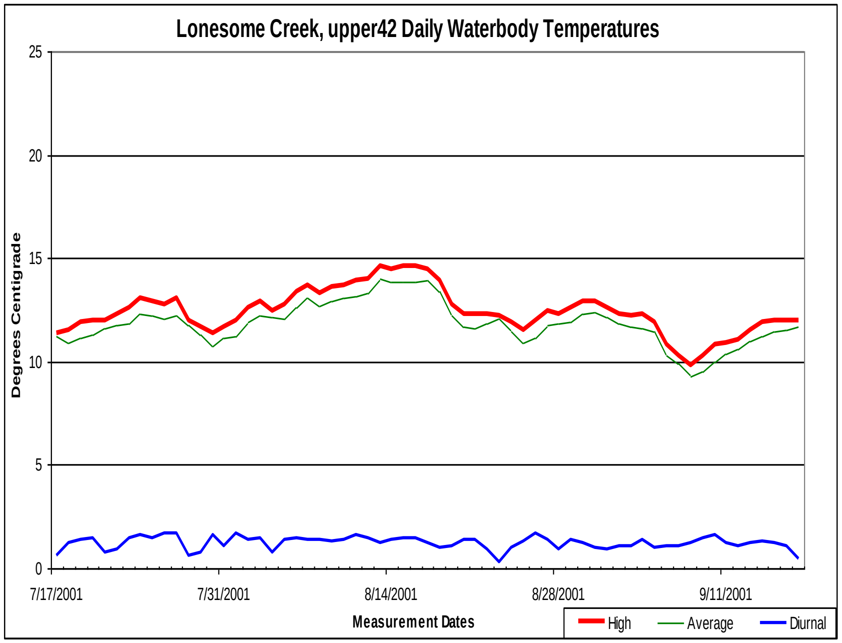


Data Source: USDA Forest Service
Water Body: Lonesome Creek, upper – Tributary to Wolf Lodge, (ID17010303PN029_02)
Data Collection Period: 7/17/2001–9/17/2001

Idaho Cold Water Aquatic Life Criteria Exceedance Summary			
	Exceedance Counts		
Criteria	Number	Prcnt	
22 °C Instantaneous	0	0%	
19 °C Average	0	0%	
Days Evaluated & Date Range	63	22-Jun	21-Sep

Idaho Salmonid Spawning Criteria Exceedance Summary			
	Exceedance Counts		
Criteria	Number	Prcnt	
13 °C Instantaneous Spring	0	0%	
9 °C Average Spring	0	0%	
Spring Days Eval'd w/in Dates	0	15-Apr	15-Jul
13 °C Instantaneous Fall	4	12%	
9 °C Average Fall	34	100%	
Fall Days Eval'd w/in Dates	34	15-Aug	15-Nov
13 °C Instantaneous Total *	4	12%	
9 °C Average Total *	34	100%	
Tot Days Eval'd w/in Both Dates *	34		

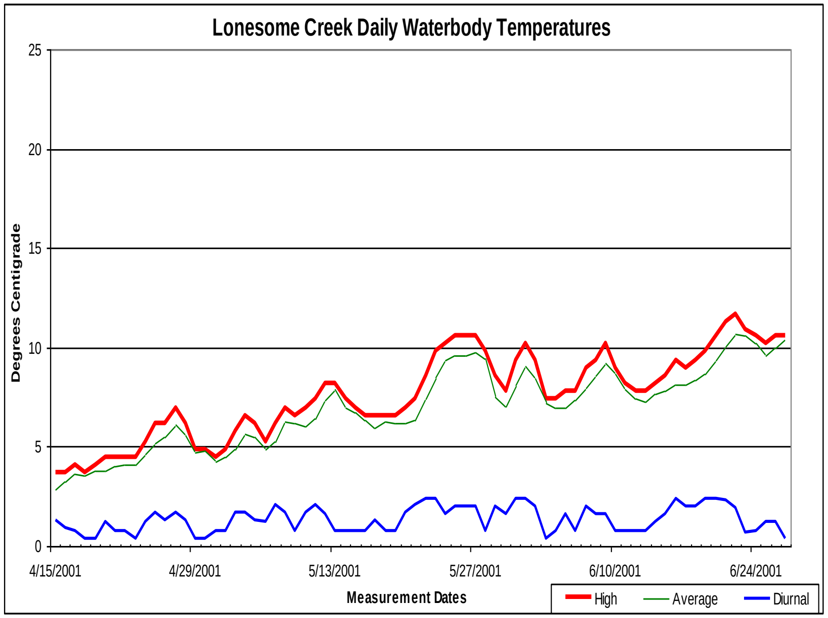
* If spring & fall dates overlap double counting may occur.



Data Source: USDA Forest Service
Water Body: Lonesome Creek, upper – tributary to Wolf Lodge, (ID17010303PN029_02)
Data Collection Period: 4/15/2001–6/27/2001

Idaho Cold Water Aquatic Life Criteria Exceedance Summary			
	Exceedance Counts		
Criteria	Number	Prcnt	
22 °C Instantaneous	0	0%	
19 °C Average	0	0%	
Days Evaluated & Date Range	6	22-Jun	21-Sep

Idaho Salmonid Spawning Criteria Exceedance Summary			
	Exceedance Counts		
Criteria	Number	Prcnt	
13 °C Instantaneous Spring	0	0%	
9 °C Average Spring	15	20%	
Spring Days Eval'd w/in Dates	74	15-Apr	15-Jul
13 °C Instantaneous Fall	0	0%	
9 °C Average Fall	0	0%	
Fall Days Eval'd w/in Dates	0	15-Aug	15-Nov
13 °C Instantaneous Total *	0	0%	
9 °C Average Total *	15	20%	
Tot Days Eval'd w/in Both Dates *	74		
* If spring & fall dates overlap double counting may occur.			

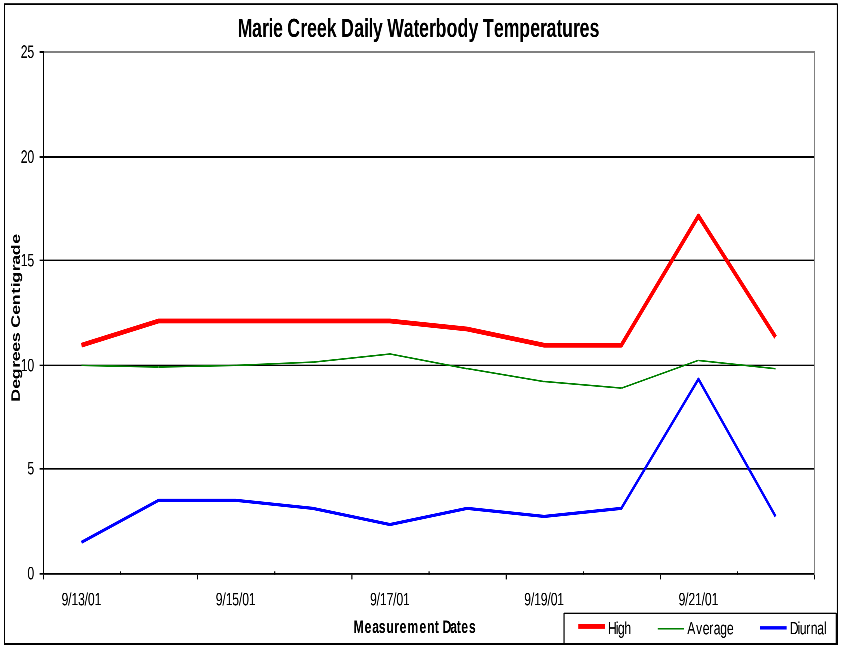


Data Source: USDA Forest Service
Water Body: Marie Creek, (ID17010303PN031_02)
Data Collection Period: 9/13/2001–9/22/2001

Idaho Cold Water Aquatic Life Criteria Exceedance Summary			
	Exceedance Counts		
Criteria	Number	Prcnt	
22 °C Instantaneous	0	0%	
19 °C Average	0	0%	
Days Evaluated & Date Range	9	22-Jun	21-Sep

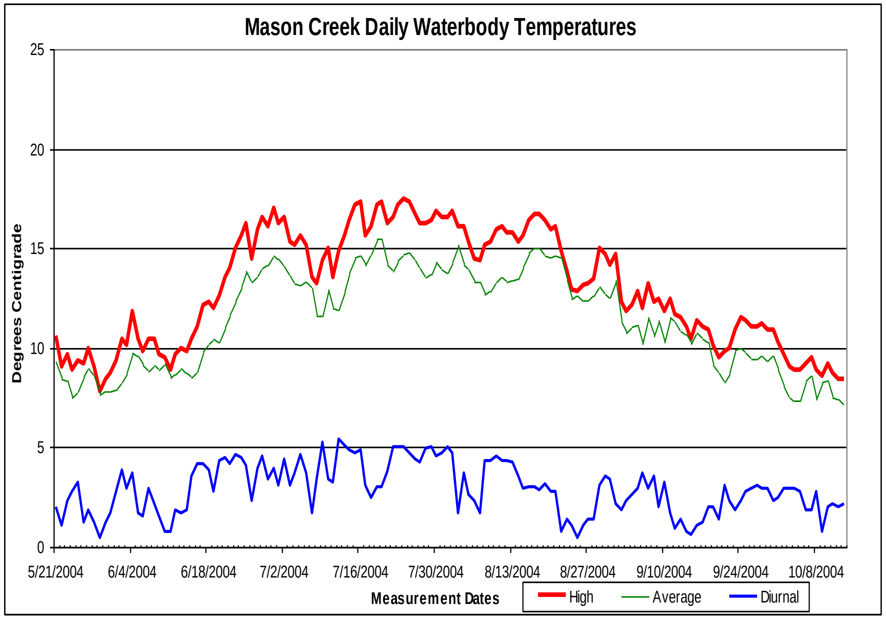
Idaho Salmonid Spawning Criteria Exceedance Summary			
	Exceedance Counts		
Criteria	Number	Prcnt	
13 °C Instantaneous Spring	0	0%	
9 °C Average Spring	0	0%	
Spring Days Eval'd w/in Dates	0	15-Apr	15-Jul
13 °C Instantaneous Fall	1	10%	
9 °C Average Fall	9	90%	
Fall Days Eval'd w/in Dates	10	15-Aug	15-Nov
13 °C Instantaneous Total *	1	10%	
9 °C Average Total *	9	90%	
Tot Days Eval'd w/in Both Dates *	10		

* If spring & fall dates overlap double counting may occur.



Data Source: USDA Forest Service
Water Body: Mason Creek, (ID17010303PN020_02)
Data Collection Period: 5/21/2004–10/13/2001

Idaho Cold Water Aquatic Life Criteria Exceedance Summary			
	Exceedance Counts		
Criteria	Number	Prcnt	
22 °C Instantaneous	0	0%	
19 °C Average	0	0%	
Days Evaluated & Date Range	92	22-Jun	21-Sep



Idaho Salmonid Spawning Criteria Exceedance Summary			
	Exceedance Counts		
Criteria	Number	Prcnt	
13 °C Instantaneous Spring	25	45%	
9 °C Average Spring	36	64%	
Spring Days Eval'd w/in Dates	56	15-Apr	15-Jul
13 °C Instantaneous Fall	17	28%	
9 °C Average Fall	44	73%	
Fall Days Eval'd w/in Dates	60	15-Aug	15-Nov
13 °C Instantaneous Total *	42	36%	
9 °C Average Total *	80	69%	
Tot Days Eval'd w/in Both Dates *	116		

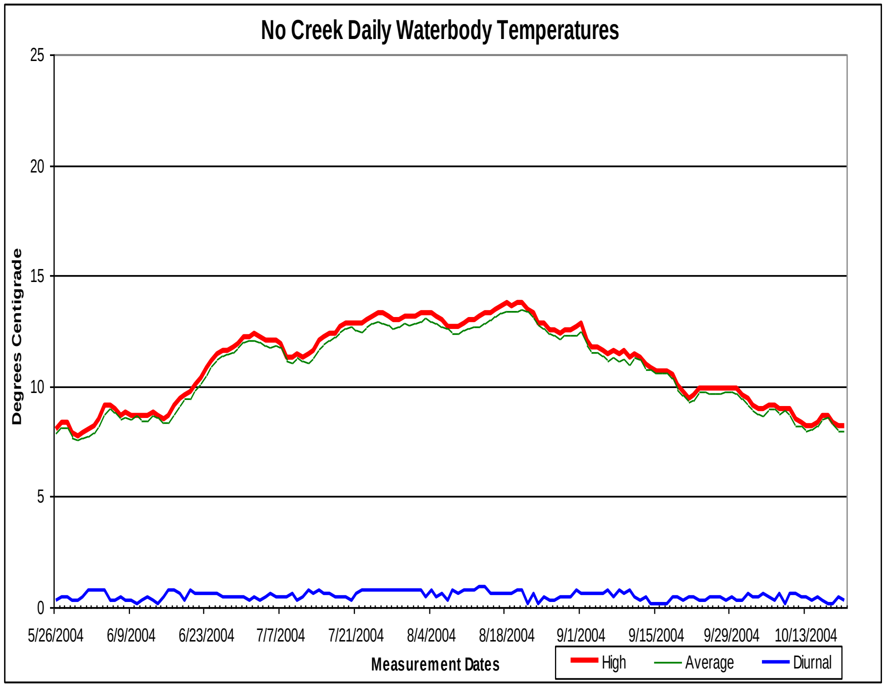
* If spring & fall dates overlap double counting may occur.

Data Source: USDA Forest Service
Water Body: No Creek, near mouth, (ID17010303PN026_02)
Data Collection Period: 5/26/2004–10/20/2004

Idaho Cold Water Aquatic Life Criteria Exceedance Summary			
	Exceedance Counts		
Criteria	Number	Prcnt	
22 °C Instantaneous	0	0%	
19 °C Average	0	0%	
Days Evaluated & Date Range	92	22-Jun	21-Sep

Idaho Salmonid Spawning Criteria Exceedance Summary			
	Exceedance Counts		
Criteria	Number	Prcnt	
13 °C Instantaneous Spring	0	0%	
9 °C Average Spring	28	55%	
Spring Days Eval'd w/in Dates	51	15-Apr	15-Jul
13 °C Instantaneous Fall	9	13%	
9 °C Average Fall	49	73%	
Fall Days Eval'd w/in Dates	67	15-Aug	15-Nov
13 °C Instantaneous Total *	9	8%	
9 °C Average Total *	77	65%	
Tot Days Eval'd w/in Both Dates *	118		

* If spring & fall dates overlap double counting may occur.

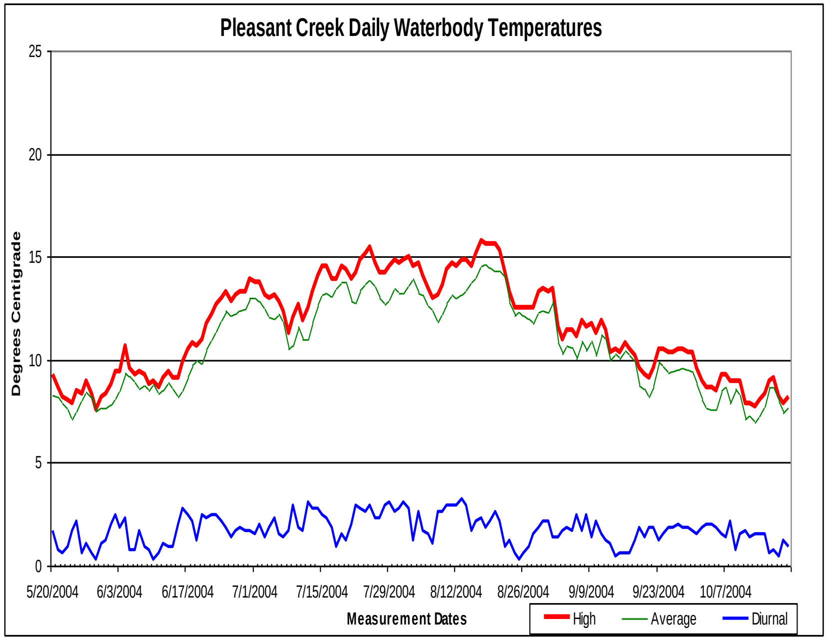


Data Source: USDA Forest Service
Water Body: Pleasant Creek, near mouth, (ID17010303PN026_02)
Data Collection Period: 5/20/2004–10/20/2004

Idaho Cold Water Aquatic Life Criteria Exceedance Summary			
	Exceedance Counts		
Criteria	Number	Prcnt	
22 °C Instantaneous	0	0%	
19 °C Average	0	0%	
Days Evaluated & Date Range	92	22-Jun	21-Sep

Idaho Salmonid Spawning Criteria Exceedance Summary			
	Exceedance Counts		
Criteria	Number	Prcnt	
13 °C Instantaneous Spring	14	25%	
9 °C Average Spring	31	54%	
Spring Days Eval'd w/in Dates	57	15-Apr	15-Jul
13 °C Instantaneous Fall	13	19%	
9 °C Average Fall	43	64%	
Fall Days Eval'd w/in Dates	67	15-Aug	15-Nov
13 °C Instantaneous Total *	27	22%	
9 °C Average Total *	74	60%	
Tot Days Eval'd w/in Both Dates *	124		

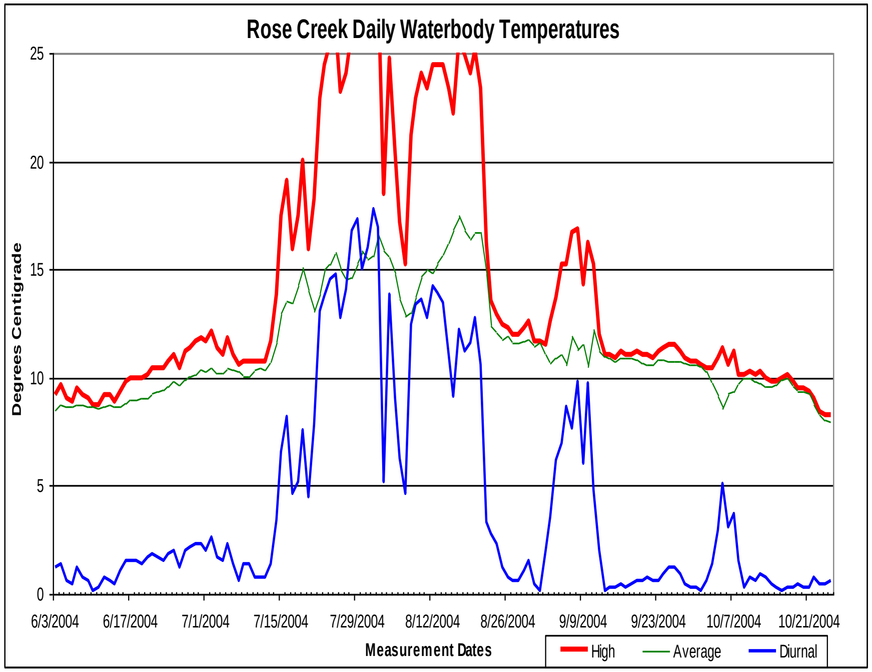
* If spring & fall dates overlap double counting may occur.



Data Source: USDA Forest Service
Water Body: Rose Creek, near mouth, (ID17010303PN021_02)
Data Collection Period: 6/3/2004–10/25/2004

Idaho Cold Water Aquatic Life
Criteria Exceedance Summary

Criteria	Exceedance Counts Number	Prcnt	
22 °C Instantaneous	26	28%	
19 °C Average	0	0%	
Days Evaluated & Date Range	92	22-Jun	21-Sep



Idaho Salmonid Spawning
Criteria Exceedance Summary

Criteria	Exceedance Counts Number	Prcnt	
13 °C Instantaneous Spring	2	5%	
9 °C Average Spring	28	65%	
Spring Days Eval'd w/in Dates	43	15-Apr	15-Jul
13 °C Instantaneous Fall	17	24%	
9 °C Average Fall	67	93%	
Fall Days Eval'd w/in Dates	72	15-Aug	15-Nov
13 °C Instantaneous Total *	19	17%	
9 °C Average Total *	95	83%	
Tot Days Eval'd w/in Both Dates *	115		

* If spring & fall dates overlap double counting may occur.

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Appendix C. Coeur d'Alene Lake Tributaries Monitoring Report

Coeur d'Alene Lake Tributaries
2008-2009 Nutrient and Sediment Monitoring
Final Report

Kristin Keith and Robert Steed

Idaho Department of Environmental Quality

Coeur d'Alene Regional Office

July 2010

Acknowledgements: We would like to give our sincere thanks to our colleagues who contributed their hard work to this project: Glen Pettit for your flexibility and willingness to drop everything and spend a day out in the field on such short notice, for your GIS expertise, and for your knowledge with respect to monitoring the streams in the Coeur d'Alene Lake watershed; to Tyson Clyne and Kajsa Stromberg for monitoring in response to the rain-on-snow events and filling in when needed; Glen Rothrock and June Bergquist for wisdom in all issues regarding the Coeur d'Alene Lake watershed, and Tom Herron for your relentless support and guidance.

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INTRODUCTION

Mining and ore processing activity in the past 100 years, primarily in the South Fork Coeur d’Alene River Basin, has resulted in deposition of millions of tons of sediment contaminated with zinc, cadmium, lead, mercury, and other metals on the bottom of Lake Coeur d’Alene. In 1983, the U.S. EPA listed the 21-square-mile Bunker Hill “box” area as well as the metals-contaminated areas in the Coeur d’Alene River corridor, adjacent floodplains, downstream water bodies, tributaries and fill areas on the National Priorities List, qualifying it for CERCLA action (USEPA FIRP/EA). The focus of CERCLA activities within the Coeur d’Alene Basin is to reduce human and ecological exposures to metals contamination, primarily from lead, cadmium and zinc. Coeur d’Alene Lake is not included in the CERCLA action, rather the metals contamination is addressed under the Coeur d’Alene Lake Management Plan developed in 2009 by the Coeur d’Alene Tribe (Tribe) and the State of Idaho Department of Environmental Quality (DEQ). The goal of the Coeur d’Alene Lake Management Plan is: *to protect and improve lake water quality by limiting basin-wide nutrient inputs that impair lake water quality conditions, which in turn influence the solubility of mining-related metals contamination contained in lake sediments.* Limiting nutrient inputs into Lake Coeur d’Alene will slow the eutrophication process which could otherwise lead to water quality conditions favorable to release of metals from lake-bottom sediments. The nutrient of concern for the Coeur d’Alene Lake Management Plan is phosphorus.

In 2008-2009, Idaho DEQ conducted instantaneous suspended solids and nutrient monitoring of 13 tributaries to Coeur d’Alene Lake in an effort to understand nutrient loading of some tributaries to Coeur d’Alene Lake. With this effort, nutrient mitigation efforts can be prioritized according to those streams that have higher loads and greatest opportunity for improvement.

BACKGROUND

The federal Clean Water Act requires states and tribes to restore and maintain the chemical, physical, and biological integrity of the nation's waters and to adopt water quality criteria necessary to protect fish, shellfish, and wildlife while providing for recreation in and on the waters whenever possible (33 USC § 1251.10). Water quality criteria have been established by the Idaho legislature and approved by the U.S. Environmental Protection Agency (EPA). These criteria are designed to protect, restore, and preserve water quality for specific beneficial uses such as cold water aquatic life, agricultural water supply, recreation, and wildlife habitat.

Beneficial uses are protected by a set of water quality criteria, which include narrative criteria for pollutants such as sediment and nutrients and numeric criteria for pollutants such as bacteria, dissolved oxygen, temperature, and turbidity (IDAPA 58.01.02.250).

Narrative criteria for excess nutrients are described in IDAPA 58.01.02.200.06, which states: “Surface waters of the state shall be free from excess nutrients that can cause visible slime growths or other nuisance aquatic growths impairing designated beneficial uses.” The concentration of phosphorus is low in surface water so that algae and aquatic growth is limited. However, excessive growth of algae often results when phosphorus is introduced from uplands into a stream through increased runoff and stream erosion processes. Phosphorus primarily exists as inorganic phosphate compounds that are very insoluble and not available to plants or as

organic compounds that are resistant to mineralization by microorganisms in the soil. However, chemical, physical and biological processes in soil and water can release dissolved orthophosphate into solution — a form easily utilized by plants.
Idaho's water quality standard for sediment is also narrative, "Sediment shall not exceed quantities which impair designated beneficial uses." (IDAPA 58.01.02.200.08). A numeric standard does exist which states, "below any applicable mixing zone set by the Department, shall not exceed background turbidity by more than fifty (50) NTU instantaneously or more than twenty-five (25) NTU for more than ten (10) consecutive days." (IDAPA 58.01.02.250.01)
Sedimentation occurs through increased runoff and stream erosion processes. Excessive sedimentation clouds the water, covers fish spawning areas, and clogs the gills of fish. In addition, other pollutants like phosphorus are attached to the sediment and are introduced to the waterbody.

PURPOSE

In 2008-2009, Idaho DEQ conducted seasonal monitoring of suspended sediment and nutrients of 13 tributaries to Coeur d'Alene Lake. The objectives of this monitoring effort were to conduct a general reconnaissance study to begin to understand the TP loading of some tributaries to Coeur d'Alene Lake as a part of the 5-year review of the Coeur d'Alene Lake and River TMDL and as a joint effort to the Coeur d'Alene Lake Management Plan.

MONITORING

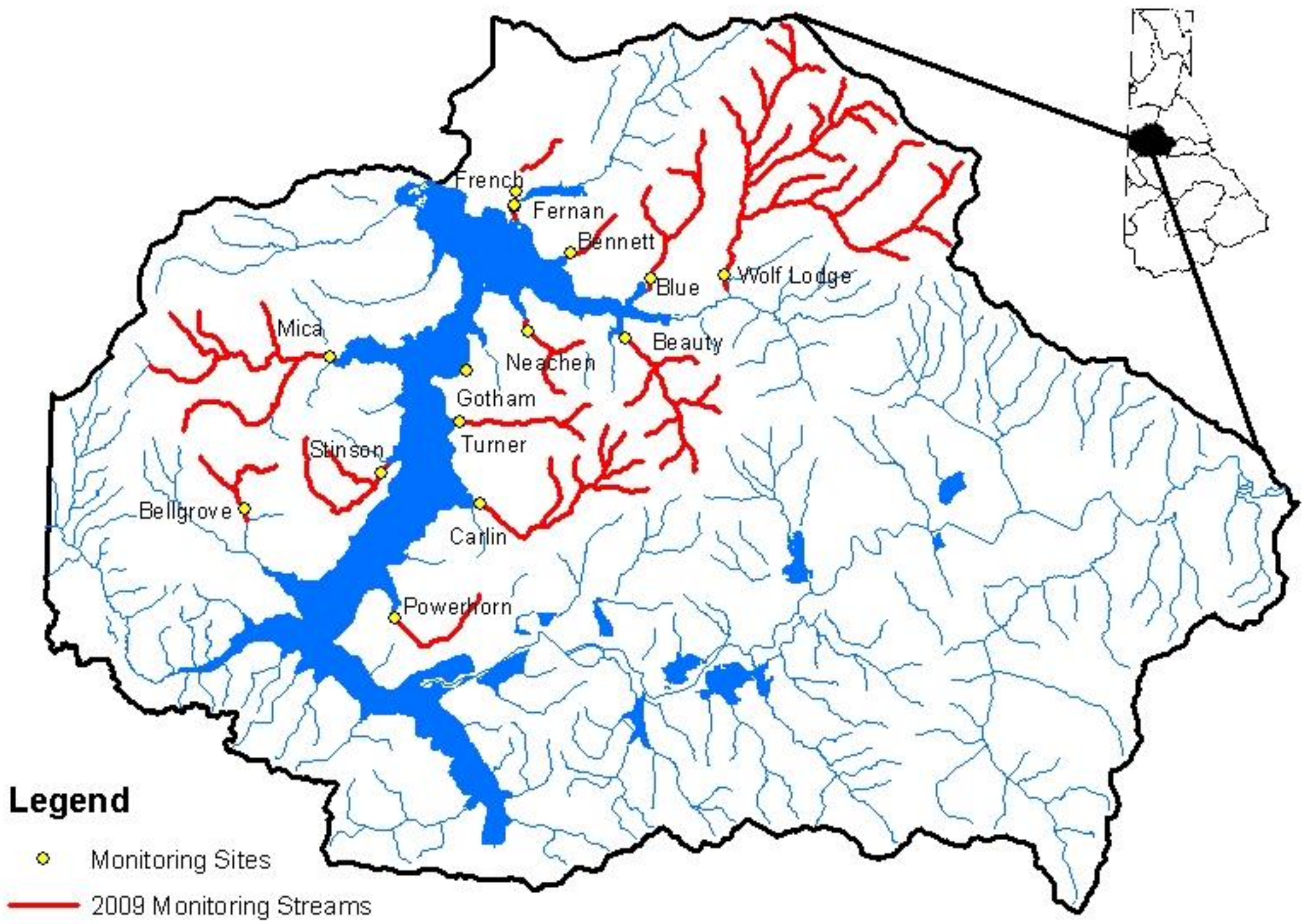
Water Quality

In 2008-2009, Idaho DEQ conducted instantaneous suspended sediment and nutrient monitoring of 13 tributaries to Coeur d'Alene Lake during winter rain-on-snow events, spring runoff, and during the summer low-flow season. Monitoring was conducted in response to the first rain-on-snow events, because previous studies suggest during these events, the highest concentrations of nutrients and sediment is delivered to the stream. Depending on the rainfall magnitude and duration, a lag time was estimated in order to catch the peak in the hydrograph during the climatic event. During runoff, an attempt was made to capture the ascending limb, descending limb, and peak of the hydrograph.

Data collected under the EPA Coeur d'Alene Basin Environmental Monitoring Plan show nutrient concentrations are highest on the ascending limb or peak of the hydrograph, then decreases rapidly thereafter. However, because there were no gauged streams in the project area, visual observations had to be made in order to estimate timing of these conditions on the streams. Streams were also sampled during low flow conditions. Sampling locations were at the mouths of Beauty Creek, Bellgrove Creek, Carlin Creek, Fernan Creek, Gotham Creek (into Gotham Bay), Mica Creek, Neachen (previously Squaw) Creek, Stinson Creek, Turner Creek, an unnamed creek into Bennett Bay, and an unnamed creek into Powderhorn Bay, (Figure 1).

Fernan Creek has two significant storm water inputs below Fernan Lake — a City of Coeur d'Alene storm water drain and French Gulch. To better understand the nutrient and suspended sediment inputs from these sources in relation to input from the Fernan Creek watershed, both sources were monitored during select rain-on-snow and runoff events. The City of Coeur d'Alene storm water outfall site is approximately 50 feet upstream of the monitoring site on Fernan Creek. French Gulch is a creek which drains a large developed area into Fernan Creek downstream of the outlet of Fernan Lake.

Figure 33: Coeur d'Alene Lake tributaries monitored during 2009 study



METHODS

Depth-integrated and equal-width-increment sampling techniques were used to collect nutrient and suspended sediment samples. Samples were collected in 250 ml bottles after complete mixing with a churn splitter. Samples were kept cool with ice then submitted to SVL Analytical for laboratory analysis of total suspended solids (TSS), total phosphorus (TP), dissolved ortho-phosphorus (dissolved ortho-P), and total nitrogen (TN). Analytical methods and reporting limits are provided in Table 1. Flow was calculated from the stream cross section and water velocity measured with a dopper flow meter on wadeable streams. On the non-wadeable streams, Mica and Wolf Lodge Creeks, a Price AA flow meter and a crane were used to collect water velocity.

Table 13: Analytical methods and reporting limits for

Parameter	Method	Reporting Limit (mg/L)	Detection Limit (mg/L)
Total Nitrogen	ASTMD-5176	0.100	0.031
Total Suspended Solids	SM 2540-D	5.0	1.7
Total Phosphorus	SM4500-P-E	0.002	0.002
Orthophosphate	SM4500-P-E	0.002	0.002

QUALITY ASSURANCE

Duplicate samples were taken on 10 percent of the samples. The results of duplicate sampling shows good precision in terms of Relative Percent Difference (RPD) for all constituents measured except TSS (Table 1). Data Quality Objectives (DQO) RPD for this project was 25 percent. While approximately every tenth sample was a duplicate, only samples taken the same day were excluded from analysis if the duplicate did not meet DQO. Therefore, TSS data for February 25, March 4, and April 16 have not been reported because they did not meet DQO. Total nitrogen data for March 4 was also not included in the monitoring data analysis. The reason for these samples being outside data quality objectives may be the high variability during high flow events. Field blanks were all within acceptable limits except for TN on March 4th. These data were already not included due to duplicate data outside data quality objectives. Laboratory quality control for each sample batch was within acceptable limits for blank, duplicate, control and matrix spike. Sample events and their achievement of DQO are summarized in Table 2.

Table 14: Quality Assurance Results of Water Quality Sampling

Duplicate Analysis					
Sample Date	**Site**	**Total P (RPD)**	**Dissolved Ortho-P (RPD)**	**Total N (RPD)**	**TSS (RPD)**
2/24/2009	Gotham Creek	0.9	0.0	9.6	21.7
2/25/2009	Blue Creek	1.3	4.1	7.5	96.9 [a]
3/4/2009	Blue Creek	1.5	3.18	--	117.9 [a]
4/9/2009	Blue Creek	17.8	0.0	4.5	17.7
4/16/2009	Unnamed to Bennett	1.5	0.0	4.9	73.4 [a]
5/4/2009	Blue Creek	3.1	6.9	6.6	0.0
6/4/2009	Carlin Creek	4.4	0.0	1.8	0.0
Deionized Water Field Blanks					
		(mg/L)	(mg/L)	(mg/L)	(mg/L)
2/24/2009	--	<0.002	<0.002	<0.100	<5
3/4/2009	--	0.004	0.002	0.132 [a]	<5
4/9/2009	--	--	<0.002	--	--
4/14/2009	--	<0.002	<0.002	<0.100	<5
5/28/2009	--	0.002	<0.002	<0.100	<5

[a]Data was not included in analysis, as it exceeded data quality objectives.

Table 15: Monitoring Event Schedule

	2008				2009															
	May	July	August		January	February		March				April					May			June
	6	3	5	7	9	24[c]	25	3[c]	4	13	24	9	13	16	20	22	4	11	27	4
Flow Period **Stream**	***Base Flow***				***Ascending Limb***	***Peak***				***Descending Limb***							***Base Flow***			
Beauty Creek						X		X				X			X			X		
Bellgrove Creek				X		X			X[ab]			X	X							X
Blue Creek					X		X[a]	X				X			X		X			X
Carlin Creek						X		X		X					X					
Fernan Creek		X					X[a]		X[ab]				X			X		X		
French Gulch							X[a]	X					X							
Gotham Creek						X		X			X	X		X[a]						
Mica Creek				X		X		X		X						X		X		
Neachen Creek						X		X				X		X[a]					X	
Stinson Creek						X			X[ab]		X	X					X			
Turner Creek			X			X		X				X		X[a]	X					X
Unnamed Creek to Bennett Bay							X[a]	X				X		X[a]			X			
Unnamed Creek to Powderhorn Bay						X		X			X	X		X[a]			X			
Flow Period	***Base Flow***				***Ascending Limb***			***Peak***									***Descending Limb***			
Wolf Lodge Creek	X						X[a]	X					X					X		
					Ascending Limb			***Peak***			***Descending***		***Base Flow***							
Gotham Creek						X		X			X	X		X[a]						

a: TSS exceeded DQO; b: Total Nitrogen exceeded DQO
c: Rain on Snow Event

MONITORING RESULTS

Overall, instantaneous suspended solids and nutrient loads were greatest during spring runoff; however, the highest observed turbidity and nutrient concentrations were observed during early rain-on-snow events. The first rain-on-snow event occurred on February 24th. On this day, the USDA Natural Resources Conservation Service (NRCS) Snotel site at Mica Creek recorded 1 inch of precipitation. The second rain-on-snow event occurred on March 3rd, where 0.3 inches of rain was recorded at the USDA NRCS Snotel site at Mica Creek. The following section provides a description of monitoring results on the project streams.

Beauty Creek

Beauty Creek drains an 11.2 mile^2 watershed, most of which is in the Coeur d'Alene National Forest. At its mouth, Beauty Creek is a third order stream, which drains into Beauty Bay on the northeast end of Coeur d'Alene Lake. During the summer months, Beauty Creek flows are limited to sub-surface flow in the vicinity of the U.S. Forest Service campground; however, just upstream of the campground, Beauty Creek is a perennial stream. Maximum flow observed during monitoring was 75 cfs during spring runoff.

The water quality monitoring site on Beauty Creek was located at the U.S. Forest Service campground less than 1 mile upstream from the mouth of the creek. Monitoring results show that total suspended solids and nutrient concentrations in Beauty Creek were consistently lower than all the other tributaries in the project area (Figure 2). Except during the rain-on-snow event on March 3, where TP concentrations in Beauty Creek were 0.063 mg/L, TP never exceeded 0.030 mg/L. Dissolved ortho-P concentrations remained relatively constant throughout the monitoring period, near 0.010 mg/L. Total nitrogen was highest during the first rain-on-snow event at 0.107 mg/L; it then stabilized at 0.050 mg/L during spring runoff on into the "low flow" sampling event in May, just prior to flow going to subsurface.

Beauty Creek channel in August 2008. All flows are subsurface.

Bellgrove Creek

Bellgrove Creek drains a 6.1 mile^2 watershed on the southwest side of Coeur d'Alene Lake. It is a second order stream at its confluence with Lake Creek, which flows into Rockford Bay in Coeur d'Alene Lake. Most of the land through which Bellgrove Creek flows is privately owned, except near its mouth, where it is within the Coeur d'Alene Indian Reservation. Like most tributaries around Coeur d'Alene Lake, Bellgrove Creek flow is subsurface near its mouth in the summer. Maximum flow observed during monitoring was 34 cfs during both rain-on-snow events.

Bellgrove Creek on August 7, 2009

The water quality monitoring site on Bellgrove Creek was located less than 1 mile upstream from the Coeur d'Alene Indian Reservation boundary. Monitoring results show that total suspended solids and nutrient concentrations in Bellgrove Creek throughout the monitoring period were consistently much higher than all the other tributaries in the project area (Figure 3). During the February 24th rain-on-snow event, the TP concentration was 0.605 mg/L. During that same storm event, dissolved ortho-P was 0.130 mg/L and TN was 1.41 mg/L, and TSS was 306 mg/L. Although suspended solids and nutrient concentrations were lower throughout the remainder of the monitoring season, they were still an order of magnitude above concentrations observed in other creeks in the project area. For example, the low flow TP was 0.153 mg/L in August 2008, and 0.084 mg/L in June 2009. In June 2009, the TN concentration was 0.237 mg/L. However, low-flow TN during August 2008 was elevated to 1.66 mg/L.

Blue Creek

Blue Creek is a stream that drains a 7.9 mile^2 watershed on the northeast side of Coeur d'Alene Lake. The headwaters of Blue Creek are within the Coeur d'Alene National Forest. Downstream of the national forest, the creek flows within private property. At its mouth, Blue Creek is a second order stream that flows within Bureau of Land Management (BLM) property, before it flows into Blue Creek Bay. While the channel upstream of the BLM property flows subsurface in early summer, recharge of the channel from the shallow aquifer within the BLM property provides flow in this reach of the channel year-round. Maximum flow observed during monitoring was 130 cfs, during the March 3rd rain-on-snow event.

The water quality monitoring site on Blue Creek was located within the BLM property at the mouth of the Creek. Monitoring results show that nutrient concentrations in Blue Creek were highest during the March 3rd rain-on-snow event with TP at 0.248 mg/L, dissolved ortho-P at 0.031 mg/L, and TN at 0.431 mg/L (Figure 4). Concentrations of all parameters decreased during spring runoff. Low-flow TP concentrations were 0.033 mg/L in May 2009. On June 23rd excessive unidentified visible growth was observed in Blue Creek, primarily within the reach flowing through the BLM property.

Excess visible slime growth on Blue Creek. Photos taken June 23, 2009

Figure 34: Beauty Creek — 2009 Monitoring Results

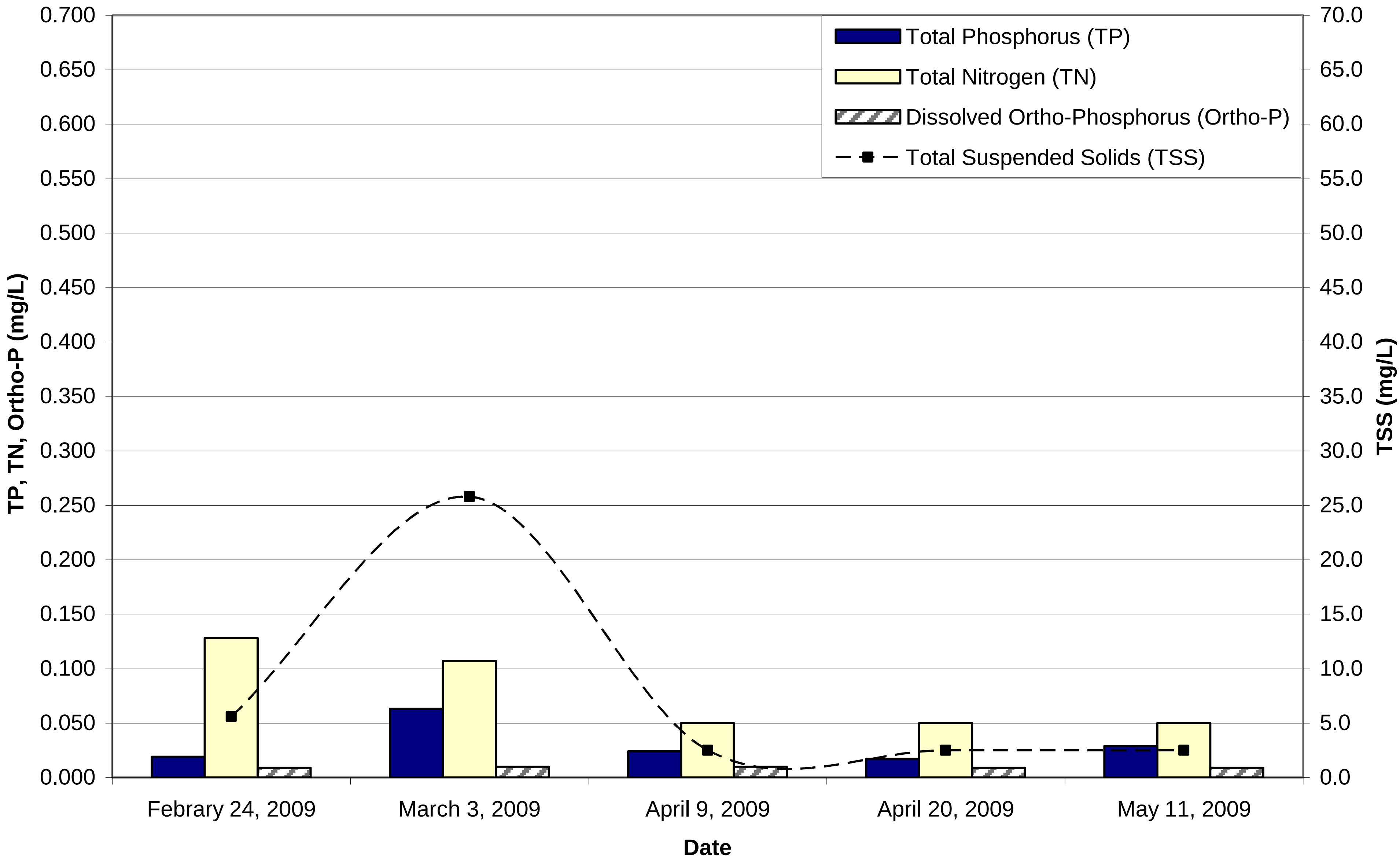
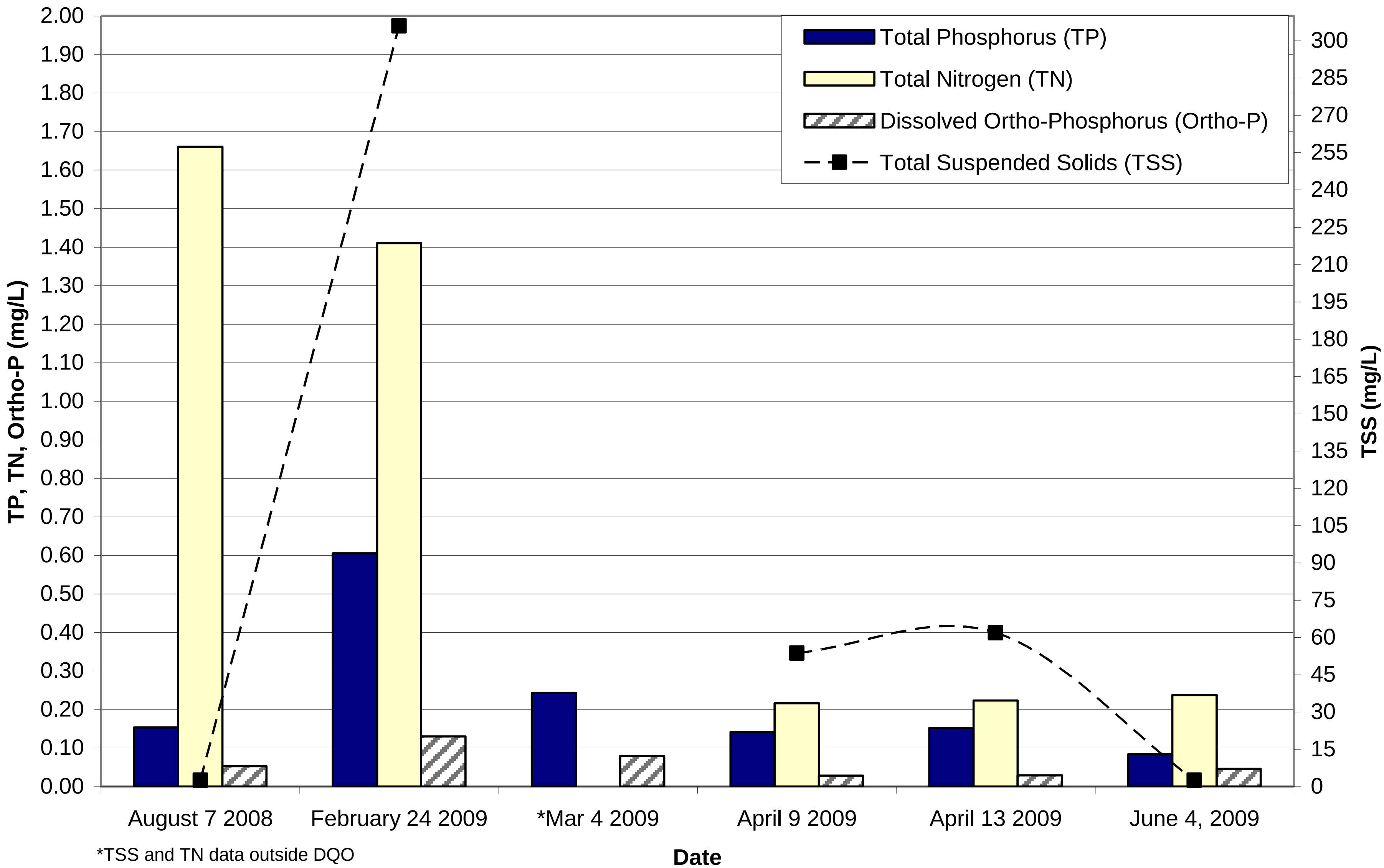
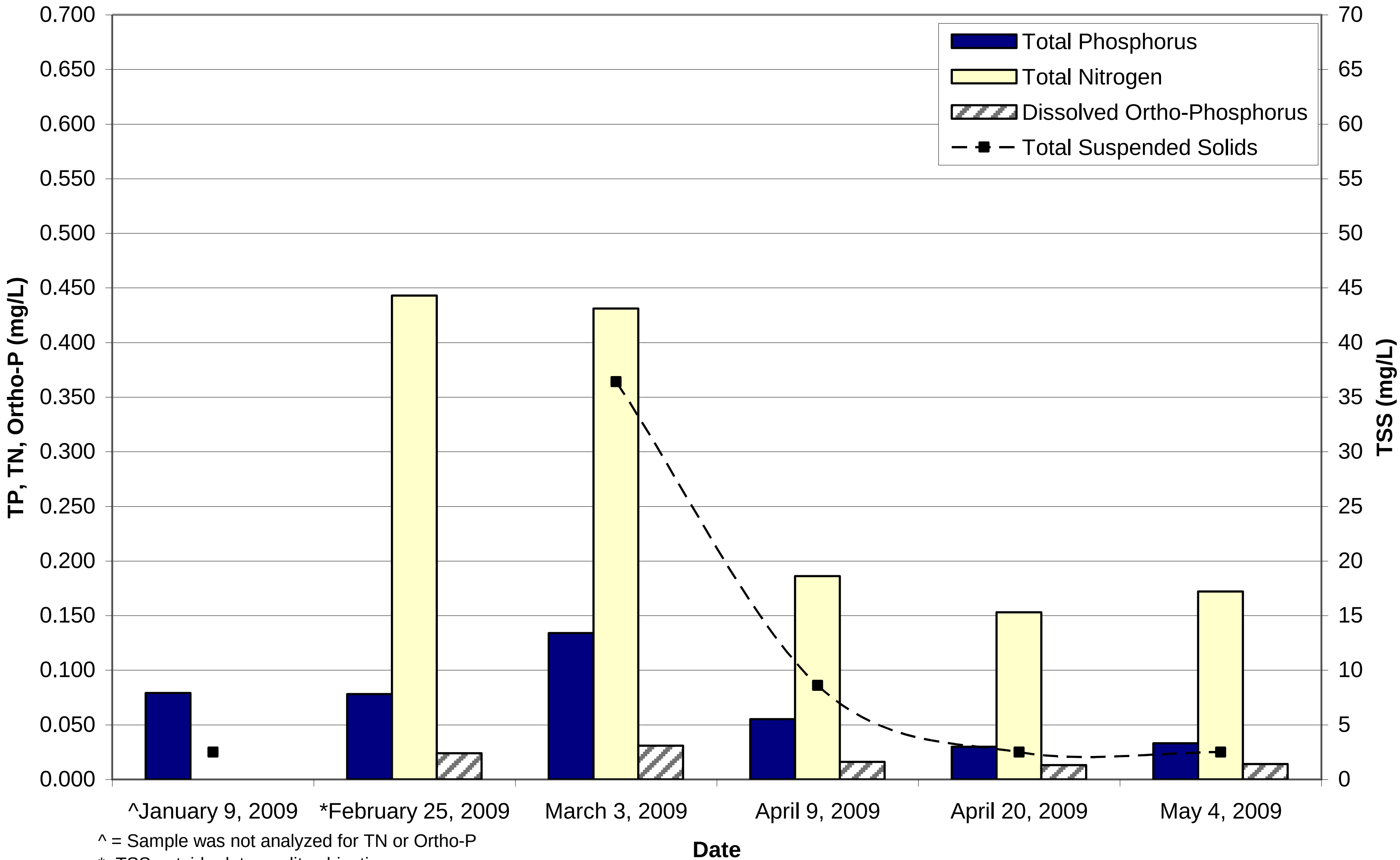


Figure 35: Bellgrove Creek — 2009 Monitoring Results



*TSS and TN data outside DQO

Figure 36: Blue Creek — 2009 Monitoring Results



^ = Sample was not analyzed for TN or Ortho-P
*=TSS outside data quality objectives

Carlin Creek

Carlin Creek is a stream, which drains a 10.8 mile^2 watershed on the southeast side of Coeur d'Alene Lake. At its mouth, Carlin Creek is a 3rd order stream where it flows into Carlin Bay. Like other tributaries to Coeur d'Alene Lake, flow is subsurface in the lower reaches during the summer months. The headwaters of Carlin Creek are within the Coeur d'Alene National Forest, and the lower portions of the creek flow within private property. Maximum flow observed during monitoring on Carlin Creek was 120 cfs, during a March 3rd rain-on-snow event.

Carlin Creek on June 26, 2009

The water quality monitoring site on Carlin Creek was located less than 1 mile upstream from Highway 97 near the mouth of the Creek. Monitoring results show that the highest TP concentration in Carlin Creek was during the February 24th rain-on-snow event at 0.127 mg/L (Figure 5). The TSS was 60.6 mg/L. Total nitrogen concentration was highest during the March 3rd rain-on-snow event at 0.382 mg/L. The dissolved ortho-P concentration was elevated slightly to 0.036 mg/L during both rain-on-snow events, but then leveled off around 0.008 mg/L for the descending limb, low flow and base flow.

Fernan Creek

Fernan Creek is a perennial stream, which drains a 19.1 mile^2 watershed on the north side of Coeur d'Alene Lake. The headwaters of Fernan Creek are within the Coeur d'Alene National Forest and the lower reaches of the creek flows within private property before flowing into Fernan Lake. From the outlet of Fernan Lake, the creek flows as a third-order stream through a golf course before flowing into Coeur d'Alene Lake. Maximum flow observed during monitoring on Fernan Creek was 88 cfs during spring runoff.

The water quality monitoring site on Fernan Creek was located downstream of the entrance bridge to the golf course. During the February 25th rain-on-snow event, the TP concentration was the highest at 0.232 mg/L (Figure 6). Total nitrogen was also high at 0.717 mg/L. On the same day, dark, turbid water was observed coming out of the storm drain into Fernan Creek immediately upstream of the monitoring site. Total Phosphorus concentration from the storm drain was 0.660 mg/L. Total phosphorus in French Gulch, which also flows into Fernan Creek upstream of the monitoring site, was 0.130 mg/L. No samples for total nitrogen were taken on that same day. Due to the proximity of the monitoring site to the storm drain and to the confluence with French Gulch, both were assumed to be the sources of the TP observed in Fernan Creek.

During the March 3rd rain-on-snow event, the storm drain was not discharging into Fernan Creek. On that day, the TP concentration in Fernan Creek was 0.047 mg/L, and the TN concentration was 0.392 mg/L. The TP concentration in French Gulch was 0.102 mg/L, which was much lower than those observed in February, suggesting the storm drain and French Gulch are likely to be significant sources of nutrients and sediment to Fernan Creek.

Total phosphorus and TN concentrations decreased in Fernan Creek within spring runoff; however, they increased slightly from April to May. No low-flow sample was taken in 2009. However, in July 2008, low-flow TP and TN were 0.340 mg/L and 0.484 mg/L, respectively.

Fernan Creek in August 2008.

Figure 37: Carlin Creek — 2009 Monitoring Results

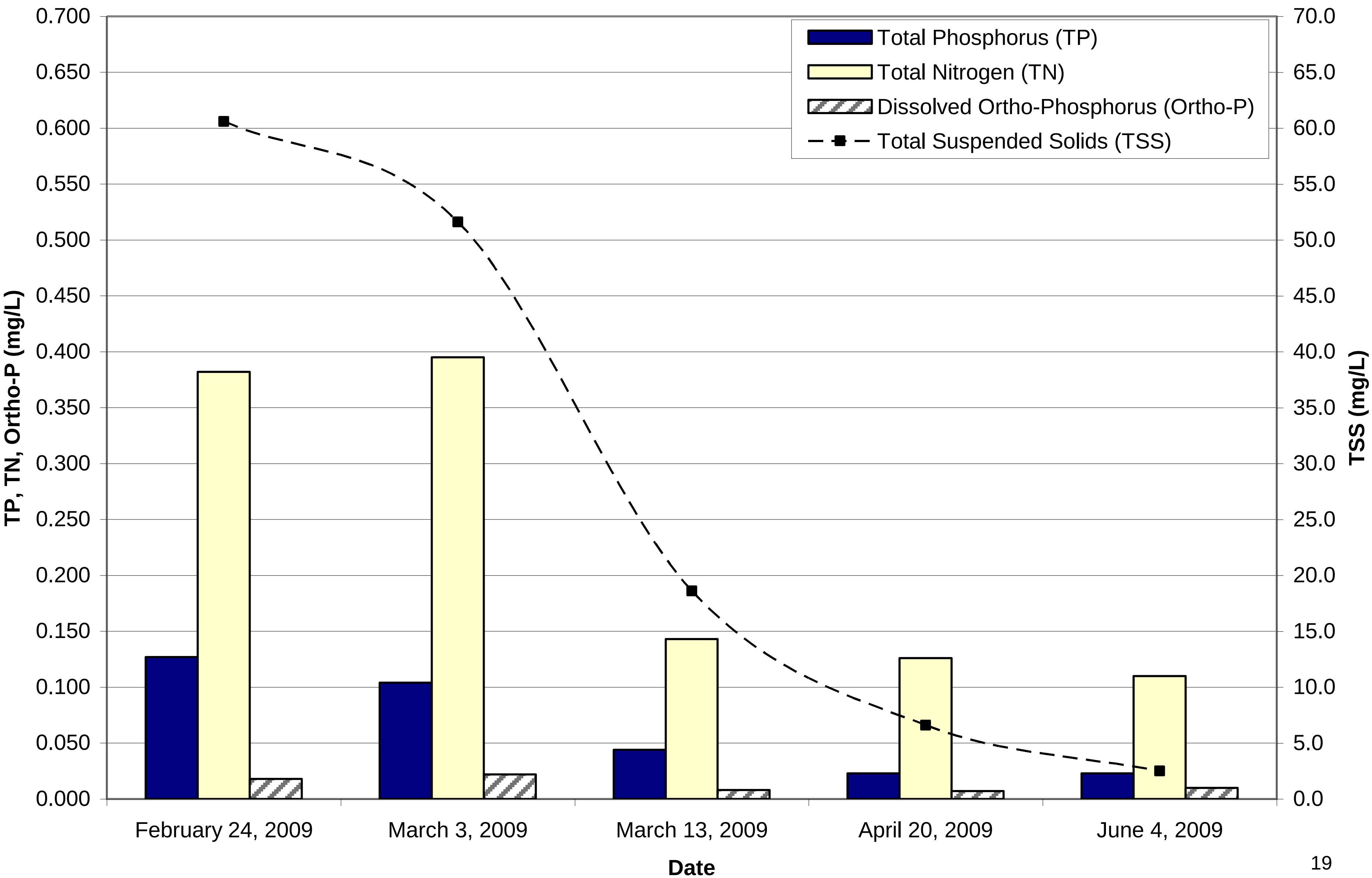
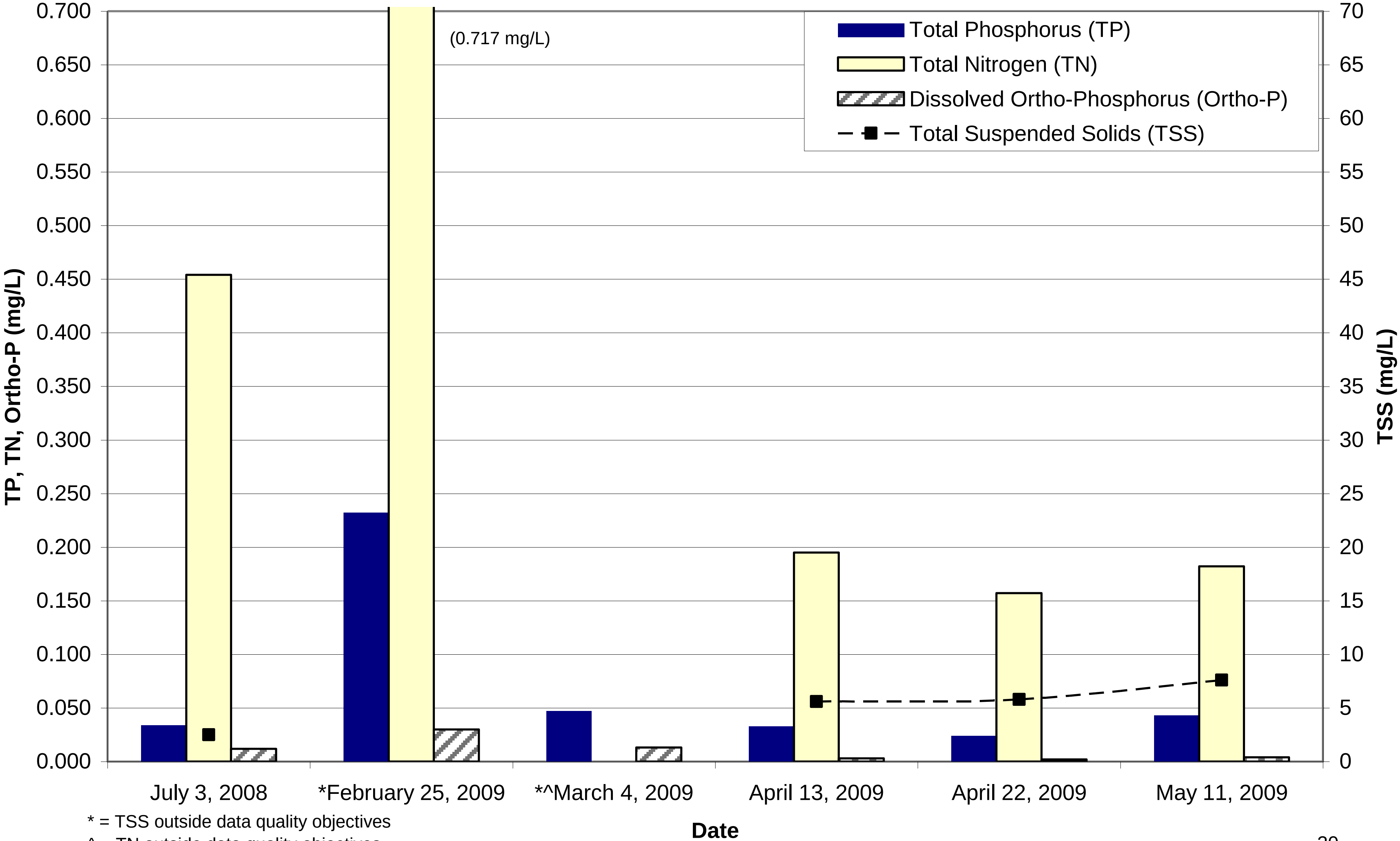


Figure 38: Fernan Creek — 2009 Monitoring Results



* = TSS outside data quality objectives
^ = TN outside data quality objectives

Gotham Creek

Gotham Creek is a small, first-order intermittent stream that is dry in late spring/early summer. In 2009, Gotham Creek went dry in early May. It drains approximately 0.9 mile^2 of private property on the east side of Coeur d'Alene Lake. Maximum flow observed on Gotham Creek was 6 cfs during a March 3rd rain-on-snow event.

The water quality monitoring site on Gotham Creek was at the mouth of the creek located just downstream of Highway 3 and then discharges into Gotham Bay. Throughout the monitoring season, TP and dissolved ortho-P concentrations were high (Figure 7). During the March 3rd rain-on-snow event, nutrient concentrations were highest. Total phosphorus was 0.250 mg/L and dissolved ortho-P was 0.070 mg/L. During low flow in early May TP concentration was the lowest at 0.084 mg/L and dissolved ortho-P was 0.050 mg/L.

Dry stream channel of Gotham Creek. Photo taken in August 2009.

Mica Creek

Mica Creek is a perennial stream that drains a 26.1 mile^2 watershed into Mica Bay on the northwest side of Coeur d'Alene Lake. The watershed of Mica Creek is within private property with a state highway thoroughfare. At its mouth, Mica Creek is a 3rd order stream. The highest flow measured in Mica Creek was during runoff at 230 cfs.

Mica Creek during March 2009 runoff.

The water quality monitoring site on Mica Creek had to be moved and was originally off a bridge on Loffs Bay Road near the mouth of a stream. This site became the backwater of Coeur d'Alene Lake. The site was moved upstream and samples were taken from both Mica Creek and SF Mica Creek above their confluence just downstream from Highway

95. Like many other tributaries to Coeur d'Alene Lake, nutrient and TSS concentrations were highest during the first rain-on-snow event — with a TP concentration of 0.147 mg/L, a dissolved ortho-P of 0.032 mg/L, TN of 0.454 mg/L, and TSS of 68.6 mg/L (Figure 8). Concentrations of all parameters except TSS decreased with each monitoring event. Low flow samples were collected in August of 2008, where TP and TN were elevated somewhat at 0.041 mg/L and 0.160 mg/L, respectively.

Neachen Creek

Neachen Creek is a second order stream that drains a 4.1 $mile^2$ watershed into a bay on the northeast side of Coeur d'Alene Lake. Like other creeks in the watershed, Neachen Creek flow is subsurface near its mouth in the summer, and the entire watershed of Neachen Creek is primarily within private property. Peak flows in Neachen Creek were during runoff at 41 cfs.

The water quality monitoring site on Neachen Creek was located adjacent to Highway 97 just after the creek goes under the road. Nutrient and TSS concentrations were highest during the second rain-on-snow event — with a TP concentration of 0.145 mg/L, a dissolved ortho-P of 0.039 mg/L, a TN of 0.422 mg/L, and TSS at 50 mg/L (Figure 9). Concentrations of all parameters, except TP, decreased with each monitoring event. Low flow samples were collected in May of 2009, where TP and TN were 0.71 mg/L and 0.161 mg/L, respectively.

Neachen Creek during March 2009 runoff.

Figure 39: Gotham Creek — 2009 Monitoring Results

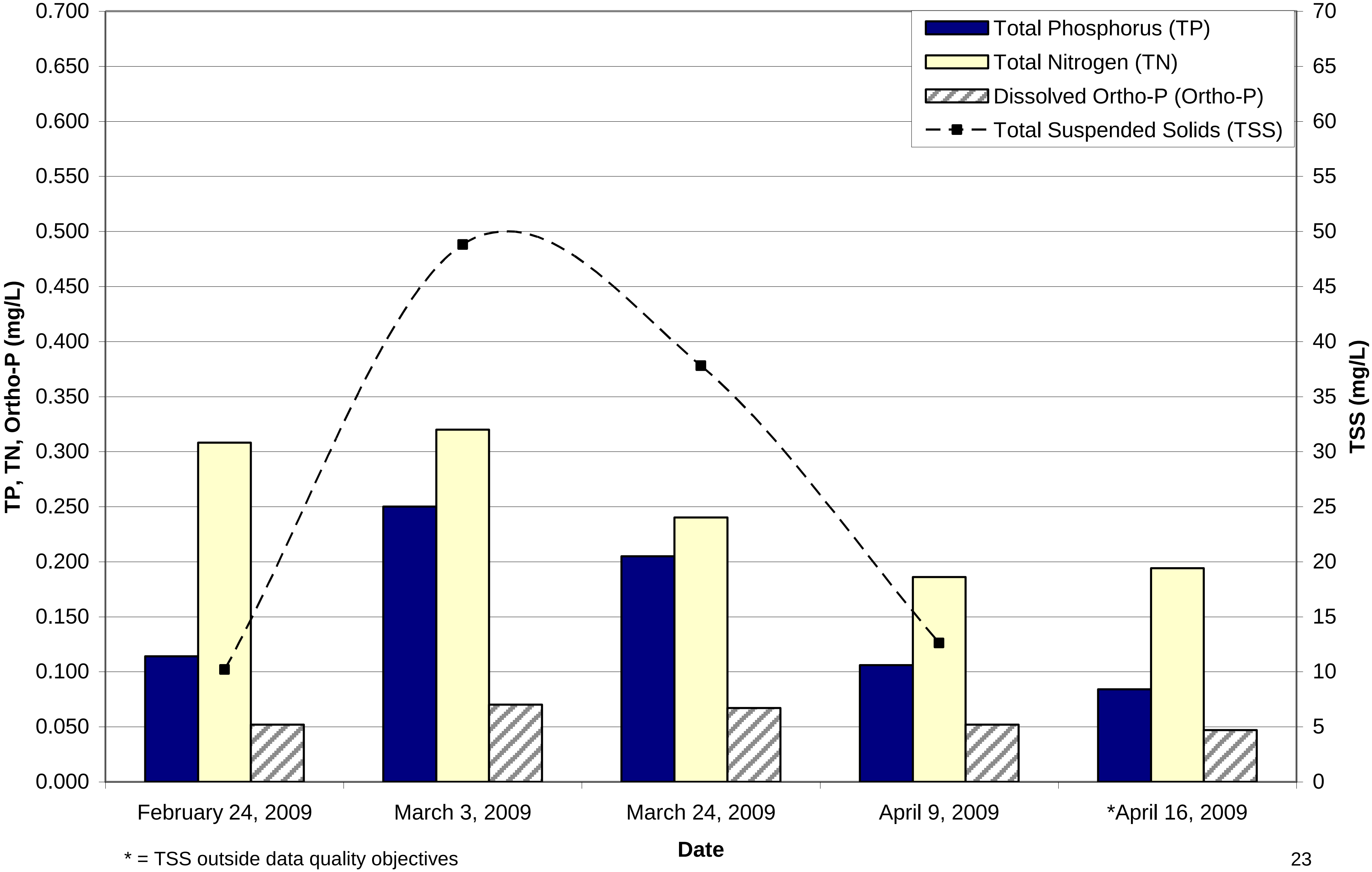


Figure 40: Mica Creek — 2009 Monitoring Results

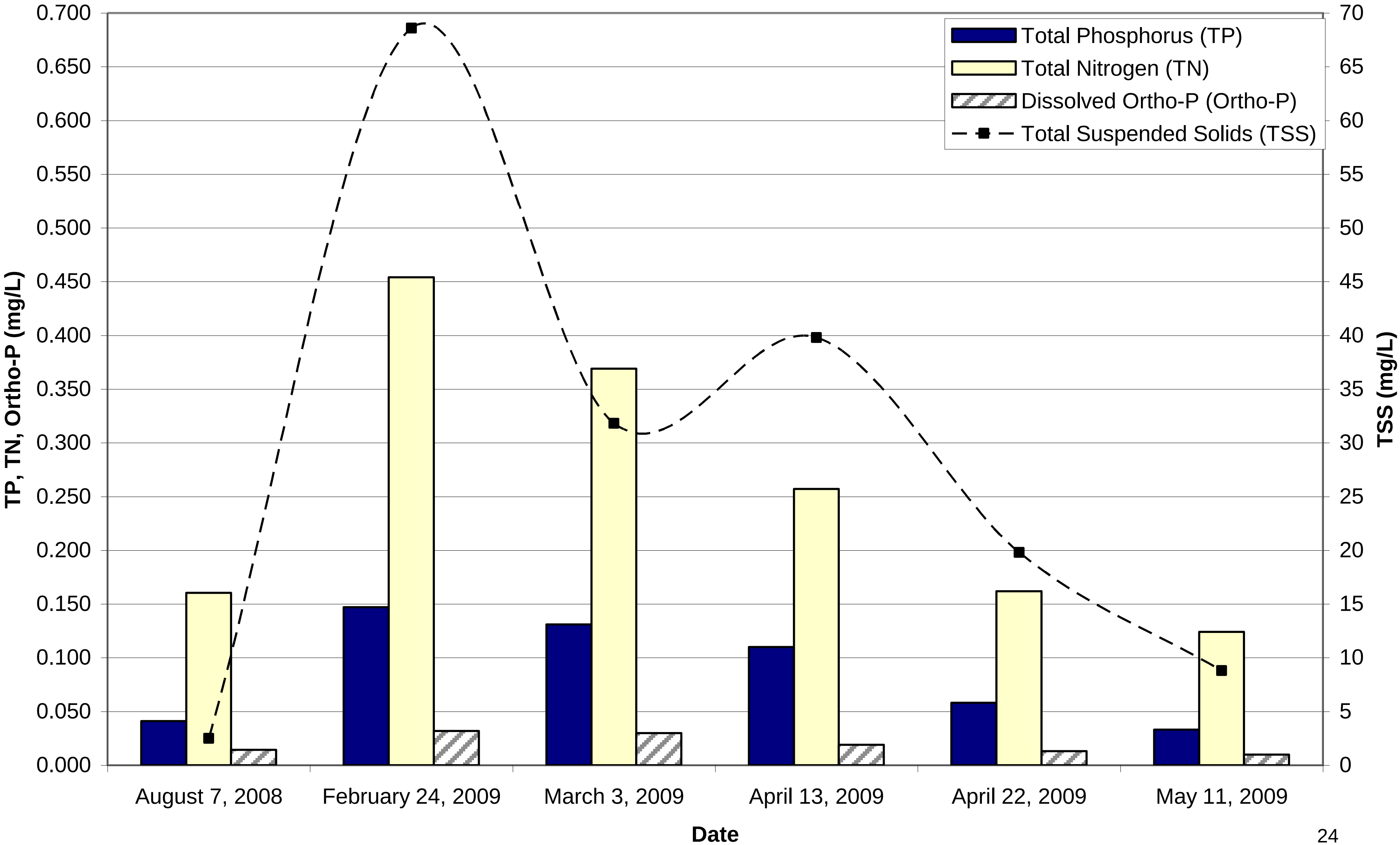
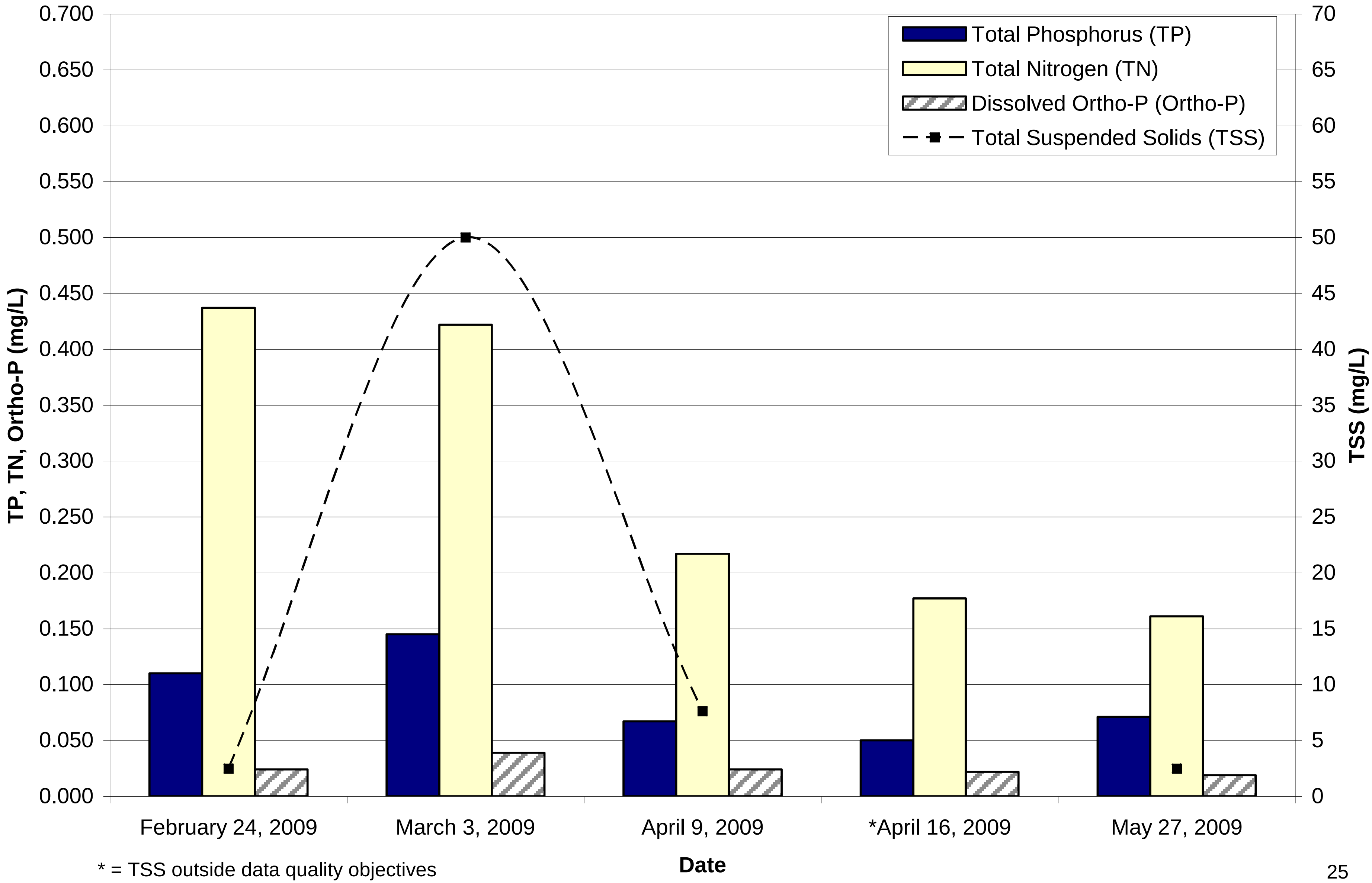


Figure 41: Neachen Creek — 2009 Monitoring Results



* = TSS outside data quality objectives

Stinson Creek

Stinson Creek is a stream that drains a 5.4 mile^2 watershed on the west side of Coeur d'Alene Lake. Like other tributaries to Coeur d'Alene Lake, flow in Stinson Creek is subsurface near it's mouth early in the summer. While, the upper reaches of the creek flows within private property, at its mouth, Stinson Creek is a second order stream that flows into a wetland within Bureau of Land Management (BLM) property. At its mouth, it flows into Loffs Bay of Coeur d'Alene Lake. Maximum flow observed during monitoring was 41 cfs, during the March 3rd rain-on-snow event.

The water quality monitoring site on Stinson Creek was located within the BLM property just upstream of the mouth of the Creek. Monitoring results show that total suspended solids and nutrient concentrations in Stinson Creek were the highest during February 24th rain-on-snow event, then they decreased during the monitoring period (Figure 10). On February 24th, TP was 0.103 mg/L, dissolved ortho-P was 0.042 mg/L, TN was 0.357 mg/L, and TSS was 44.2 mg/L. During low-flow conditions in May, TP and TN were elevated compared to other streams around the lake at 0.047 mg/L and 0.171 mg/L, respectively.

Stinson Creek during March 2009 runoff.

Turner Creek

Turner Creek in July 2008.

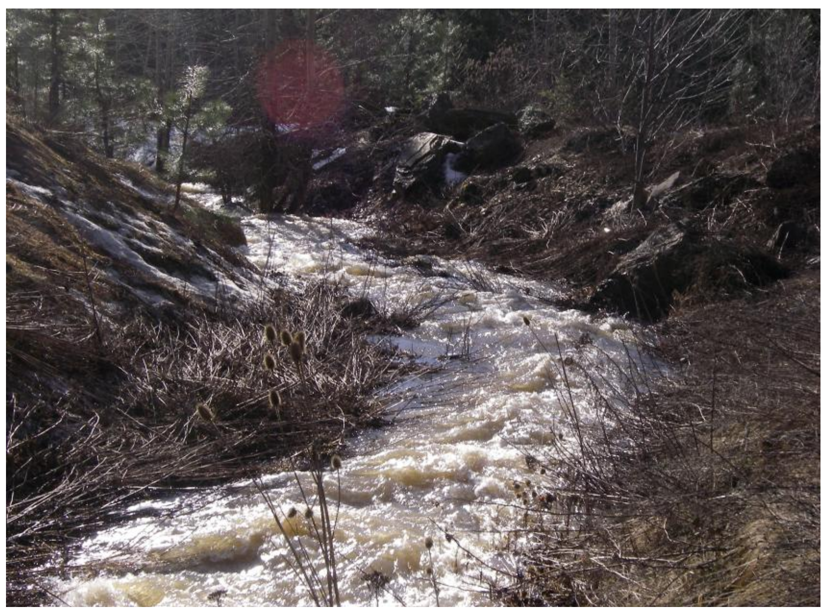
Turner Creek is a stream that drains a 6.4 mile^2 watershed on the east side of Coeur d'Alene Lake. Like other tributaries to Coeur d'Alene Lake, Turner Creek flow is subsurface near its mouth during the summer months. Headwaters of the creek are in the Coeur d'Alene National Forest, but after less than a mile, the creek flows within private property. At its mouth, Turner Creek is a second order stream that flows into Turner Bay of Coeur d'Alene Lake. Maximum flow observed during monitoring was 54 cfs during the March 3rd rain-on-snow event.

The water quality monitoring site on Turner Creek was located just upstream of the mouth of the creek. Monitoring results show that total suspended solids and nutrient concentrations in Turner Creek were the highest during the second rain-on-snow event on March 3rd, then they decreased during the monitoring period (Figure 11). On March 3rd, TP was 0.139 mg/L, dissolved ortho-P was 0.037 mg/L, TN was 0.321 mg/L, and TSS was 52.6 mg/L. Low-flow TP in August 2008 was 0.037 mg/L and in June 2009 was 0.031 mg/L. In both years, TN was 0.050 mg/L.

Unnamed Creek to Bennett Bay

The unnamed creek to Bennett Bay is a small, intermittent stream whose flow goes sub-surface in the summer. In 2009, the creek had no flow by late June. It drains a 2.2 $mile^2$ watershed on the north side of Coeur d'Alene Lake, and the entire creek flows within private property. Maximum flow observed during monitoring was 32 cfs during the March 3rd rain-on-snow event.

The water quality monitoring site on this creek was located adjacent to Sunnyside road directly under the Highway 90 Bridge. Monitoring results show that total suspended solids and nutrient concentrations were elevated throughout the monitoring period (Figure 12). On March 3rd, TP was highest at 0.248 mg/L, dissolved ortho-P was 0.071 mg/L, TN was 0.871 mg/L, and TSS was 0.072 mg/L. During low-flow conditions in May 2009, TP and TN were 0.050 mg/L and 0.237 mg/L, respectively.



Unnamed Creek into Bennett Bay during February 2009 rain-on-snow event.

Figure 42: Stinson Creek — 2009 Monitoring Results

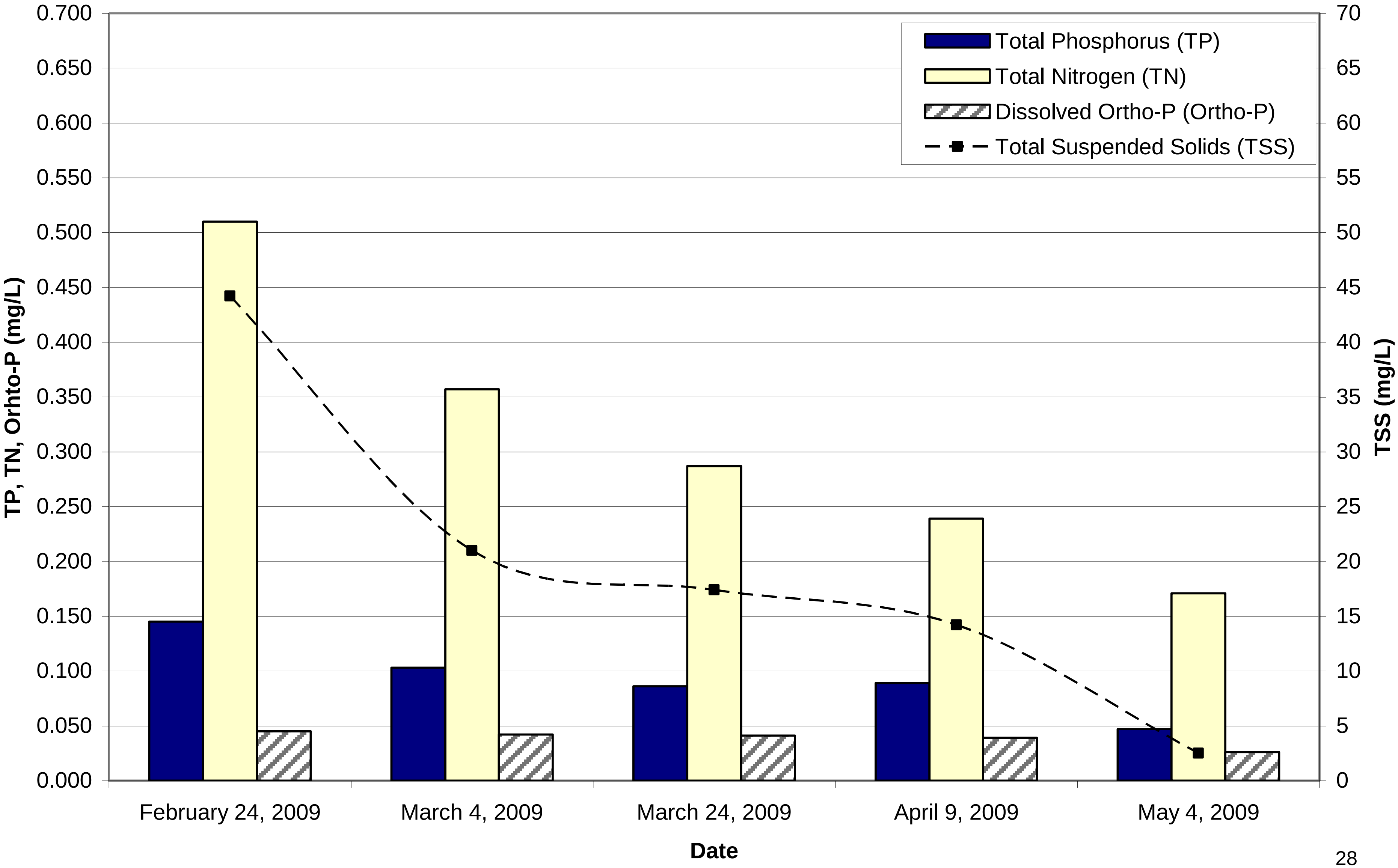
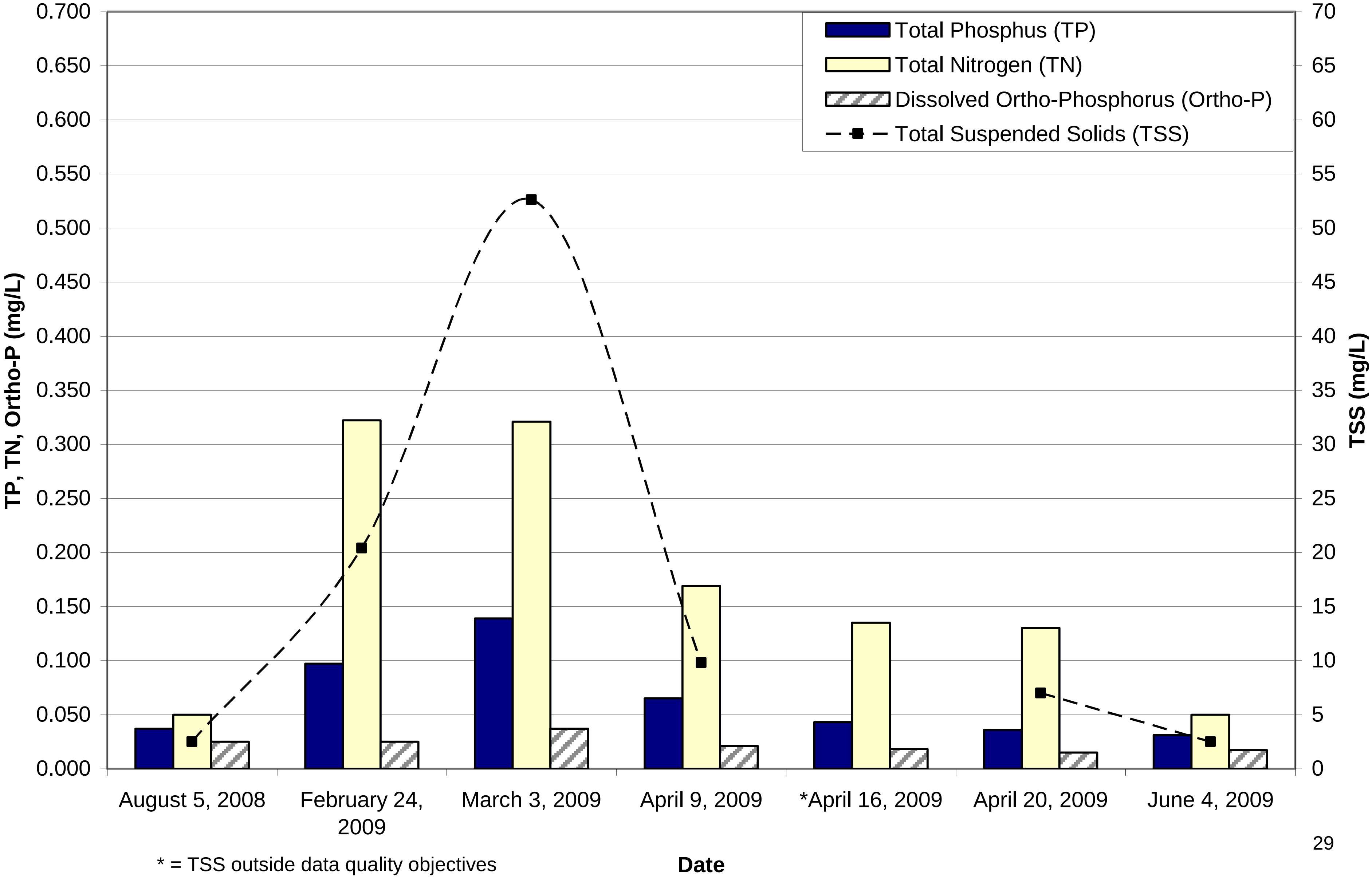
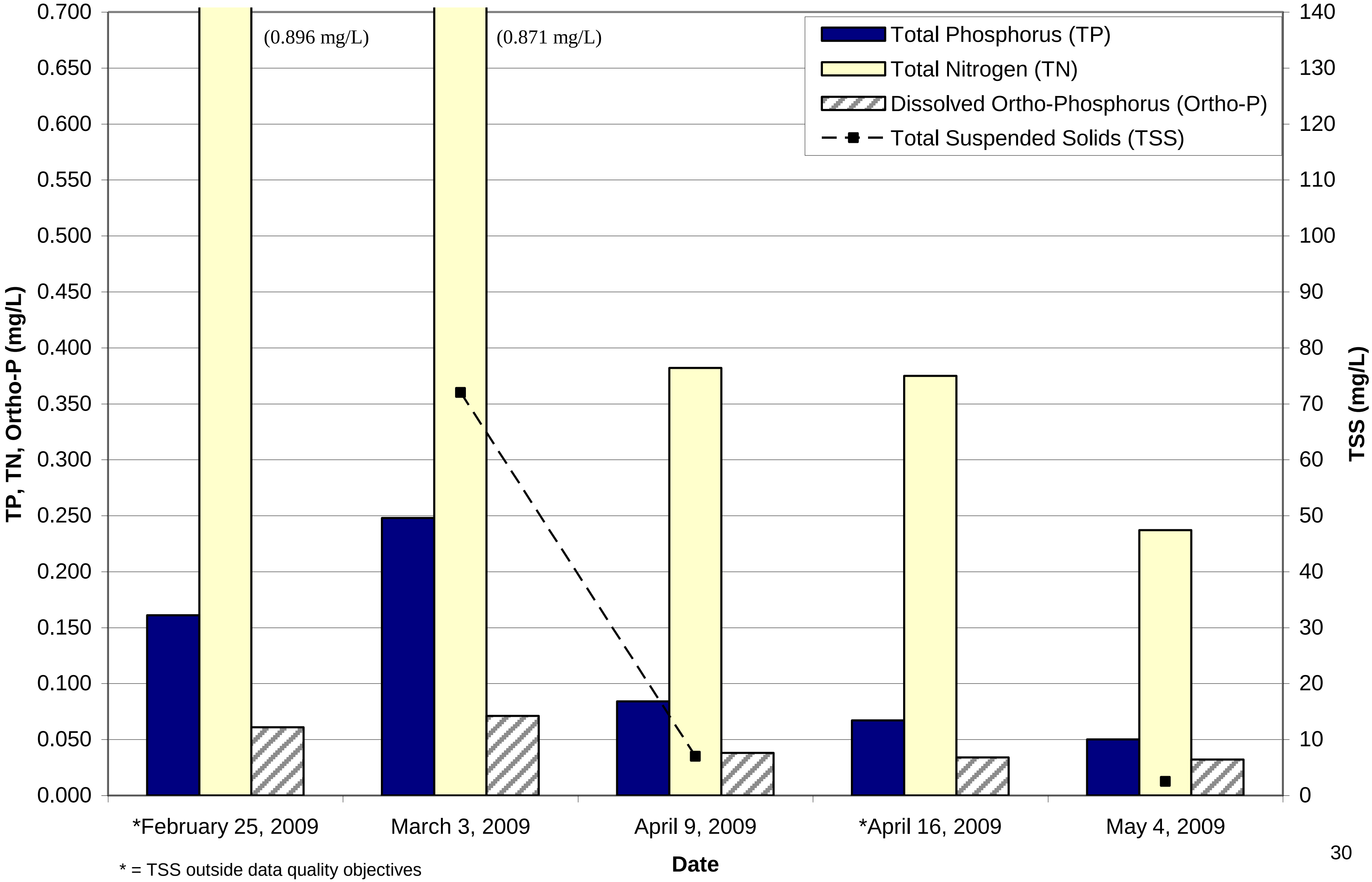


Figure 43: Turner Creek — 2009 Monitoring Results



* = TSS outside data quality objectives

Figure 44: Unnamed Tributary to Bennett Bay — 2009 Monitoring Results



* = TSS outside data quality objectives

Unnamed Creek to Powderhorn Bay

Unnamed Creek into Powderhorn Bay in June 2009.

The unnamed creek to Powderhorn Bay is a small stream that drains a 3.5 mile^2 watershed on the southeast side of Coeur d’Alene Lake. Like many tributaries to Coeur d’Alene Lake, flow in this creek is subsurface near its mouth during the summer. The entire creek is located within private property. Maximum flow observed during the monitoring period was 43 cfs during the March 3rd rain-on-snow event.

The water quality monitoring site on this creek was originally located at the mouth of the creek until lake levels went up and backwater conditions existed at the monitoring site. Then it was upstream from the mouth about a mile at a bridge on private property. Monitoring results show that total suspended solids and nutrient concentrations were elevated throughout the monitoring period (Figure 13). On March 3rd, nutrient and TSS concentrations were highest, with TP at 0.174 mg/L, TN at 0.513 mg/L, and TSS at 45.0 mg/L. Dissolved ortho-P remained high throughout the monitoring period at concentrations near 0.050 mg/L. Prior to flow going subsurface in May 2009, TP was 0.083 mg/L.

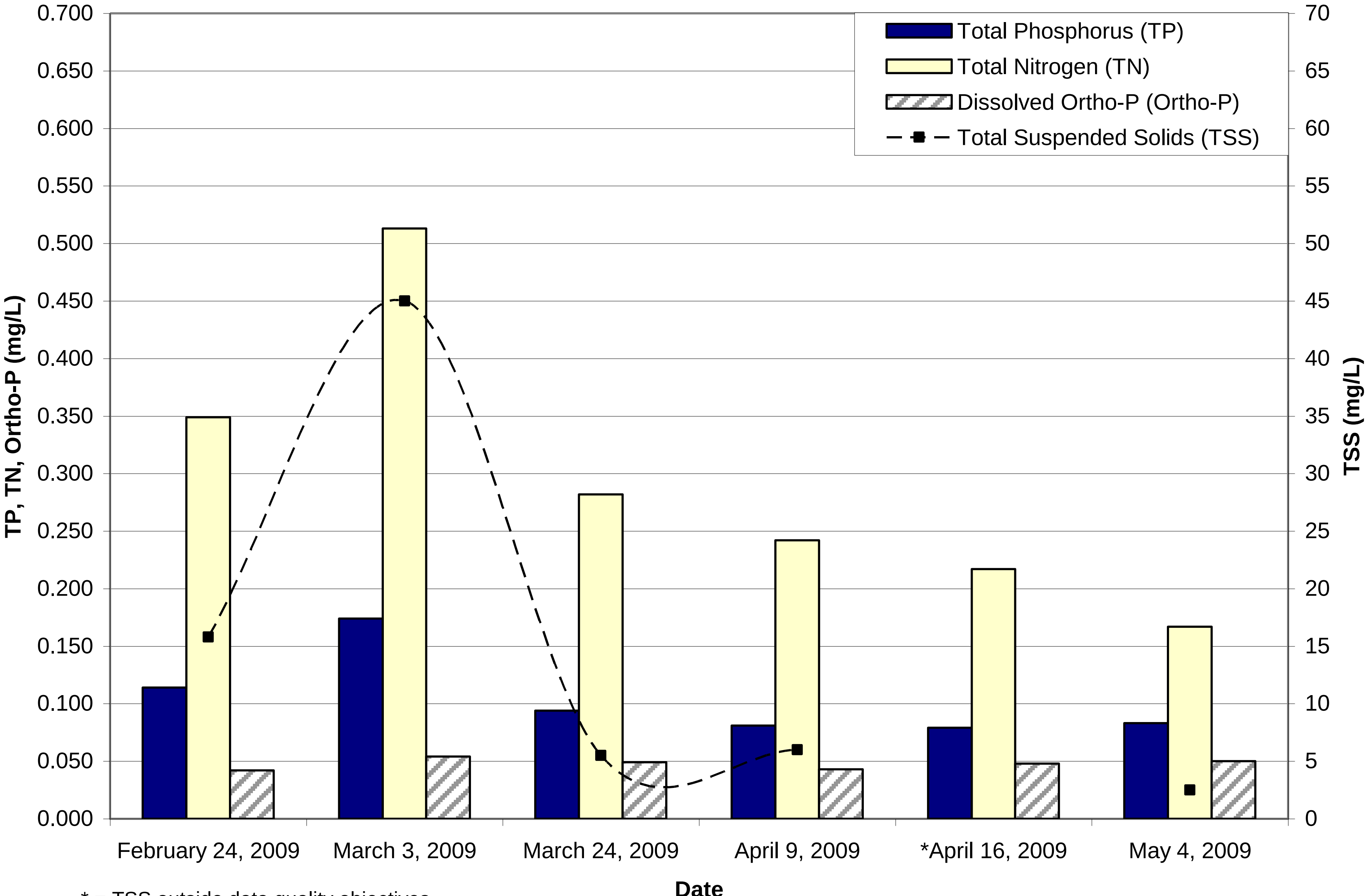
Wolf Lodge Creek

Wolf Lodge Creek is a 3rd-order perennial stream that drains a 40 mile^2 watershed into Wolf Lodge Bay on the northeast side of Coeur d’Alene Lake. The headwaters of Wolf Lodge Creek are within the Coeur d’Alene National Forest. Upstream of the confluence with Lonesome Creek it then flows into private property all the way to the mouth. The highest flow measured in Wolf Lodge Creek was 770 cfs runoff.

Wolf Lodge Creek during March 2009 runoff.

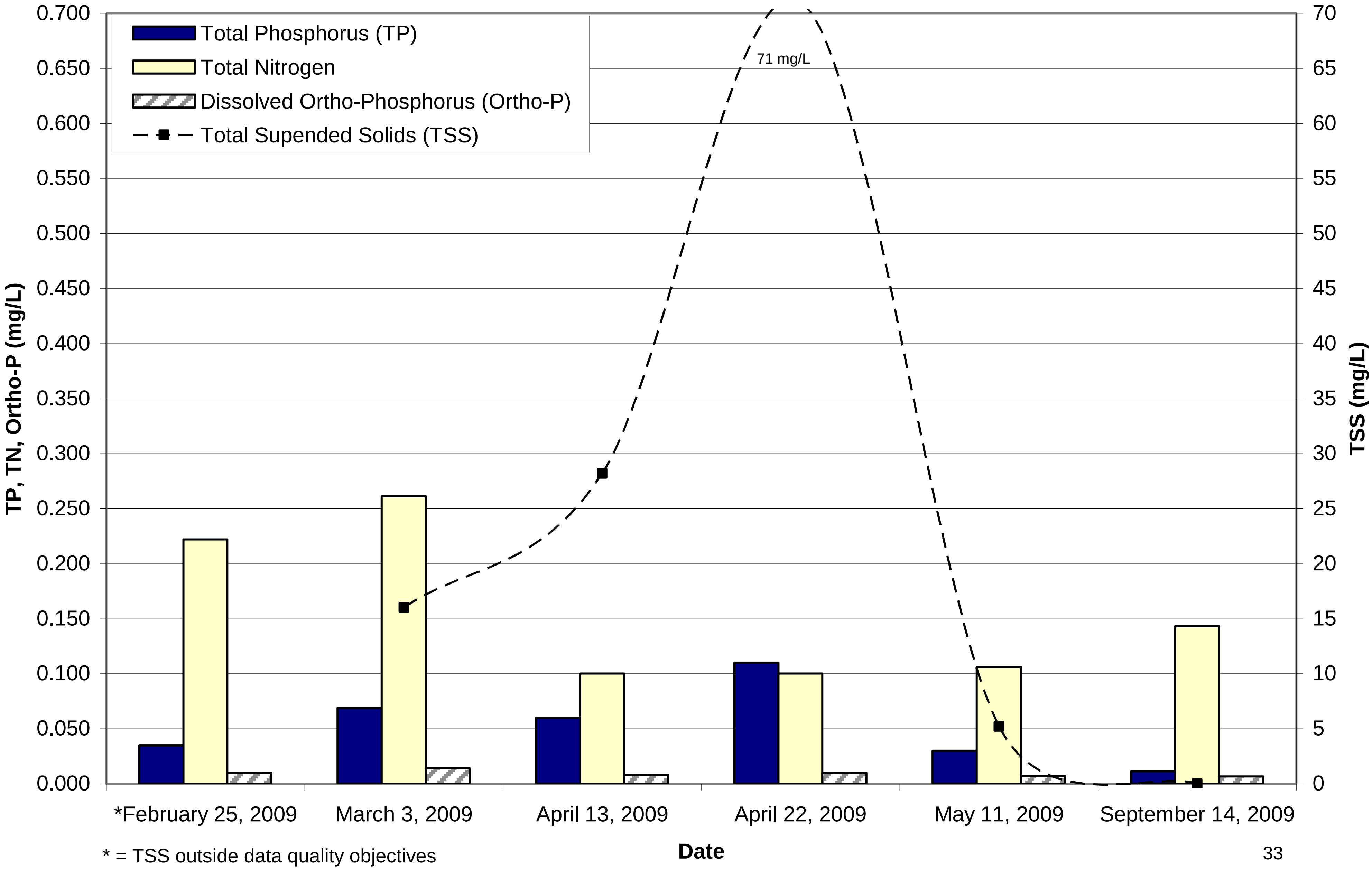
The water quality monitoring site on Wolf Lodge Creek was from a bridge on Wolf Lodge Creek Road upstream o where Wolf Lodge Creek flow into a grazing/wetland area at the mouth. Nutrient and TSS concentrations were highest during spring runoff. On April 22, TP was 0.110 mg/L, dissolved ortho-P was 0.010 mg/L, TN was 0.100 mg/L, and TSS was 71.0 mg/L (Figure 14). Concentrations of all parameters except TSS decreased with each monitoring event. Low flow samples collected in August of 2008, where TP and TN were 0.011 mg/L and 0.143 mg/L, respectively.

Figure 45: Unnamed Creek into Powderhorn Bay — 2009 Monitoring Results



* = TSS outside data quality objectives

Figure 46: Wolf Lodge Creek — 2009 Monitoring Results



* = TSS outside data quality objectives

LOADING ANALYSIS TO COEUR D'ALENE LAKE

Loading analyses were done to make a gross approximation of TP loads to Coeur d'Alene Lake. To perform a more thorough loading analysis of TP from streams, it is best to have a multiple-year TP dataset with continuous flow data to extrapolate loads between nutrient sampling events. Because there is no continuous flow data for the watersheds, and there is only one year of TP data, a loading analysis was done using a 24-hour TP load calculated using Equation 1. Results are represented in Figures 15 – 27. Using this approach, the results were used to prioritize watersheds for efforts to mitigate phosphorus delivered by tributaries into Coeur d'Alene Lake.

Equation 1:

Load in pounds per day = (Flow converted to liters per day) x (TP in lbs per liter)

Figure 47: Beauty Creek — Total Phosphorus Load

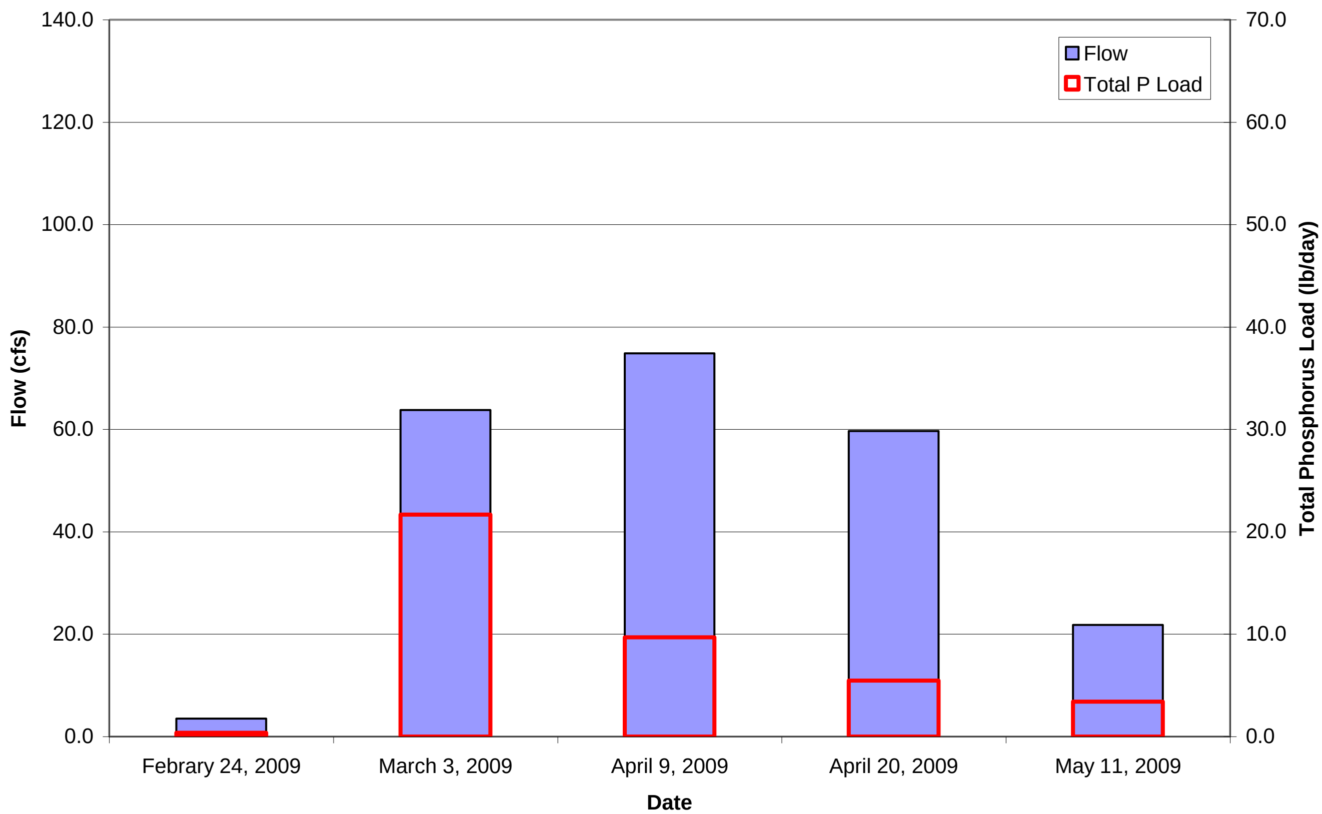


Figure 48: Bellgrove Creek — Total Phosphorus Load

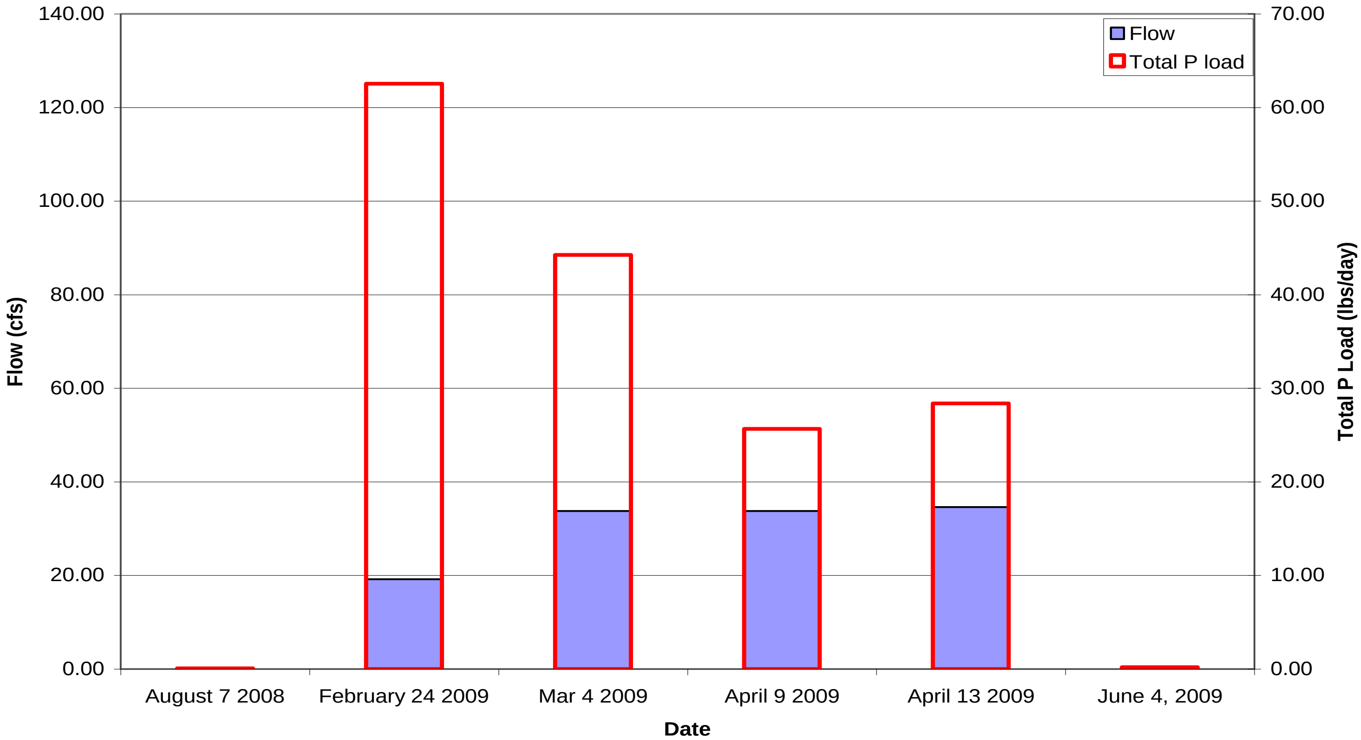


Figure 49: Blue Creek — Total Phosphorus Load

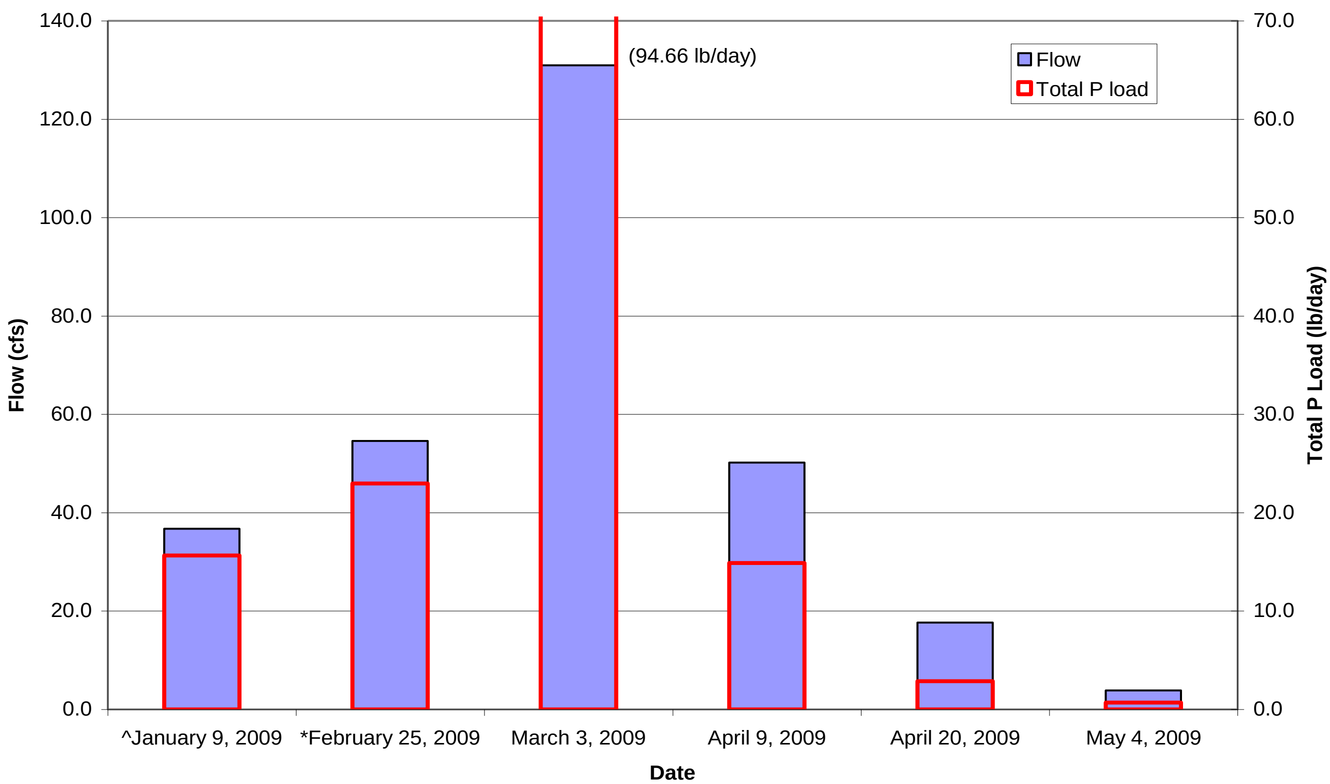


Figure 50: Carlin Creek — Total Phosphorus Load

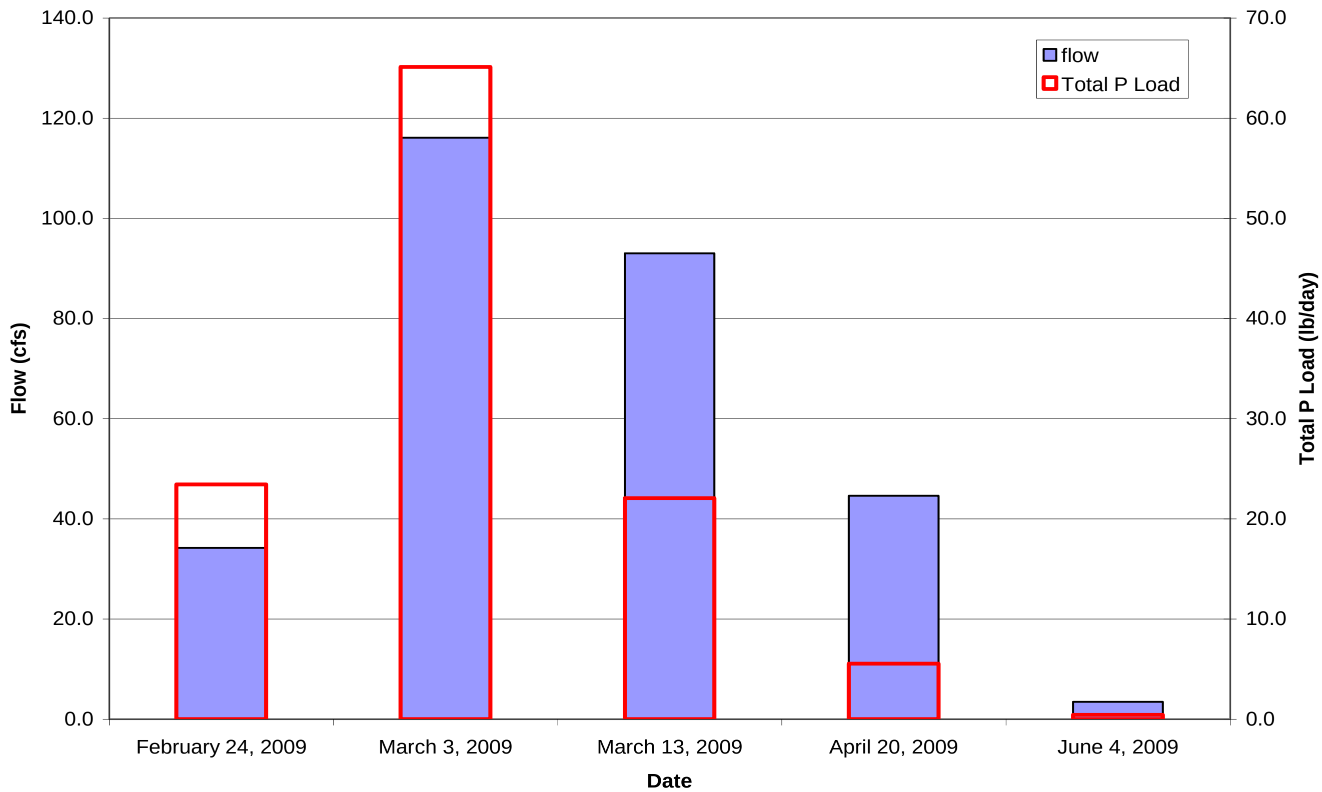


Figure 51: Fernan Creek — Total Phosphorus Load

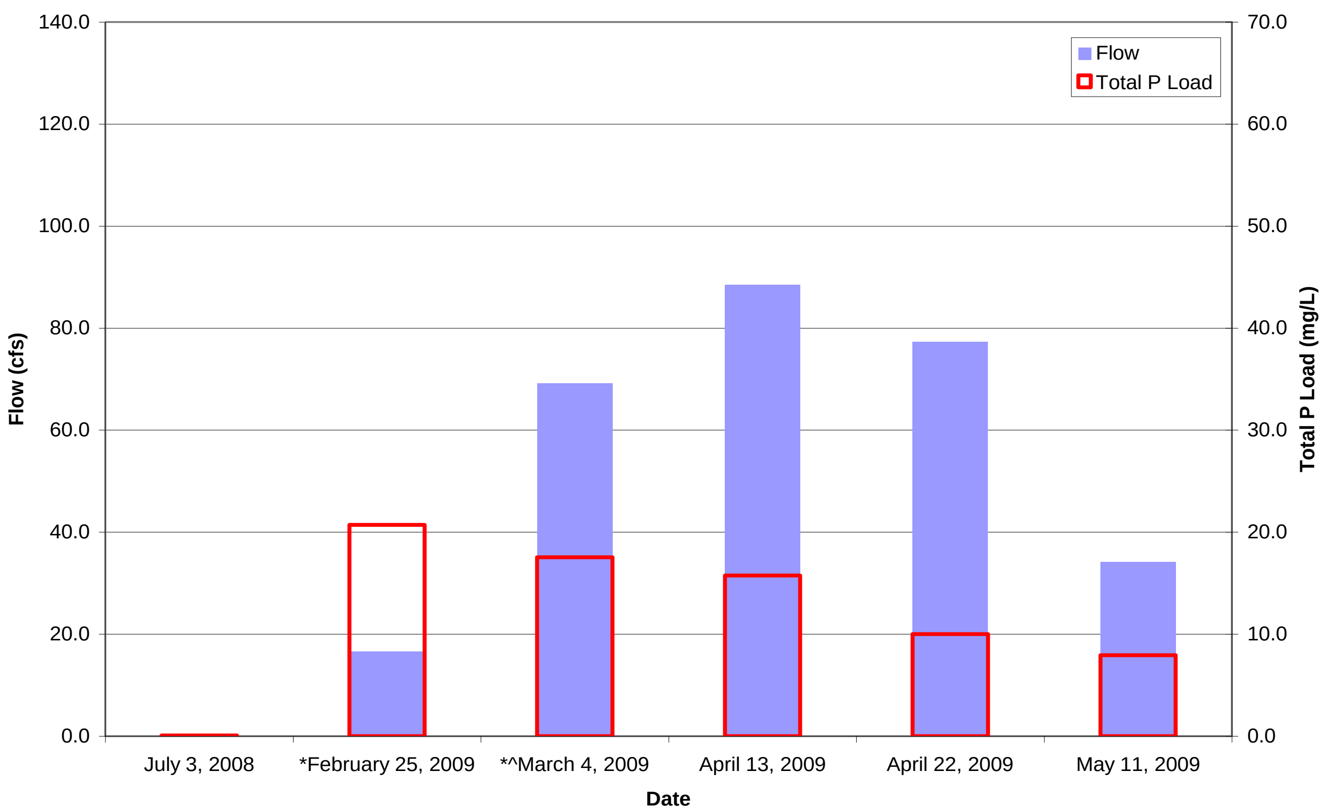
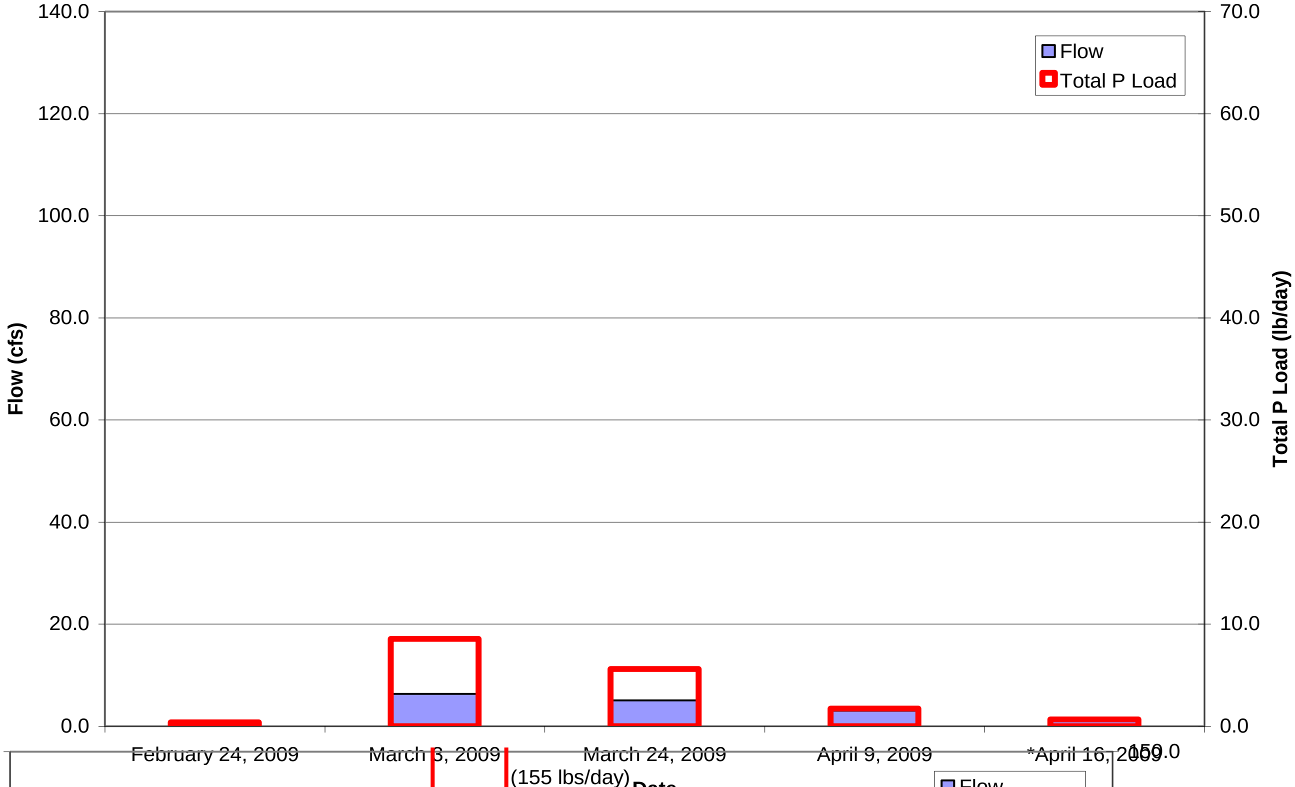


Figure 52: Gotham Creek — Total Phosphorus Load



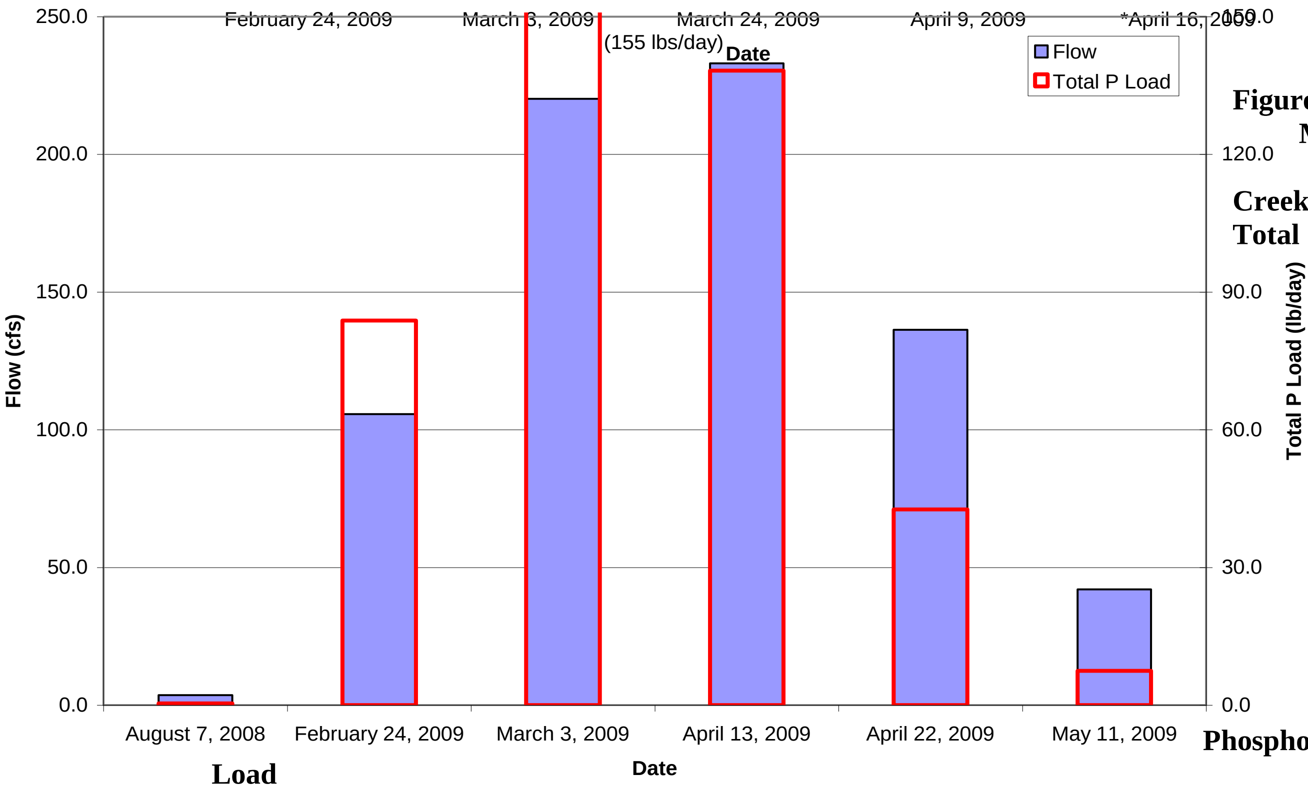


Figure 53: Mica Creek — Total Phosphorus Load

Figure 54: Neachen Creek — Total Phosphorus Load

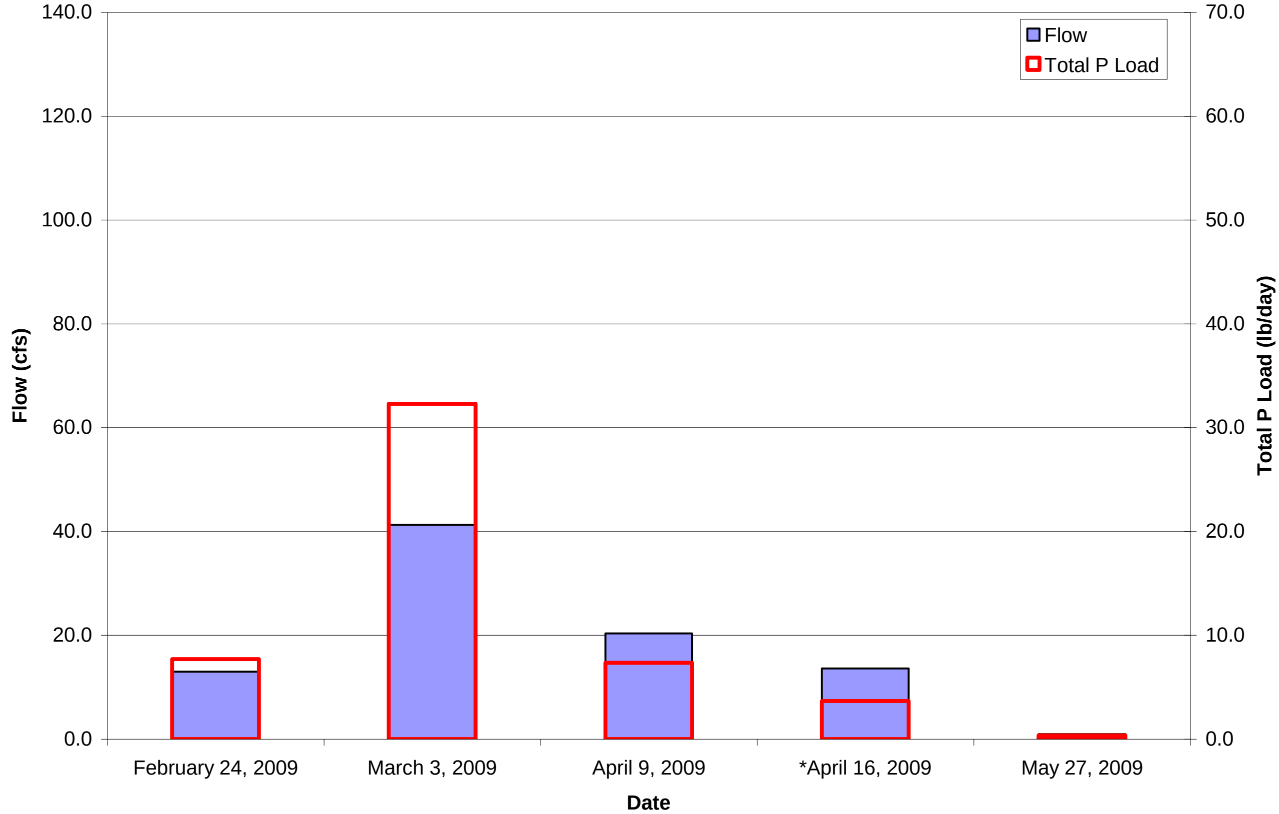


Figure 55: Stinson Creek — Total Phosphorus Load

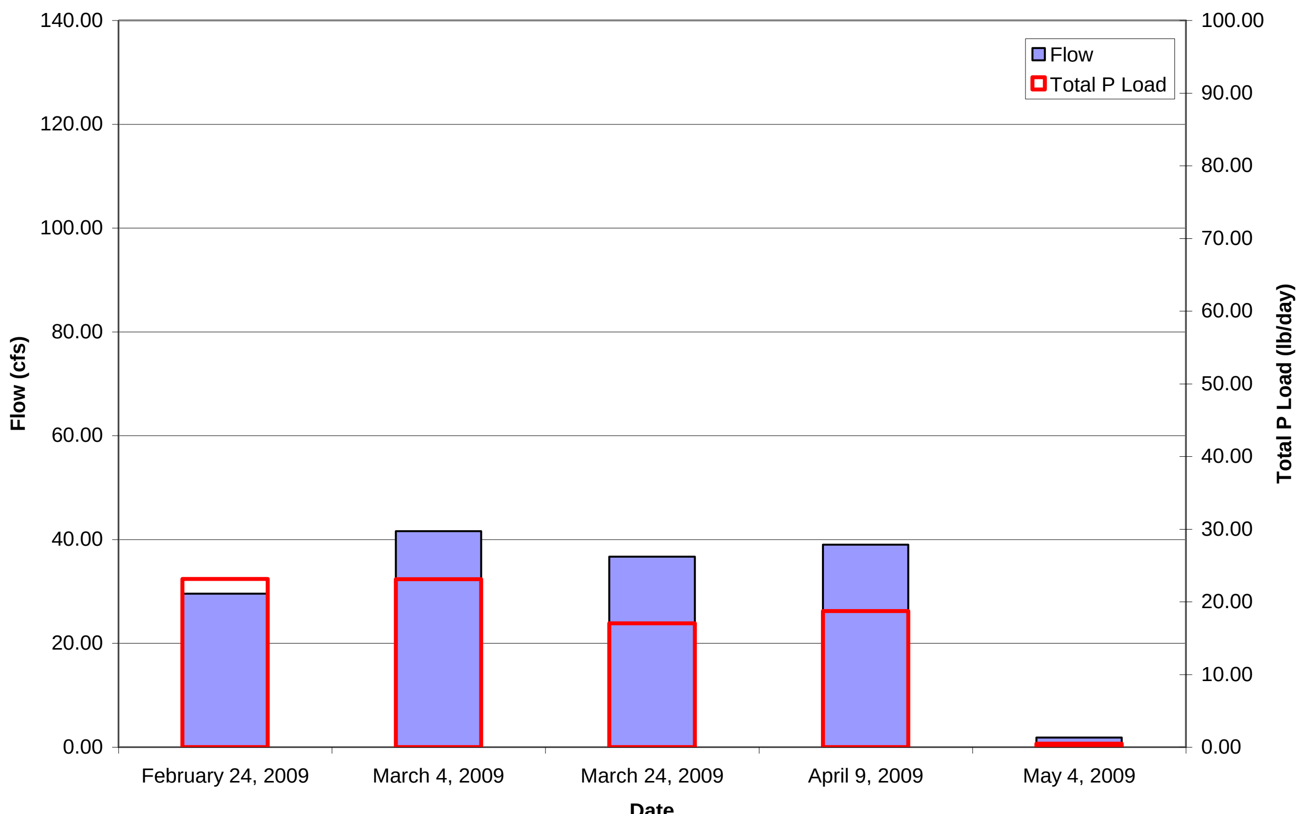


Figure 56: Turner Creek — Total Phosphorus

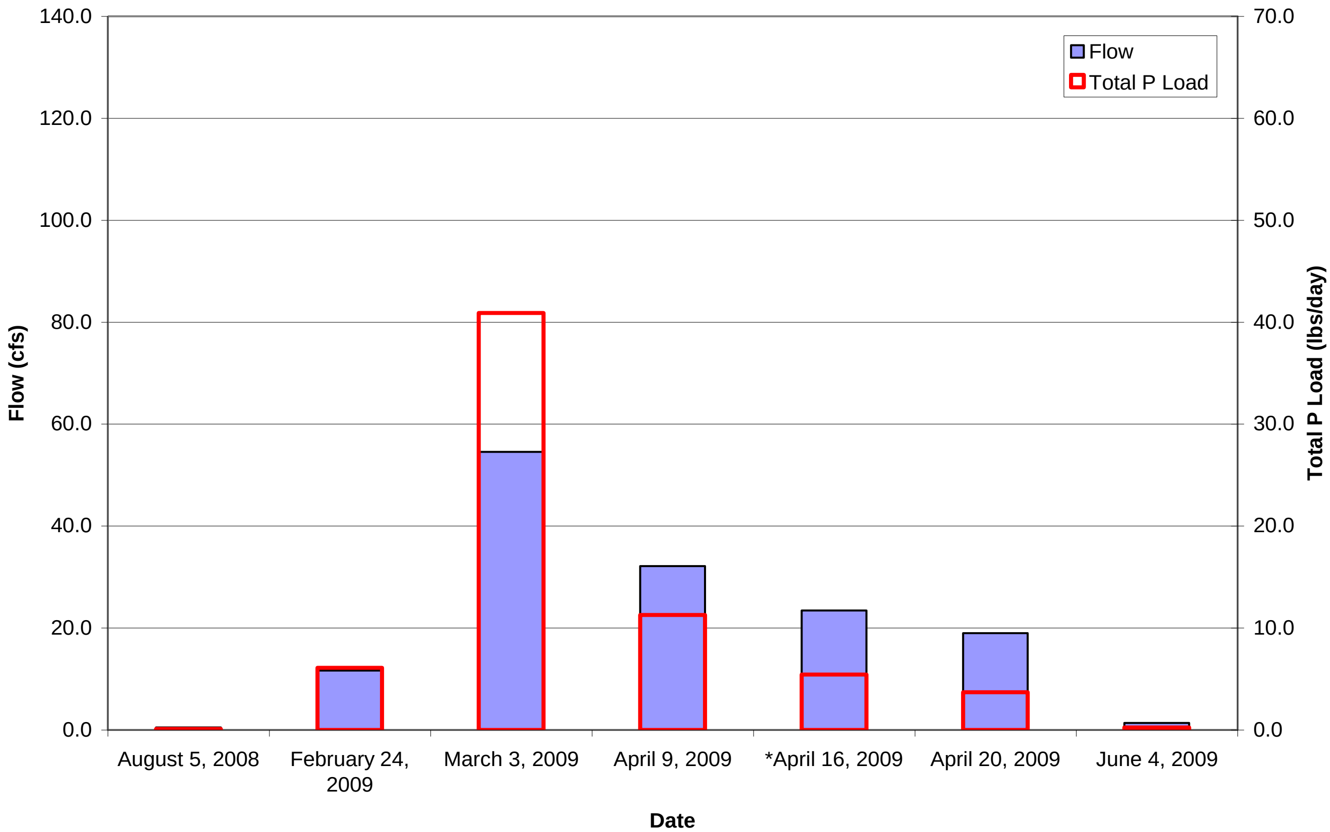


Figure 57: Unnamed Tributary to Bennett Bay Total Phosphorus Load

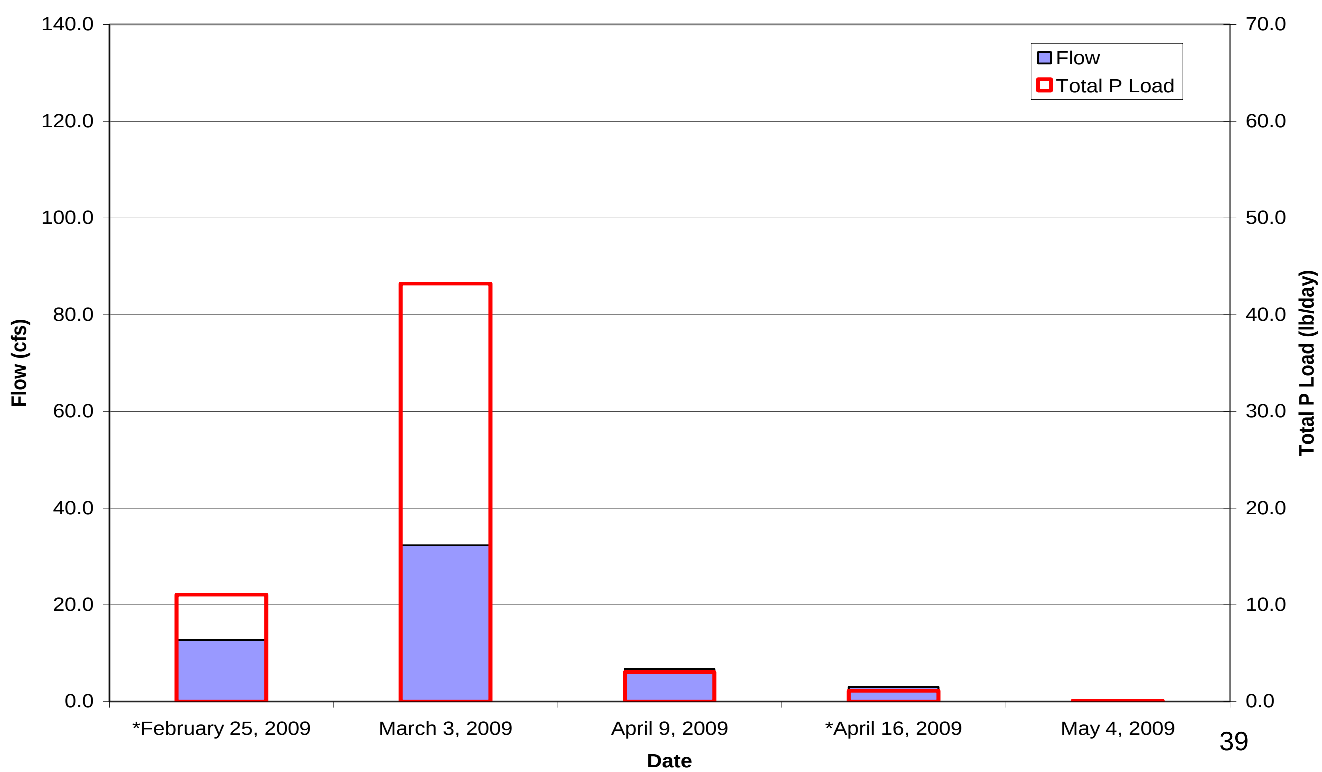


Figure 58: Unnamed Creek to Powderhorn Bay

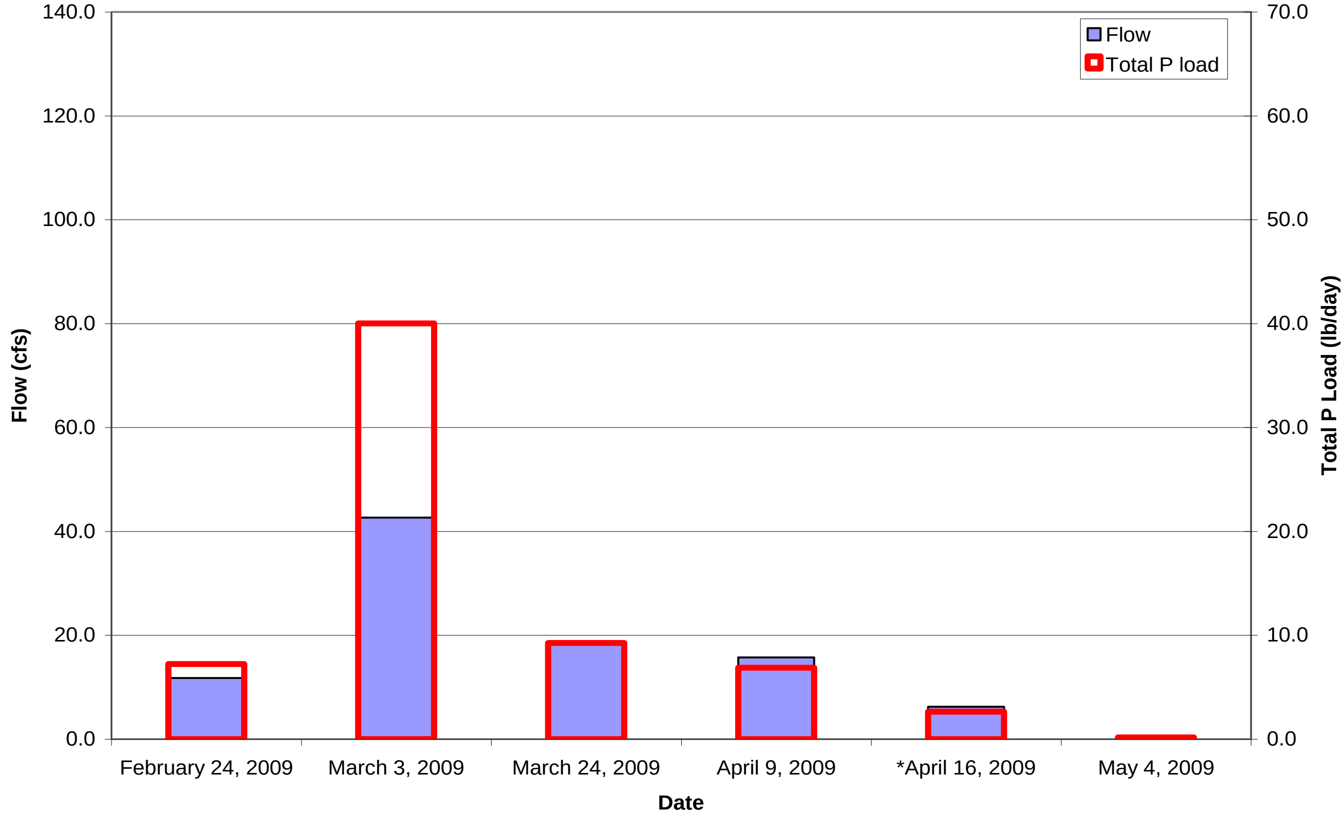
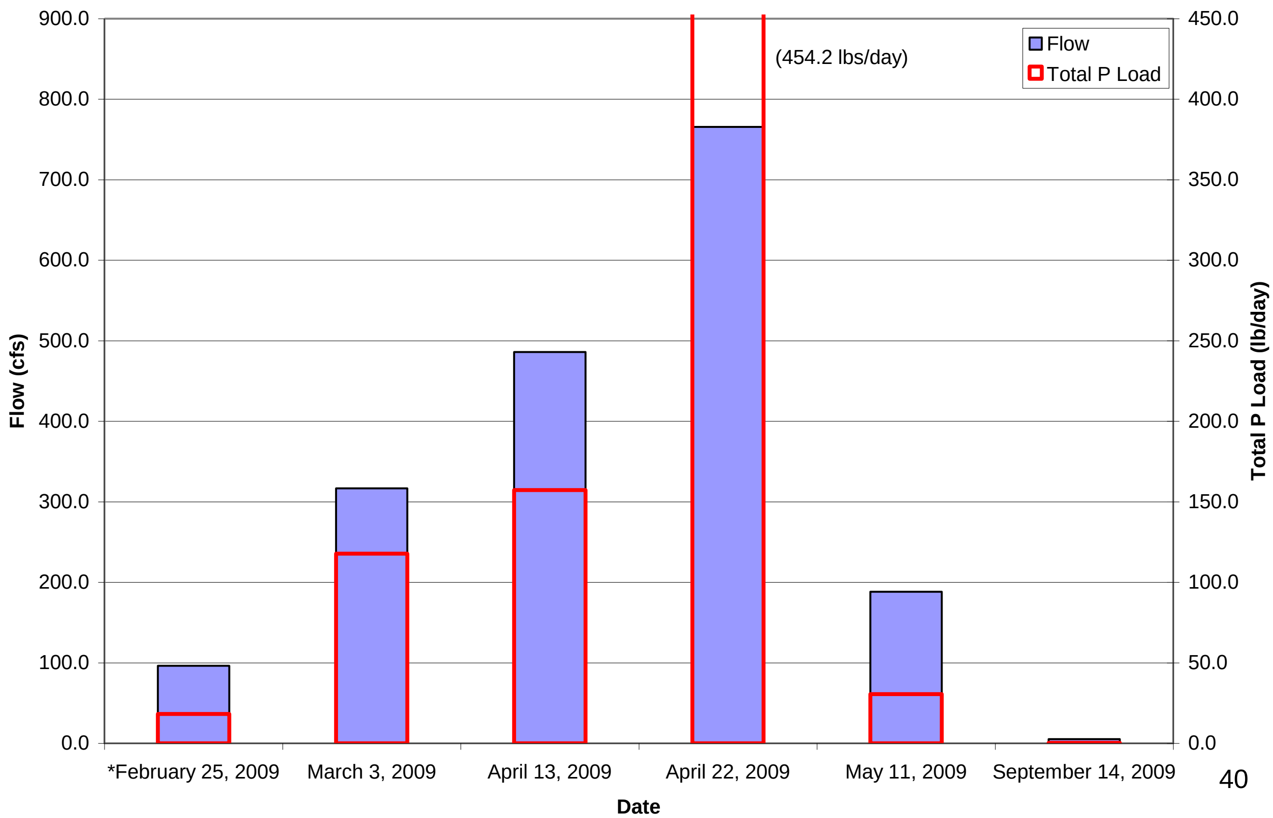


Figure 59: Wolf Lodge Creek — Total Phosphorus Load



An initial loading analysis was done to calculate an annual TP load (in lb/year) using the 24-hour TP load for the flow period and an estimate of days for the various flow periods (Table 4). Numbers of days in the flow period were estimated using hydrographs from historical data collected by USGS on Carlin Creek, Wolf Lodge Creek, and Fighting Creek (Figure 30, hydrogeology section). To rank the 13 streams by annual TP load to Coeur d'Alene Lake, a more qualitative analysis was done by assigning a weighted value to the stream load based on distribution of the 75/25 percentiles. Highest annual TP loads based on this analysis were from Mica Creek, Bellgrove Creek, Blue Creek, and Carlin Creek (Table 5).

Table 16: Estimated average number of days for each flow condition.

	Tributaries		Wolf Lodge Creek		Gotham Creek	
Flow period	**Estimated Days**	**Percent of year**	**Estimated Days**	**Percent of year**	**Estimated Days**	**Percent of year**
Ascending Limb	30	8.2	30	8.2	30	8.2
Rain on Snow	7	1.9	7	1.9	7	1.9
Peak Flow	30	8.2	30	8.2	30	8.2
Descending Limb	60	16.4	90	24.7	60	16.4
Base Flow	238	65.2	208	57.0	30	8.2

Table 17: [1]Annual TP load for watersheds draining into Coeur d'Alene Lake in lb/yr.

	Ascending Limb	**Base Flow**	**Rain on Snow**	**Peak Flow**	**Descending Limb**
Beauty Creek	--	--	3	650	580
Bellgrove Creek	--	44	440	1300	1700
Blue Creek	470	160	160	2800	890
Carlin Creek	--	101	160	2000	1300
Fernan Creek	--	15	150	530	940
Gotham Creek	--	1	3	250	100
Mica Creek	--	190	590	4700	8300
Neachen Creek	--	85	54	970	440
Stinson Creek	--	110	160	690	1100
Turner Creek	--	55	43	1200	680
Unnamed Creek to Bennett Bay	--	24	77	1300	180
Unnamed Creek to Powderhorn Bay	--	38	51	1200	410
Wolf Lodge Creek	--	64	130	1400	2700

[1]Annual TP load rounded to 2 significant figures.

When prioritizing watersheds for efforts to mitigate phosphorus delivered by tributaries into Coeur d’Alene Lake, the focus should be on watersheds where human activity has resulted in excess pollution. Although total load into Coeur d'Alene Lake is important in determining which tributaries are contributing the most phosphorus, the total load is biased towards large watersheds by their size. Total phosphorus loading occurs in a natural/undisturbed state, and a large natural/undisturbed watershed could have a higher loading than a small highly-disturbed watershed — if total load is the only element of prioritization.

The goal for setting priorities for phosphorus restoration efforts was to have the largest benefit for the lowest cost. Therefore, an alternative analysis was performed to evaluate TP loading rate (in lb/mi^2/yr) of individual watersheds by using TP load, the number of days in the flow period, and watershed area information. With this information, we were able to make predictions on the load per square mile per day for tributaries that drain into Coeur d’Alene Lake (Table 6). TP loading rate may be useful for predicting loads from non-monitored watersheds as well for establishing a prioritization schedule that is less biased by watershed size.

Table 18: [1]TP loading rates for watersheds that flow into Coeur d'Alene Lake.

	TP Load Rate (lbs/mi2/yr)				
	Ascending Limb	**Base Flow**	**Rain on Snow**	**Peak Flow**	**Descending Limb**
Beauty Creek	--[a]	7	0.2	58	52
Bellgrove Creek	--[a]	7	72	220	280
Blue Creek	60	21	20	360	110
Carlin Creek	--[a]	9	15	180	120
Fernan Creek	--[a]	0.8	8	27	49
Gotham Creek	--[a]	1	3	280	110
Mica Creek	--[a]	7	22	180	320
Neachen Creek	--[a]	21	13	240	110
Stinson Creek	--[a]	20	30	130	210
Turner Creek	--[a]	9	7	190	110
Unnamed Creek to Bennett Bay	--[a]	11	35	590	83
Unnamed Creek to Powderhorn Bay	--[a]	11	14	340	120
Wolf Lodge Creek	--[a]	2	3	340	69

[1]Annual TP load rounded to 2 significant figures.
a: no sample was taken for the ascending limb of the hydrograph

Woods and Beckwith (1997) calculated loading from Carlin Creek and Wolf Lodge Creek, using 1991-1992 monitoring data and a computer program (FLUX) developed by Walker (1987) that stratifies streamflow and nutrient concentration data. The stratified data were then used to compute load with the smallest coefficient of variation. The 1991-1992 annual TP loads for Carlin Creek and Wolf Lodge Creek were compared to 2009

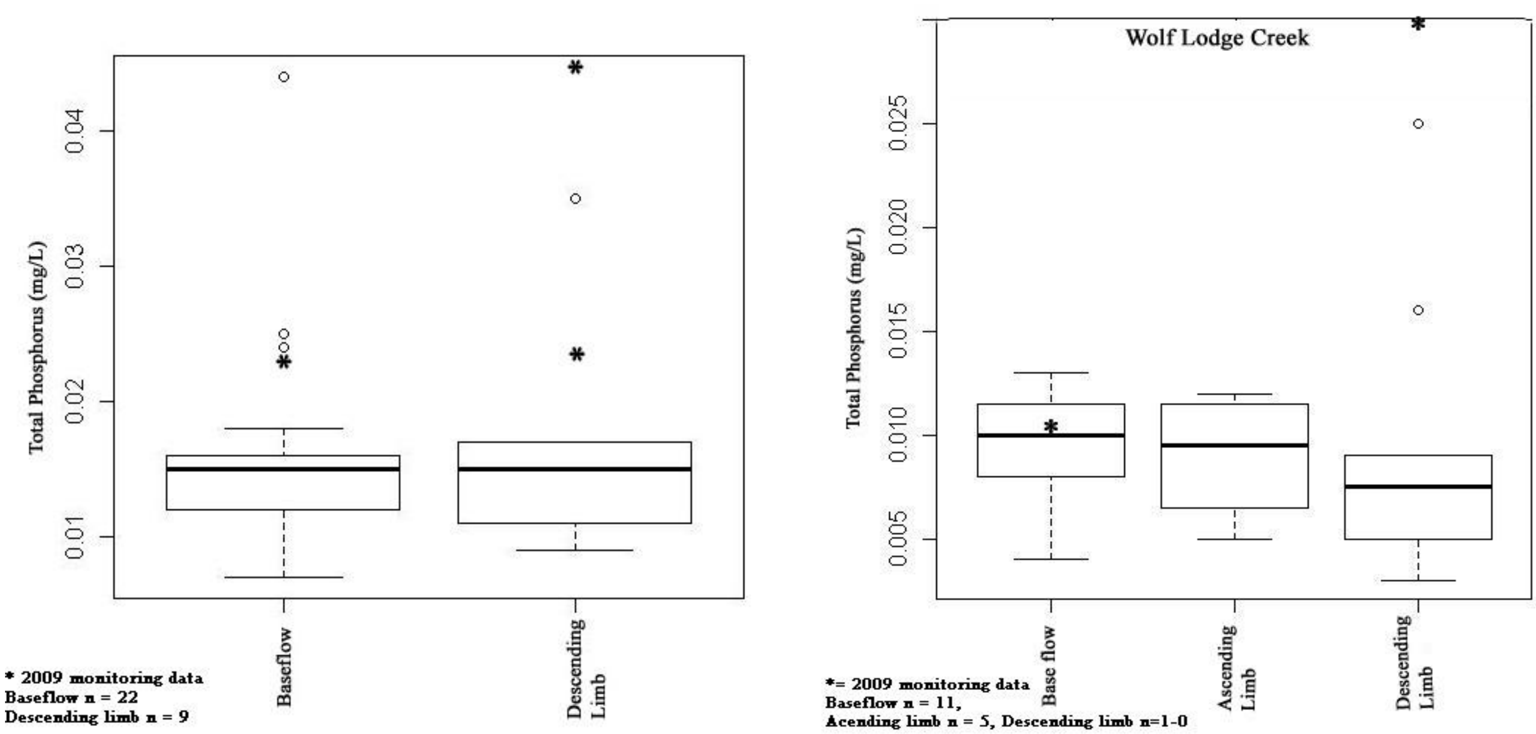
TP loads. Results of the comparison show an order of magnitude difference in the loads (Table 7). This discrepancy may be explained by the difference in TP concentration and flow between 1991-1992 and 2009.

In 2009, base flow (Carlin Creek and Wolf Lodge Creek) and descending limb (Carlin Creek only) TP concentration was much higher than the median for these flow periods in 1991-1992 (Figure 28). The number of samples taken during rain-on-snow and peak flow events was not large enough to calculate a median; however, in Carlin Creek, rain-on-snow TP concentration in 1992 was 0.026 mg/L compared to 0.127 mg/L in 2009; peak flow TP concentration in 1992 was 0.026 mg/L compared to 0.104 mg/L in 2009. In Wolf Lodge Creek, rain-on-snow TP concentration in 1992 was 0.016 mg/L compared to 0.035 mg/L in 2009; mean peak flow TP concentration in 1992 was 0.005 mg/L compared to 0.080 mg/L in 2009. In addition, flows were significantly higher in 2009 than in 1991 and 1992 in Carlin Creek, particularly during the peak and descending limb of the hydrographs where there was almost an order of magnitude difference. Flows in Wolf Lodge Creek were similar during the two time periods, except during peak flow, where there was a 400 cfs difference in mean flow.

Table 19: Loading comparison for years 1991, 1992, 2009

Carlin Creek 1991 (USGS)	Carlin Creek 1992 (USGS)	Carlin Creek 2009	Wolf Lodge Creek 1991 (USGS)	Wolf Lodge Creek 1992 (USGS)	Wolf Lodge Creek 2009
Total Phosphorus Load (lbs)					
452	234	1,881	1,300	478	18,655

Figure 60: Box and whisker plot of USGS TP data taken from Carlin and Wolf Lodge Creeks in 1991-1992 & 2009.



To determine the watersheds where human activity has resulted in excess pollution to the stream, watersheds were identified whose TP loading rates for each individual watershed flow period (event rate) exceeded the average TP loading rate for Coeur d’Alene subbasin for each flow period (Table 6). The event rate was given a score based on the magnitude that the event rate was greater than the average rate. The watershed was then ranked according to a sum of the scores (Table 7). The scores were determined by the percentile distribution of all the values greater than the average rate. In cases where multiple events occurred during a flow period, the larger event rate was used. The sum of the score is dimensionless and has only relative significance.

Sometimes the event rate was less than the average TP loading rate, and in these cases we can assume that those streams were not a priority for efforts to mitigate phosphorus delivered to Coeur d’Alene Lake. Other times the event rate was more than the average rate, and in these cases we can assume human-caused pollution is impacting those streams and they are a higher priority for TP mitigation efforts. The values in Table 7 relate to the magnitude that the event rate was greater than the average rate — the higher the number, the worse the potential for human-caused pollution in the watershed. Blank cells depict conditions where the event rate was less than the average rate. The final ranking determined the highest priority watersheds for efforts to mitigate phosphorus to Coeur d’Alene Lake, and priority watersheds are Bellgrove Creek, Mica Creek, Blue Creek, and the unnamed creek into Bennett Bay.

Table 6: Average TP load rates for Coeur d'Alene Lake subbasin.

Flow Period	TP load rate ($lb/mi^2/day$)
Ascending Limb	2.0
Rain on Snow	2.7
Peak Flow	6.8
Descending Limb	1.6
Base Flow	0.1

These rates are for Coeur d' Alene Lake tributary watersheds 40 square miles and smaller.

Table 7: Total Phosphorus Priority Schedule for Tributaries to Coeur d'Alene Lake

			Score				
	Stream	**Priority**	**Rain On Snow**	**Peak Flow**	**Descending Limb**	**Base Flow**	**Total**
1	Bellgrove	Very High	4	2	4		10
2	Mica Creek	High	2		4	1	7
3	Blue Creek	High	1	4	2		7
4	Bennett Creek	High		4	3		7
5	Stinson Creek	Moderate			3	3	6
6	Powderhorn Creek	Moderate		4		2	6
7	Gotham Creek	Moderate		3	2		5
8	Wolf Lodge Creek	Moderate		4			4
9	Neachen Creek	Moderate		3		1	4
10	Fernan Creek	Low				2	2
11	Carlin Creek	Very Low			1		1
12	Turner Creek	Very Low			1		1
13	Beauty Creek	Very Low				1	1

Score of 1 = within the 25%tile of the range of values that exceed average load rate (lb/mi2/day) (0-0.28)
Score of 2 = between the 25 and 50%tile of the range of values that exceed average load rate (0.28-0.54)
Score of 3 = between the 50 and 75%tile of the range of values that exceed average load rate (0.54-2.86)
Score of 4 = greater than 75%tile of the range of values that exceed average load rate (>2.86)

HYDROGEOLOGY OF TRIBUTARIES TO COEUR D'ALENE LAKE

Collection of meaningful water quality data has been challenging on the tributaries to Lake Coeur d'Alene. DEQ's Beneficial Use Reconnaissance Program (BURP) is the primary method to make beneficial use support status determinations. It relies heavily upon biological parameters and monitoring data collected in the summer. However, only 3 of the 13 tributaries in this project have been evaluated within the last 10 years under this program. This is due to the fact that flow was subsurface in most tributaries to Coeur d'Alene Lake when an attempt was made to monitor the stream using the BURP protocol. Rather than attributing this observation to intermittent stream flow, it is likely that flow is subsurface in the summer near the mouth of most tributaries to Coeur d'Alene Lake. This subsurface flow is explained by geologic history of the area.

During Coeur d'Alene Lake's history, the elevation of the lake has been variable. Coeur d'Alene Lake was formed by periglacial processes due to contact with the terminus of the glacier that flowed south in the Purcell Trench (10k - 15k years ago). Glacial moraines forced the St. Joe River south and westward to its current location. Glacial processes are likely to have resulted in different static water elevations, one of these significant elevations (52 feet above current full pool) allowed for delta-like deposition to occur in flooded v-shaped stream valleys of the tributaries to the newly-formed Coeur d'Alene Lake. Glacial activity was predominantly north of what is now Coeur d'Alene Lake, so these watersheds were dominated by fluvial processes.

Today most tributaries to the Lake have a wedge of water-deposited alluvium (delta) occupying their watershed from the Post Falls Dam maintained "full pool" of 2128' to 2182' (Figure 42). These wedges vary in length with the following examples: Beauty Creek 5,000 ft, Wolf Lodge Creek 19,000 ft, Blue Creek 8550 ft, Fernan Creek 11,600 ft (Fernan Lake), Cougar Creek 12,100 ft, Kid Creek, 4,000 ft, Mica Creek 11,700 ft, Rockford Creek 3,700 ft. We observe relatively coarse aggregate has accumulated over portions of the emergent delta formations and further upstream areas, and we suspect these accumulations are due to the change in knick point since Coeur d'Alene Lake has dropped to the 2128 elevation. Stream energy may not be enough to carry larger particles across these low-gradient emergent delta formations because it is typical to see cobble-dominated substrate extending up the watershed.

As a result of the low-gradient wedge of deltaic sediments between 2128 and 2182, the tributaries to Coeur d'Alene Lake have a unique hydrograph (Figure 43). Latour Creek and Big Creek are nearby stream gauges that show "normal" stream hydrography for the area. Fighting Creek, which is a tributary to Coeur d'Alene Lake shows a similar hydrograph to Latour and Big Creeks; however, it does not have a low-gradient deltaic wedge between 2128' and 2182'. Plummer Creek and Carlin Creek may represent most of the Coeur d'Alene Lake tributary flow conditions as affected by the low-gradient wedge of deltaic sediments between the 2128' and 2182' elevations. It is predicted that Beauty, Blue, Carlin, Cougar, Fernan, Kid, Lyle, Mica, Neachen, Turner, unnamed to Bennett Bay, and unnamed to Powderhorn Bay act similarly — with peak flows in February or March and base flows in May and June. Further verification of this hydrography was from a comparison between base flows modeled by USGS Stream Stats with base flows observed during the months of May and June, where the two values were consistent — except on Beauty Creek, where flows were much higher just prior to going subsurface.

Figure 61: Map of deltaic sediments between 2128 and 2182 on tributaries to Coeur d'Alene Lake.

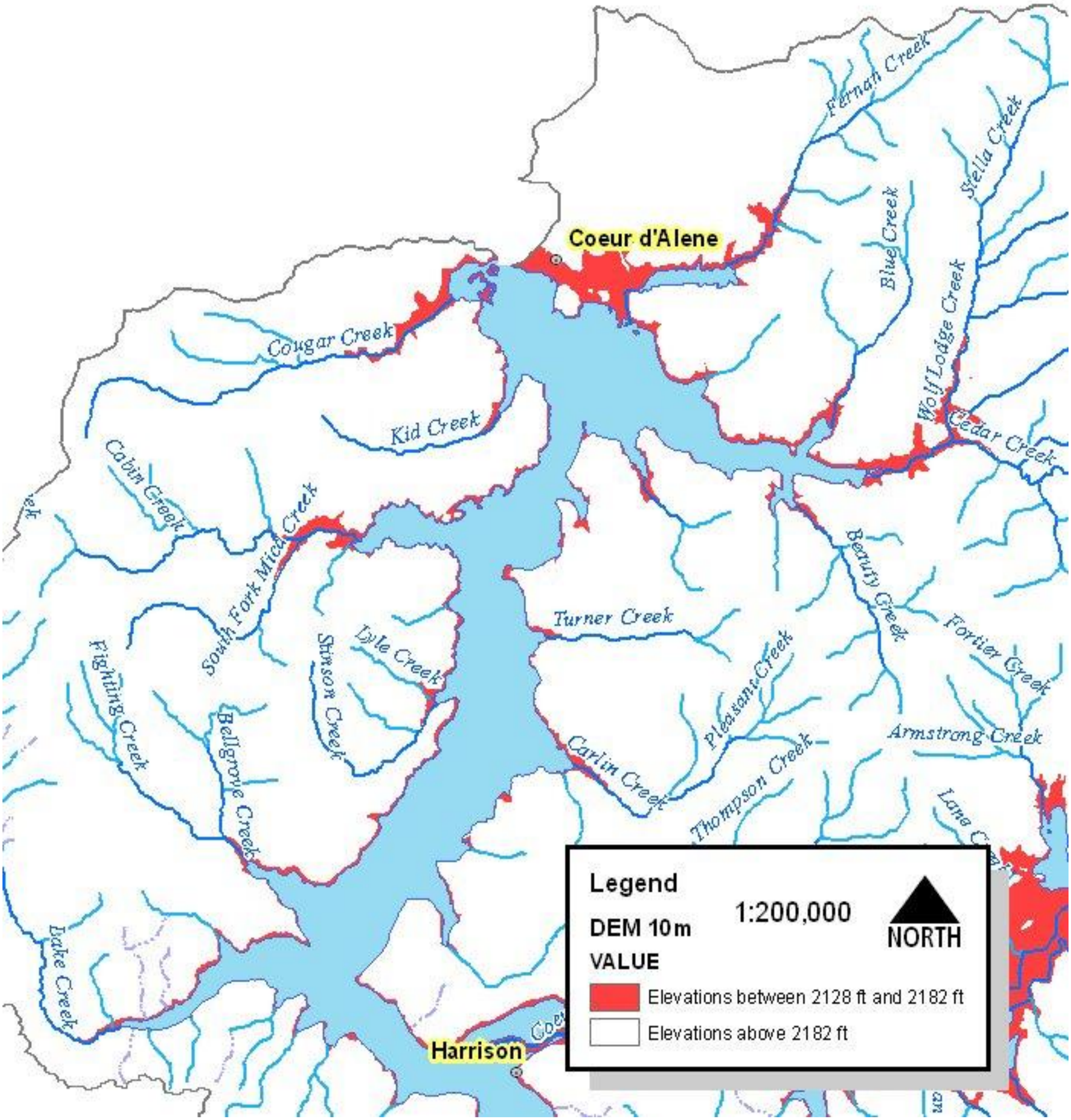
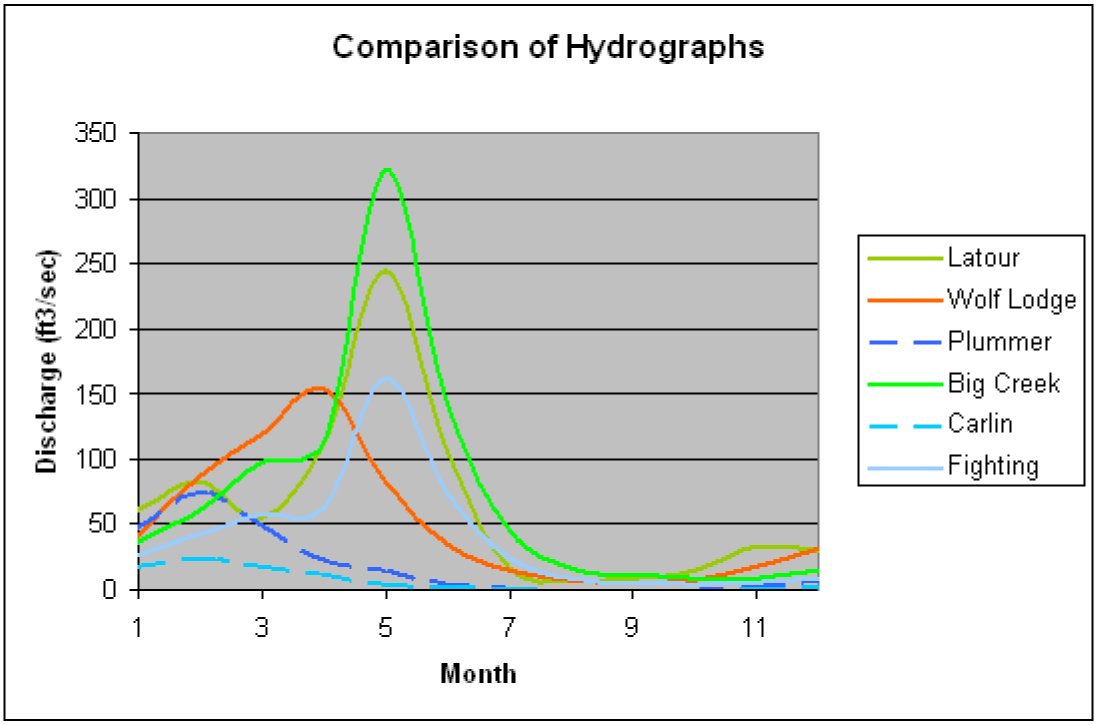


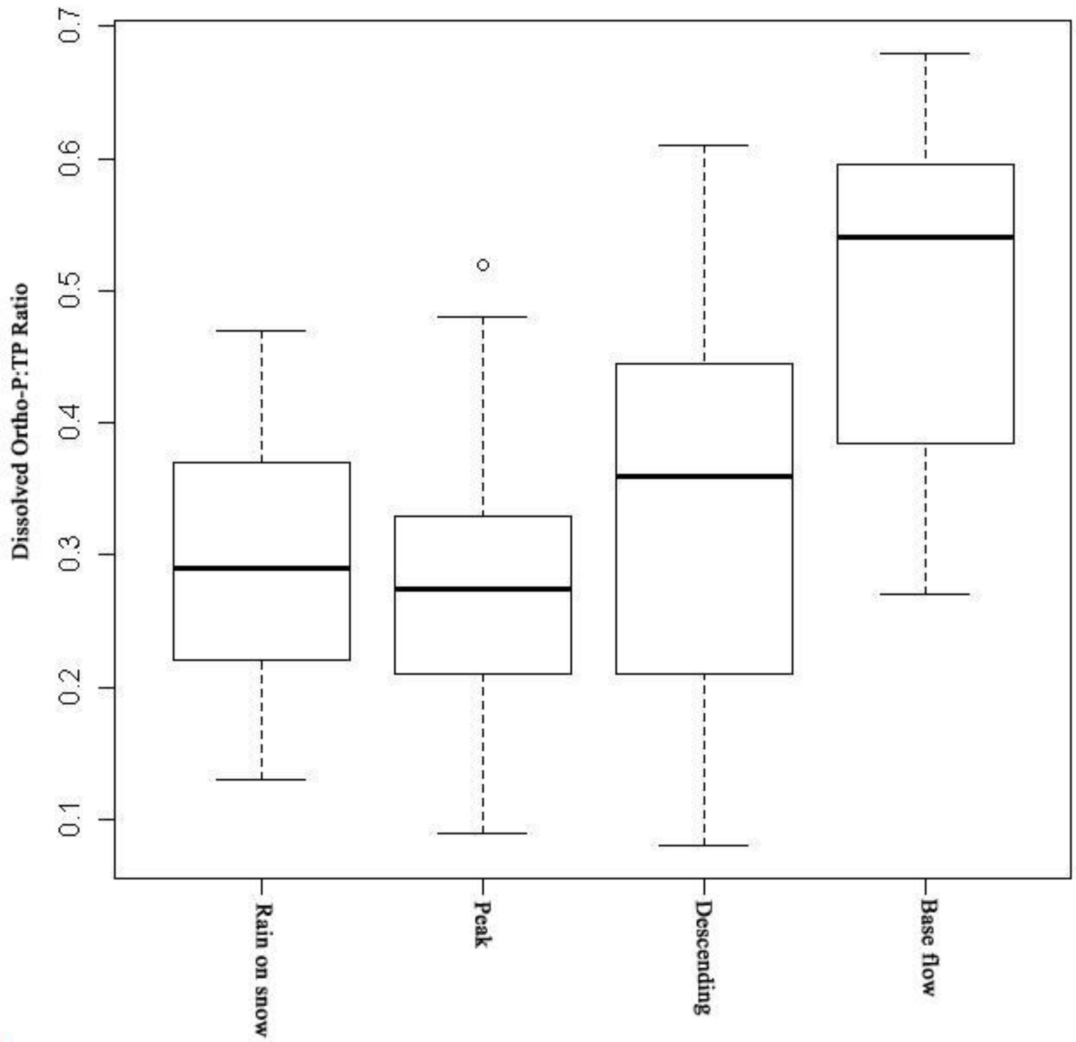
Figure 62: Comparison of hydrographs from creeks in the Coeur d'Alene watershed.



EVALUATION OF ORTHO-P:TOTAL P RATIO

Orthophosphate is the phosphorus form that is directly taken up by algae. The concentration of Ortho-P to TP is an index of the amount of phosphorus immediately available for algal growth. Long term monitoring at river and stream sites in Montana show the ratio of Ortho-P to TP (Ortho-P:TP) ranges from 0.26 to 0.5. An acceptable Ortho-P:TP ratio for the 90th percentile of reference streams in the Northern Rockies Ecoregion in Montana (Omernick III Ecoregion) was 0.35 (Suplee & Watson, et. al 2008). When evaluating dissolved Ortho-P:TP ratios by flow period in our project streams, ratios were highest during the base flow period (Figure 44). The median dissolved Ortho-P:TP of 0.54 during base flow was above that of reference streams in the same ecoregion and above the 90th percentile of Montana streams. This suggests tributaries to Coeur d'Alene Lake support more bioavailable phosphorus during the growing season than what typical reference streams in the region would support.

Figure 63: Box and Whisker plots of dissolved Ortho-P:TP ratios of tributaries to Coeur d'Alene Lake



SEDIMENT

The Idaho numeric standard for sediment impairments in streams is specific to turbidity. This standard is most often utilized when assessing sediment pollution from a source on a stream. For example, turbidity levels are measured above and below a feed lot. It seemed reasonable to evaluate for turbidity pollution during the rain on snow events, since turbidity was measured on every stream during each of these events. A comparison was made with individual stream turbidity measurements to the average turbidity of streams in the watershed. Turbidity data on February 24th from Bellgrove Creek and Fernan Creek were excluded from the average as they were outliers — Bellgrove Creek turbidity was an order of magnitude greater than the other streams, and the data concluded turbidity in Fernan Creek was primarily attributed to pollution from the City of Coeur d'Alene storm drain. Average turbidity of Coeur d'Alene Lake Tributaries for the February and March rain-on-snow events are 27.9 NTU and 36.0 NTU respectively. Results of this evaluation suggest Bellgrove Creek likely exceeded and Turner

Creek may have exceeded Idaho's standard for turbidity during these rain-on-snow events (Table 8).

Table 20. Comparison of turbidity measurement to the Idaho numeric standard for turbidity on tributaries to Lake Coeur d'Alene.

Date	Average Turbidity (NTU)	Instantaneous Turbidity Standard (NTU)	10-day Turbidity Standard (NTU)
Feb 24 & 25, 2009	27.9	57.9	52.9
Mar 3 & 4, 2009	36.0	86.0	60.9

Date	Creek Name	Turbidity (NTU)
2/24/09	Bellgrove Creek	167.0
2/24/09	Fernan Creek	79.2
2/24/09	City of Ceour d'Alene storm drain to Fernan Creek	351
2/24/09	French Gulch (tributary to Fernan creek)	33.8
3/3/09	Turner Creek	75.7

Turbidity/TSS regression curves were generated for each of the streams. Although more data needs to be collected to have relative confidence in such a correlation, initial results show high correlation on a number of the streams (Table 9).

Table 21. Regression analysis of Turbidity vs. TSS on tributaries to Lake Coeur d'Alene.

Creek Name	R^2 value
Beauty Creek	0.798
Bellgrove Creek	0.995
Blue Creek	0.855
Carlin Creek	0.091
Fernan Creed	0.497
Gotham Creek	0.952
Mica Creek	0.744
Neachen Creek	0.408
Stinson Creek	0.985
Turner Creek	0.996
Unnamed Creek to Bennett Bay	0.696
Unnamed Creek to Powderhorn Bay	0.954

CONCLUSION/DISCUSSION

It is well documented that excess nutrients can accelerate the eutrophication process in surface water. A common effect of eutrophication in streams is an increased fluctuation of DO and pH due to the elevated aquatic plant growth. Such fluctuations, if severe enough, can have a direct negative effect on aquatic life and other beneficial uses. Local differences in climate, geology, soils have a combined effect on stream nutrient concentrations and eutrophication, which makes it a challenge to determine instream nutrient concentrations that are above natural background levels and harmful to beneficial uses.

Suspended sediment and nutrient monitoring of 13 tributaries to Coeur d’Alene Lake during winter rain-on-snow events, spring runoff, and during the summer low-flow season concluded the highest instantaneous suspended sediment and nutrient concentrations were observed during early rain-on-snow events. Although this is a concern for TP loading to Coeur d’Alene Lake, the higher flows and colder temperature are not conducive to aquatic plant growth during the winter and early spring months. However, dissolved Ortho-P:TP during base flow period in tributaries to Coeur d’Alene Lake are above that of reference streams in the region suggesting bioavailable phosphorus may be a concern for beneficial uses for the streams and for loading to the lake. After a very high runoff year, field observations were inconclusive for excess aquatic vegetation growth — except on Blue Creek, where growth was abundant. Future field monitoring will focus on answering this question.

Loading from tributaries to Coeur d'Alene Lake is significant. A loading analysis to calculate total phosphorus load from tributaries to the lake determined nutrient loads were greatest during spring runoff. When combining the loads from all flow periods, the highest annual TP loads were from Mica Creek, Bellgrove Creek, Blue Creek and Carlin Creek. However, this analysis was biased toward watershed size. When prioritizing watersheds for efforts to mitigate phosphorus delivered by tributaries into Coeur d’Alene Lake, the focus should be on watersheds where human activity has resulted in excess pollution. Therefore, an alternative analysis was performed to evaluate TP loading rate, which looks at TP load per square-mile. Results of this analysis determined Bellgrove Creek, Mica Creek, Blue Creek, and Bennett Creek to be high priority waters where efforts of improvement would most likely reduce loads.

A comparison of 2009 TP loads with 1991-1992 TP loads calculated by the USGS, determined the 2009 loads are an order of magnitude higher. This may be explained by the higher TP concentrations and flows observed in 2009, particularly during the high flow events.

TP loading of the tributaries to Coeur d’Alene Lake are very likely affected by seasonal subsurface flows. Many of the tributaries to the lake have a wedge of water-deposited alluvium (delta) at the lowest portions of the watershed. These wedges influence the hydrologic characteristics and cause water to flow subsurface into Coeur d'Alene Lake. Future loading studies should include the use of peizometers for collection of subsurface water quality samples along with modeling using USGS Streamstats, under the assumption of perennial flow to the lake. In addition, the seasonal flow through interstitial spaces may allow chemical reactions such as adsorption/desorption of phosphorus, which would affect TP loading to the lake.

Because flow is subsurface during low-flow conditions on many of the tributaries to the lake, conventional tools for evaluation of beneficial use support may not be appropriate in stream reaches flowing within ancient delta deposits, and other methods for evaluation of beneficial use support should be utilized on these streams. For example, DEQ's Beneficial Use Reconnaissance Program (BURP), the primary method to make beneficial use support status determinations, relies heavily upon biological parameters and monitoring data collected during low-flow conditions in the summer. Because flow is subsurface during low flow conditions on these streams, more often than not the opportunity for collection of data under the BURP program has been missed on these streams. Planning for data collection under this program should include identifying sites upstream of the ancient delta deposits (above 2182') where there is perennial flow.

Another conventional tool for evaluation of beneficial use impairments due to excess nutrients includes developing a numeric interpretation of nutrient narrative criteria. Application of this criterion during base flow conditions coupled with any observations of visible slime growth in the stream helps with understanding any nutrient impairment and provides a basis for setting nutrient targets for loading analyses.

Recently, DEQ has defined a numerical guideline for TP of 9 ug/L in a northern Idaho stream. This was done using reference stream TP data from streams in the Idaho Panhandle region (DEQ, 2007). This guideline is comparable to EPA-suggested Ecoregional Criteria (EPA 2000), nutrient criteria guidelines recommended by Oregon State University (OSU 2007), and Montana Department of Environmental Quality (Suplee et. al. 2008). Numeric nutrient guidelines will likely be proposed by DEQ on other Panhandle streams. However, making an evaluation of nutrient impairment using his approach may not be appropriate on tributaries to Coeur d'Alene Lake where base flow can go subsurface. Total phosphorus must be evaluated from a water quality sample taken during base flow conditions. Water quality samples during this project were taken at higher flows than base flow conditions as defined by the USGS StreamStats model. Future monitoring efforts to capture TP at base flow may be worth while on the unnamed tributary to Bennett Bay, Gotham Creek, Neachen Creek, and the unnamed tributary to Powderhorn Bay where TP concentrations were above 50 ug/L during low-flow conditions.

Water quality monitoring for sediment is a challenge at high flows. Results from duplicate samples taken in response to rain on snow events were outside data quality objectives. During such high flow events, more sand-sized sediment is suspended in the water column. A study by the US Geological Survey showed relatively large variance in TSS for 3 sets of quality control samples high in sand. The same study showed analysis of two quality control data sets for suspended sediment concentration (SCC) were within variance outlined in their National Sediment Laboratory Quality Assurance Program. They conclude "The method for determining TSS, which was originally designed for analyses of wastewater samples, is shown to be fundamentally unreliable for the analysis of natural-water samples. In contrast, the method for determining SSC produces relatively reliable results for samples of natural water, regardless of the amount or percentage of sand-size material in the samples” (USGS 2000). Should funds allow, future water quality monitoring at high flows should include SCC instead of TSS.

With enough data, turbidity/TSS regression curves are a good tool to predict TSS in a stream using just a turbidity meter. Although more data needs to be collected to have relative confidence in such a correlation, initial results show high correlation on a number of the tributaries to Coeur d’Alene Lake. However, given the data quality problems discussed above, this correlation should be generated at lower flows on these streams.

Although phosphorus-bound sediment is a concern for Coeur d’Alene Lake, further evaluations need to be conducted to evaluate beneficial use impairment due to sedimentation on the tributaries to Coeur d’Alene Lake. It is likely Bellgrove Creek did exceed turbidity standards during rain-on-snow events. Turner Creek may have exceeded the standard as well. The City of Coeur d’Alene storm drain that discharges to Fernan Creek was a significant source of sediment to Fernan Creek, causing it to exceed turbidity standards during a February rain-on-snow event. The City of Coeur d’Alene has just been approved by the EPA for an MS4 storm water permit with the EPA which will regulate discharges from their storm drain system. Under this permit, the city will be required to monitor and manage discharge from storm drains to comply with the permit.

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APPENDIX A

Data Sampling Date	Inst. Flow (cfs)	Turbidity NTU	TP (mg/L)	Dissolved OrthoP (mg/L)	TSS (mg/L)	TN (mg/L)	TP load (lbs/ day)	Dissolved OrthoP (lbs/ day)	TSS (tons/ day)	TN load (lbs/ day)
Beauty Creek										
2/24/2009	3.52	4.5	0.019	0.009	5.6 [b]	0.128	0.36	0.17	0.05[b]	2.43
3/3/2009	63.78	13.0	0.063	0.010	25.8	0.107	21.67	3.44	4.12	36.81
4/9/2009	74.84	6.1	0.024	0.010	2.5	0.050	9.69	4.04	0.47	20.18
4/20/2009	59.68	2.9	0.017	0.009	2.50	0.050	5.47	2.90	0.37	16.09
5/11/2009	21.80	1.9	0.029	0.009	2.50	0.050	3.41	1.06	0.14	5.88
Bellgrove Creek										
8/7/2009	0.10	--	0.153	0.053	2.5	1.660	0.08	0.03	0.00	0.90
2/24/2009	19.16	167.0	0.605	0.130	306.0 [b]	1.410	62.52	13.43	14.69 [b]	145.72
3/4/2009	33.75	39.9	0.243	0.079	78.0	--	44.24	14.38	6.60	129.79
4/9/2009	33.75	37.0	0.141	0.028	53.6	0.216	25.67	5.10	4.53	39.32
4/13/2009	34.6	36.6	0.152	0.029	61.80	0.223	28.38	5.42	5.36	41.64
6/4/2009	0.41	49.3	0.084	0.046	2.50	0.237	0.19	0.10	0.00	0.52
Blue Creek										
1/9/2009	36.72	18.2	0.079	--	2.5	--	15.65	--	--	--
2/25/2009	54.57	21.5	0.078	0.024	--	0.443	22.96	7.06	--	130.39
3/3/2009	130.97	44.1	0.134	0.031	36.4	0.431	94.66	21.90	11.95	304.47
4/9/2009	50.17	13.4	0.055	0.016	8.6	0.186	14.88	4.33	1.08	50.33
4/20/2009	17.67	7.1	0.030	0.013	2.50	0.153	2.86	1.24	0.11	14.58
5/4/2009	3.84	5.7	0.033	0.014	2.50	0.172	0.68	0.29	0.02	3.56

[b]Data outside data quality objectives

Sampling Date	Inst. Flow (cfs)	Turbidity NTU	TP (mg/L)	Diss. OrthoP (mg/L)	TSS (mg/L)	TN (mg/L)	TP load (lbs/ day)	Diss. OrthoP (lbs/ day)	TSS (tons/ day)	TN load (lbs/ day)
Carlin Creek										
2/24/2009	34.2	39.3	0.127	0.02	60.60 [b]	0.382	23.43	3.32	5.19 [b]	70.47
3/3/2009	116.1	35.2	0.104	0.02	51.60	0.395	65.12	13.77	15.01	247.31
3/13/2009	93.0	14.5	0.044	0.01	18.60	0.143	22.07	4.01	4.33	71.72
4/20/2009	44.59	7.8	0.023	0.007	6.60	0.126	5.53	1.68	0.74	30.30
6/4/2009	3.43	49.3	0.023	0.010	2.50	0.110	0.43	0.19	0.02	2.04
Fernan Creek										
7/3/08	0.34	--	0.034	0.012	2.5	0.454	0.06	0.02	--	0.83
2/25/09	16.56	79.2	0.232	0.030	--	0.717	20.72	2.68	--	64.04
3/4/09	69.15	11.1	0.047	0.013	10.8	--	17.53	4.85	1.87	146.21
4/13/09	88.44	6.9	0.033	0.003	5.60	0.195	15.74	1.43	1.24	93.02
4/22/09	77.31	5.2	0.024	0.002	5.80	0.157	10.01	0.83	1.12	65.47
5/11/09	34.19	7.8	0.043	0.004	7.60	0.182	7.93	0.74	0.65	33.56
French Gulch										
2/25/2009	8.42	33.8	0.130	--	--	--	5.90	--	--	--
3/3/2009	20.58	25.0	0.102	--	8.40	--	11.32	--	0.43	--
4/13/09	9.13	14.7	0.069	--	11.20	--	15.74	--	0.26	--
Gotham Creek										
2/24/2009	0.60	27.2	0.114	0.052	10.2 [b]	0.308	0.37	0.17	0.02 [b]	1.00
3/3/2009	6.33	59.0	0.250	0.070	48.8	0.320	8.54	2.39	0.77	10.93
3/24/2009	5.05	57.8	0.205	0.067	37.8	0.240	5.58	1.82	0.48	6.54
4/9/2009	3.00	19.9	0.106	0.052	12.6	0.186	1.72	0.84	0.09	3.01
4/16/2006	1.47	14.2	0.084	0.047	--	0.194	0.67	0.37	--	1.54

[b]Data outside data quality objectives

Sampling Date	Inst. Flow (cfs)	Turbidity NTU	TP (mg/L)	Diss. OrthoP (mg/L)	TSS (mg/L)	TN (mg/L)	TP load (lbs/ day)	Diss. OrthoP (lbs/ day)	TSS (tons/ day)	TN load (lbs/ day)
Mica Creek										
8/7/2008	3.59	--	0.041	0.014	2.5	0.160	0.39	0.15	0.01	1.72
2/24/2009	105.7	29.7	0.147	0.032	68.60	0.454	83.79 [b]	18.24	18.17 [b]	258.79
3/3/2009	220.2	27.4	0.131	0.030	31.80	0.369	155.58	35.63	17.55	438.22
3/13/2009	233.0	24.1	0.110	0.019	39.80	0.257	138.25	23.88	23.24	323.01
4/22/2009	136.32	12.7	0.058	0.013	19.80	0.162	42.65	9.56	6.76	119.11
5/11/2009	42.06	6.5	0.033	0.010	8.80	0.124	7.49	2.27	0.93	28.13
Neachen Creek										
2/24/2009	12.97	34.0	0.110	0.024	2.5 [b]	0.437	7.70	1.68	0.08	30.57
3/3/2009	41.29	58.8	0.145	0.039	50.0	0.422	32.29	8.69	5.17	93.98
4/9/2009	20.35	15.6	0.067	0.024	7.6	0.217	7.35	2.63	0.39	23.82
4/16/2009	13.59	11.5	0.050	0.022	--	0.177	3.67	1.61	--	12.97
5/27/2009	0.93	--	0.071	0.019	2.50	0.161	0.36	0.10	0.01	0.81
Stinson Creek										
2/24/2009	29.57	37.7	0.145	0.045	44.2 [b]	0.510	23.13	7.18	3.28 [b]	81.34
3/4/2009	41.61	23.4	0.103	0.042	21.0	--	23.12	9.43	2.19	80.12
3/24/2009	36.71	20.7	0.086	0.041	17.4	0.287	17.03	8.12	1.60	56.83
4/9/2009	39.02	16.7	0.089	0.039	14.2	0.239	18.73	8.21	1.39	50.30
5/4/2009	1.83	7.1	0.047	0.026	2.50	0.171	0.46	0.26	0.01	1.69

[b]Data outside data quality objectives

Sampling Date	Inst. Flow (cfs)	Turbidity NTU	TP (mg/L)	Diss. OrthoP (mg/L)	TSS (mg/L)	TN (mg/L)	TP load (lbs/ day)	Diss. OrthoP (lbs/ day)	TSS (tons/ day)	TN load (lbs/ day)
Turner Creek										
8/5/2008	0.50	--	0.04	0.03	2.50	0.05	0.10	0.07	0.00	0.13
2/24/2009	11.63	32.5	0.097	0.025	20.4 [b]	0.322	6.08	1.57	0.59 [b]	20.20
3/3/2009	54.56	75.7	0.139	0.037	52.6	0.321	40.91	10.89	7.19	94.46
4/9/2009	32.13	16.5	0.065	0.021	9.8	0.169	11.26	3.64	0.79	29.29
4/16/2009	23.42	11.2	0.043	0.018	--	0.135	5.43	2.27	--	17.05
4/20/2009	18.96	9.6	0.036	0.015	7.00	0.130	3.68	1.53	0.33	0.00
6/4/2009	1.39	49.3	0.031	0.017	2.50	0.050	0.23	0.13	0.01	0.37
Unnamed Creek to Bennett Bay										
2/25/2009	12.72	39.2	0.161	0.061	--	0.896	11.05	4.19	--	61.47
3/3/2009	32.30	0.8	0.248	0.071	72.0	0.871	43.21	12.37	5.83	151.74
4/9/2009	6.73	17.2	0.084	0.038	7.0	0.382	3.05	1.38	0.12	13.87
4/16/2009	3.04	12.4	0.067	0.034	--	0.375	1.10	0.56	--	6.15
5/4/2009	0.38	7.1	0.050	0.032	2.50	0.237	0.10	0.07	0.00	0.49
Unnamed Creek to Powderhorn Bay										
2/24/2009	11.75	32.0	0.114	0.042	15.8 [b]	0.349	7.22	2.66	0.47 [b]	22.12
3/3/2009	42.63	54.4	0.174	0.054	45.0	0.513	40.01	12.42	4.81	117.96
3/24/2009	18.23	24.2	0.094	0.049	5.5	0.282	9.24	4.82	0.25	27.73
4/9/2009	15.70	18.7	0.081	0.043	6.0	0.242	6.86	3.64	0.24	20.49
4/16/2009	6.21	15.2	0.079	0.048	--	0.217	2.65	1.61	--	7.27
5/4/2009	0.36	16.2	0.083	0.050	2.50	0.167	0.16	0.10	0.00	0.32

[b]Data outside data quality objectives

Sampling Date	Inst. Flow (cfs)	Turbidity NTU	TP (mg/L)	Diss. OrthoP (mg/L)	TSS (mg/L)	TN (mg/L)	TP load (lbs/ day)	Diss. OrthoP (lbs/ day)	TSS (tons/ day)	TN load (lbs/ day)
Wolf Lodge Creek										
5/6/2008	708.23	--	--	--	36.4	--	--	--	--	--
2/25/2009	96.12	9.2	0.035	0.010	--	0.222	18.15	5.18	--	115.10
3/3/2009	316.45	24.0	0.069	0.014	16.0	0.261	117.77	23.90	12.69	445.49
4/13/2009	486.1	13.2	0.060	0.008	28.20	0.100	157.30	20.97	34.35	262.17
4/22/2009	765.55	30.3	0.110	0.010	71.00	0.100	454.21	41.29	136.22	412.92
5/11/2009	188.32	2.9	0.030	0.007	5.20	0.106	30.47	7.11	2.45	107.67
9/14/2009	5.03	--	0.011	0.007	--	0.143	0.31	0.18	--	3.88

[b]Data outside data quality objectives

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Appendix D. Thompson Creek Watershed Assessment

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Thompson Creek Watershed Assessment
Coeur d'Alene Lake Subbasin
(Hydrologic Unit Code 17010303)

Tyson Clyne, Kristin Keith
Idaho Department of Environmental Quality,
Coeur d'Alene Regional Office
February 25, 2010

Introduction

Thompson Creek (assessment unit ID17010303PN025_02) has been identified as not fully supporting beneficial uses as a result of excess sediment and is included in Category 5 of Idaho's 2008 Integrated Report (DEQ 2009). The status of Thompson Creek has been carried forward from previous §303(d) reports. This watershed assessment includes an interpretation of existing monitoring data, a field visit, and a GIS modeling exercise to validate beneficial use status of Thompson Creek from the effects of excess sediment. Thompson Creek has been determined to be fully supporting beneficial uses, and sediment should be removed from Idaho's 2010 Integrated Report as a pollutant cause.

Monitoring Data

Prior to a watershed assessment visit on October 26, 2009, the only water quality monitoring on Thompson Creek was a Beneficial Use Reconnaissance Program (BURP) assessment conducted in 1996 by the Idaho Department of Environmental Quality (DEQ). In 2001, the Idaho Department of Lands (IDL) completed a cumulative watershed effects (CWE) assessment for the Thompson Creek watershed (Saunders and Zahoor 2001). The BURP survey, CWE assessment, and field visit are discussed below.

Beneficial Use Reconnaissance Program

The BURP procedure relies heavily upon biological parameters, and monitoring data are used to make beneficial use support status determinations. DEQ completed a BURP survey within the Thompson Creek watershed in 1996 (site number 1996SCDAB037). The survey was located approximately 1.5 miles upstream from Thompson Creek's confluence with Thompson Lake and upstream of Thompson Creek's only major tributary. At the BURP site, Thompson Creek is a 1st-order stream and drains a 1,900-acre watershed.

During the survey, the stream discharge was measured to be 0.01 cubic feet per second—flow considered to be intermittent and suboptimal for aquatic life uses (IDAPA 58.01.02.070.06). In addition, the macroinvertebrates were collected using a modified Hess sampler, which is part of DEQ's protocol but is not an appropriate method for macroinvertebrate sampling at such low flows.

Substrate was measured during the survey using the modified Wolman pebble count method at 3 riffle cross sections. In granitic watersheds, fine sediment (<6.35 millimeters) in excess of 20–25% of total substrate has been shown to reduce embryo survival and fry emergence by 50% (Bjornn and Reiser 1991). A minimum of 50 particles were measured at each of the riffles within the survey reach. Fine particles (<6.35 millimeters) measured at the BURP location made up about 26% of the total distribution. This percentage may be at the upper end of the threshold where fine particles could negatively affect salmonid spawning and emergence, but numbers for belt geology are not available. According to May (2009), salmonid spawning is an appropriate beneficial use for Thompson Creek.

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During the CWE assessment, sedimentation from mass failures and surface erosion were inventoried, and both were determined to be low. The surface erosion and mass failure hazard ratings are based on soil characteristics, geologic material type, and percent slope. This rating reflects the low relief and low surface erosion characteristics of the underlying geology; 95% of the watershed (1,900 acres) exhibits a slope of 0–30%, resulting in a low surface erosion hazard rating.

The channel stability index (CSI) was calculated for the watershed based on some bank sloughing, reduced vegetation bank protection, lack of organic debris, channel bottom movement, and channel bottom rock shape/roundness—all contributing to a moderate rating. An average CSI score of 45 is in the middle of the moderate rating category.

Timber harvest is occurring or has occurred in the majority of the watershed. The CWE hydrologic risk assessment was completed within the watershed. The assessment determined the watershed to be at a high risk of adverse impacts to stream channel stability from the potential increase in magnitude and frequency of peak-flow events. A canopy removal index rating of 0.73 was determined by dividing the total acres of canopy removed by the total acreage of the watershed.

Sediment delivery to streams from roads, skid trails, and mass failures was evaluated by IDL during the CWE process. The Thompson Creek watershed contained approximately 20 miles of roads, all of which were within forestry land use areas. Approximately 3 miles of road were evaluated during the assessment, and an emphasis was made to evaluate those roads close to streams, which have a high potential to impact water quality. The average CWE road score was calculated to be 38. This score is in the low range, and the individual road segments evaluated all rated low to moderate.

Logging activities within the watershed most commonly use ground-based skidding because of the topography. Logging activities must comply with the Idaho Forest Practices Act (FPA), which restricts the use of ground-based skidding in the stream protection zone. Historic logging, which did not need to meet the requirements of the FPA, created skid trails within this protection zone, but field visits by IDL have shown that these old trails have been substantially revegetated and can no longer be utilized for timber harvest. New skid trails are outside the protection zone, resulting in very little sediment delivery. The overall skid-trail rating score was 2, which is a baseline score. No mass failures were observed during the assessment, resulting in a score of 9, also a baseline score.

The total sediment delivery rating for the watershed was 49.3. Scores less than 66 are classified as a low total sediment delivery score; 66–105 are classified as moderate; and scores greater than

105 indicate a high total sediment delivery potential. A score of 49.3 is well below the "low" rating cut-off.

Using BURP data collected by DEQ in 1996 and the resulting determination of impairment by sediment, the CWE report recommended a management direction of additional analysis based on the low sediment delivery rating. One management problem was identified during the evaluation which was associated with a poor road surface.

Field Visit—October 26, 2009

On October 26, 2009, Kristin Keith and Tyson Clyne of DEQ's Coeur d'Alene Regional Office visited Thompson Creek to evaluate whether sediment is impairing beneficial uses. The portions of the stream that were evaluated were those most likely to be impaired due to riparian vegetation removal or other land use activities. Most portions of the stream were fenced to exclude cattle and restrict public access. Cattle had limited access to the stream, and there was neither overgrazing nor bank trampling. Riparian vegetation was at or near full potential in 80–90% of the area observed. Where woody vegetation was lacking, grasses, sedges, and forbs dominated. DEQ did not observe any areas of streambank lacking vegetative cover and resulting in exposed soil. The current conditions demonstrate a low bank erosion hazard index and near-bank stress index (Rosgen 2006) (Figure 1). No large depositional features were noted and the substrate was not imbedded. These condition ratings support findings that sedimentation within the watershed is not impairing beneficial uses.

Figure 1. Thompson Creek streambanks and riparian vegetation.

GIS Analysis

GIS analysis was used to compare the sedimentation rate of the Thompson Creek watershed with that of Carlin Creek, which is a reference watershed for full support.

Land use types within the Thompson Creek watershed include roads, forest harvest, agriculture, grazing, and rural development. Roads within the watershed are unpaved gravel roads with culvert crossings. A vegetated buffer does exist adjacent to most of the roads, protecting the stream from road runoff, but there are places where the road's proximity does have a potential of contributing sediment to the stream. Road stream crossings pose a risk of being an additional sediment source by reducing or eliminating the vegetated buffer. If the crossings, in this case, culverts in the Thompson Creek watershed, are improperly sized, streambank scour can occur above and below the crossing.

Timber harvest practices can result in surface erosion and, if in close proximity to the stream, can contribute sediment. This scenario can be eliminated if the infiltration rate is great enough, if a vegetated buffer is left along the stream, and if work in the riparian area is limited. The FPA, if properly implemented, should reduce the risk of sedimentation from timber harvest.

Similar to timber harvest, agricultural practices can export sediment to nearby streams. Overland erosion caused by alteration of the landscape can reduce infiltration rates, expose soil, and result in a net increase in sediment export. Grazing can also increase sediment export if not properly controlled. Grazing near and on streambanks can greatly reduce streambank vegetation, resulting in increased bank erosion. Plant roots act as a binding agent to hold streambanks together. When the plant is removed, the roots die and the streambank becomes susceptible to erosion.

Four different land use types—roads, timber harvest, agriculture, and grazing—were assessed using GIS software to determine their extent in the watershed (Table 1). Once the acreage was determined, a sediment yield coefficient was applied to the respective land use then multiplied by the total acres of each land use to determine the current sediment load. The sediment yield coefficients were determined using other process-based modeling techniques (Table 2).

Table 1. Land use area within the Thompson Creek and Carlin Creek watersheds.

Watershed	Natural Background	Timber Harvest		Roads		Agriculture/ grazing
		Moderate Harvest	High Harvest	Within 200 ft of Stream	Outside 200 ft of Stream	
Carlin Creek Watershed (acres)	2542	2837	859	14	162	43
Thompson Creek Watershed (acres)	775	771	213	8	31	96
Carlin Creek Watershed (%)	39.0	43.9	13.3	0.2	2.5	0.7
Thompson Creek Watershed (%)	41.0	41.0	11.0	0.4	1.7	5.1

Table 2. Sediment yield coefficient origins.

Land use Type	Sediment Yield Coefficient (tons/acre/year)	Sediment Yield Coefficient Origin
Background	0.023	WATSED[a]
Timber Harvest	0.07	WATSED, Kootenai TMDL, and Fish Creek TMDL
Road	4	CWE Report and McGreer equation[b]
Agriculture and Grazing	0.04	RUSLE2[c]

[a] WATSED is software for modeling hydrologic and sediment responses.
[b] The CWE road score of 38 was translated into a forest road sediment yield based on a known relationship between a CWE road score and sediment yield per mile of road (McGreer 1997).
[c] RUSLE2 – Revised Universal Soil Loss Equation, Version 2

Due to the similar characteristics of the Thompson Creek and Carlin Creek watersheds, a paired watershed approach was utilized to compare sediment loading between the two watersheds. Comparing sediment load from the Thompson Creek watershed to a watershed that fully supports its beneficial uses helps in evaluating the potential sediment risk posed by the land use activities in the Thompson Creek watershed. Current and background sediment loads for both Carlin and Thompson Creeks were calculated using the same methods.

The natural background sediment load was determined by multiplying the entire watershed acres by the background sediment yield coefficient. The background sediment yield coefficient assumes the entire watershed was forested before settlement. The current sediment yield was calculated by multiplying the total acres of each land use by the sediment yield coefficient for the landuse (Table 3). Roads within the 200-foot stream corridor were allocated 100% of the sediment yield coefficient. It was assumed that all sediment from roads within the 200-foot corridor was delivered to the stream system. This is a conservative estimate of actual delivery. Roads outside the 200-foot stream corridor were allocated 10% of the sediment yield coefficient. Finally, the current percentage above background sediment load was calculated to determine an expected range (Table 4).

Table 3. Sediment load estimates in pounds per acre per year by land use in the Thompson Creek and Carlin Creek watersheds.

		Timber Harvest		Roads		
	Natural Background	Moderate Harvest	High Harvest	Within 200 ft of Stream	Outside 200 ft of Stream	Agriculture
Carlin Creek	58	199	180	58	68	2
Thompson Creek	18	54	45	32	13	4

Table 4. Sediment loading comparison of the Thompson Creek and Carlin Creek watersheds.

Watershed	Natural Background Load (tons/year)	Current Load (tons/year)	Percent Above Background
Carlin Creek	148	565	281
Thompson Creek	44	166	277

This type of sediment modeling provides a relative rather than an exact sediment estimate. Because sediment was estimated in both watersheds using the same sediment yield coefficients and satellite imagery to classify land use types, the results are comparable.

Conclusions

Thompson Creek (assessment unit ID17010303PN025_02) has been identified as not fully supporting beneficial uses, with sediment as a cause, and is included in Category 5 of Idaho's 2008 Integrated Report. Substantial evidence has been provided that is the basis for the full support status of Thompson Creek, which included an evaluation of existing monitoring data from Thompson Creek, a site visit, and a GIS modeling exercise that compared sediment loading from the Thompson Creek watershed with loading in the Carlin Creek watershed, a neighboring watershed that currently supports its beneficial uses. Land use practices, geology, soil, and vegetation types are similar between Carlin and Thompson Creeks.

Findings derived from this watershed assessment on Thompson Creek are as follows:

- A comparison of substrate size distribution measured during BURP surveys of Thompson and Carlin Creeks suggests closeness in relative abundance of substrate size between the two watersheds.
- A 2001 IDL CWE survey gave a total sediment delivery rating for the watershed of 49.3, which is well below the "low" rating cut-off.
- A DEQ field visit in October 2009 concluded there was no excessive bank erosion, embeddedness, or channel incision due to grazing or other land use impacts. Stream crossings appeared to be properly sized, causing no excess bank erosion above or below crossings. The riparian zone was at or near full potential.
- A GIS modeling exercise demonstrated that sediment loads from the Thompson Creek and Carlin Creek watersheds were approximately the same.

In summary, monitoring, field observations, and GIS modeling show sediment is not in excess in Thompson Creek, and it is reasonable to assume full support of cold aquatic life therein. As a result, the DEQ Coeur d'Alene Regional Office has proposed to delist Thompson Creek (assessment unit ID17010303PN025_02) from Category 5 and place it in Category 2 of Idaho's 2010 Integrated Report.

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