Coeur d'Alene Lake Subbasin Assessment Update
2011 Addendum and Update

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Coeur d'Alene Lake and River TMDL
Subbasin Assessment Update

April 2011

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EXECUTIVE SUMMARY

This document presents an update of the subbasin assessment conducted as part of the five-year review of the *Coeur d'Alene Lake and River Subbasin Assessment and Proposed Total Maximum Daily Load*. The data collected as part of this subbasin assessment update was used to evaluate make recommendations for beneficial use support status in Idaho's 2010 Integrated Report. 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 was written to support of the Coeur d'Alene Lake Management Plan (DEQ & Coeur d'Alene Tribe 2009).

Table A. Recommended beneficial use support status and actions for streams.

Stream	Assessment Unit Number	303(d) listing 2008 IR	Recommend 303(d) listing 2010 IR	Action
Bellgrove Creek	ID17010303PN005_02	E. Coli	Sediment	Write sediment TMDL
Cedar Creek	ID17010303PN030_02	Sediment Temperature	Sediment Temperature	No action needed until more implementation occurs
Coeur d'Alene River	ID17010303PN007_06 ID17010303PN016_06	Temperature Sediment	Temperature Sediment	Wait for ROD under OU3, then place in Section 4b of IR
Cougar Creek	ID17010303PN002_02	Habitat Alt. Sediment Temperature	Habitat Alt. Sediment Temperature	No action needed until more implementation occurs
Fourth of July Creek	ID17010303PN020_03	Habitat Alt. Sediment	Habitat Alt.	Remove sediment from 2010 303(d) list
Kid Creek	ID17010303PN003_02	Habitat Alt. Sediment	Habitat Alt. Sediment	Priority for BURP. Further sediment transport evaluation needed
Latour Creek	ID17010303PN015_02	Sediment Temperature	Sediment Temperature	No action needed until more implementation occurs
Marie Creek	ID17010303PN029_03	Habitat Alt. Sediment Temperature	Habitat Alt. Sediment Temperature	No action needed. More time needed following implementation activities
Mica Creek	ID17010303PN004_02 ID17010303PN004_03	Habitat Alt. Sediment E. Coli	Habitat Alt. Sediment E. Coli	No action needed. More time needed following implementation activities
Thompson Creek	ID17010303PN025_02	Sediment	None	Move to Section 2 of Integrated Report – fully supporting beneficial uses.
Willow Creek	ID17010303PN011_02	Sediment	None	Move to Section 2 of Integrated Report – fully supporting beneficial uses.
Upper Wolf Lodge Creek	ID17010303PN029_02	Sediment Temperature	Sediment Temperature	No action needed. More time needed following implementation activities
Lower Wolf Lodge Creek	ID17010303PN029_03	Habitat Alt. Sediment Temperature	Habitat Alt. Sediment Temperature	No action needed until more implementation occurs

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. 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 is intended to meet the intent and purpose of Idaho Statue 39-3611(7). The report provides consideration of the most current and applicable information in conformance with Idaho Statute 39-3607, which includes an evaluation of the current watershed conditions, an evaluation of the implementation activities that have taken place in the subbasin, and consultation with the Watershed Advisory Group (WAG). An evaluation of the recommendations presented is provided.

Coeur d'Alene Lake

This document does not directly address the water quality and beneficial use support of Coeur d'Alene Lake, which is a separate effort by the State of 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. 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.

About Assessment Units

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. This modification included identifying stream segments by Assessment Units (AUs) instead of non-uniform stream segments, and defining the use support of stream AUs by five categories, published as Sections, in the Integrated Report.

Assessment units (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 WBAG II (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. Because AUs are an extension of water body identification numbers, there is now a direct tie to the WQS for each AU, so that beneficial uses defined in the WQS are clearly tied to streams on the landscape.

To facilitate comparisons between the 1998 §303 (d) list and the 2002 Section 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.state.id.us/water/data_reports/surface_water/monitoring/2002.cfm#2002final. The boundaries from the 1998 §303(d)-listed segments have been transferred to the new AU framework using an approach quite similar to how DEQ has been writing SBAs and TMDLs. All AUs contained in any listed segment were carried forward to the 2002 §303(d) listings in Section 5 of the integrated report (DEQ, 2005). Any AU not wholly contained within a previously listed segment, but partially contained (even minimally), was also included on the §303(d) list. This was necessary to maintain the integrity of the 1998 §303(d) list and continuity with the TMDL program. The Coeur d’Alene Lake Tributaries subbasin waterbodies listed on the 2002 §303 (d) list are included in this report, but the review is focused on the draft 2010 status lists.

When assessing new data that indicate full support, only the AU that the monitoring data represents will be removed (de-listed) from the §303(d) list (Section 5 of the integrated report).

Subbasin at a Glance

The following is a summary of a few 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 SBA/TMDL (1999).

The Coeur d'Alene Lake Subbasin (in hydrologic unit code [HUC] 17010303) drains 650.5 square miles, which includes the Coeur d'Alene Lake, the Coeur d'Alene River, and the waters which drain directly to the river and the lake (Figure 1). The Coeur d'Alene Lake Subbasin is located in Benewah, Bonner, Kootenai and Shoshone counties of northern Idaho. It lies within the Northern Rocky Mountain physiographic region to the west of the Bitterroot Mountains.

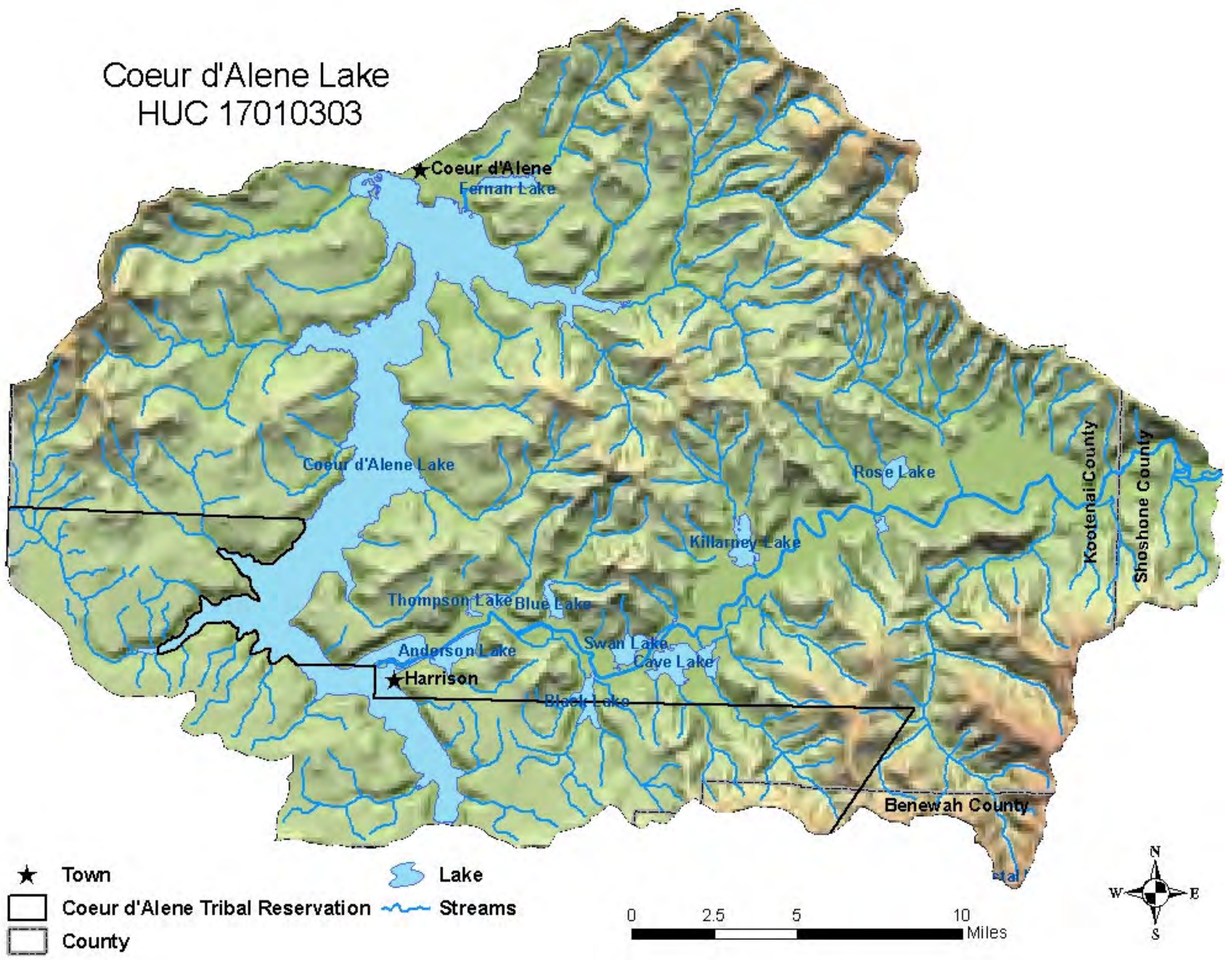


Figure 1. Extent of Coeur d'Alene Lake Watershed (HUC 17010303)

The tributary contributing the largest flow to Coeur d'Alene Lake is the St. Joe River. The Coeur d'Alene River is the second largest tributary contributing flow to Coeur d'Alene Lake. It flows from the confluence of the North and South Forks of the Coeur d'Alene River near Enaville, Idaho westward to its mouth at Lake Coeur d'Alene near Harrison, Idaho. The river's tributaries flow from the Coeur d'Alene Mountains on the north and by 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.

The Coeur d'Alene River flows through a generally broad floodplain ranging from ¼ to 1 ¾ miles in width. 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 relative low elevation of these watersheds causes earlier maximum discharge than from 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 control of surface elevation of Coeur d'Alene Lake at Post Falls Dam. 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 Post Falls Dam.

Most of the watershed 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, it 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 watershed between the 2128 and 2182 feet elevations (Figure 2). These wedges influence the hydrologic characteristics, and they result in subsurface flow into Coeur d'Alene Lake during the summer months. The length of the wedge varies in length. Perennial flow exists upstream of the deltaic sediments on most tributaries to the lake.

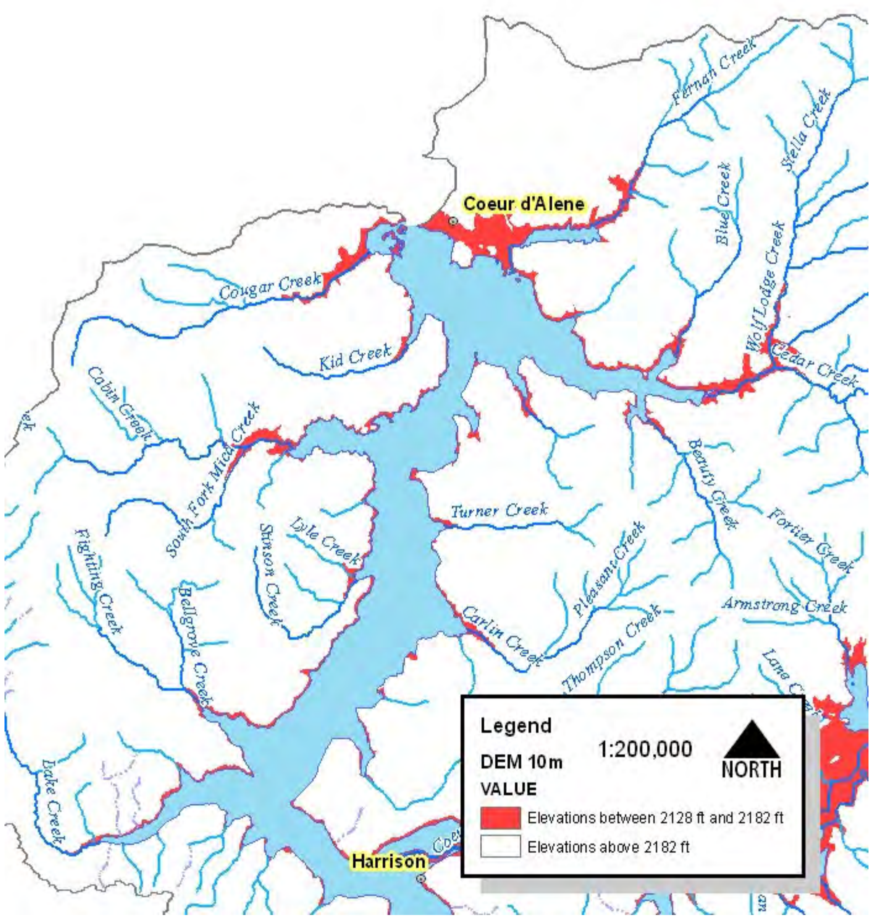


Figure 2. Map of deltaic sediment deposits around Coeur d'Alene Lake.

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)). 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 (US Fish and Wildlife Service 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 Subbasin, has resulted in extensive deposits of metals (lead, cadmium, zinc)-contaminated sediments along the bed, banks, and floodplain of the North and South Forks of the Coeur d'Alene River, the Coeur d'Alene River, the eleven lateral lakes, numerous wetlands located along the lower Coeur d'Alene River, the lakebed of Lake Coeur d'Alene, 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 impacted negatively. 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 (National Research Council 2005).

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 opportunity of Coeur d'Alene Lake and the surrounding area has resulted in a steady population increase since the 1990's. Growth in Kootenai County has averaged 3.0 percent — a 2.8 percent increase from 2006-2007. The U.S. Census Bureau ranked Kootenai County the 69th-fastest growing metropolitan area in the country from July 1, 2004 – July 1 2005 (US Census Bureau 2006).

Changes to Subbasin Characteristics

Since 2000, the Coeur d'Alene Lake watershed has experienced significant changes – primarily as a result of residential development (Table 1). Growth in Kootenai County has averaged 3.0 percent — a 2.8 percent increase from 2006-2007. The U.S. Census Bureau ranked Kotenai County the 69th-fastest growing metropolitan area in the country from July 1, 2004-July 1, 2005 (U.S. Census Bureau 2006).

Table 1. Kootenai County demographic information

Population	1990	2000	% Increase 1990-2000	2006/2007	% Increase 2000-2006/2007
Coeur d'Alene	24,561	34,527	40.5	[1]41,328	19.0
Kootenai County	69,795	108,685	55.7	[2]134,442	23.7
State of Idaho	1,006,749	1,293,953	28.5	[2]1,499,402	15.9

[1]2006 Census Bureau data [2] 2007 Census Bureau data

Much of this development along the tributaries to Lake Coeur d'Alene is in the form of 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 sub-watershed. As a result, the streams are confined in places and routed through culverts.

Beneficial Use Status

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*, second edition (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". Designated uses are specifically listed for water bodies in Idaho in tables in the Idaho water quality standards (see IDAPA 58.01.02.003.27 and .02.109-.02.160 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 the "presumed uses," DEQ will apply the numeric cold water aquatic life criteria and primary or secondary contact recreation criteria to undesignated waters

Beneficial Uses

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 sections 110 through 160 are also listed separately in Table 3. Beneficial use support status for all the waterbodies in the Coeur d'Alene Lake watershed are listed in Appendix A and illustrated in Figure 3. Major subwatersheds are illustrated in Figure 4.

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 which 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, those used for swimming, water skiing, or skin diving.
Secondary Contact Recreation	Water quality appropriate for recreational uses on or about the water and which are not included in the primary contact category. These activities may include fishing, boating, wading, infrequent swimming, and other activities where ingestion of raw water is not likely to occur.
Domestic Water Supply	Water quality appropriate for drinking water supplies. Public drinking water is treated before it enters the tap. A separate set standards governs public drinking water.
Special Resource Water	Those specific segments or bodies of water which are recognized as needing intensive protection to: preserve outstanding or unique characteristics; or to maintain current beneficial use.

Table 3: Waters in the Coeur d'Alene Lake Subbasin with designated beneficial uses in Idaho water quality standards (IDAPA 58.01.02, Sections 110 through 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	ID17010303PN028_03 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, SS = salmonid spawning, PCR = primary contact recreation, DWS = domestic

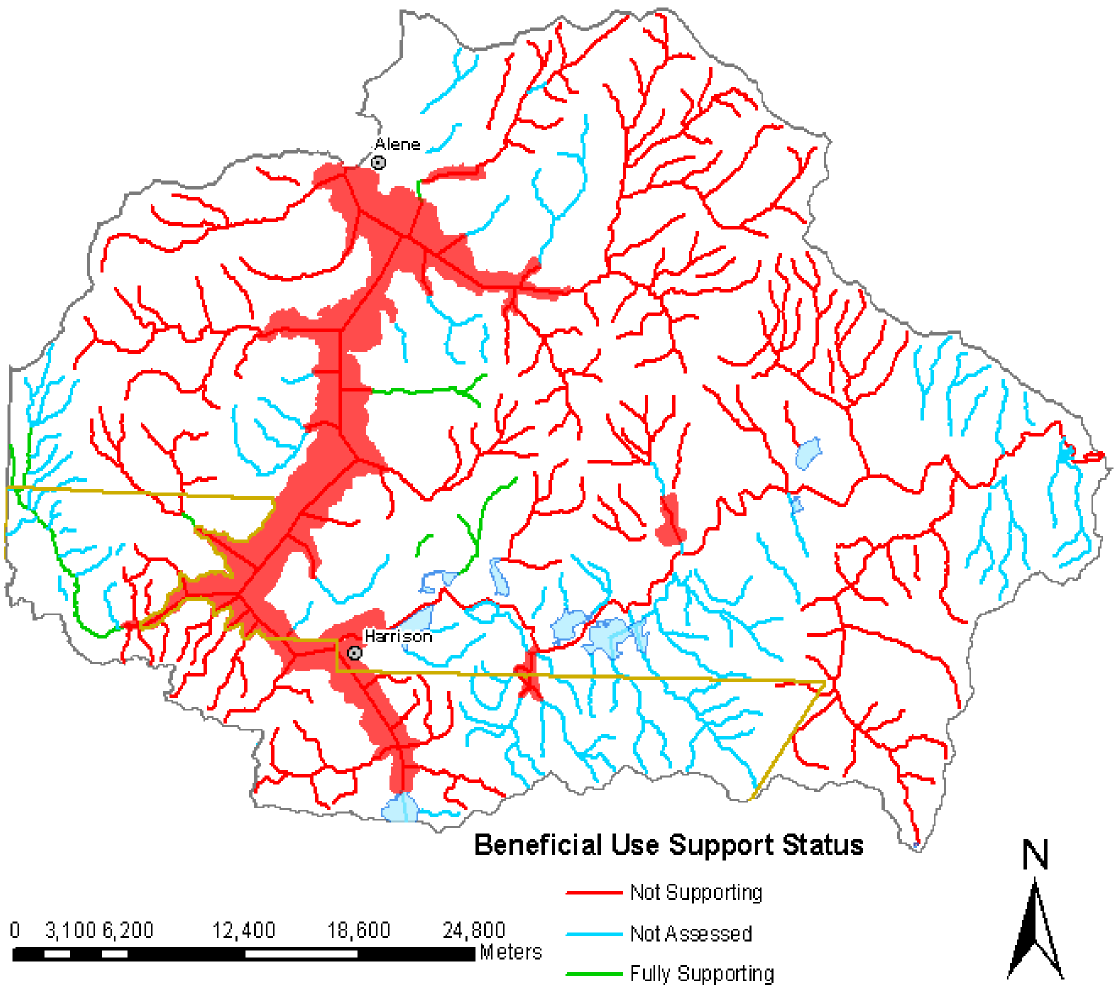


Figure 3: Coeur d'Alene Lake Tributary HUC Beneficial Use Support Status

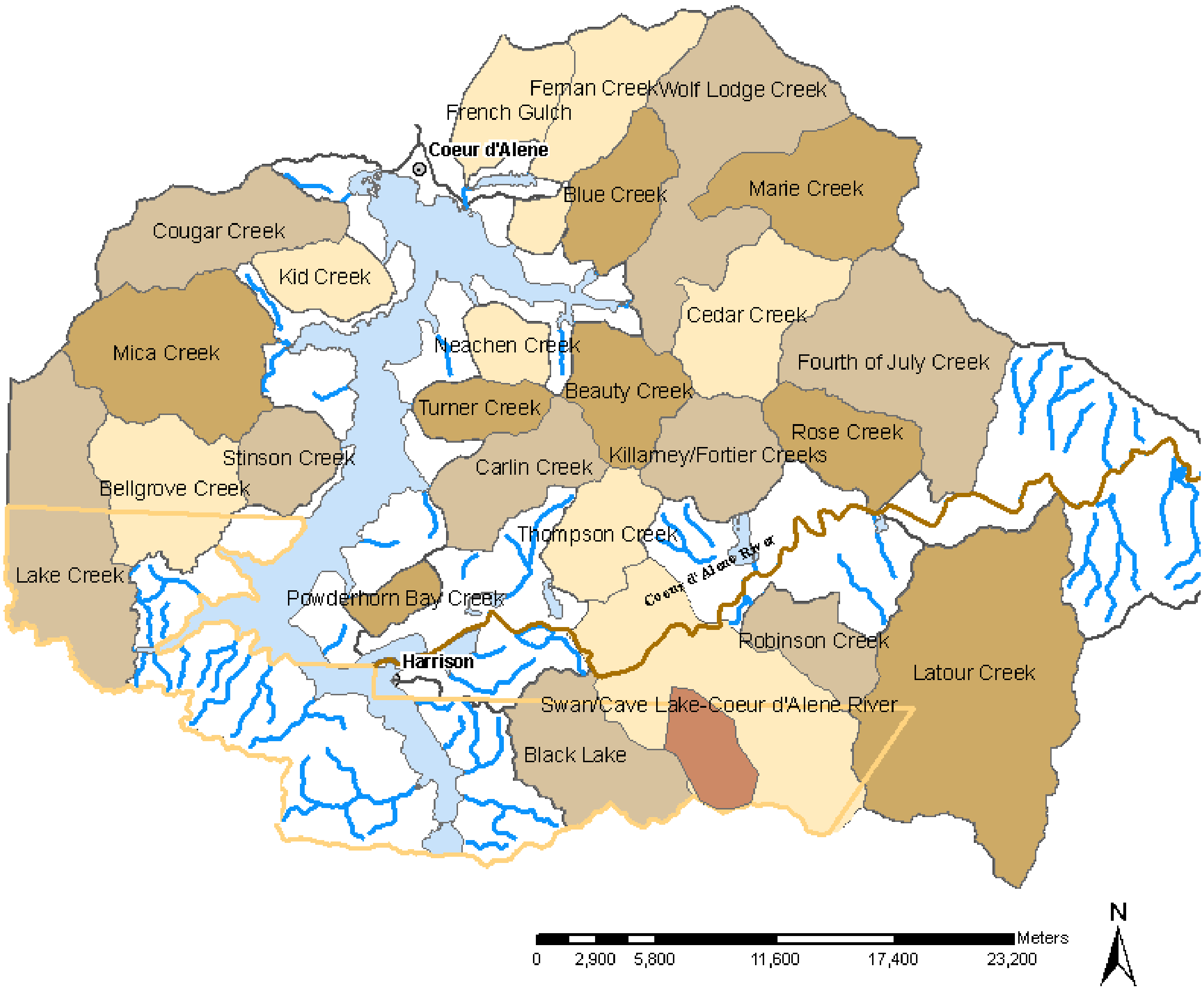


Figure 4 Major subwatersheds in the Coeur d’Alene Lake watershed.

Summary and Analysis of Monitoring Data

DEQ Beneficial Use Reconnaissance Program

The DEQ Beneficial Use Reconnaissance Program (BURP) combines biological monitoring and habitat assessment data to determine the quality of Idaho's waters. The purpose of BURP is for use in determining the existing uses and beneficial use support status of Idaho's water bodies. The program has been implemented statewide since 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 watershed. As discussed earlier, many of the tributaries to the Coeur d'Alene Lake have a wedge of deltaic sediments at the lowest portions of the watershed. These wedges influence the hydrologic characteristics, and they allow water to flow subsurface into Coeur d'Alene Lake during the summer months. As such, summer monitoring crews have missed opportunities to collect BURP data from a number of streams in this watershed. Since 2000, 12 BURP surveys have been completed within the Coeur d'Alene Lake and River watershed, of which 7 streams were determined to be fully supporting beneficial uses (Table 4). An average BURP score of 2 and above is indicative of conditions in the stream that are fully supporting beneficial uses. At 10 other sites, collection of data was attempted, but they were unsuccessful due to subsurface flow or other complications.

Idaho Department of Lands Cumulative Watershed Effects Assessment

The Cumulative Watershed Effects assessment (CWE) was conducted on a number of streams within the Coeur d'Alene Lake HUC in 1999 by personnel from Idaho Department of Lands and in 2009 by Terra Graphics. The CWE process evaluates the extent to which forest practices impacts 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, and scores for creeks within the Coeur d'Alene Lake HUC are presented in Table 5:

- erosion and mass failure hazards,
- canopy closure/stream temperature,
- channel stability,
- hydrologic risks,
- sediment delivery,
- nutrients, and
- beneficial uses/fine sediment.

Surface erosion and mass failure hazard ratings are based on soil characteristics, geologic material type, and percent slope. The Channel stability index is based on two assessments of the stream: 1) the stream bank assessment and 2) the channel bottom assessment. The stream bank assessment evaluates the amount of bank sloughing, the percent of vegetative cover, percent of bank rock content, and the prevalence of bank cutting. When the Forest Canopy Removal Index is graphed against the Channel Stability Index, a Hydrologic Risk Assessment can be determined. The Hydrologic Risk Assessment determines the risk of adverse impacts to stream channel stability from the potential increase in magnitude and frequency of peak flow events in response to forest canopy removal. The total sediment delivery rating is the sum of the sediment delivery scores for roads, skid trails, and mass failures for the watershed. For more information on the CWE process, see individual CWE reports. Need to summarize Scores

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

Stream	Assessment Unit Number	BURP ID	Date	SMI	SMI Score	SFI	SFI Score	SHI	SHI Score	[1]Ave Score
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	7/15/2008	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 BURP data was collected, stream was dry						
Turner Creek	ID17010303PN027_02	2006SCDAA044	08/15/2006	No BURP data was 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 BURP data was collected, stream was dry						
Fernan Creek	ID17010303PN034_3	2005SCDAA010	07/14/2005	38.7	1	77.0	2	56.0	2	1.7

Fisheries Data

Fisheries data are important because limitations to fish populations resulting from water quality pollution is handled in TMDLs. DEQ consulted with local fisheries biologist regarding the species of fishes known to occupy the Coeur d'Alene Lake Subbasin. A list of native and non-native species is provided in Table 5 (draft, verify with Kajsa when it is final).

Table 5. Native fishes of the Coeur d'Alene Lake watershed.

Native Species	
Common Name	**Scientific Name**
Bull trout	*Salvelinus confluentus*
Largescale sucker	*Catostomus macrocheilus*
Longnose dace	*Rhinichthys cataractae*
Mottled sculpin	*Cottus bairdi*
Mountain whitefish	*Prosopium williamsoni*
Northern pikeminnow	*Ptychocheilus oregonensis*
Redside shiner	*Richardsonius balteatus*
Shorthead sculpin	*Cottus confusus*
Torrent sculpin	*Cottus rhotheus*
Westslope cutthroat trout	*Oncorhynchus clarki*
Non-native 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)

A recent cutthroat trout (*Oncorhynchus clarki lewisii*) telemetry study by Idaho Department of Fish and Game was conducted in the Coeur d'Alene River (upstream from the Cataldo Mission boat ramp) and the North Fork Coeur d'Alene River watersheds to determine why densities of westslope cutthroat trout equal to, or greater than 300 mm had not increased at set snorkel transects in the Coeur d'Alene watershed in the past 30 years. Results suggested non-compliance with the fishing regulations, degraded or loss of habitat and cold water refugia, degraded or loss of over-winter habitat and degraded summer rearing habitat all suppress cutthroat trout equal to, or greater than 300 mm in length (Dupont, et. al. 2004).

Migration of westslope cutthroat trout from upstream the Cataldo Mission boat ramp downstream into the Coeur d'Alene River and its tributaries was not observed in this study, and it is believed to be an avoidance response to the elevated heavy metals concentrations that currently occur in the mainstem Coeur d'Alene River. Biologists suggest that continued work to reduce heavy metal concentrations should increase 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. It was also believed that cutthroat trout avoided the inundated reach of the Coeur d'Alene River, which is a result of water level management at Post Falls Dam. It was thought that this shallow reach has conditions cutthroat trout tend to avoid — a high amount of fine-sediment imbedded substrate, little cover, and sloughing stream banks (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 watershed tended to stay in one subbasin for the entire summer, fall, and winter seasons. This same study emphasized the importance of cold water refugia during summer months when water temperatures go 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).

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 come up with a status update for westslope cutthroat trout, which expands a database originally developed in 2002 (May, 2009). Experts considered current distribution, conservation populations, and historical range of the species. Leadership for this effort in Idaho and management of the Idaho portion of the database is with the Idaho Department of Fish and Game. Results indicated westslope cutthroat trout are currently present in most of the streams within the Coeur d'Alene Lake subbasin; however, habitat quality for cold water salmonids is fair to poor in the majority of the watershed (Figure 5). Habitat quality was based on professional judgment using visual surveys. Streams that do not appear in Figure X are not known to be occupied by westslope cutthroat trout.

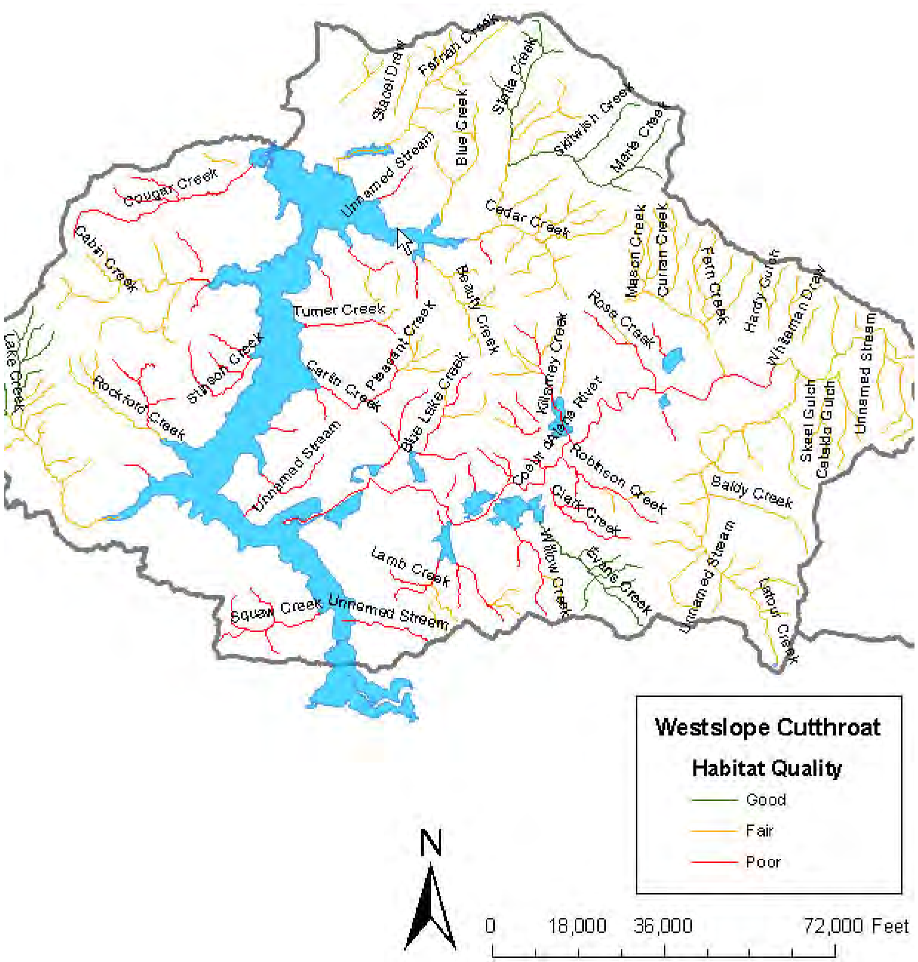


Figure 5. Habitat quality for westslope cutthroat trout (May 2009).

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

Stream Erosion Surveys and Monitoring Summaries

Cougar Creek

In 2000, the Kootenai-Shoshone Soil and Water Conservation District conducted a stream erosion survey along 998 feet of Cougar Creek (ID17010303PN02_02) just upstream from Highway 95. The survey found the study reach, for the most part, densely foliated, 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).

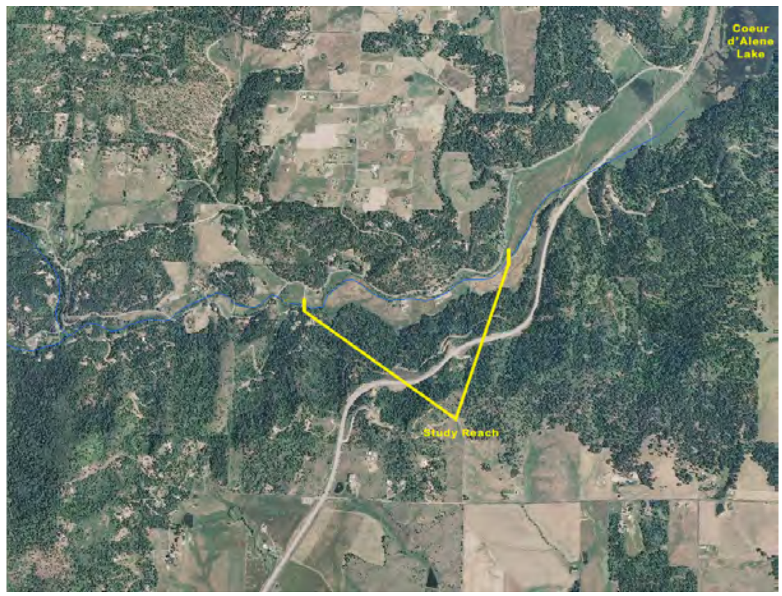


Figure 6 Site of 2000 and 2009 erosion survey.

In 2009, DEQ and the Idaho Soil Conservation Commission conducted a visual stream survey of Cougar Creek, in an effort to evaluate changes in erosion characteristics of the stream since the 2000 survey (Figure 6). Sites which had significant erosion in 2000 were relocated by GPS.

Overall, sites that showed significant bank erosion in 2000 appeared to be in the process of recovering as a result of lack of livestock pressure on the streambanks. Streambanks that were vertical had side slopes of 40 percent or less with grassy/shrub cover over greater than 70 percent of the bank (Figure 7). In some places, the channel was beginning to meander — although the road and hay field put constraints on this process. There was, however, significant erosion occurring upstream of the 2000 survey reach . One source was found at a site just upstream of the survey reach, where a culvert was failing and there was significant bank erosion downstream of the culvert (Figures 8 & 9). Above this site, Cougar Creek is channelized alongside numerous ranchettes along Cougar Creek. As a result, the channel is deeply incised in this reach and there were frequent, bare-vertical banks (Figure 9). 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 7. Incised channel recovery in Cougar Creek.

Figure 8. Failing culvert on Cougar Creek (left) with downstream channel instability (right)

Figure 9. 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 Assessment Unit 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 its proximity to a major four-lane highway, to be densely foliated with good stream bank stability, no channel embeddedness, and lots of habitat complexity. There were very few areas of 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 mid-stream depositional features were present after a very high flow event in January 2011; however, they were not at an elevation within the channel that would redirect flow towards the banks 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 Kootenai-Shoshone Soil and Water Conservation District conducted a stream erosion survey along the entire channel of Kid Creek (ID17010303PN03_02). The analysis started from the Worley Highway District office and ended at the mouth. Results of the survey indicated much of the study reaches were in good condition with abundant riparian vegetation. In areas where there were erosion problems, adjacent land uses had much influence on the stream (Smith 2002). In 2009, DEQ and the Idaho Soil 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 results of the visual stream survey were: 1) there were numerous culverts along the creek which posed a challenge to fish passage; 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 stream bank stability, no excess fine sediment in the channel bed, and good access to the floodplain (Figures 10 - 12). As seen in 2000, however, there were still isolated areas of erosion concerns. For example, in the headwaters, where there was no canopy cover and the stream was over-widened — suggesting this creek underwent lateral recession since 2000 (Figure 10). 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 10). 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 over-widened, and the banks were trampled. In addition to localized erosion problems, there was one large culvert near the mouth of the stream had failed, and the stream flow was under the culvert (Figure 11).


Figure 10. 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 11. Failed culvert near the mouth of Kid Creek (left) and incised channel near the mouth of Kid Creek (right)   Figure 12. Over-widened channel at the headwaters of Kid Creek (below).

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 be 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). This reach of creek was a transition reach between Rosgen *B* and *C* channels. The total length of the streambanks surveyed was 785 feet of stream. Of this study reach, 141 feet, or 18 percent, 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 Bank Erosion Hazard Index (BEHI) rated *High* in two reaches and *Very High* on one reach. Nearbank Stress rated *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/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 ft/yr or 217 ft^3/yr (10 tons/year).

On the same study reach, a Pfankuch channel stability assessment was done. 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 bedload, which frequently manifested as instream depositional features above bankfull elevation. These features cause a high shear stress resulting in erosion and undercutting of stream bank and large woody debris accumulation into the channel. The erosion/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 and 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. Going downstream to the mouth, it became more and more evident that Latour Creek did not have enough stream energy to competently move this excessive bedload material downstream. As a result, it was apparent the percent stream bank instability also increased above the 18 percent observed in the study reach.

Thompson Creek

In October 2009, DEQ Coeur d'Alene Regional Office visited Thompson Creek (ID17010303PN25_02) to evaluate whether sediment is impairing beneficial uses. Portions of the stream that were evaluated were those most likely to be impaired due to removal of riparian vegetation or impacted by other land use activities. Most portions of the stream were fenced to exclude cattle access and to restrict public access. It was observed that cattle had limited access to the stream, and there was neither over-grazing nor bank trampling. Riparian vegetation was at or near full potential in 80-90 percent of the area observed. Where woody vegetation was lacking, grasses, sedges and forbs dominated. Areas of stream bank lacking vegetative cover resulting in exposed soil were not observed. The current conditions demonstrated a low bank erosion hazard index and near bank stress index (Rosgen, 2006) (Figure 13). 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 13 Thompson Creek stream banks and riparian vegetation.

Willow Creek

Field visits in 2009 show no land use practice contributing sediment to stream. The pasture was in fallow, and there was approx 180 feet between road and stream channel.

Figure 14. Willow Creek in July 2009.

Wolf Lodge Creek

The upper Wolf Lodge Creek assessment unit (ID17010303PN29_02) starts at the headwaters in U.S. Forest Service property and ends at private property about ½-mile downstream from the National Forest System property. This assessment unit 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 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. However, local areas with excessively high bedload in the stream channels were a concern throughout the watershed. For example, in Stella Creek, the channel had excessively high bedload, 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 bank erosion hazard index (BEHI) and undercutting of stream bank and large woody debris accumulation into the channel. The erosion/large woody debris accumulation into the channel can exacerbate the channel instability as pools behind the debris fill and the channel migration occurs. On both streams, there was evidence of remnant channels. On lower Stella Creek toward the USFS boundary, there was higher incidence of excessive bedload 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 baseflow conditions.

Other concerns on Stella Creek were an estimated 1,400 feet of stream channel that was diked along Stella Creek without a permit (Figure 15). Comparisons of areal 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 stream flow and sediment transfer regime of the creek, which will likely increase sediment loading to Wolf Lodge Creek downstream, particularly during high flow events.

Figure 15: A 2008 photograph of Stella Creek showing significant channel modification.

In 2008, DEQ conducted a survey of lower Wolf Lodge Creek (ID7010303PN29_03), which included field observations and bank erosion evaluations using looking at the bank erosion hazard index (BEHI) and near bank stress (NBS) characteristics as identified by Rosgen (2006). The lower Wolf Lodge Creek assessment unit starts on private property below the confluence with Stella Creek about ½ mile downstream from the U.S. Forest Service property. The assessment unit ends just upstream of the Wolf Lodge Creek campground, and it does not include any tributaries to Wolf Lodge Creek. Results indicated localized areas where the channel is relatively unstable, with moderate/high BEHI and moderate NBS causing 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 bedload 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 (Figures 16 - 17). This process was very evident following the 2008 runoff season, where bankpin studies and field observations showed significant amount of depositional features along lower Wolf Lodge Creek and loss of 3 feet or more of streambank in places. As the creek enters an alluvial fan further down the watershed, it has a stable, braided channel morphology. Riparian vegetation is abundant, and stream bank stability is good.

Figure 16: Large point bar on lower Wolf Lodge Creek deposited during the 2008 runoff season – result of excessive bedload in the stream (left). Depositional zone just above a bridge in lower Wolf Lodge Creek. This site is partially dredged every year (right).

Figure 17 Instream depositional bars on lower Wolf Lodge Creek. Such features are symptomatic of excessive bedload (left). Bank erosion on lower Wolf Lodge Creek, where bank erosion studies showed a loss of 3 feet of streambank during the 2008 runoff season (right).

Marie Creek

Marie Creek (ID17010303PN31_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 stream banks were well vegetated and stable (Figure 18). However, instream depositional features above bankfull elevation were present, albeit at less frequency than that observed in Stella Creek. Associated with these features were lateral erosion and undercutting of stream bank and large woody debris accumulation into the channel. No excessive fine sediment was observed.

Figure 18. Marie Creek September 2008. Instream depositional features in Marie Creek (right)

Nutrient and Suspended Sediment Monitoring

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. Results of this monitoring project are in the *Coeur d'Alene Lake Tributaries 2008-2009 Nutrient and Sediment Monitoring Final Report* (Appendix D). The results 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 (Figure 19).

Figure 19. Excess visible slime growth on Blue Creek. Photos taken June 23, 2009

Temperature Monitoring

The U.S. Forest Service, Idaho Panhandle National Forests, Coeur d'Alene River Ranger District collected stream temperature data on streams in the Coeur d'Alene Lake Subbasin from 1999 to 2008. Temperature data were collected from 60 sites on 15 assessment units and 27 streams (Figure 20, Appendix B). These data were supplied to DEQ and analyzed for compliance with Idaho water quality temperature standards. Data were analyzed for compliance with Idaho water quality criteria for cold water aquatic life and salmonid spawning (WQS 250.02.b and 250.02f). Temperature data from all of the assessment units exceeded Idaho water quality standards. Data from five assessment units exceeded the criteria for cold water aquatic life; all assessment units exceeded criteria for salmonid spawning. The exceedances were not infrequent, brief and small, and the air temperature exemptions did not affect their compliance status. Results of this analysis are provided in Appendix B.

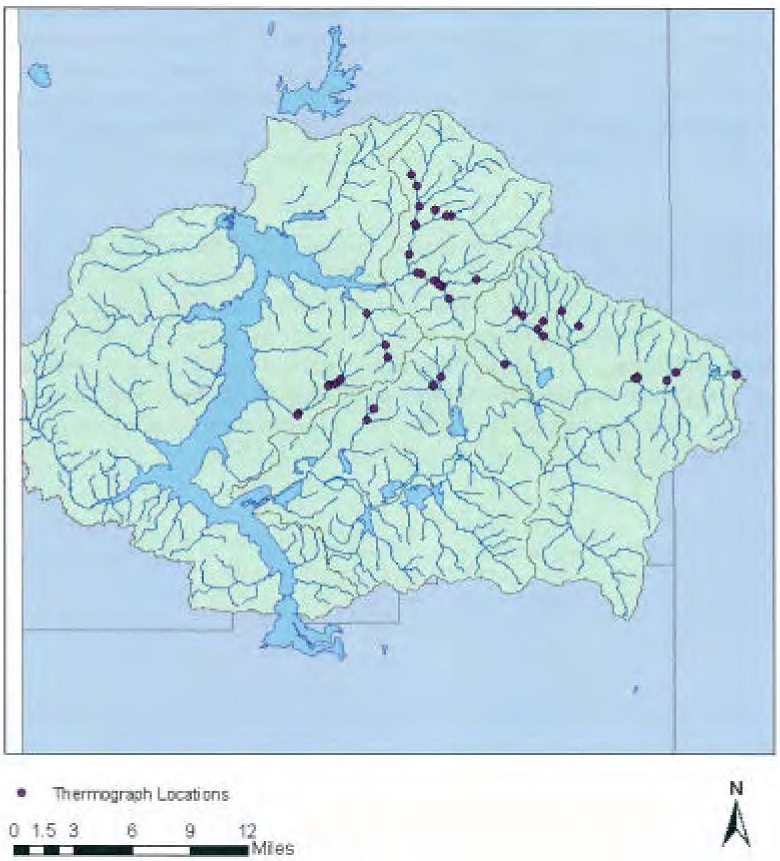


Figure 20. U.S. Forest Service temperature data collection sites in the Coeur d'Alene Lake watershed, 1999-2009

U.S. Forest Service Environmental Assessment

Wolf Lodge Creek

In October 2002, a site investigation by Tetra Tech was conducted as part of the Horizon Moon Environmental Assessment to evaluate stream conditions in upper Wolf Lodge Creek which included its major tributary, Stella Creek. Stream cross section and profile surveys and stream channel characterization were performed on Stella Creek approximately 200 feet upstream of the Stella Creek and Wolf Lodge Creek confluence. This monitoring site was established in 1978 by the USFS. Longitudinal/gradient surveys were performed along the length of a 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 stream flow and sediment transport, conclusions drawn by the survey 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 reaches were established by Tetra Tech 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 Stella Creeks were fair. Bank erosion potential was low/moderate for the upper Stella and Wolf Lodge Creek sites, but high for lower Stella Creek. In their rating, both channels were classified as C3 channels using the Rosgen Classification method. Due to the slope of the channels, they are more likely B4 channels — in this case, the Pfankuch stability rating for the two channels was poor.

As part of the Blue Alder Environmental Assessment, the USFS conducted further studies within the upper Wolf Lodge Creek watershed. It was determined that the average monthly peak flows in Wolf Lodge Creek increased from 3 percent between the early 1980s and the early 2000s to 7 percent following the Horizon Sun harvest activity in 2000 and 2001 (Blue Alder EA 2008). It was determined that stream hydrogeologic processes are responding slowly to harvest activity in the 1980sas 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 1) fish density was relatively low, with a lower number of native than non-native trout; 2) the pool-to-riffle ratio was moderate; and 3) abundant woody debris with scour pools significant for fish. Wolf Lodge Creek survey data indicated the following: 1) fish density was relatively high, with a lower number of native trout; 2) pool-to-riffle ratio was good; 3) channel stability at cross-sections was in good condition; and 4) single and aggregate LWD 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. It was determined that the average monthly peak flows in Wolf Lodge Creek increased from 6 percent between the early 1980s and the early 2000s to 8 percent following the Horizon Sun harvest activity in 2000 and 2001 (Blue Alder EA 2008). It was 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 1) fish density was relatively low, with equal number of native and non-native trout; 2) the pool-to-riffle ratio was moderate; and 3) abundant woody debris with scour pools significant for fish. Wolf Lodge Creek survey data indicated the following: 1) fish density was relatively high, with a lower number of native trout; 2) pool-to-riffle ratio was good; 3) channel stability at cross-sections was in good condition; and 4) abundant woody debris with scour pools significant for fish.

The same Environmental Assessment determined stable stream bed, stream banks and large wood in Lonesome Creek, a small tributary to Stella Creek.

Marie Creek

In October 2002, a site investigation by Tetra Tech was conducted as part of the Horizon Moon Environmental Assessment to evaluate stream conditions in Marie Creek. 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 a 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 stream flow and sediment transport, conclusions drawn by the survey 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 May 2008 Blue Alder Environmental Assessment, the USFS conducted studies within the Marie Creek watershed (Blue Alder EA 2008). It was determined that the average monthly peak flows were 6 percent 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 only three percent over baseline, as vegetation continues to recover from past activity. Stream surveys in 2006 indicated the following: 1) fish density was relatively low, with a lower number of native than non-native trout; 2) channel stability at cross-sections was in good condition; 3) pool-to-riffle ratio was good; and 4) single and aggregate LWD class was well distributed in length and diameter.

In 1991 the USFS installed a sediment pond in lower Marie Creek. Eleven years of monitoring starting from 1996 indicates 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.

Surveys of Skitwish Creek, a larger tributary to Marie Creek determined the bed and banks are stable, large wood is stable, and there is good vegetative bank cover. Some undercutting of banks was present, but they determined little active bank erosion was evident.

Cedar Creek

The Cedar Creek (ID17010303PN030_02 and ID17010303PN030_03) assessment unit includes tributaries to Cedar Creek such as the South Fork Cedar Creek, Chinese Gulch, and Alder Creek. As part of the May 2008 Blue Alder Environmental Assessment, the USFS conducted studies within the Cedar Creek watershed (Blue Alder EA 2008). Due to the presence of I90 on much of the middle reaches of this creak, the stream is severely constricted, with minimal meander bends, reduced pools, and reduced large wood. This, combined with high road densities within the headwaters of Cedar Creek, and lower upslope canopy density has impacted the hydrologic regime of Cedar Creek. It was determined that the average monthly peak flows were ten percent above baseline from 1980s to the mid 1990s. This increase was attributed to past harvest activity. Currently, average monthly peak flows are down to only eight percent over baseline, as vegetation continues to recover from past activity. Near the mouth of the stream, channel aggradation and large amounts of sand were observed.

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

Stream surveys in 2006 indicated the following: 1) fish density was relatively high, comprised of native trout. The high densities may be due to population concentration due to limited habitat 2) channel stability at cross-sections was in good condition; 3) pool-to-riffle ratio was good; but sections of the stream were dry, which limited habitat; and 4) single and aggregate LWD class was small in length and diameter.

E. coli Monitoring

Bellgrove Creek

In June, 2005 water quality samples were taken from Bellgrove Creek downstream from the Elk production facility just east of I95 and tested for *Escherichia coli* (*E. coli*). *E.Coli* counts exceeded Idaho's Water Quality Standard for primary contact of 406 *E.coli* organisms per 100 ml. Four samples were taken no more than a week apart over thirty days to calculate a geometric mean of 5204 *E.coli* organisms per 100 ml, which exceeded Idaho's Water Quality Standard for a geometric mean of 126 *E.coli* organisms per 100 ml. In May, 2007 water quality samples were taken above and below the elk production facility, and Idaho's Water Quality Standard for a geometric mean of 126 *E.coli* organisms per 100 ml was exceeded at both locations downstream of the elk production facility (Table 6).

Road De-icing Agent Monitoring

The Idaho Transportation Department began using sodium chloride to improve vehicle traction on north Idaho roadways in 2003. The use of sodium chloride in 2003 was limited, but since 2003 has grown to include all five north Idaho counties. The wide-spread use of road salt is attributed to the department's attempts to provide the safest, least expensive, and most effective means of improving vehicle traction in the winter.

Cedar and Fourth of July Creeks are failing to support cold water aquatic life beneficial use and are included on Idaho's 2002 Integrated Report and draft 2008 Integrated Report. 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. Monitoring of deicing agents was conducted to help address complaints from the public concerned about possible aquatic impacts caused by road salt, and to evaluate whether additional pollutants are impairing beneficial uses. Monitoring was conducted 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, water samples were also collected and specific conductance measured in Fern Creek. The Fern Creek sampling location is upstream of I-90 and is not impacted by runoff from I-90.

Based on the monitoring results described in this report, it was 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. 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 (*Appendix C).

Table 6. E. Coli enumeration results on Bellgrove Creek, 2005 & 2007

*Location	Date	CFU	Date	CFU	Date	CFU	Date	CFU	Date	CFU	Date	CFU	Geomean
Downstream elk facility	6/15/2005	3100	6/29/2005	13800	7/6/2005	5900	7/12/2005	8400	7/26/2005	1800	--	--	5204
1/3 mile downstream elk facility	--	--	6/29/2005	4200	7/6/2005	320	7/12/2005	390	7/26/2005	1900	--	--	999
Above elk facility (but below 95 bridge)	5/10/2007	40	5/15/2007	19	5/18/2007	54	5/22/2007	88	5/25/2007	120	5/29/2007	61	53
Fighting Creek 0.2 miles below conf. of Bellgrove	5/10/2007	97	5/15/2007	230	5/18/2007	80	5/22/2007	300	5/25/2007	6	5/29/2007	70	80
¾ mile below elk facility	5/10/2007	1600	5/15/2007	400	5/18/2007	250	5/22/2007	930	5/25/2007	450	5/29/2007	450	923
below elk facility	5/10/2007	750	5/15/2007	1900	5/18/2007	880	5/22/2007	2300	5/25/2007	580	5/29/2007	490	1108

Review of Implementation Plan and Activities

The *Coeur d'Alene Lake and River Total Maximum Daily Load Implementation Plan* was developed in 2002 by DEQ and the following state management agency for various land use activities:

- Idaho Department of Lands (IDL), timber harvest activities,
- Idaho Soil Conservation Commission (ISCC), agriculture, and
- Idaho Transportation Department (ITD), roads.

Each agency took the lead in identifying areas of concern for pollutant loading and selecting best management practices (BMPs) to use to reduce the nonpoint source pollution and achieve the pollutant load reductions and targets of the TMDL. It was agreed upon that all agencies would conduct initial field trips to list areas of know problems and produce an annual list of projects in the TMDL watersheds.

Cougar Creek

Specific projects for sediment reduction in Cougar Creek were identified by the lead agencies under the *Coeur d'Alene Lake and River Total Maximum Daily Load Implementation Plan* and they are listed in Table 6. WAG to update 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. Just upstream of the Nature Conservancy property, land use on approximately 75 acres was converted from grazing to just hay production. Eighty eight (88) acres of property at the mouth is now owned by the Nature Conservancy. Consequently, the wetland function to filter sediment (and nutrients) before it reaches Lake Coeur d'Alene has been restored. In addition, natural streambank protection and channel revegetation 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 revegetation. No known implementation activities have been done upstream of these projects.

Kid Creek

Specific projects for sediment reduction in Kid Creek were identified by the lead agencies under the *Coeur d'Alene Lake and River Total Maximum Daily Load Implementation Plan* and they are listed in Table 7. WAG to update The Idaho Soil Conservation Commission and the Kootenai Shoshone Soil and Water Conservation District has done a number of projects on the agricultural ground within the Kid Creek watershed. BMPs installed in these projects included riparian buffers and sediment ponds to stop sediment transport from pastures to the creek and grade structures within the creek

Table 7. Implementation projects identified for Cougar Creek in the *Coeur d'Alene Lake and River Total Maximum Daily Load Implementation Plan*

Agency	Project Description	Percent Complete
IDL	Seed & mulch road fill and cut at stream crossing	
IDL	Seed & mulch road fill and cut on switchback	
IDL	Seed & mulch road cut	
IDL	Investigate 4 culverts and mitigate as needed	
IDL	Armor 3 drainage ditch gullies with rock/seed & mulch	
IDL	Field investigation of 2 road problem combinations	
IDL	Field investigation of 3 general problems	
IDL	Seed & mulch to stabilize 2 cut & fill slope problems	
IDL	Restrict or redirect use of off-road vehicles	
IDL	Re-establish canopy by planting to provide shade	
IDL	Stabilize 2 miles of road with greater than 10% grade	
IDL	Inventory additional road miles	
*KSSWCD	Nutrient management 10 fields	
*KSSWCD	Channel vegetation 5,000 feet	
*KSSWCD	Prescribed grazing 500 acres	
*KSSWCD	Pasture and hayland planting 150 acres	
*KSSWCD	Forest riparian buffer, 10 acres	
*KSSWCD	Fencing – cross fence 2,000 feet	
*KSSWCD	Fencing – riparian use exclusion 60 acres	
*KSSWCD	Heavy use area protection – livestock access 6 each	
*KSSWCD	Tank or trough	
*KSSWCD	Pipeline 2,000 feet	
*KSSWCD	Streambank protection 500 feet	
*KSSWCD	Pond 3 each	
*KSSWCD	Sediment basin 5 each	
*KSSWCD	Channel vegetation 1,000 feet	
*KSSWCD	Forest riparian buffer 10 acre	
*KSSWCD	Streambank protection 1,000 feet	

Table 8. Implementation projects identified for Kid Creek in the *Coeur d'Alene Lake and River Total Maximum Daily Load Implementation Plan*

Agency	Project Description	Percent Complete
IDL	Re-established canopy by planting to provide shade	
IDL	Inventory additional road miles	
KSSWCD	Nutrient management on 8 fields	
KSSWCD	Channel vegetation 500 feet	
KSSWCD	Prescribed grazing 1000 acres	
KSSWCD	Pasture and hayland planting 50 acres	
KSSWCD	Forest riparian buffer 5 acres	
KSSWCD	Fencing – riparian use exclusion or cross 20,000 feet	
KSSWCD	Riparian use exclusion 25 acres	
KSSWCD	Heavy use area protection – livestock access 1 each	
KSSWCD	Tank or trough – 11 each	
KSSWCD	Pipelines 3050 feet	
KSSWCD	Pond 3 each	
KSSWCD	Pump plant for water control	
KSSWCD	Animal trails and walkways	
KSSWCD	Spring development	

Latour Creek

Specific projects for sediment reduction in Latour Creek were identified by the lead agencies under the *Coeur d'Alene Lake and River Total Maximum Daily Load Implementation Plan* and they are listed in Table 8. WAG to update

Table 9. Implementation projects identified for Latour Creek in the *Coeur d'Alene Lake and River Total Maximum Daily Load Implementation Plan*

Agency	Project Description	Percent Complete
IDL	Investigate 4 culvert problems and mitigate as needed	
IDL	Re-establish canopy by planting to provide shade	
IDL	Inventory road miles and mitigate as needed	
KSSWCD	Channel vegetation 1,000 feet	
KSSWCD	Forest riparian buffer 10 acres	
KSSWCD	Streambank protection 1,000 feet	

The Idaho Department of Lands acquired 5.7 miles of road from the U.S. Bureau of Land Management. With funds from Idaho Department of Environmental Quality under section 319 of the Clean Water Act, 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 estimated 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 bridges with a steel bridge over Lost Girl Creek and Butler Creek. Work was also done on the support structures and decking on the Latour Creek Bridge.

- Reconstruction of the 5.7 mile road 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. There was 1 mile of road where there was not adequate rock, and 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, aligning, crowning, and installing rolling dips.

Mica Creek

Specific projects for sediment reduction in Mica Creek were identified by the lead agencies under the *Coeur d'Alene Lake and River Total Maximum Daily Load Implementation Plan* and they are listed in Table 9. WAG to update In 2008, work was done to remove debris and stabilize 560 feet of stream channel and 400 feet of tributary channel on Mica Creek. Where? It was implemented through a partnership between DEQ, KSSWCD, the NRCS and the SCC. In addition, the riparian area was fenced on ____ feet of stream on Mica Creek below Interstate 95. In 2009, the same landowner was awarded a grant under the Clean Water Act 319 program to remove debris and stabilize of 920 feet of eroding stream bank. As part of this grant, BURP monitoring will occur to ________.

Table 10. Implementation projects identified for Mica Creek in the *Coeur d'Alene Lake and River Total Maximum Daily Load Implementation Plan*

Agency	Project Description	Percent Complete
IDL	Investigate 3 culverts and mitigate as needed	
IDL	Seed and mulch / re-direct water flow of 3 washouts	
IDL	Seed and mulch / rock armor 2 ditch/gully problems	
IDL	Field investigation of "perched" landing	
IDL	Field investigation of 2 general problems	
IDL	Inventory road miles and mitigate as needed	
IDL	Re-establish canopy by planting to provide shade	
IDL	Stabilize road through surfacing/drainage/seed and mulch	
IDL	Inventory additional road miles	
KSSWCD	Nutrient management on 8 fields	
KSSWCD	Channel vegetation 500 feet	
KSSWCD	Prescribed grazing 1000 acres	
KSSWCD	Forest riparian buffer 5 acres	
KSSWCD	Pasture and hayland planting 50 acres	
KSSWCD	Fencing – riparian use exclusion or cross 20,000 feet	
KSSWCD	Riparian use exclusion 25 acres	
KSSWCD	Heavy use area protection – livestock access 1 each	
KSSWCD	Tank or trough – 11 each	
KSSWCD	Pump plant for water control – 2 each	
KSSWCD	Pipeline 3050 feet	
KSSWCD	Animal trails and walkways – 3 each	
KSSWCD	Spring development 4 each	
KSSWCD	Pond 3 each	

Wolf Lodge Creek

In the 2002 Coeur d'Alene Lake and River Total Maximum Daily Load Implementation plan, designated management agencies took the lead in identifying areas of concern for pollutant loading and selecting Best Management Practices to use to reduce the nonpoint source pollution to the upper Wolf Lodge Creek watershed. Specific projects for sediment reduction in upper Wolf Lodge Creek were identified by the lead agencies and they are listed in Table 10. The projects were intended for implementation within the entire Wolf Lodge Creek watershed, which includes the all tributaries including Marie Creek and Cedar Creek.

Table 11. Implementation projects identified for Wolf Lodge Creek in the *Coeur d'Alene Lake and River Total Maximum Daily Load Implementation Plan*

Agency	Project Description	Percent Complete
IDL	Field investigation of yarding on steep slopes	IDL to provide
IDL	Field investigation of 2 management problems	IDL to provide
IDL	Seed and mulch to stabilize 1 mass failure	
IDL	Surface/seed and mulch/fix drainage or abandon road	
IDL	Remove 53 stream crossings and upgrade 2 crossings	
IDL	Re-establish canopy by planting to provide shade	
KSSWCD	Nutrient management on 10 fields	
KSSWCD	Channel vegetation 2,500 feet	
KSSWCD	Prescribed grazing 300 acres	
KSSWCD	Forest riparian buffer 10 acres	
KSSWCD	Fencing – cross fence 2,000 feet	
KSSWCD	Fencing – riparian use exclusion 10,000 feet	
KSSWCD	Sediment and erosion control structure 2 each	
KSSWCD	Heavy use area protection – livestock access 3 each	
KSSWCD	Tank or trough – 4 each	
KSSWCD	Pipelines 2000 feet	
KSSWCD	Sediment basin	

The U.S. Forest Service 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 has reduced sediment yield by 14 percent (WATSED model output). Road storage and culvert removal in 2003 in the Wolf Lodge Creek watershed has resulted in a modeled reduction in sediment yield of 8 percent. Road storage and culvert removal in the Marie Creek watershed in 2003 has resulted in a modeled sediment reduction of 8 percent (USFS Blue Alder Environmental Assessment, 2009).

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

Marie Creek

The U.S. Forest Service 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 in the Marie Creek watershed has reduced sediment yield by an estimated 8 percent (USFS Blue Alder Environmental Assessment, 2009).

Cedar Creek

The U.S. Forest Service has done some restoration work in the Cedar Creek watershed, primarily as road restoration work within the South Fork Cedar Creek watershed. As a result of this work, the road density has decreased from 7.3 mile/mile2 to 5.2 mile/mile2. This amounts to an estimated reduction in sediment yield of 25 percent. (USFS Blue Alder Environmental Assessment, 2009).

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 during spring runoff. With the help of section 319 of Clean Water Act funds and with BLM CWWR (spell out) funds, the road was moved, the channel was reconstructed, and the landslide was stabilized. Towards the mouth, the creek was diverted into floodplain property to slow flow and to distribute sediment before it reached Blue Creek.

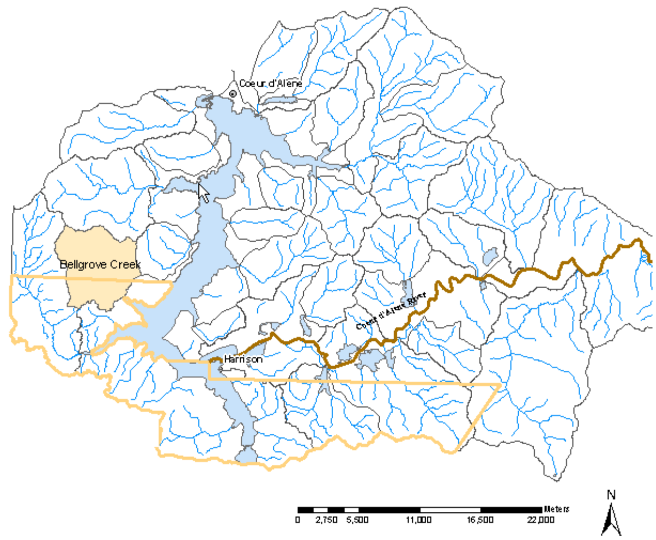
Beneficial Use Support Status Evaluation

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

Table 12. Recommended 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	Recommend 303(d) listing 2010 Integrated Report	Action
Bellgrove Creek	ID17010303PN005_02	E. Coli	Sediment	Write sediment TMDL
Cedar Creek	ID17010303PN030_02	Sediment Temperature	Sediment Temperature	No action needed until more implementation occurs
Coeur d'Alene River	ID17010303PN007_06 ID17010303PN016_06	Temperature Sediment	Temperature Sediment	Wait for ROD under OU3, then place in Section 4b of IR
Cougar Creek	ID17010303PN002_02	Habitat Alt. Sediment Temperature	Habitat Alt. Sediment Temperature	No action needed until more implementation occurs
Fourth of July Creek	ID17010303PN020_03	Habitat Alt. Sediment	Habitat Alt.	Remove sediment from 2010 303(d) list
Kid Creek	ID17010303PN003_02	Habitat Alt. Sediment	Habitat Alt. Sediment	Priority for BURP. Further sediment transport evaluation needed
Latour Creek	ID17010303PN015_02	Sediment Temperature	Sediment Temperature	No action needed until more implementation occurs
Marie Creek	ID17010303PN029_03	Habitat Alt. Sediment Temperature	Habitat Alt. Sediment Temperature	No action needed. More time needed following implementation activities
Mica Creek	ID17010303PN004_02 ID17010303PN004_03	Habitat Alt. Sediment E. Coli	Habitat Alt. Sediment E. Coli	No action needed. More time needed following implementation activities
Thompson Creek	ID17010303PN025_02	Sediment	None	Move to Section 2 of Integrated Report – fully supporting beneficial uses.
Willow Creek	ID17010303PN011_02	Sediment	None	Move to Section 2 of Integrated Report – fully supporting beneficial uses.
Upper Wolf Lodge Creek	ID17010303PN029_02	Sediment Temperature	Sediment Temperature	No action needed. More time needed following implementation activities
Lower Wolf Lodge Creek	ID17010303PN029_03	Habitat Alt. Sediment Temperature	Habitat Alt. Sediment Temperature	No action needed until more implementation occurs

Bellgrove Creek



Bellgrove Creek (ID17010303PN005_02, listed as Fighting Creek in Idaho's 2008 Integrated Report) 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.

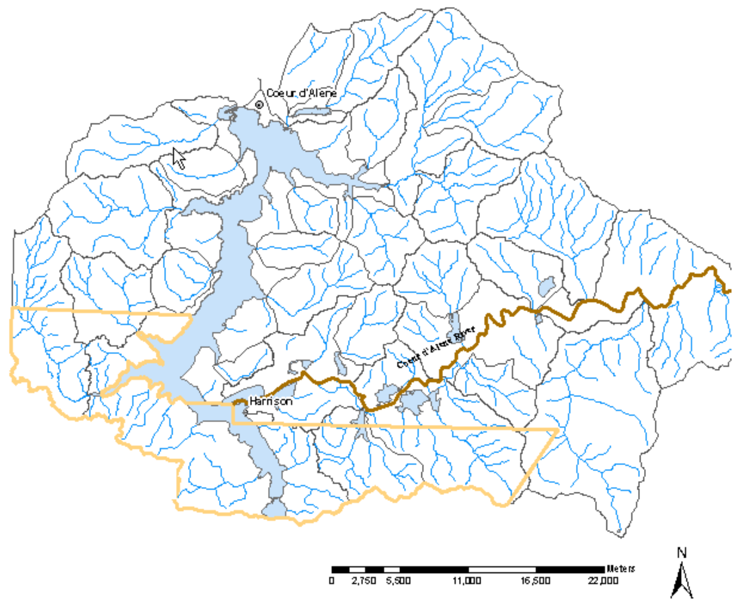
Bellgrove creek is currently listed on Idaho's 2008 Integrated Report as impaired for *E. coli* due to violations of Water Quality Standards in 2005 and 2007. Data indicates a confined elk feeding operation is the primary source of the high *E. coli*.

In 2008, Bellgrove Creek was assessed for beneficial use support using the BURP protocol, and results from the process concluded 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 6.35mm) were 36.4 percent of the total distribution. This percentage is above the 24 percent threshold shown in granitic watersheds to reduce embryo survival and fry emergence by percent (Bjornn and Reiser 1991). However, stream bank stability was observed to be 89-93 percent 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 in 2009 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, and during a rain-on-snow event, nutrient and suspended solids concentrations were an order of magnitude above concentrations observed in other creeks (Appendix D). In addition, exceedances of Idaho's turbidity Water Quality Standard may have been violated when comparing data during the rain-on-snow on Bellgrove Creek with other streams in the project area. During this same project period, there were visual observations during the two rain-on-snow events that showed gully erosion from the property into Bellgrove Creek. These observations, along with *E. coli* exceedances, make it reasonable to believe that the elk farm facility is contributing to nutrients and sediment 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* is weight of 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, it is inconclusive as to whether beneficial use impairment due to nutrients is occurring on Bellgrove Creek. As such, it is recommended that Bellgrove Creek be listed in Section 5 of Idaho's 2010 Integrated Report as impaired due to E. coli and sediment.

Coeur d'Alene River



The Coeur d'Alene River from the headwaters at the SF 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. This same AU is listed as *not supporting* salmonid spawning beneficial use due to temperature. These impairments date back to the 1998 section 303(d) list.

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 Basin, has resulted in an estimated 54.5 to 70 million tons of mine tailings discharged into the Coeur d'Alene River, its tributaries and floodplain (National Research Council 2005). Rain-on-snow and spring snowmelt runoff events continue to redistribute these sediments on the channel bed, banks, floodplain, and natural levees of the river. In addition, water elevations in Lake Coeur d'Alene are held up to 7.5 feet higher by the Post Falls dam during the months of June to mid-September. This results in backwater conditions on the Coeur d'Alene River from Cataldo to the mouth. Due to these special challenges, the DEQ Coeur d'Alene Regional Office has determined to take alternate action to TMDLs for the impairments on the Coeur d'Alene River, as explained below.

Sediment and Metals Impairments

In the sub-basin assessment of 2000 *Coeur d'Alene Lake and River Sub-Basin Assessment and Proposed Total Maximum Daily Loads*, 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. These findings are different that that discovered by Dupont, et. al. (2008). It further states 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 remains on section 5 of Idaho's Integrated Report.

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 (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. Under aquatic and soil conditions within the basin, lead is primarily present and transported as part of the sediment, and zinc is 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 focus to date has been within the 21-square-mile Bunker Hill "box" area (Operable Units 1 and 2), which has a primary focus to reduce human exposure to metals in contaminated sediment and water. In 1998, the U.S. EPA extended superfund activities and conducted a remedial investigation/feasibility study of contamination outside the 21-square-mile Bunker Hill "box" area. In doing so, they created Operable Unit 3 (OU3). In 2002, the U.S. 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 sub-watershed. 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, the 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 (EPA 2010). These studies, along with existing studies under CERCLA and under the Post Falls dam recertification process will be critical information for the amended ROD for OU3 in the lower Coeur d'Alene River.

Recommendations:
Impairments on the Coeur d'Alene River should be classified under "Extremely Difficult Problems" category identified in the Report of the Federal Advisory Committee on the TMDL (FACA 1998), and all sediment and metals TMDLs on the lower river be postponed. Once the ROD for OU3 is completed, it is recommended the Coeur d'Alene River be placed under section 4b of Idaho's Integrated Report under the premise that the ROD would be the water quality plan, under which water quality standards would be met.

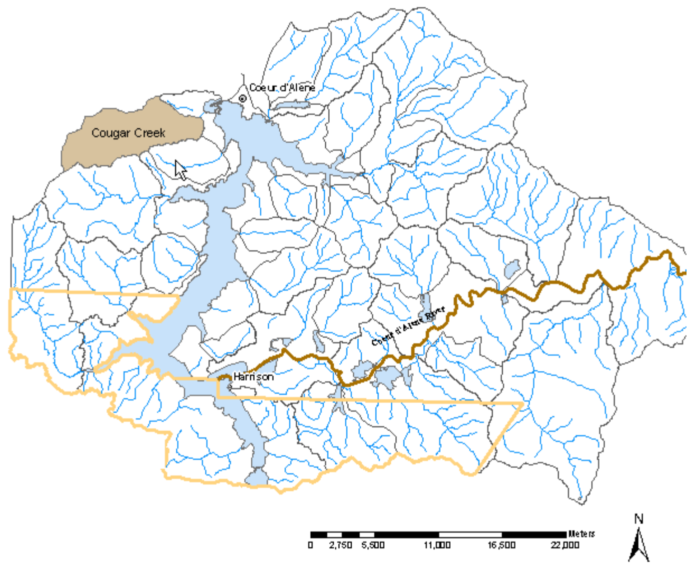
Temperature Impairments

In April of 2008, Idaho Department of Environmental Quality and Idaho Department of Fish and Game entered into a settlement agreement with Avista Corporation concerning the relicensing of the Post Falls Hydroelectric Project (HED). During the Clean Water Act 401 Water Quality Certification process, DEQ determined that backwater conditions, caused operation of the Post Falls HED, results in water quality impairments in the lower reaches of the Coeur d'Alene River and other tributaries to Coeur d'Alene Lake. Such impairments are exceedances of Idaho's cold water aquatic life and salmonid spawning temperature criteria along with increased bank erosion and sedimentation (AVISTA relicence study). Under the settlement agreement, Avista has agreed to develop and implement a Water Quality Improvement and Erosion Control Plan to address these water quality impairments and comply with Idaho Water Quality Standards.

Recommendations:
One primary cause for the temperature impairment on the lower reaches of the Coeur d'Alene River has been determined to be flow alteration as a result of water elevations in Lake Coeur d'Alene being held up to 7.5 feet higher by the Post Falls dam during the months of June to mid-September. Under the settlement agreement, implementation actions have been defined. It is therefore recommended that both assessment units ID17010303PN07_06 and ID17010303PN016_06 be placed in section 4c of Idaho's Integrated Report for "other flow regime alterations". Temperature impairments on the river will be addressed by implementation of temperature TMDLs on tributaries to the Coeur d'Alene River and through implementation of the Water Quality Improvement and Erosion Control Plan to be developed by Avista under the Settlement Agreement with DEQ and Idaho Department of Fish and Game Concerning the Relicensing of the Post Falls HED.

Cougar Creek

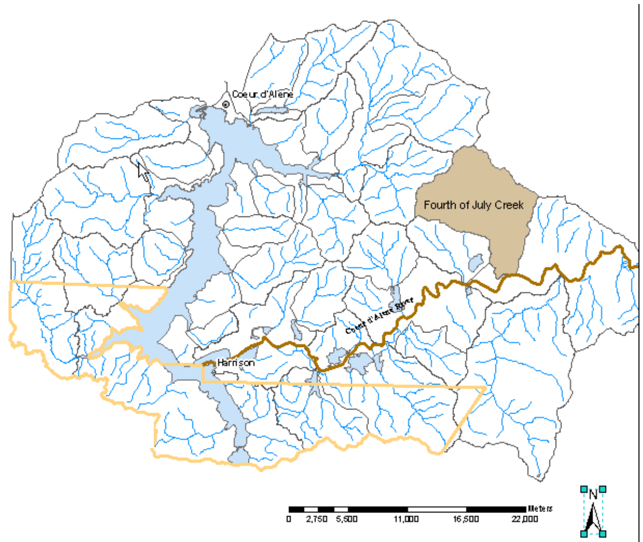
The Cougar Creek assessment unit (ID1701033PN02_02) is included in Idaho's draft 2010 Integrated Report as *not supporting* cold water aquatic life and salmonid spawning beneficial uses. The cause of impairment is listed as habitat alteration, sedimentation, and temperature.



Recent assessments by DEQ and IDL have provided insight as to the sediment conditions of the 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 pressure to the stream channel just upstream has resulted in marked improvement to streambank stability at the mouth of the watershed and an overall reduction of sediment in that reach. However, excessive sedimentation still exists in the watershed. Since 1999, the watershed has experienced much residential development with a 70 percent 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 IDL CWE evaluations indicate there is a 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, recent DEQ surveys observed excessive erosion and sedimentation on private land and in the channel throughout the watershed. This 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 are a weight of 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. Therefore, it is recommended Cougar Creek remain in Section 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*.

Fourth of July Creek



Currently, the entire Fourth of July Creek watershed is listed as impaired for sediment and physical habitat alteration on the list of impaired waters in Idaho's 2008 Integrated Report . Fourth of July Creek (Assessment Unit ID17010303PN020_03) was originally listed for sediment in the 1990s when the addition of traction sand to the highway resulted in excessive sediment and impairment of beneficial uses in Fourth of July Creek near I-90. Justification for delisting the sedimentation cause is based on modeling done in 1999 under the Coeur d'Alene Lake and River Subbasin Assessment (in relation to the Coeur d'Alene Lake and River Subbasin Assessment and Proposed TMDL), channel substrate and streambank data collected in 2006 during BURP monitoring, Idaho Department of Lands Cumulative Watershed Effects data, and site visits done in 2009-2010.

Sediment loading estimates completed under the Coeur d'Alene Lake and River Subbasin Assessment and Proposed Total Maximum Daily Load were based primarily on sources of sediment from land use types and road characteristics, and it 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 it 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 near background conditions.

In 1999, a Cumulative Watershed Effects assessment (CWE) was conducted by personnel from Idaho Department of Lands. The CWE process evaluates the extent to which forest practices impacts sediment delivery to the stream and recommends management actions based on the evaluation. Results of the CWE analysis gave an overall rating of sediment delivery to Fourth of July Creek as low. No CWE data has been collected since this time.

The Fourth of July Creek Assessment Unit ID17010303PN020_03 was monitored IDEQ in 2006 using BURP. Based on scores from this monitoring data, this AU is not full support. However, the biological data collected on this day was questionable because flow was 0.16 cfs. At such a low flow the Hess sampler is not designed to collect macroinvertebrates, and electrofishing isn't done. Wolman pebble counts collected during this monitoring event demonstrated percent fines were 4.78 percent — well below the 20 percent fines threshold that reduces embryo survival and fry emergence. In addition, greater than 95 percent of stream banks were observed to be stable.

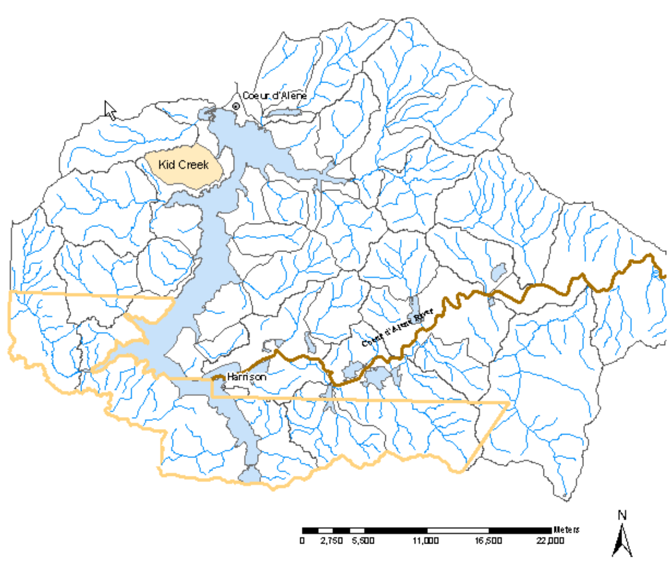
Coeur D'Alene Regional Office staff conducted several field visits in 2009-2011 along the entire length of the Fourth of July Creek Assessment Unit ID17010303PN020_03. The survey found the study reaches, despite being highly channelized due to its proximity to I90, to be densely foliated with good stream bank stability, no channel embeddedness, and lots of habitat complexity. There were very few areas of significant bank erosion. Mass wasting was also not evident at these sites.

The Fourth of July Creek Assessment Unit 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 at the mouth of the Creek. Although flow alteration presents it's own complexities to the system, data analysis and site observations has provided weight of evidence that aquatic life use on Fourth of July Creek is not impaired by sediment. Therefore, IDEQ Coeur d'Alene Regional Office staff proposes to remove the sediment from Section 5 on the 2010 Integrated Report. Data from the USFS has demonstrated the cause is due to temperature.

Kid Creek

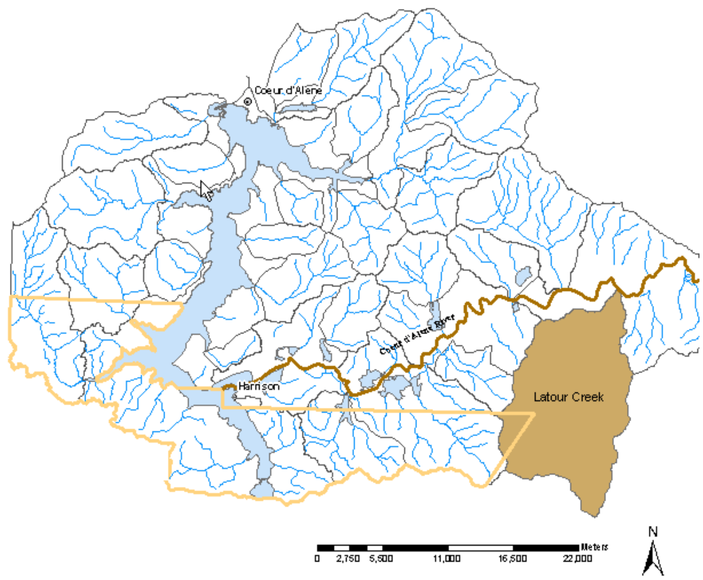
The Kid Creek assessment unit (ID17010303PN03_02) is included in Idaho's draft 2010 Integrated Report as *not supporting* cold water aquatic life and salmonid spawning beneficial uses. The causes of the beneficial use impairment are habitat alteration and sediment..

Recent field surveys indicate there are localized areas of concern for erosion and sedimentation in Kid Creek, and there are numerous culverts along the creek which pose a challenge to fish passage.



The culverts may be the reason for the lack of westslope cutthroat trout documented by May (2009). Despite of these localized problems, the stream generally has abundant riparian vegetation, good stream bank stability, no excess fine sediment in the channel bed, and good access to the floodplain. In addition, there is no indication of excess bedload as evidenced by large, instream depositional features. This may be attributed to the installation of riparian buffers, upland sediment ponds, and grade structures within the creek which has resulted in a reduction of 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, more analysis is needed before any assessment decisions for the Integrated Report are made. It is also recommended Kid Creek be re-assessed for beneficial use support using BURP. Until these assessments are made, Kid Creek will remain in Section 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*.

Latour Creek



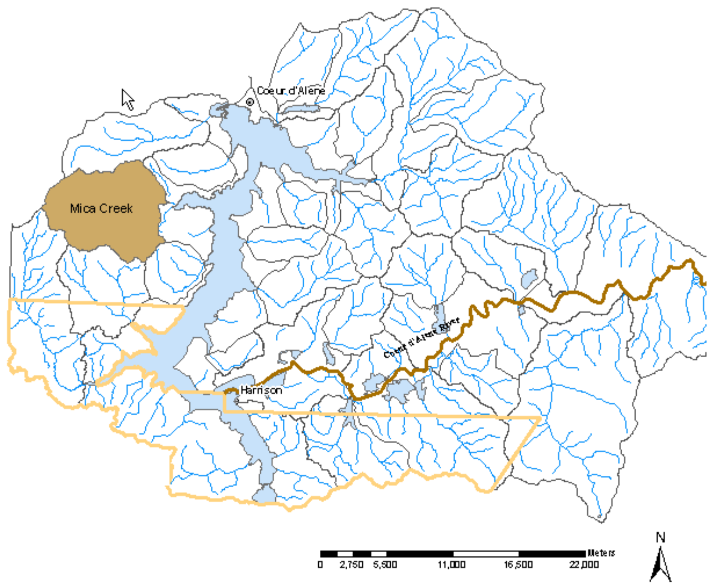
The Latour Creek assessment unit (ID17010303PN015_02) is listed in Idaho's draft 2010 Integrated Report as *not supporting* cold water aquatic life and salmonid spawning beneficial uses. The causes of impairment are sediment and temperature.

As is the case with many streams within the Coeur d'Alene Lake watershed, Latour Creek has an excessive amount of bedload, which is consistent with the *fair* rating of habitat quality in May (2009). This was evident in the 2008 DEQ erosion study reach in the form of in-stream depositional features that have caused lateral migration of the stream channel resulting in erosion of the stream banks and poor channel stability. DEQ estimated 10 tons/year erosion from the study reach. From visual observations, it is conceivable this erosion rate is higher downstream from the study reach as sediment transport conditions worsen — evidenced by greater aggradation/in-stream channel deposition and streambank erosion. This high-bedload process negatively affects beneficial use support with channel widening, pool filling, and filling of interstitial spaces with fine sediment, and this is likely a factor in exceedances of Idaho temperature Water Quality Standards. In addition, aerial photographs appear to show that there may be a large amount of 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 percent increase in road miles since 1999. With these sources of sediment to Latour Creek, it is likely that the excessive bedload will remain in the system for a very long time, and channel instability and erosion of stream banks 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 are a weight of evidence that 1) Latour Creek is functioning at a sediment transport/deposition rate well above natural background; 2) there are still significant sources of excess sediment to the system; and 3) 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, it is recommended Latour Creek remain in Section 4a of Idaho's 2010 Integrated Report as an impaired stream with a TMDL for sediment, and it will be subject to load reductions defined in the *Coeur d'Alene Lake and River TMDL*.

Mica Creek

The Mica Creek assessment unit (ID17010303PN004_02 and ID17010303PN004_03) is listed in Idaho's draft 2010 Integrated Report as *not supporting* cold water aquatic life and salmonid spawning beneficial uses. The cause of impairment is sedimentation, habitat alteration, and fecal coliform.

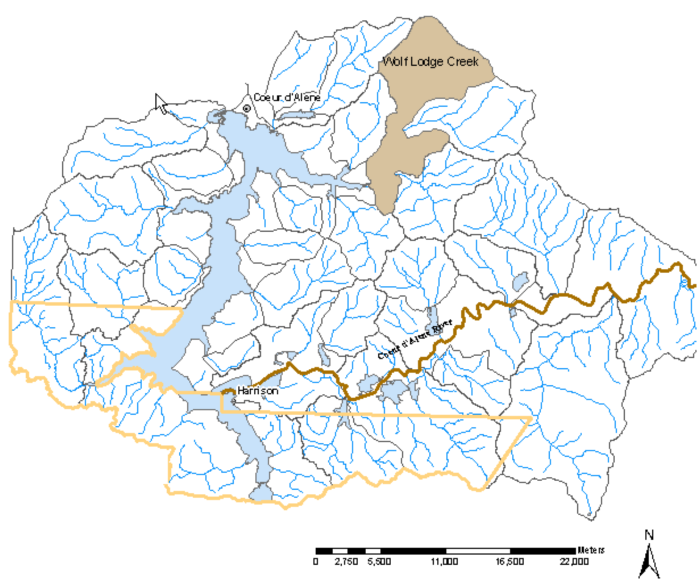


Since 1999, there has been a 72 percent increase in road miles, and an order of magnitude increase in the amount of acres under timber harvest. The IDL Hydrologic Risk Assessment rated Mica Creek as a high risk of adverse impacts to stream channel stability from the potential increase in magnitude and frequency of peak flow events in response to forest canopy removal. IDL also recently identified a number of culvert and road problems which could lead to sedimentation in the creek. In winter 2001-2002, Idaho Transportation Department discharged storm water from construction activity on U.S. Hwy 95 into the South Fork Mica Creek and its tributaries that violated Idaho State water quality standards for turbidity (CH2MHill 2003). The increased sedimentation from this episode, roads, culverts, and forest canopy removal has probably resulted in the poor habitat quality in Mica Creek identified by May (2009) most likely is still due to sedimentation in Mica Creek.

Although much change has occurred in the Mica Creek watershed, not all the changes translate into a negative impact to the beneficial use of the creek. Much implementation activity has been occurring within in the lower watershed — all of which targeted toward decreasing sedimentation in Mica Creek. 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 very useful information as to any improvements that take place, and it will assist with any beneficial use support evaluations. As such, 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, it is recommended that Mica Creek remain in Section 4a of Idaho's 2010 Integrated Report as impaired stream for sediment and bacteria and be subject to load restrictions defined in the *Coeur d'Alene Lake and River TMDL*.

Wolf Lodge Creek

The *Coeur d'Alene Lake and River TMDL* sets an interim load target for the entire Wolf Lodge Creek watershed, which includes Wolf Lodge, Marie, and Cedar Creeks and all their tributaries. The *CDA Lake and River Subbasin Assessment* identified the sediment interfering with the beneficial use within the Wolf Lodge Creek watersheds is most likely large bedload particles that is mobilized during large discharge events (return period of 10-15 years). .



Upper Wolf Lodge Creek

The Upper Wolf Lodge Creek assessment unit (ID17010303PN29_02) is on Idaho's draft 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 percent decrease in sediment load from their property. In addition, 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.

However, in the lower reaches of this subwatershed, there is indication the upper Wolf Lodge Creek assessment unit 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. This is 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 bedload 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. It 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 bedload, is being deposited upstream as evidenced by instream depositional features, channel aggradation, and the on-going process of undercutting banks and accumulation of trees in the stream. There is additional concern over the lower reaches of this assessment unit which are on private property. Levy installation on lower Stella Creek has significantly altered stream channel hydraulics in that reach. As a result, there has been channel widening and an increase in the load of sediment transported to lower Wolf Lodge Creek downstream.

In conclusion, a large amount of implementation has occurred in this watershed to diminish the sediment sources to the stream channels. Yet, there still exists a high bedload influence on channel instability in Stella Creek and probably 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 landuse activity may exacerbate the channel instability problem. Therefore, there is weight of evidence 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. Therefore, it is recommended that upper Wolf Lodge Creek remain in Section 4a of Idaho's 2010 Integrated Report as an for sediment, and be subject to load reductions defined in the *Coeur d'Alene Lake and River TMDL*.

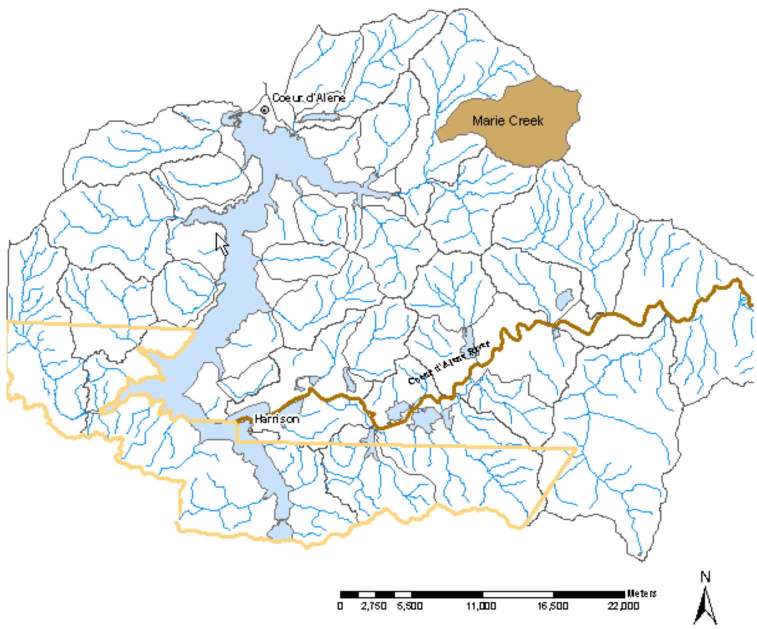
Lower Wolf Lodge Creek

The lower Wolf Lodge Creek assessment unit (ID7010303PN29_03) on Idaho's draft 2010 Integrated Report as *not supporting* beneficial uses for cold water aquatic life and salmonid spawning due to habitat alteration, sediment, and temperature. This has been verified by recent failing BURP scores in 2006 on lower Wolf Lodge Creek.

As is the case in upper Wolf Lodge Creek, high bedload is the cause for impairment of the beneficial use. 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.

In conclusion, there is weight of evidence that 1) lower Wolf Lodge Creek is functioning at a sediment transport/deposition rate well above natural background; 2) habitat quality and macroinvertebrate populations are poor; and 3) 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, it is recommended that lower Wolf Lodge Creek remain in Section 4a of Idaho's 2010 Integrated Report as an impaired stream with a sediment TMDL, and it will remain under the restriction of the *2000 Coeur d'Alene Lake Tributaries TMDL*.

Marie Creek



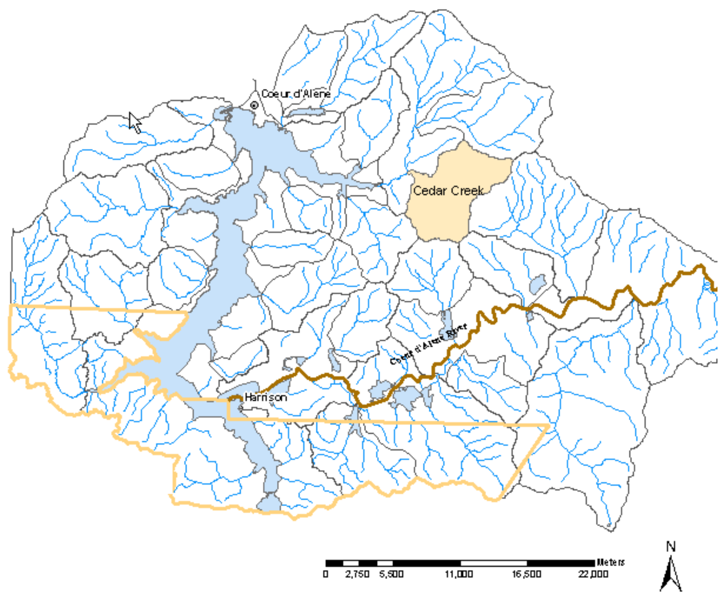
The Marie Creek (ID17010303PN031_02) assessment unit is listed in Idaho's draft 2010 Integrated Report as not supporting cold water aquatic life and salmonid spawning beneficial use. The cause of impairment is habitat alteration, sedimentation, and temperature. The basis for this listing was verified with failing BURP scores in 2006 on the mouth of Marie Creek.

Recent field visits observed localized areas of excessive aggradation in the Marie Creek, particularly at the mouth of Marie Creek where a decrease in channel slope has resulted in bedload deposition and hydrogeologic conditions conducive for subsurface baseflow. Such conditions are not favorable for aquatic life support. Albeit present in less frequency than in Stella and upper Wolf Lodge Creeks, excessive bedload in Marie Creek does manifests as localized areas of instream depositional features above bankfull elevation. As described earlier, this condition ultimately negatively affects beneficial use support. Lateral erosion of stream banks 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, there is reasonable assumption Marie Creek is fairly efficient during high-flow events to eventually move the bedload downstream, and the stream may be on a trajectory toward full beneficial use support — as long as a new source of bedload does not materialize.

There is further evidence to support the assumption that Marie Creek may be on a trajectory toward full beneficial use support. USFS implementation in the upper watershed has decreased sediment loading by 8 percent. Field visits on Marie Creek observed well-vegetated riparian areas, good streambank stability, and low percent fines in the creek. Although there was relatively low fish density, the 2006 USFS stream surveys indicate there was good channel stability at cross-sections, good pool-to-riffle ratios, and LWD was 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 bedload and channel instability, there is reasonable assumption Marie Creek is on a trajectory toward reaching its load capacity for sediment — as long as a new source of bedload does not materialize. Any change in landuse activity may exacerbate the existing channel instability/erosion problem and reverse the trajectory. Therefore, it is recommended that Marie Creek remain in Section 4a of Idaho's 2010 Integrated Report as an impaired stream with a sediment TMDL and be subject to the load reductions described in the *2000 Coeur d'Alene Lake Tributaries TMDL*.

Cedar Creek



The Cedar Creek (ID17010303PN030_02 and ID17010303PN030_03) assessment unit is listed in Idaho's draft 2010 Integrated Report as not supporting cold water aquatic life and salmonid spawning beneficial uses. The cause of impairment is sedimentation, and temperature. The basis for this listing was verified by failing BURP scores in 2006 at the mouth of Cedar Creek.

The non-supporting status of Cedar Creek can be explained by the high road density in the upper watershed, geomorphic restrictions on Cedar Creek caused by the highway, and temperature criteria exceedances. Although recent restoration work by the USFS has reduced the sediment load by 25 percent on their property, recent field investigations by the USFS observed aggradation and large amounts of sand near the mouth of Cedar Creek. Such observations are symptoms that the creek is still functioning above its sediment load capacity. Therefore, it is recommended that Cedar Creek remain in section 4a of IDEQ Integrated Report as an impaired stream with a sediment TMDL and be subject to the load reductions of the *2000 Coeur d'Alene Lake Tributaries TMDL*.

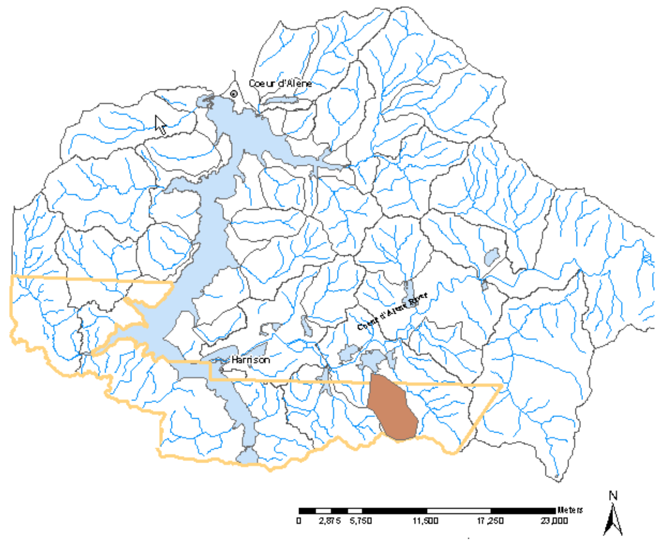
Thompson Creek

Thompson Creek (assessment unit ID17010303PN025_02) has been identified as *not supporting* beneficial uses as a result of excess sediment and is included in section 5 of Idaho's 2008 Integrated Report. The status of Thompson Creek has been carried forward from previous §303(d) reports. A watershed assessment was done which included 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. Details of this evaluation are in the February 2010 report, *Thompson Creek Watershed Assessment Coeur D'Alene Lake HUC 17010303* (Appendix C).

In addition to a modeling comparison with Carlin Creek, IDEQ Coeur d'Alene Regional Office conducted a site visit of Thompson Creek to evaluate whether sediment is impairing beneficial uses. Portions of the stream that were evaluated were those most likely to be impaired due to removal of riparian vegetation or impacted by other land use activities. It was observed that cattle were excluded from the stream (except for stream crossing sites), and neither over-grazing nor bank trampling was observed. Most portions of the stream were fenced to exclude cattle access and to restrict public access. Riparian vegetation was at or near full potential in 80-90 percent of the area observed. Where woody vegetation was lacking, grasses, sedges and forbs dominated. Areas of stream bank lacking vegetative cover resulting in exposed soil were not observed. An evaluation of the stream erosive factors following the method outlined in Rosgen (2006) determined current conditions demonstrate a low bank erosion hazard index and near bank stress index. 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.

In summary, monitoring, field observations, and GIS modeling and show sediment is not in excessive amounts in Thompson Creek, and it is reasonable to assume full support of cold aquatic life therein. As a result, it is recommended Thompson Creek (assessment unit ID17010303PN025_02) be moved from Section 5 to Section 2 of Idaho's 2010 Integrated Report.

Willow Creek



Willow Creek (ID17010303PN011_02) is a small watershed with the headwaters within the boundaries of the Coeur d'Alene Indian Reservation. Less than a 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 set. The 1996 BURP site is missing: Wolman Pebble Count, Percent Fines, Width/Depth Ratio, Undercut Banks, Wetted Depth Measurements, Pool Quality Index and Fish parameters. Field visits in 2009 show no land use practice contributing sediment to stream. The pasture was in fallow, and there was approx 180 feet between road and stream channel. This short AU is immediately downstream from the Coeur d'Alene Tribal boundary. The Coeur d'Alene Tribe is proposing that EPA delist Willow Creek above this AU based on field visits by the tribe (personal contact, Scott Fields Coeur d'Alene Tribe). Therefore, it is recommended that Willow Creek be delisted from Section 5 in Idaho's draft 2010 Integrated Report. However, because no BURP monitoring has been conducted on Willow Creek, the stream should be considered "unassessed" for beneficial use support and placed in Section 3 of the Integrated Report.

Other tributaries around Coeur d'Alene Lake (Historic Assessment Unit ID17010303PN001_02)

Assessment Unit ID17010303PN001_02 was a single assessment unit of approximately 35 small named and un-named creeks that drain into Coeur d'Alene Lake (Figure 21). Consequently, they were initially evaluated as one unit for beneficial use support. Although they are listed on Idaho's 2008 Integrated report as impaired for sediment and for unknown pollutant (nutrient suspected), this listing is incorrect as it is 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 these streams be individually assessed for beneficial use support accordingly. Therefore this assessment unit was split. Described below is an explanation of the assessment unit split that occurred in 2010. The splits are summarized in Table X.

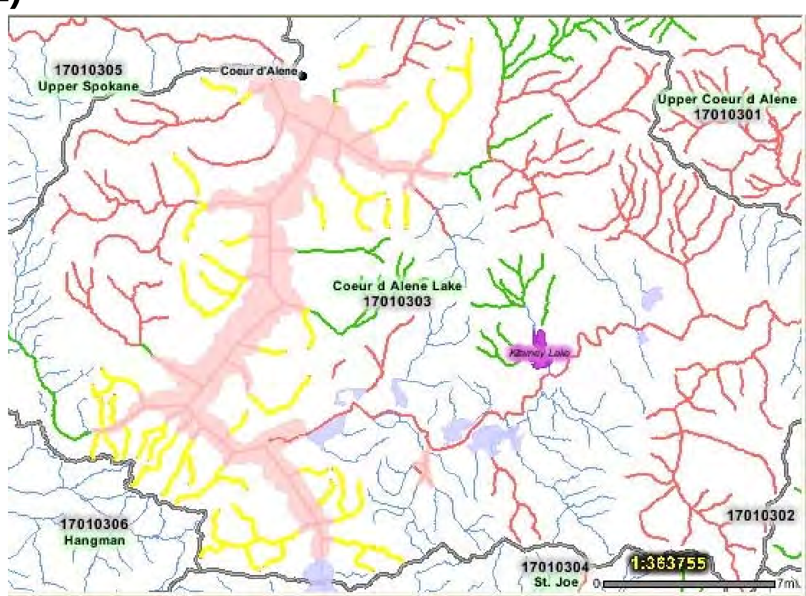


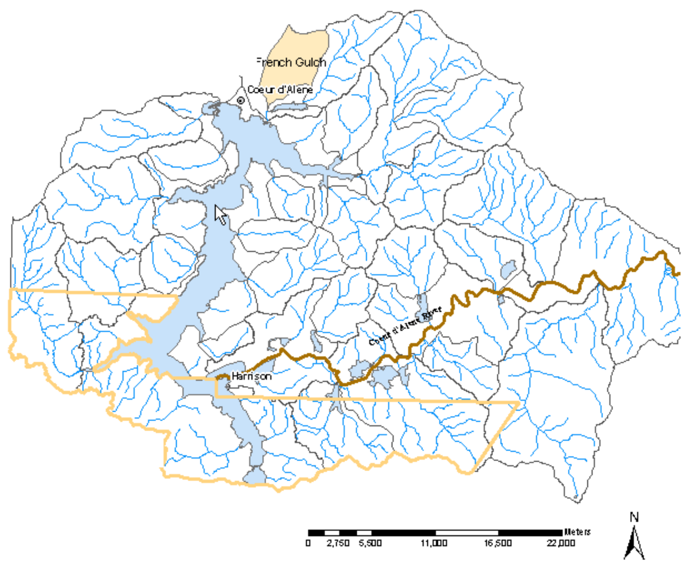
Figure 21. Historic assessment unit ID17010303PN001_02

Fernan Creek at the Mouth

This stream segment is just downstream of the third-order segment of Fernan Creek (ID17010303PN032_03) that starts at the outlet of Fernan Lake. This assessment unit is currently listed as *fully supporting* the Cold Water Aquatic Life under Idaho's 2008 Integrated Report. 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 third-order segment of Fernan Creek (ID17010303PN032_03) and will remain as *fully supporting* the Cold Water Aquatic Life beneficial use on the 2010 Integrated Report..

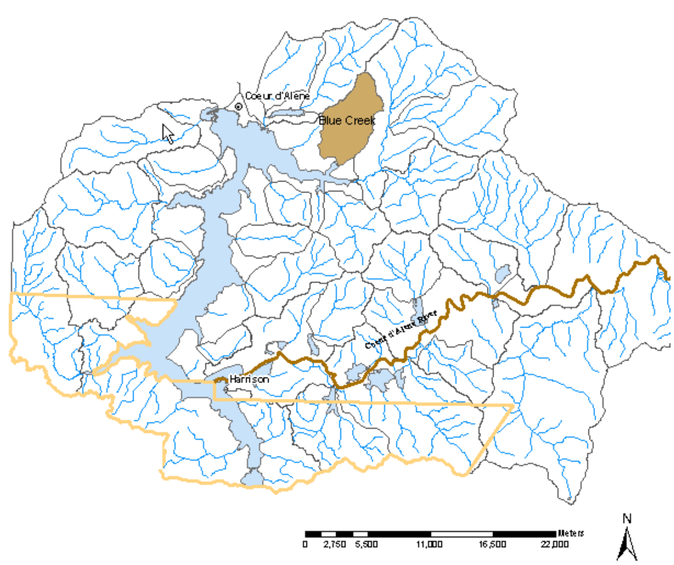
French Gulch

French Gulch drains a 2.2 mile^2 watershed on the north side of Coeur d'Alene Lake. The entire creek flows within private property. Housing densities in this watershed are up to 100 homes per mile^2, 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. Although TP and TSS 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 there are excess nutrients and sediment most likely from the developed area upstream. 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 assessment unit (ID17010303PN001_02a) in Section 3 of Idaho's 2010 Integrated Report.



Blue Creek

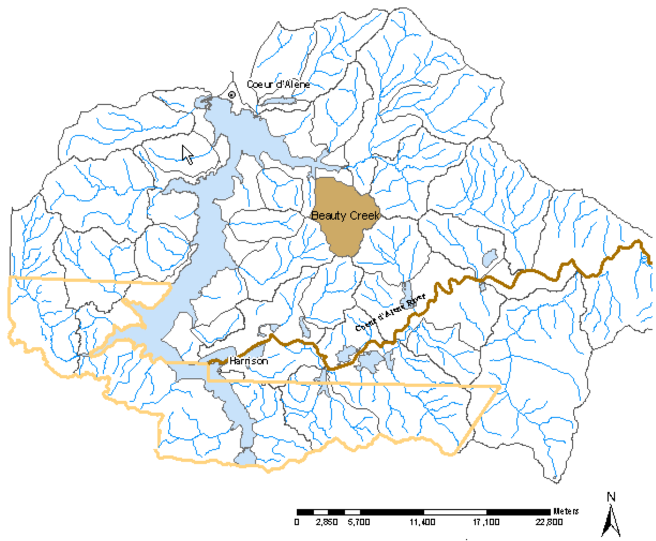
Blue Creek is a stream that drains a 7.9 mile^2 watershed on the northeast side of Coeur d'Alene Lake. The headwaters of Blue Creek are within the Coeur d'Alene National Forest. Downstream of the national forest, the creek flows within private property. At its mouth, Blue Creek is a second order stream 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. Sunnyside Creek and Folsom Creek are two ephemeral tributaries to Blue Creek.



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 observed to be significantly high, however, excessive 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 assessment unit (ID17010303PN001_02c) in Section 3 of Idaho's 2010 Integrated Report.

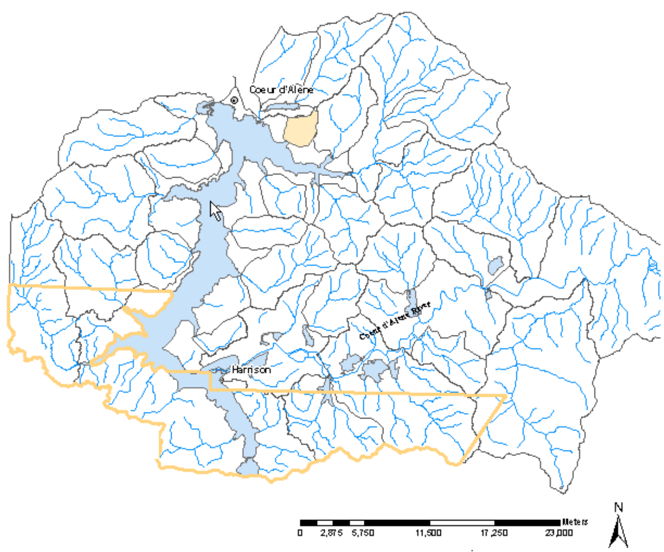
Unnamed Tributary to Beauty Bay

This tributary was grouped with other tributaries to Beauty Creek under assessment unit ID17010303PN028_02. In 2008 this assessment unit was evaluated for beneficial use using the BURP program and it came up full support. Therefore, this assessment unit will be listed in Idaho's 2010 Integrated report as *fully supporting* beneficial uses.



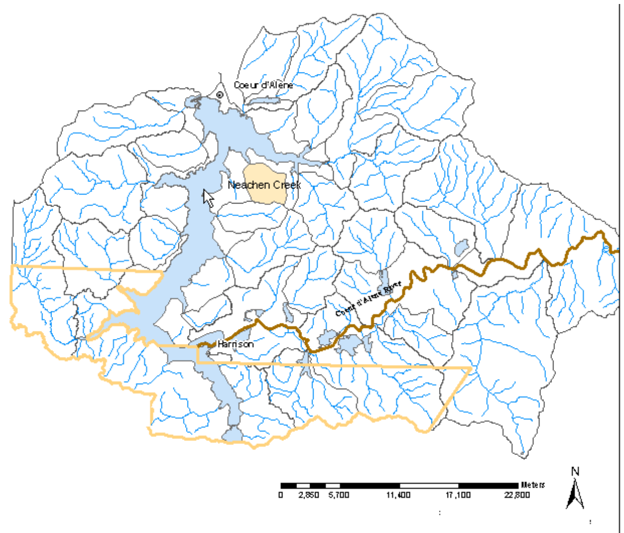
Unnamed Tributary to Bennett Bay

This stream drains a 2.2 mile2 watershed on the north side of Coeur d'Alene Lake. The entire creek flows within private property. Housing densities in this watershed are up to 100 homes per mile2, 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 water quality monitoring project. The results raise concern that nutrients may be a pollutant of concern on this creek. Therefore, it is recommended that it be prioritized for beneficial use support status evaluation using the BURP program or another appropriate method for intermittent streams. However, until the evaluation can be conducted, it is recommended that it be listed as an unassessed water body under one assessment unit in Idaho's 2010 Integrated Report.



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

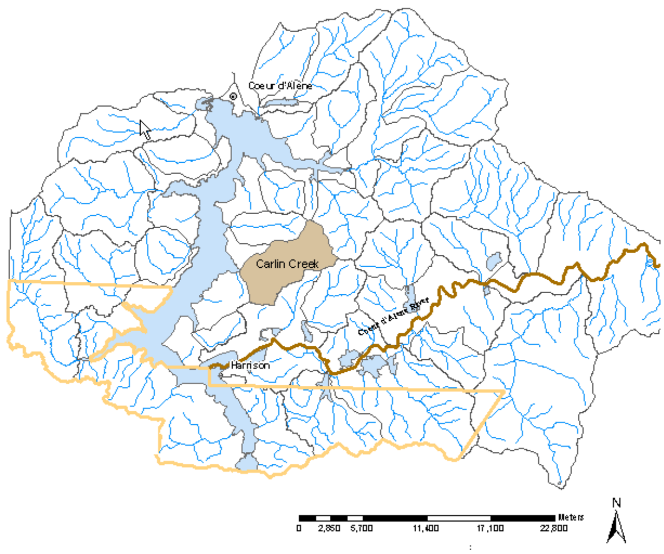
Neachen Creek is a second order stream that drains a 4.1 mile^2 watershed into a bay on the northeast side of Coeur d'Alene Lake. The entire watershed of Neachen Creek is primarily within private property, with a housing density of less than 10 homes per mile^2.



Neachen Creek and the unnamed creek into Gotham Bay were part of the 2009 Coeur d'Alene Lake tributaries water quality 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 have suspicion for the same water quality impairment on the unnamed creek into Echo Bay. Therefore, it is recommended that both creeks be prioritized for beneficial use support status evaluation using the BURP program. However, until the evaluation can be conducted, the creeks were listed as unassessed water bodies under one assessment unit in Idaho's 2010 Integrated Report.

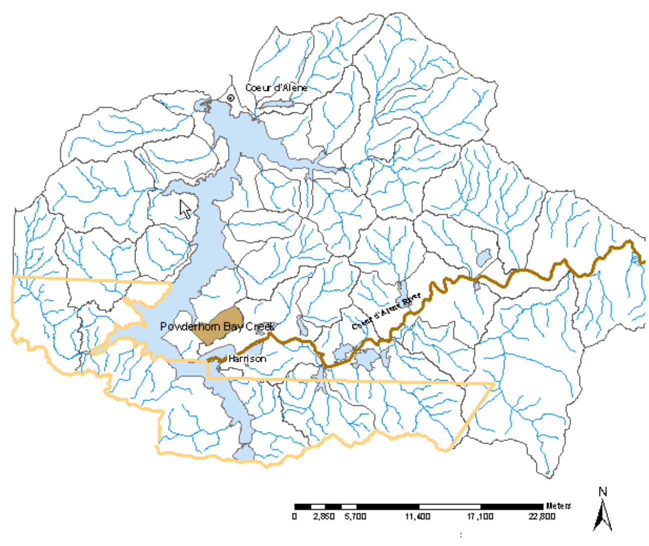
Unnamed Tributary to Carlin Bay, Unnamed Tributary to Half Round Bay

Although these creeks have never been assessed, they should be grouped with Carlin Creek under Assessment Unit ID17010303PN026_02 as they all share similar agricultural landuse. The tributary to Half Round Bay should be named Hungry Hollow Creek, as identified on the USGS 1:24,000 topoQuads. In 2008, Carlin Creek was evaluated for beneficial use support using the BURP program and it was determined to be fully supporting of the uses. Therefore, this assessment unit will be listed in Idaho's 2010 Integrated report as fully supporting beneficial uses.



Unnamed Tributary to Powderhorn Bay, and Unnamed Tributary to Bell Bay

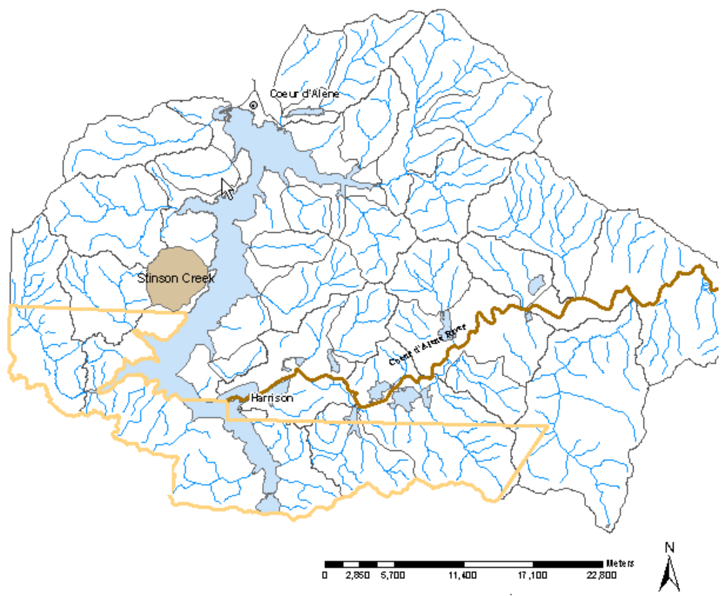
The unnamed creek to Powderhorn Bay drains a 3.5 mile^2 watershed on the southeast side of Coeur d'Alene Lake, and the entire creek flows within private property. The unnamed tributary to Bell Bay is just to the south of this creek.



The unnamed creek into Powederhorn Bay was part of the 2009 Coeur d'Alene Lake tributaries nutrients and sediment monitoring project. The high total phosphorus values observed, and the presence of extensive timber harvest areas and agricultural/rural development land along this creek raises concern that the creek may be impaired due to excess nutrients. However, it has been never been evaluated individually for beneficial use support. Therefore, it is recommended that this creek be prioritized for beneficial use support status evaluation using the BURP program. Until the evaluation can be conducted, the creek was listed with the unnamed tributary to Bell Bay under their own individual assessment unit (ID17010303PN001_02e) as *unassessed* in Section 3 of Idaho's 2010 Integrated Report.

Delcaro Creek, Lyle Creek, Scott Creek, Stinson Creek

Stinson Creek is stream that drains a 5.4 mile^2 watershed on the west side of Coeur d'Alene Lake. The upper reaches of the creek flows within private property. At its mouth, Stinson Creek is a second order stream that flows within Bureau of Land Management (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. Delcaro Creek shares the same landuse as the Stinson Creek watershed None of these creeks have been evaluated individually for beneficial use support.



Stinson Creek was part of the 2009 Coeur d'Alene Lake tributaries nutrient and sediment monitoring project. The high total phosphorus values observed, and the presence of a large golf course community at the headwaters of Stinson Creek raises concern that the creek may be impaired due to excess nutrients. Therefore, it is recommended that this creek be prioritized for beneficial use support status evaluation using the BURP program. Until the evaluation can be conducted, Stinson and Delcaro Creeks were listed as their own individual assessment unit (ID17010303PN001_02f) as *unassessed* in Section 3 of Idaho's 2010 Integrated Report.

Unnamed Tributaries to Mica Creek and Mica Bay

These tributaries were grouped with the North Fork Mica Creek under assessment unit ID17010303PN004_02. This assessment unit is in Section 4a of the 2008 Integrated Report as an impaired stream with a sediment TMDL.

Mica Creek at the Mouth

This stream segment was grouped with the third-order segment of Mica Creek just upstream (ID17010303PN004_03). It is currently listed in section 4a the 2008 Integrated Report as an impaired stream with a sediment TMDL.

Unnamed Tributaries to Cougar Creek, Cougar Creek at the Mouth

These stream segments were grouped with Cougar Creek under Assessment Unit ID17010303PN002_02. This assessment unit is in section 4a of the 2008 Integrated Report as an impaired stream with a sediment TMDL.

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APPENDIX A Beneficial Use Support Status of Streams

BENEFICIAL USE SUPPORT STATUS OF STREAMS IN THE COEUR D'ALENE LAKE TRIBUTARIES HUC 12/1/10

Subwatershed	Stream Names	Stream Miles	Assessment Unit	Beneficial Use	Support Status	Impairment (2010 Draft 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	ID17010303PN008_02	COLD SCR	Not Assessed Not Assessed	
Beauty Creek	Beauty Creek Unnamed Tributary	11.59	ID17010303PN028_02 ID17010303PN028_03	COLD SS SCR	Not Supporting Not Supporting Full Support	Temperature
Bellgrove Creek	Bellgrove Creek Fighting Creek	3.45 5.02	ID17010303PN005_02	COLD SCR	Not Supporting Not Supporting	Sediment Fecal Coliform
Black Lake Tributaries	Unnamed Tributaries to Black Lake Porter Creek	5.00	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	ID17010303PN001_02C	COLD SS SCR	Not supporting Not Assessed Not Assessed	Phosphorus
Blue Lake	Blue Lake	227 acres	ID17010303PN024L_0L	COLD PCR	Not Assessed Not Assessed	
Blue Lake Tributaries	Cottonwood Creek Unnamed Tributary	9.80	ID17010303PN024_02	COLD SS	Not Supporting 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	ID17010303PN013_02	COLD PCR	Not Assessed Not Assessed	
Carlin Creek	Carlin Creek Carrill Creek	16.88	ID17010303PN026_02	COLD SS	Not Supporting Not Supporting	Temperature

	North Creek Pleasant Creek Unnamed Tributary			SCR	Full Support	
Cataldo Gulch	Cataldo Gulch Skeel Gulch	10.94	ID17010303PN017_02	COLD SCR	Not Assessed Not Assessed	
Cave Lake Tributaries	Willow Creek in ID	1.00	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	ID17010303PN0010_02 ID17010303PN0010_03 ID17010303PN0012_02	COLD SCR	Not Assessed Not Assessed	
Cedar Creek	Alder Creek Cedar Creek Chinese Gulch Rutherford Gulch SF Cedar Creek Unnamed Tributary	26.38	ID17010303PN030_02 ID17010303PN030_03	COLD SS SCR (30_02)	Not supporting Not supporting Full support	Sediment Temperature
Coeur d'Alene River	Coeur d'Alene River Latour Creek to Mouth	29.41	ID17010303PN007_06	COLD PCR SS	Not Supporting Not Assessed Supporting	Cadmium, Lead, Zinc Habitat alteration Temperature, Sediment
Coeur d'Alene River Tributary	Unnamed Tributaries	3.93	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	ID17010303PN016_06	COLD PCR	Not Supporting Supporting	Cadmium, Lead, Zinc Temperature
Cougar Creek	Cougar Creek NF Cougar Creek Unnamed Tributary	9.11 2.60 3.99	ID17010303PN002_02	COLD SS SCR	Not supporting Not supporting Not Assessed	Habitat Alteration Temperature Sediment
Fernan Creek	Fernan Creek from Fernan Lake to	0.74	ID17010303PN032_03	COLD PCR	Full Support Full Support	

	mouth					
Fernan Creek	Fernan Creek Jungle Gulch Rondo Gulch Smith Gulch Stacel Draw Unnamed Tributary	15.74	ID17010303PN034_02	COLD SCR	Not Supporting Full Support	Temperature
Fernan Creek	Fernan Creek	1.27	ID17010303PN034_02a	COLD DWS	Not Assessed Not Assessed	
Fernan Creek	Fernan Creek	3.14	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	ID17010303PN020_02 ID17010303PN020_03	COLD SS SCR	Not Supporting Not Supporting Not Assessed	Habitat Alteration Temperature
French Gulch	French Gulch	1.64	ID17010303PN001_02c	COLD SCR	Not Supporting Not Assessed	Total Phosphorus Sediment
Kid Creek	Kid Creek	4.08	ID17010303PN003_02	COLD SS SCR	Not Supporting Not Supporting Not Assessed	Habitat Alteration Sediment
Killarney Lake	Killarney Lake	499 acres	ID17010303PN022L_0L	COLD SCR	Not Supporting Not Supporting	Mercury
Killarney Lake Tributaries	Armstrong Creek Chatfield Creek Fortier Creek Killarney Creek Lane Creek McGinnis Creek Unnamed Tributary	10.92	ID17010303PN022_02	COLD SS	Not Supporting Not Supporting	Temperature
Killarney Lake	Fortier Creek	1.58	ID17010303PN022_03	COLD	Not Assessed	

Tributaries				SS PCR	Not Assessed Not Assessed	
Lake Creek	Lake Creek Bozard Creek Kruse Creek School Creek Unnamed Tributaries	14.7	ID17010303PN006_02 ID17010303PN006_03	COLD SS PCR SCR	Not Assessed 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	ID17010303PN015_02	COLD SS SCR	Not Supporting Not Supporting Supporting	Sediment 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	ID17010303PN031_02	COLD SS	Not supporting Not supporting	Temperature Sediment Habitat Alteration
Mica Creek	Mica Creek at Mouth Unnamed Tributary Cabin Creek Rock Creek North Fork Mica Creek South Fork Mica Creek	24.18	ID17010303PN004_02 ID17010303PN004_03	COLD SS PCR SCR	Not Supporting Not Assessed Not Supporting Not Supporting	Habitat Alteration Fecal Coliform Sediment
Neachen Creek	Neachen Creek Unnamed Tributary	6.67	ID17010303PN001_02e	COLD SS SCR	Not Assessed Not Assessed Not Assessed	
Powderhorn Creek	Unnamed Tributary to CDA Lake near	4.78	ID17010303PN001_02e	COLD SS	Not Assessed Not Assessed	

	Bell Bay, Powderhorn Creek			SCR	Not Assessed	
Robinson Creek	Robinson Creek Canary Creek Unnamed Tributary	12.15	ID17010303PN013_02	COLD SCR	Not Assessed Not Assessed	
Rose Creek	Rose Creek Unnamed Tributary	8.17	ID17010303PN021_02	COLD SS	Not Supporting Not Supporting	Temperature
Rose Lake	Rose Lake	317 acres	ID17010303PN021L_0L	COLD PCR	Not Assessed Not Assessed	
Stinson Creek	Delcardo Creek Lyle Creek Scott Creek Stinson Creek	1.24 1.97 1.87 4.94	ID17010303PN001_02f	COLD SS PCR SCR	Not Assessed Not Assessed Not Assessed Not Assessed	
Swan Lake	Swan Lake	435	ID17010303PN023L_0L	COLD PCR	Not Assessed Not Assessed	
Swan Lake Tributaries	Unnamed Tributaries	6.49	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	ID17010303PN025_02	COLD	Full Support	
Turner Creek	Turner Creek Unnamed Tributary	5.12	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	ID17010303PN029_02 ID17010303PN029_03	COLD (d) SS (d) PCR (d)	Not supporting Not supporting Full Support	Temperature Sediment Habitat Alteration (29_03)

(d) = designated use

APPENDIX B Temperature Assessments in the Coeur d'Alene Lake Watershed

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

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

The U.S. Forest Service, Idaho Panhandle National Forests, Coeur d'Alene River Ranger District collected stream temperature data on streams in the Coeur d'Alene Lake Subbasin (17010303) from 1999 to 2008. Temperature data were collected from 60 sites on 15 assessment units and 27 streams (Table 1; Figure 1). These data were supplied to DEQ and analyzed for compliance with Idaho water quality standards. Data were analyzed for compliance with Idaho water quality criteria for cold water aquatic life and salmonid spawning (WQS 250.02.b and 250.02.f; Table 2). All sites were below 3,000 ft elevation and were analyzed for spring salmonid spawning during the period May 1 to July 1.

Temperature data from all of the assessment units exceeded Idaho water quality standards (Table 3). Data from five assessment units exceeded the criteria for cold water aquatic life; all assessment units exceeded criteria for salmonid spawning. As an additional piece of information, Idaho bull trout criteria were assessed. All assessment units also exceeded Idaho bull trout temperature criteria. Overall, the exceedances were not infrequent, brief and small, and the air temperature exemptions did not affect their compliance status. Therefore, the 15 assessment units evaluated may be recommended for a temperature impairment designation in the next integrated report (Table 4).

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

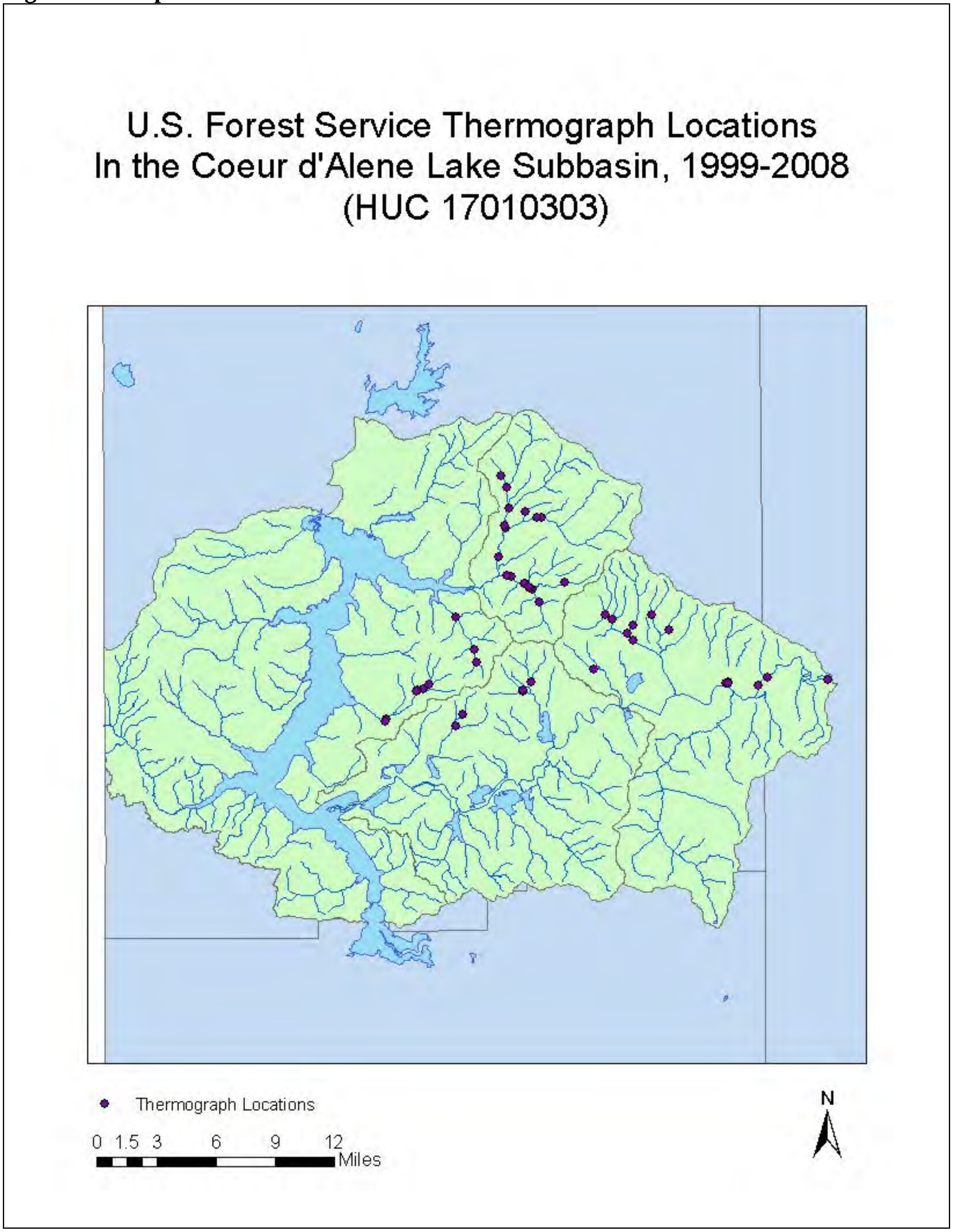

Table 1. Temperature monitoring locations in the Coeur d'Alene River Subbasin streams of this analysis, 1999-2008.

Assessment Unit Name	Assessment Unit	Stream Name	USFS Site Description	Year	Lat.	Long.
Coeur d'Alene River, Latour Cr. to Harrison	ID17010303PN07_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 R. to Latour Cr.	ID17010303PN16_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	ID17010303PN20_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	ID17010303PN20_03	Fourth of July Creek	Below Curran Creek	2006	47.583099	-116.469787

Assessment Unit Name	Assessment Unit	Stream Name	USFS Site Description	Year	Lat.	Long.
Rose Creek	ID17010303PN21_02	Rose Creek	Rose Creek (lower reach) on private land	2004	47.562570	-116.512027
Tributaries to Killarney Lake	ID17010303PN22_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	ID17010303PN24_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
Carlin Creek	ID17010303PN26_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	ID17010303PN28_02	Beauty Creek	Right fork above road 438 up unnamed tributary	1999	47.568570	-116.638594

Assessment Unit Name	Assessment Unit	Stream Name	USFS Site Description	Year	Lat.	Long.
		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	ID17010303PN28_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	ID17010303PN29_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	ID17010303PN29_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
Cedar Creek, headwaters and tributaries	ID17010303PN30_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

Assessment Unit Name	Assessment Unit	Stream Name	USFS Site Description	Year	Lat.	Long.
		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	ID17010303PN30_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	ID17010303PN31_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 1. Water temperature criteria applied in Coeur d’Alene Lake Subbasin streams.

<table>
<tr><th>Beneficial Use</th><th>Location</th><th>Temperature Criteria</th><th colspan="2">Dates</th></tr>
<tr><td rowspan="2">Cold Water Aquatic Life</td><td rowspan="2">Applies to entire subbasin</td><td>22 °C MDMT</td><td colspan="2" rowspan="2">All year</td></tr>
<tr><td>19 °C MDAT</td></tr>
<tr><td rowspan="2">Salmonid Spawning</td><td rowspan="2">Applies to entire subbasin</td><td>13 °C MDMT</td><td rowspan="2"><u>Spring</u>

> 4,000ft
Jun 1-July 31

3,000-4,000ft
May 15- July 15

<3,000ft
May 1- July 1</td><td rowspan="2"><u>Fall</u>

Aug 15-Nov 15</td></tr>
<tr><td>9 °C MDAT</td></tr>
<tr><td rowspan="2">Idaho Bull Trout Criteria</td><td rowspan="2">Applies to entire subbasin
(?)</td><td>13 °C MWMT</td><td><u>Rearing</u>

Jun 1 – Aug 31</td><td>N/A</td></tr>
<tr><td>9 °C MDAT</td><td>N/A</td><td><u>Spawning</u>

Sep 1 – Oct 31</td></tr>
<tr><td>EPA Bull Trout Criteria</td><td>Cougar Creek Fernan Creek
Kid Creek
Mica Creek South Fork Mica Creek
Squaw Creek Turner Creek</td><td>10 °C MWMT</td><td colspan="2">Jun 1 – Sep 30</td></tr>
</table>

Table 3. Temperature monitoring locations in the Coeur d'Alene River Subbasin streams of this analysis, 2002-2008; 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	**SS – spring**	**SS – fall**	**ID Bull Trout**
Coeur d'Alene River, Latour Cr. 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 R. to Latour Cr.	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	X
			Mouth	2006	O	X	X	X
		Fern Creek	Above private land	2006	O	X	X	X
		Mason Creek	Mason near mouth (lower reach) near I-90	2004	O	X	X	X
			Above I-90	2006	O	X	X	X
		Mill Creek	Above I-90	2006	O	X	X	X
		Rantenan Creek	Just above private land	2006	O	X	X	X
Fourth of July Creek, lower	ID17010303PN020_03	Fourth of July Creek	Below Curran Creek	2006	O	X	X	X
Rose Creek	ID17010303PN021_02	Rose Creek	Rose Creek (lower reach) on private land	2004	X	X	X	X
Tributaries to Killarney Lake	ID17010303PN022_02	Armstrong Creek	Located on FS and private boundary	2004	O	X	X	X

Assessment Unit Name	Assessment Unit	Stream Name	USFS Site Description	Year	Criteria Evaluation			
					CWAL	**SS – spring**	**SS – fall**	**ID Bull Trout**
		Armstrong Creek tributary	70 m upstream from confluence with Armstrong	2004	O	X	X	X
		Fortier Creek	Fortier Cr above private land (middle reach)	2004	O	X	X	X
Cottonwood Creek	ID17010303PN024_02	Blue Lake Creek	None	2008	O	X	X	X
		Cottonwood Creek	Cottonwood near confluence with Blue Lake Cr. off 614	2004	X	X	X	X
			None	2008	O	X	X	X
Carlin Creek	ID17010303PN026_02	Carlin Creek	Lower Carlin Creek	2004	O	X	X	X
			None	2008	O	X	X	X
		Carrill Creek	Lower Carrill at mouth (20 m upstream from Pleasant Cr.)	2004	O	X	X	X
		Johns Creek	Mouth of Johns Creek just above trail 257	2004	O	X	X	X
		No Creek	Lower No approx. 120 m from trail crossing	2004	O	X	X	X
		Pleasant Creek	Lower Pleasant Cr. below Carrill Cr., above No	2004	O	X	X	X
			Above mouth	2008	O	X	X	X
Beauty Creek, headwaters and tributaries	ID17010303PN028_02	Beauty Creek	Right fork above road 438 up unnamed tributary	1999	O	X	X	X
			Left fork above road 438 above unnamed tributary	1999	O	X	X	X
			Upper Beauty, middle Sec 19 off 438	2004	O	X	X	X
Beauty Creek, lower	ID17010303PN028_03	Beauty Creek	Beauty Cr. at confluence with Caribou Cr.	1999	O	X	X	X
			Beauty Cr. at confluence with Caribou Cr.	2001	O	NA	X	X
			Beauty Cr. at confluence with Caribou Cr.	2002	O	X	X	X
			Lower Beauty Cr. below Caribou	2004	O	X	X	X

Assessment Unit Name	**Assessment Unit**	**Stream Name**	**USFS Site Description**	**Year**	**Criteria Evaluation**			
					CWAL	**SS – spring**	**SS – fall**	**ID Bull Trout**
			Cr.					
			below Caribou Cr.	2008	O	X	X	X
Wolf Lodge Creek, upper	ID17010303PN029_02	Lonesome Creek	Lonesome Creek below Stella Cr.	2001	O	NA	X	X
			Lonesome Creek (upper reach) (2 readings)	2001	O	X	NA	NA
			Mouth	2006	O	X	X	X
		Stella Creek	Above Lonesome Creek	2006	O	X	X	X
Wolf Lodge Creek, lower	ID17010303PN029_03	Wolf Lodge Creek	Above Marie Cr. Just below Meyers Hill Road	2006	O	X	X	X
			Under Funk's bridge	2006	O	X	X	X
Cedar Creek, headwaters and tributaries	ID17010303PN030_02	Alder Creek	Lower Alder, 40 m upstream from I-90	2004	O	X	X	X
			Lower Alder, 60 m upstream from I-90	2005	O	X	X	X
			25-30 m upstream from I-90	2006	O	X	X	X
		Cedar Creek	Upper reach above SF Cedar	2000	O	NA	X	X
			Upper reach above SF Cedar	2001	O	X	X	X
			Upper reach above SF Cedar	2004	X	X	NA	X
			Cedar Cr. below the SF	2005	X	X	X	X
			Cedar Cr. below the SF	2006	O	X	X	X
		South Fork Cedar Creek	Lower to mid SF, up from I-90	2004	O	X	X	X
Cedar Creek, lower	ID17010303PN030_03	Cedar Creek	Cedar Creek, lower reach north of I-90	2000	O	NA	X	X
			Cedar Creek, lower reach north of I-90	2001	O	X	X	X
			Lower Cedar Cr, near Strauss	2005	O	X	X	X

Assessment Unit Name	Assessment Unit	Stream Name	USFS Site Description	Year	Criteria Evaluation			
					CWAL	**SS – spring**	**SS – fall**	**ID Bull Trout**
			house					
Marie Creek	ID17010303PN031_02	Marie Creek	Marie Cr. near bridge	2001	O	NA		
			Lower Marie off trail	2005	O	X	X	X
			Trail 214 at Marie Cr. floodplain, Approx. 600 ft below Burton	2006	O	X	X	X
		Searchlight Creek	Above Trail 241	2006	O	X	X	X

Table 4. Temperature assessment status of selected Coeur d'Alene River Subbasin streams. Italics indicate changes in status related to temperature.

Assessment Unit Name	**Assessment Unit**	**2002 Water Quality Status**	**2008 Water Quality Status**	**Suggested Temperature Status**
Coeur d'Alene River, Latour Cr. to Harrison	ID17010303PN007_06	Impaired: Sediment, Metals, Physical Substrate Habitat Alteration, Temperature	Impaired: Sediment, Metals, Physical Substrate Habitat Alteration, Temperature	Impaired
Coeur d'Alene River, South Fork Coeur d'Alene R. to Latour Cr.	ID17010303PN016_06	Impaired: Physical Substrate Habitat Alteration, Metals, Temperature	Impaired: Metals, Temperature	Impaired
Fourth of July Creek, headwaters and tributaries	ID17010303PN020_02	Impaired: Sediment, Physical Substrate Habitat Alteration Temperature not assessed	Impaired: Sediment, Physical Substrate Habitat Alteration Temperature not assessed	*Impaired*
Fourth of July Creek, lower	ID17010303PN020_03	Impaired: Sediment, Physical Substrate Habitat Alteration Temperature not assessed	Impaired: Sediment, Physical Substrate Habitat Alteration Temperature not assessed	*Impaired*
Rose Creek	ID17010303PN021_02	Not Assessed	Not Assessed	*Impaired*
Tributaries to Killarney Lake	ID17010303PN022_02	Not Assessed	Full Support	*Impaired*
Cottonwood Creek	ID17010303PN024_02	Not Assessed	Not Assessed	*Impaired*
Carlin Creek	ID17010303PN026_02	Full Support	Full Support	*Impaired*
Beauty Creek, headwaters and tributaries	ID17010303PN028_02	Not Assessed	Not Assessed	*Impaired*
Beauty Creek, lower	ID17010303PN028_03	Impaired: Temperature	Impaired: Temperature	Impaired
Wolf Lodge Creek, upper	ID17010303PN029_02	Impaired: Sediment Full Support	Full Support	*Impaired*

Assessment Unit Name	Assessment Unit	2002 Water Quality Status	2008 Water Quality Status	Suggested Temperature Status
Wolf Lodge Creek, lower	ID17010303PN029_03	Impaired: Sediment, Physical Substrate Habitat Alteration, Temperature	Impaired: Sediment, Physical Substrate Habitat Alteration, Temperature	Impaired
Cedar Creek, headwaters and tributaries	ID17010303PN030_02	Impaired: Sediment Temperature not assessed	Impaired: Sediment Temperature not assessed	*Impaired*
Cedar Creek, lower	ID17010303PN030_03	Impaired: Sediment Temperature not assessed	Impaired: Sediment Temperature not assessed	*Impaired*
Marie Creek	ID17010303PN031_02	Impaired: Sediment, Physical Substrate Habitat Alteration, Temperature	Impaired: Sediment, Physical Substrate Habitat Alteration, Temperature	Impaired

APPENDIX C Thompson Creek Watershed Assessment

Thompson Creek Watershed Assessment
Coeur d'Alene Lake HUC 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. 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 as been determined to be fully supporting beneficial uses and sediment should be removed from the Idaho's 2010 Integrated Report as a cause of sediment.

Monitoring Data

Prior to a Watershed assessment visit on October 26, 2009, the only water quality monitoring on Thompson Creek was a BURP assessment conducted in 1996 by DEQ. In 2001, the Idaho Department of Lands (IDL) completed a Cumulative Watershed Effects (CWE) assessment for the Thompson Creek watershed (Saunders, 2001).

Beneficial Use Reconnaissance Program (BURP)

The Beneficial Use Reconnaissance Program (BURP) procedure relies heavily upon biological parameters and monitoring data is 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 the Thompson Creek's confluence with Thompson Lake, and upstream of Thompson Creek's only major tributary. At the BURP site, Thompson Creek is a first order stream and drains a 1,900 acre watershed.

During the survey, the stream discharge was measured to be 0.01 cfs — flow considered to be intermittent and suboptimal for aquatic life uses (IDAPA58.01.02.070.06). 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 (< 6.35mm) 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 (< 6.35mm) 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 impact salmonid spawning and emergence, but numbers for belt geology are not available.

Cumulative Watershed Effects Assessment – Thompson Creek HUC Nos. 17060303 – 0402

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. Ninety-five percent (95%) of the watershed (2,355 acres) exhibits a slope of 0-30% resulting in a low surface erosion hazard rating.

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.

Timber harvest is occurring or has occurred in the majority of the watershed. The CWE hydrologic risk assessment (HRR) was completed within the watershed. The HRR 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 were evaluated by IDL during the CWE process. During the evaluation 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 has 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 receive a low total sediment delivery score, 66 – 105 are classified as moderate, and > 105 are considered to have a high total sediment delivery potential. A score of 49.3 is well below the “low” rating cut-off.

Using the 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 and associated with a poor road surface.

Field Visit - October 26, 2009

On October 26, 2009, Kristin Keith and Tyson Clyne of DEQ Coeur d’Alene Regional Office visited Thompson Creek to evaluate whether sediment is impairing beneficial uses. Portions of the stream that were evaluated were those most likely to be impaired due to removal of riparian vegetation or impacted by other land use activities. Most portions of the stream were fenced to exclude cattle access and to restrict public access. It was observed that cattle had limited access to the stream, and their was neither over-grazing 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. Areas of stream bank lacking vegetative cover resulting in exposed soil were not observed. The current conditions demonstrate a low bank erosion hazard index and near bank stress index (Rosgen, 2006) (Figure 2). 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 2. Thompson Creek stream banks and riparian vegetation.

GIS Analysis

GIS was used to compare the rate of sedimentation in the Thompson Creek watershed with Carlin Creek, which is a reference condition 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 source by reducing or eliminating the vegetated buffer and if the crossing type, in this case culverts in the Thompson Creek watershed, are improperly sized stream bank 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 stream banks can greatly reduce stream bank vegetation, resulting in increased bank erosion. Plant roots act as a binding agent to hold stream banks together, when the plant is removed the roots die and the stream bank becomes susceptible to erosion.

Four different land use types — roads, timber harvest, agriculture, and grazing — was assessed using GIS software to determine the extent in the watershed (Table 2). Once the acreage was determined, a sediment yield coefficient was applied to the respective landuse 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 3).

Table 2. Landuse area within the Thompson Creek and Carlin Creek watersheds.

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

Table 3. Sediment yield coefficient origins.

Land use Type	Sediment Yield Coefficient (tons/acre/year)	Sediment Yield Coefficient Origin
Background	0.023	WATSED
Road	4	[1]CWE Report and McGreer equation
Timber Harvest	0.07	WATSED, Kootenai and Fish Creek TMDL
Agriculture and Grazing	0.04	RUSLE2

[1]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).

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. Comparison of sediment load from Thompson Creek watershed to a watershed that fully supports its beneficial uses helps in the evaluation of the potential sediment risk posed by the land use activities in the Thompson Creek watershed. Current and background sediment loads for both Carlin Creek and Thompson Creek were calculated using the same methods. The background sediment load was determined by multiplying the entire watershed by the background sediment yield coefficient. The background sediment yield coefficient assumes the entire watershed was forested before the 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 4). 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 not within the 200-foot stream corridor were allocated 10% of the sediment yield coefficient. Finally, the percent current above background sediment load was calculated to determine an expected range (Table 5).

Table 4. Sediment load estimates in lbs/acre/year by land use in Thompson Creek and Carlin Creek watersheds.

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

Table 5. Sediment loading comparison of Thompson Creek and Carlin Creek watersheds.

Watershed	Background Load (tons/yr)	Current Load (tons/yr)	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 image 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. A weight of evidence has been provided that is the basis for this different assessment, which included an evaluation of existing monitoring data from Thompson Creek, and a GIS modeling exercise that compared sediment loading from the Thompson Creek watershed with 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 Creek.

Findings derived from the Watershed Assessment on Thompson Creek follow:

- 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 Idaho Department of Lands 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, imbeddedness, 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 crossing. The riparian zone was at or near full potential.
- GIS modeling exercise demonstrated that sediment loads from Thompson Creek and Carlin Creek were approximately the same in the two watersheds.

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

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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

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Idaho Department of Environmental Quality

Coeur d'Alene Regional Office

July 2010

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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

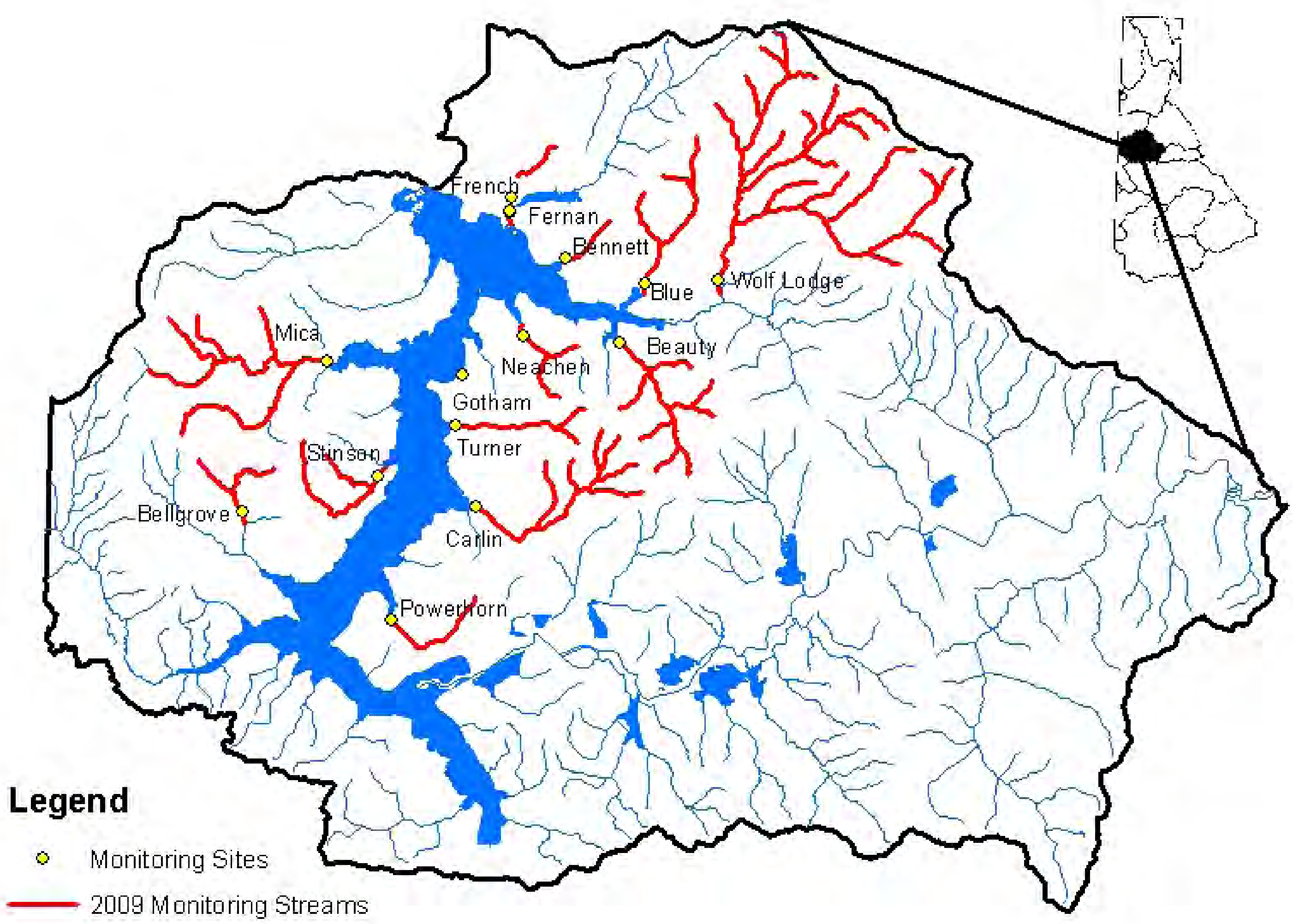
Water Quality

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 1: 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 1: 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 2: 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 3: 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 2: Beauty Creek — 2009 Monitoring Results

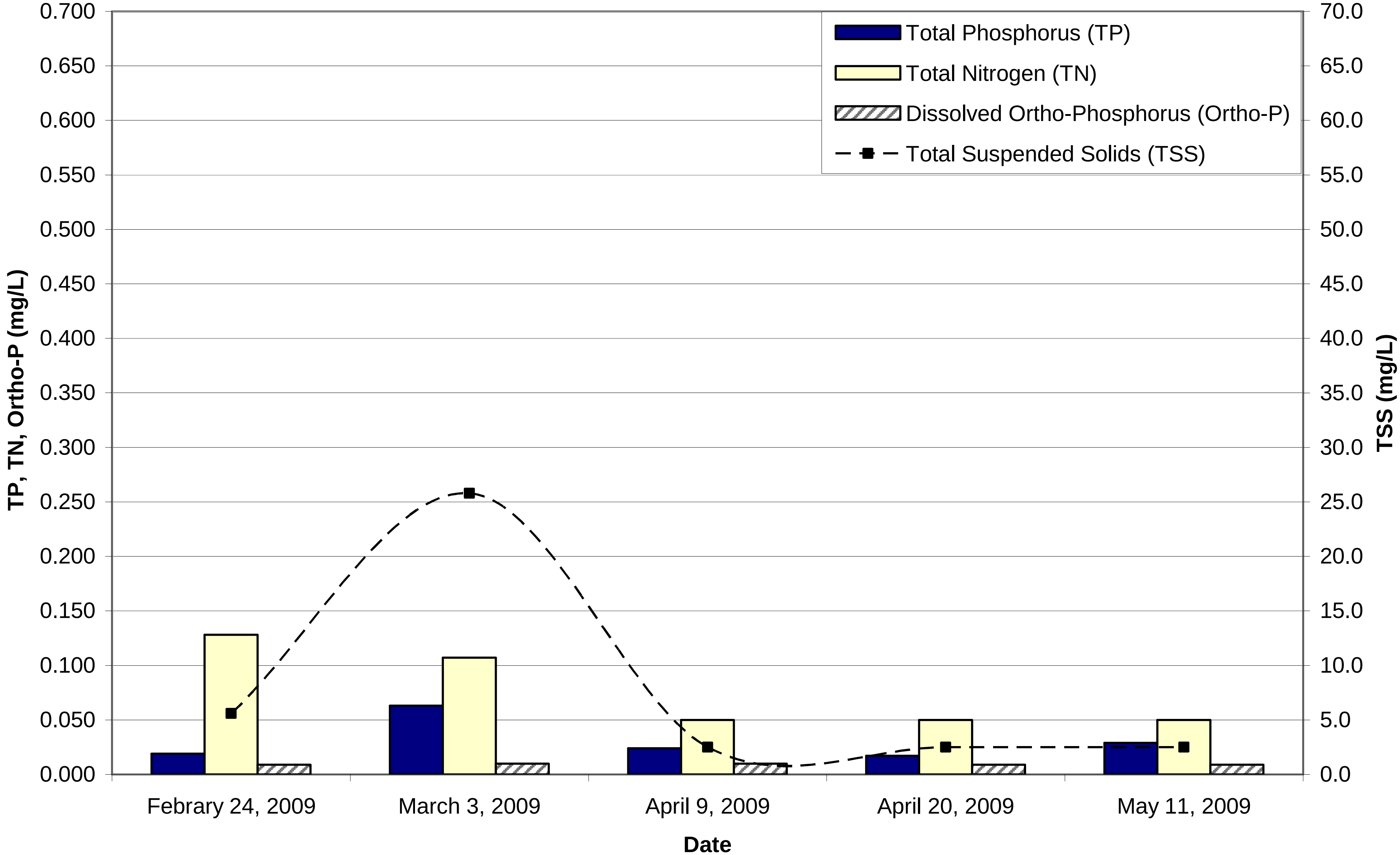


Figure 3: Bellgrove Creek — 2009 Monitoring Results

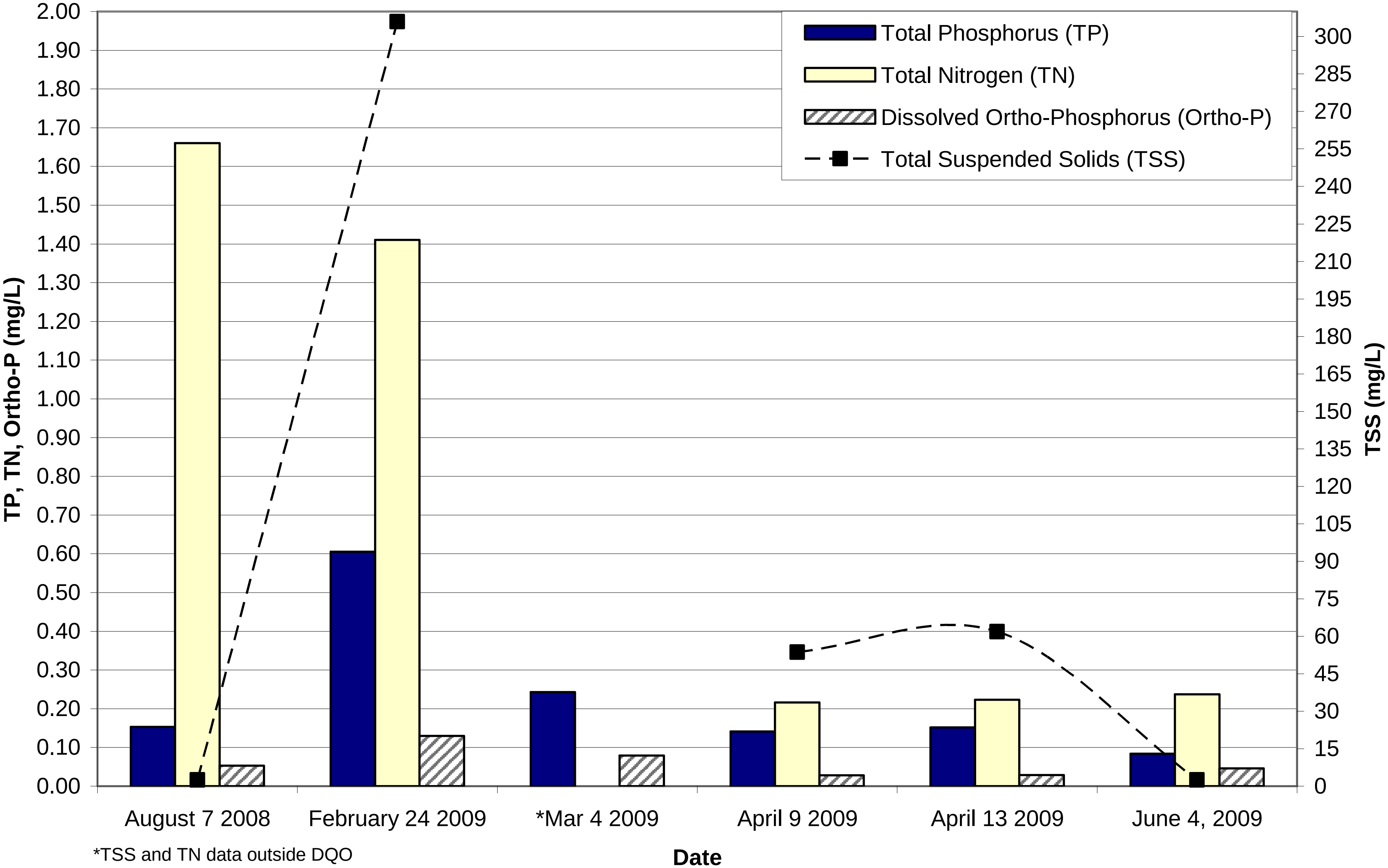
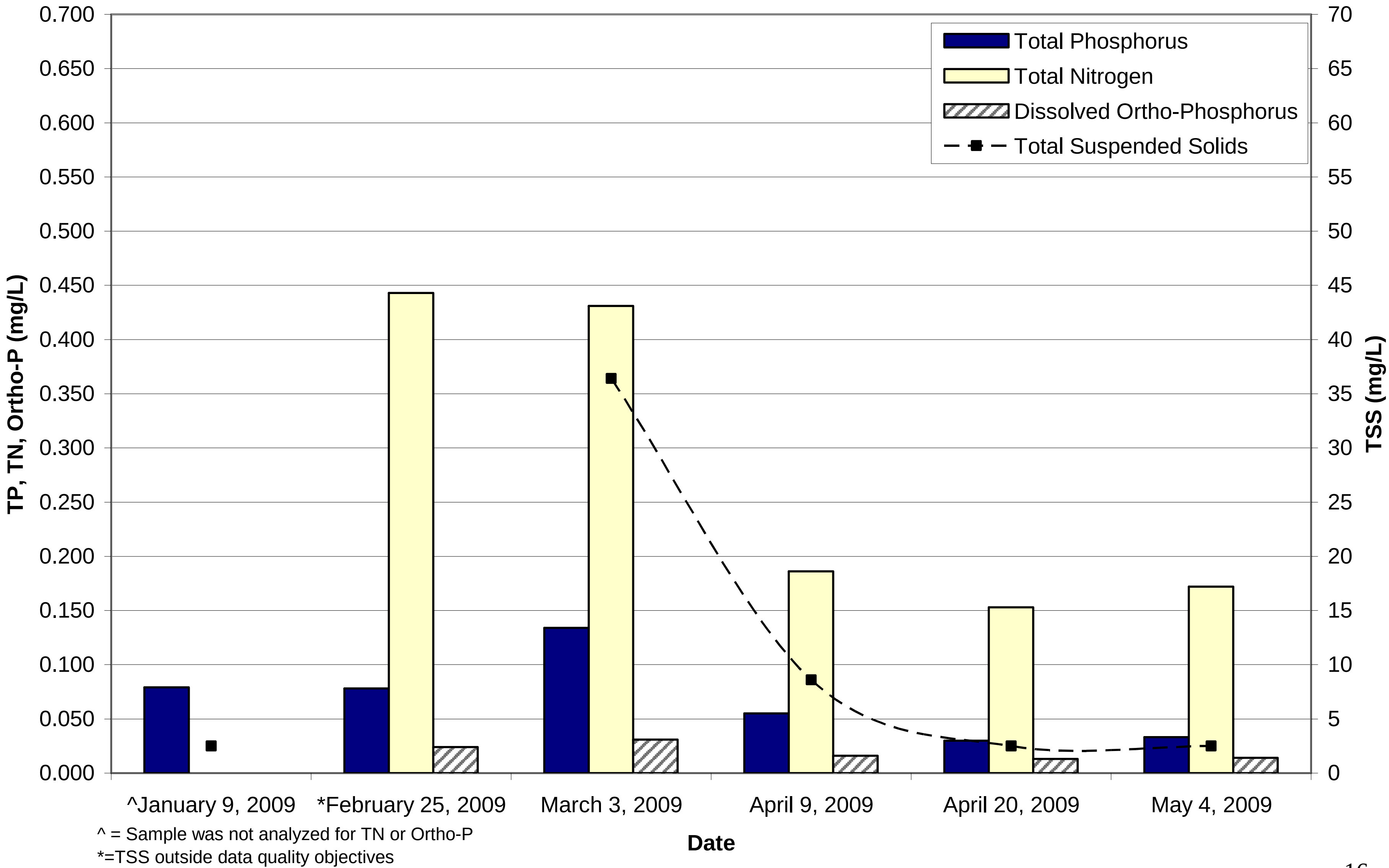


Figure 4: Blue Creek — 2009 Monitoring Results



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 5: Carlin Creek — 2009 Monitoring Results

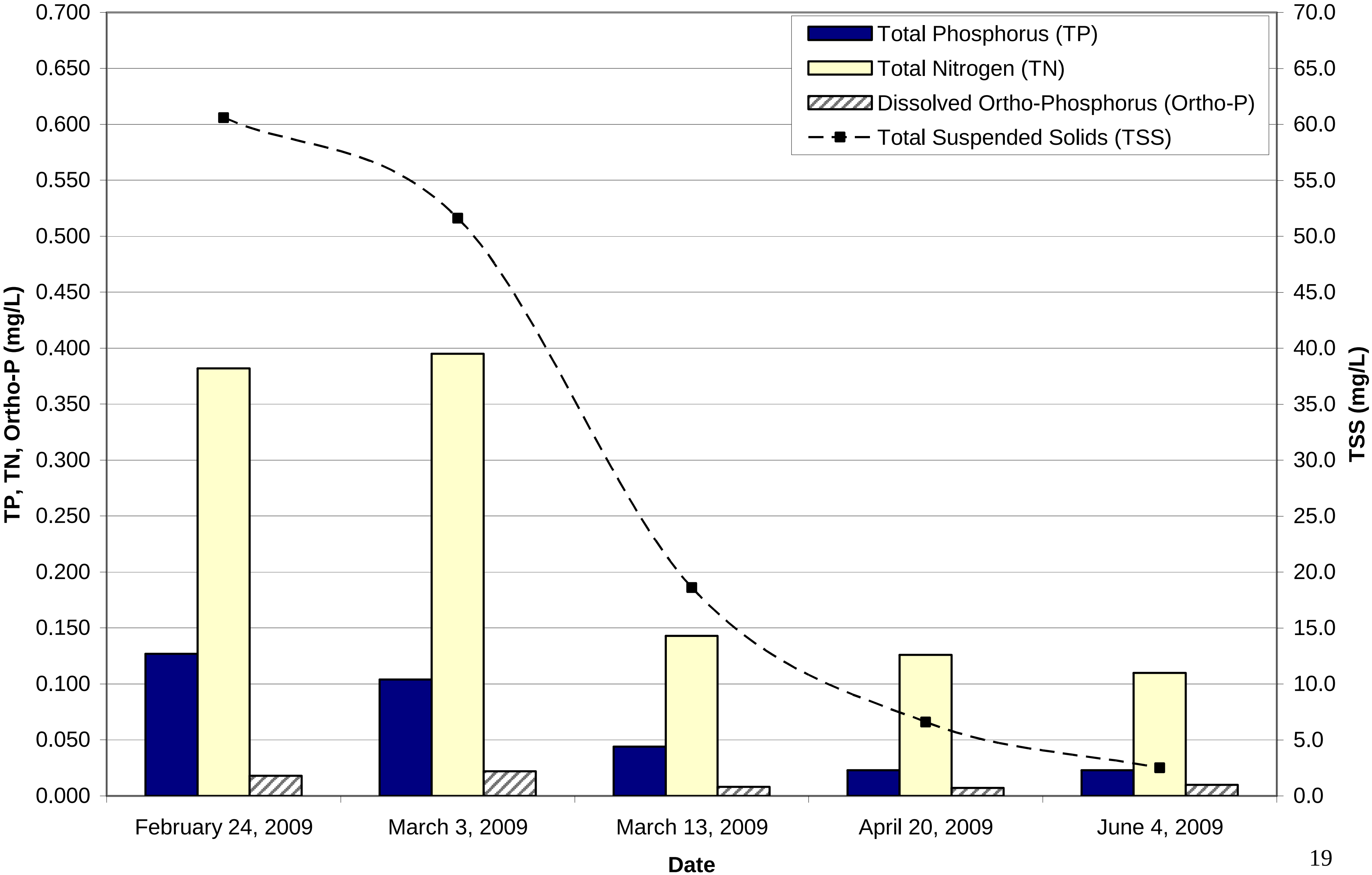
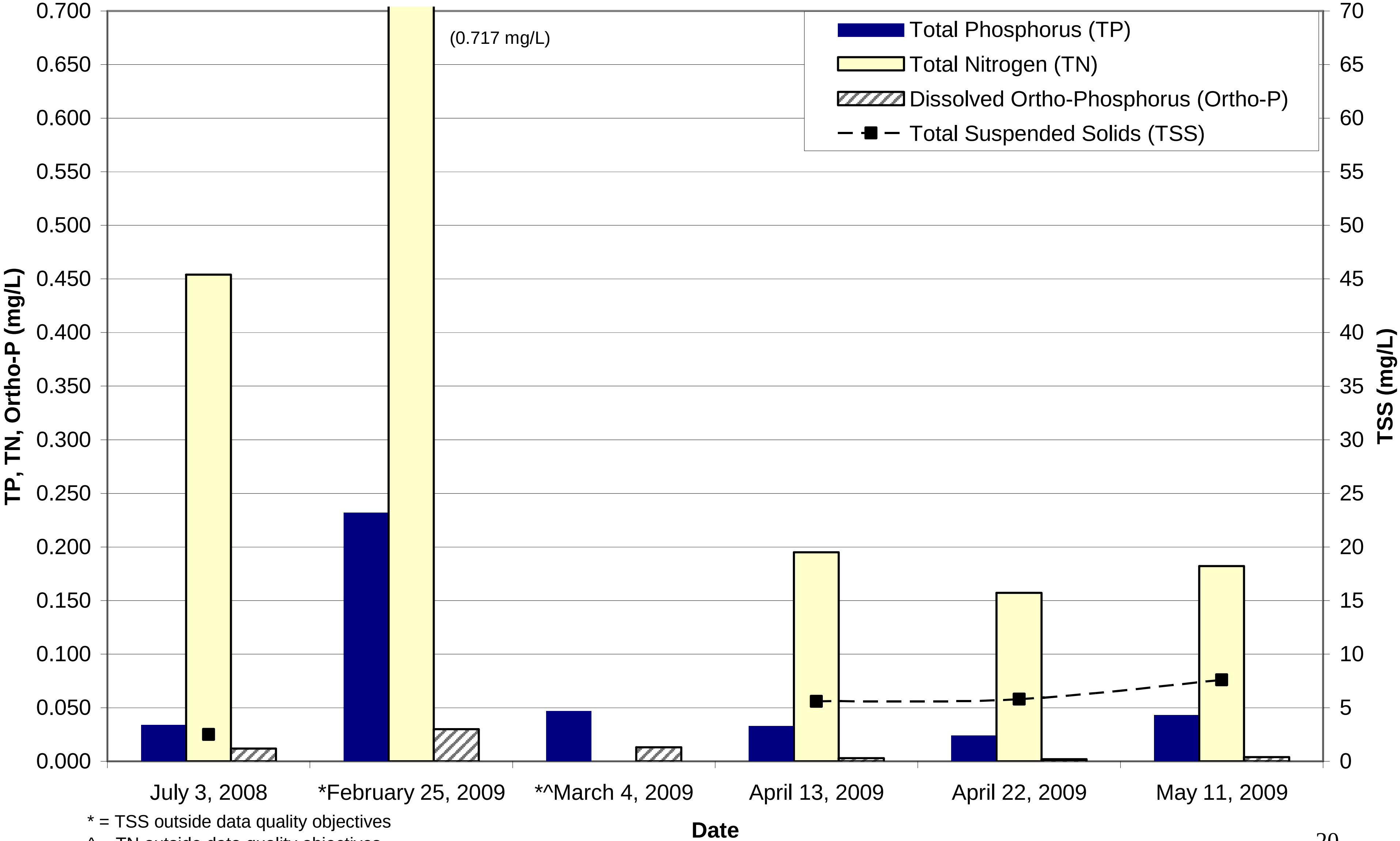


Figure 6: Fernan Creek — 2009 Monitoring Results



* = 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.

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

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.

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.

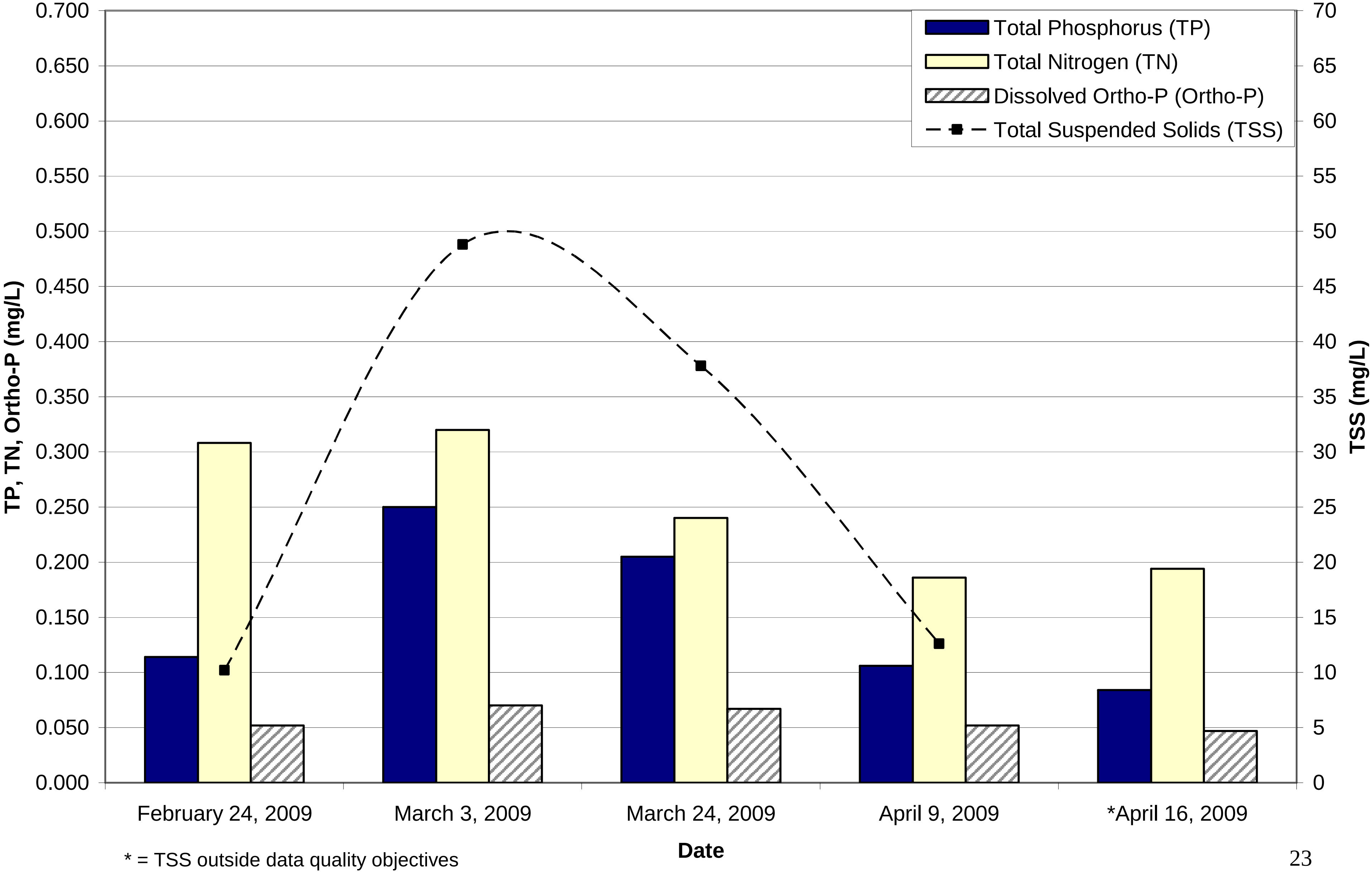
Neachen Creek

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 7: Gotham Creek — 2009 Monitoring Results



* = TSS outside data quality objectives

Figure 8: Mica Creek — 2009 Monitoring Results

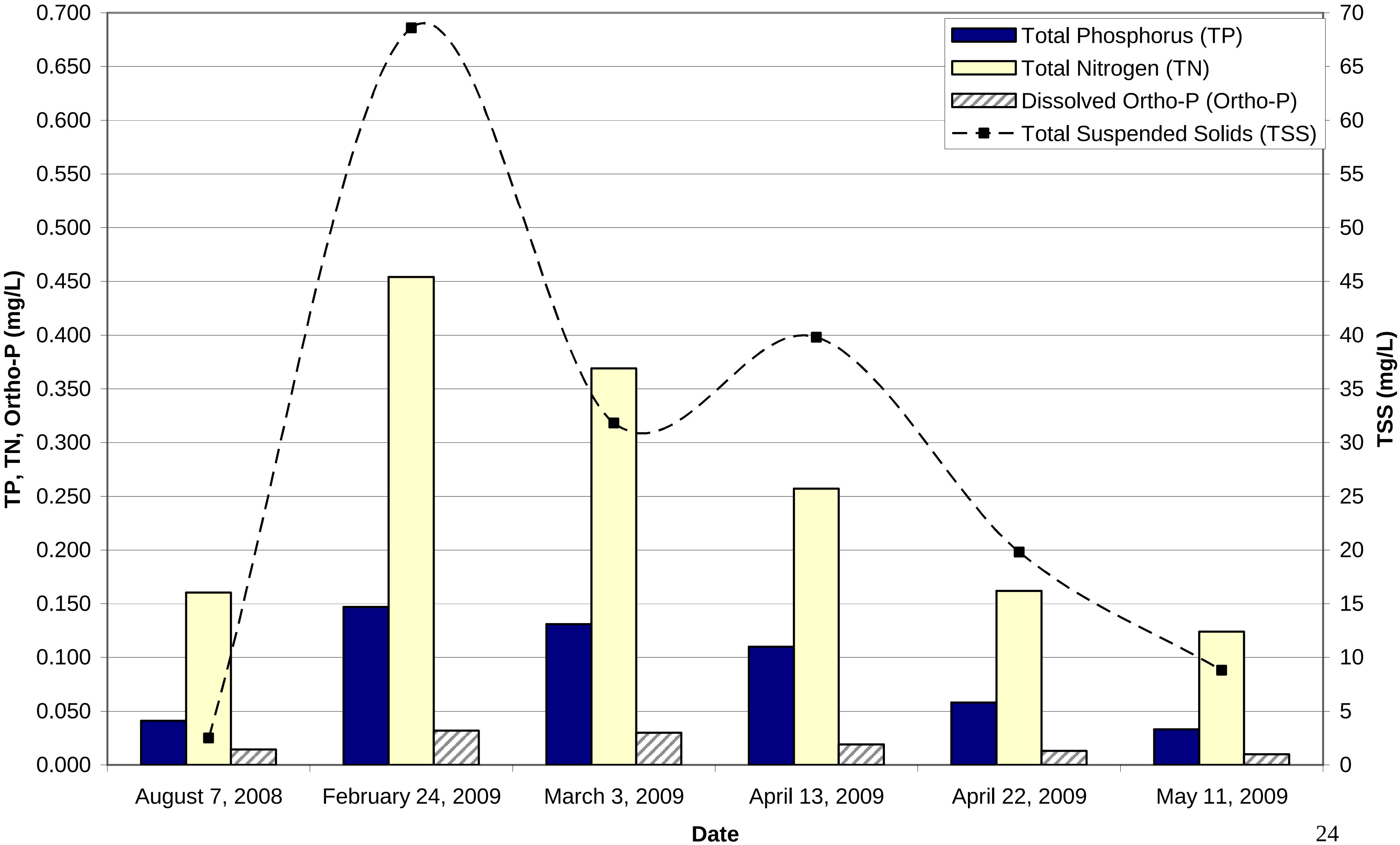
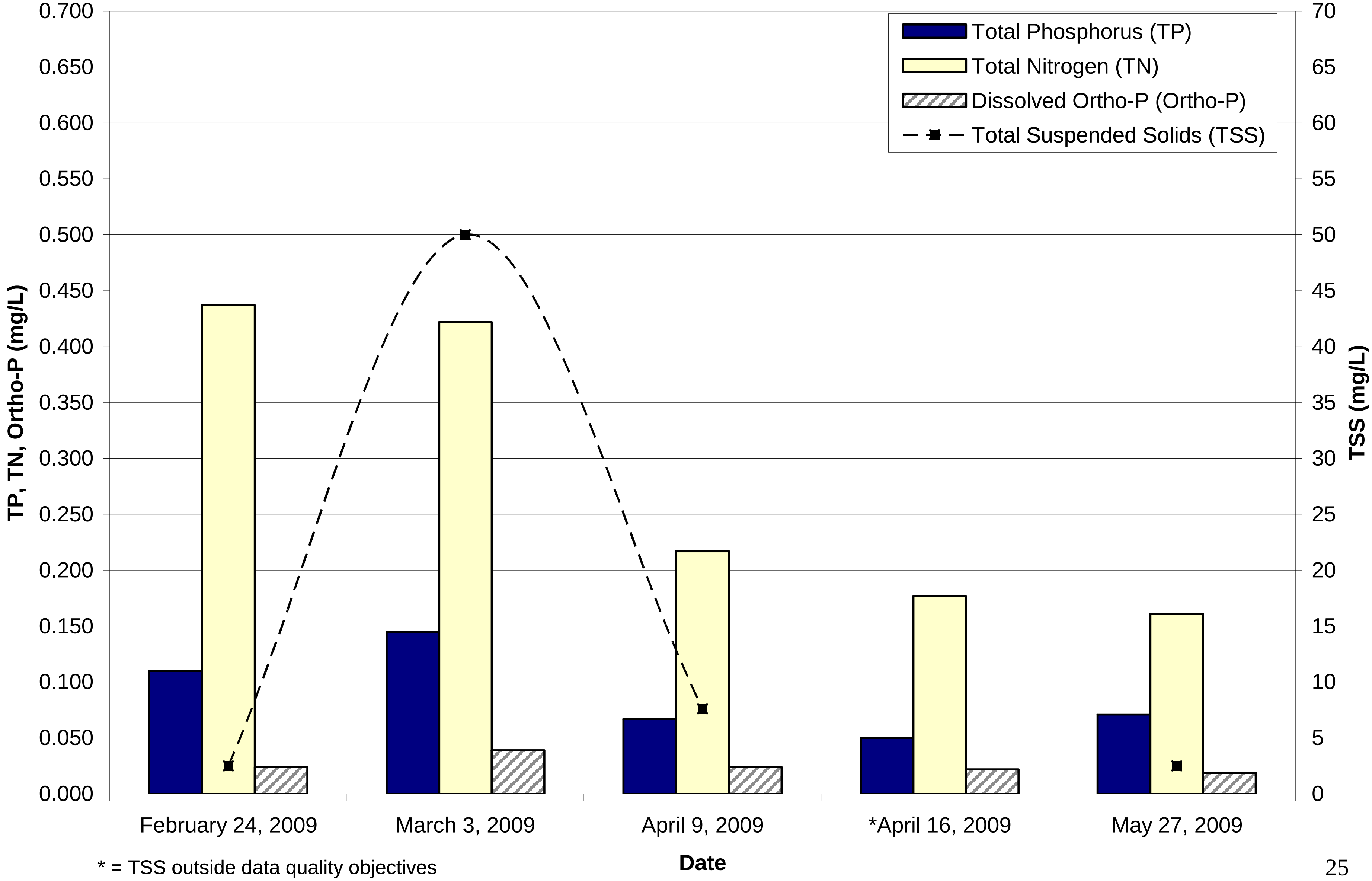


Figure 9: Neachen Creek — 2009 Monitoring Results



* = 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 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

Turner Creek in July 2008.

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 10: Stinson Creek — 2009 Monitoring Results

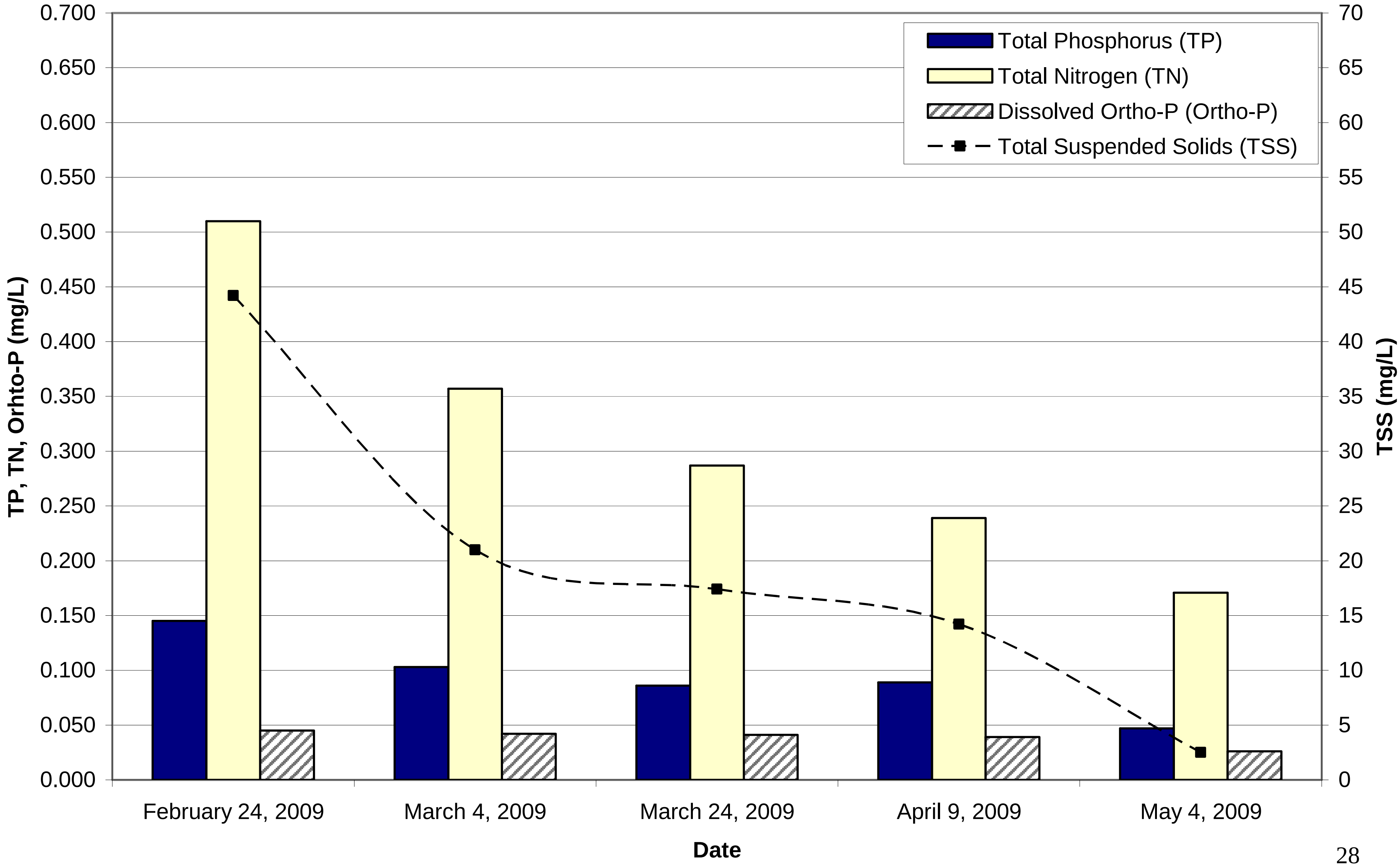


Figure 11: Turner Creek — 2009 Monitoring Results

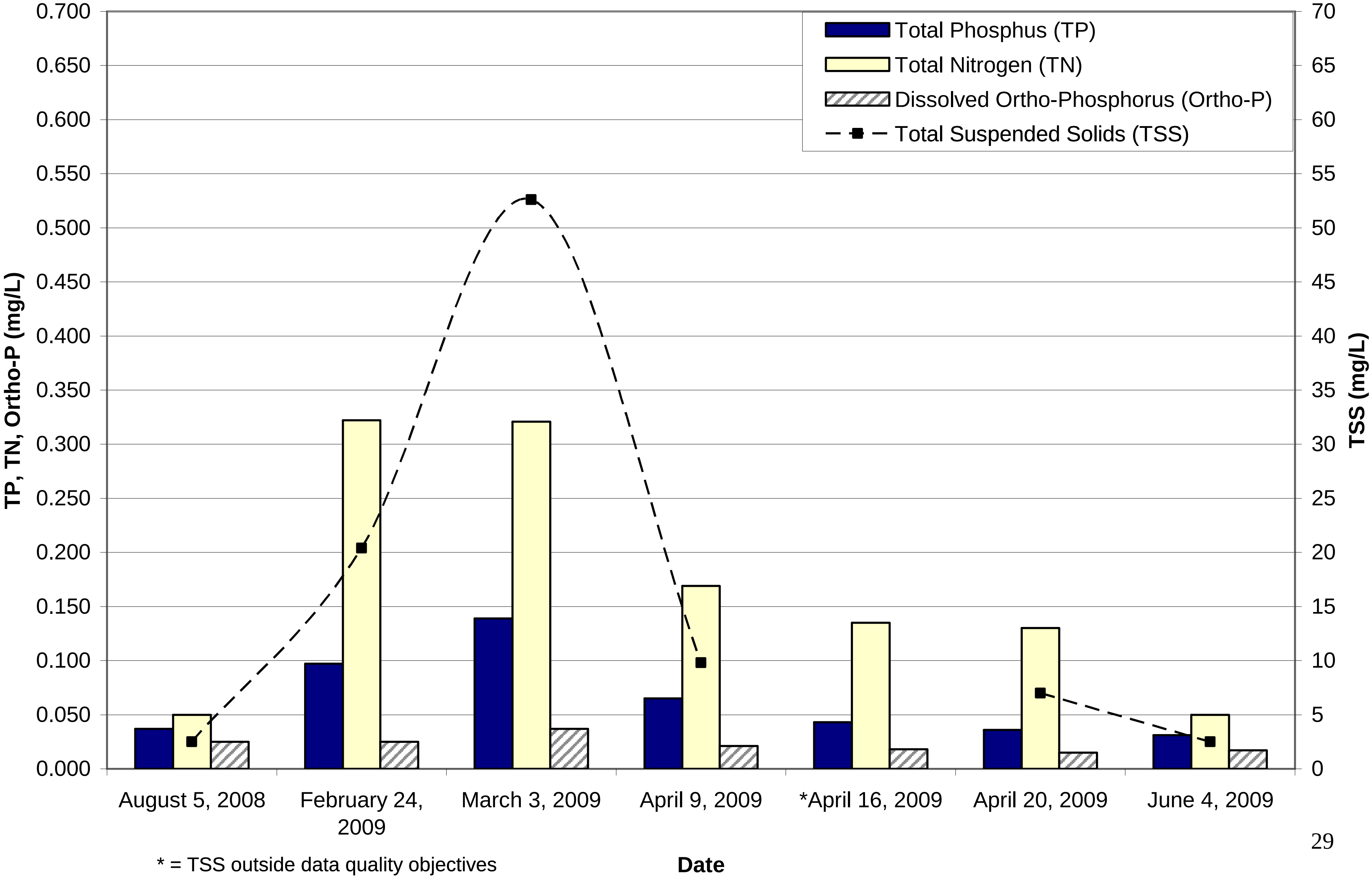
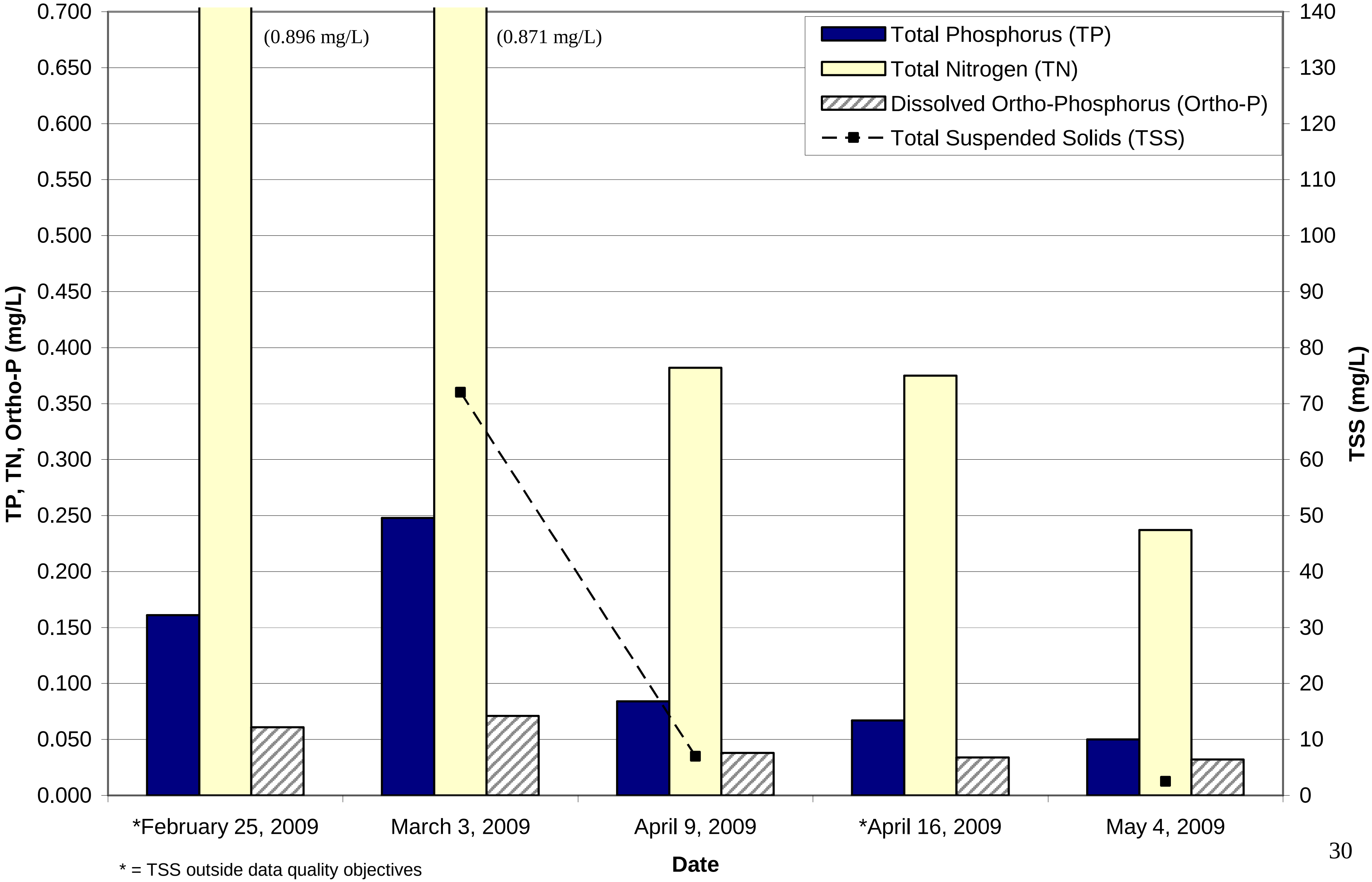


Figure 12: Unnamed Tributary to Bennett Bay — 2009 Monitoring Results



* = TSS outside data quality objectives

Unnamed Creek to Powderhorn Bay

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.

Unnamed Creek into Powderhorn Bay in June 2009.

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.

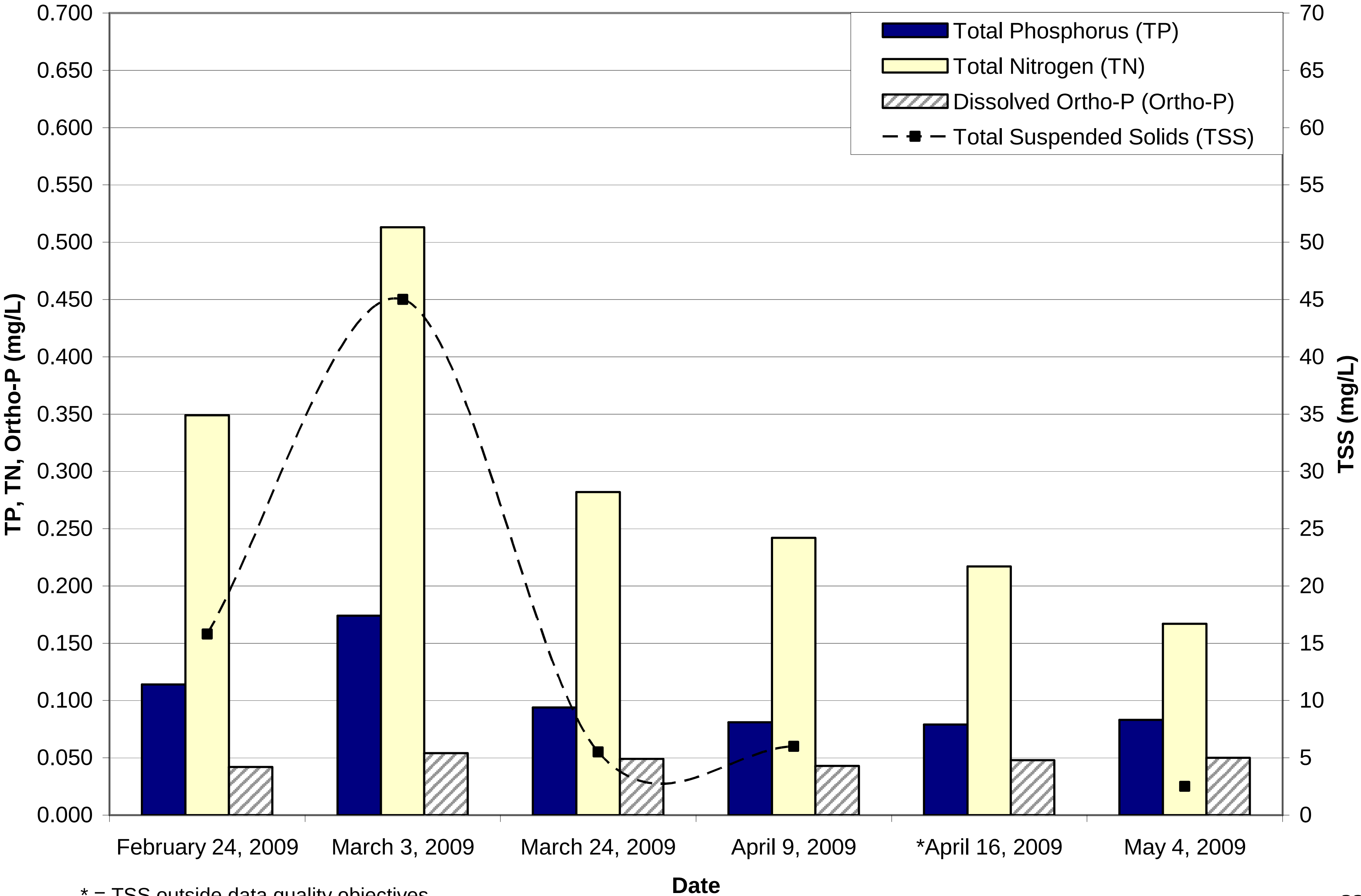
Wolf Lodge Creek

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.

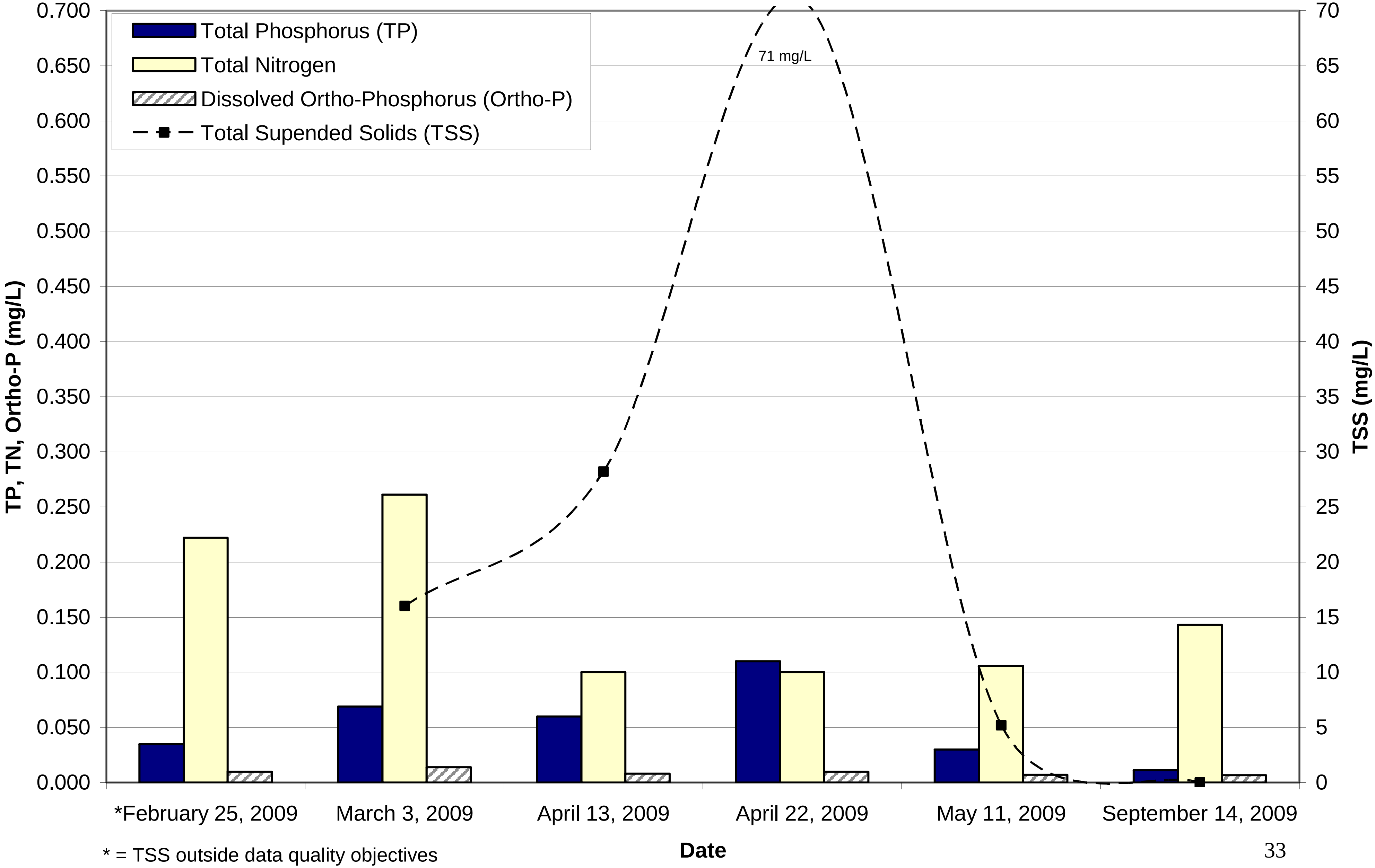
The water quality monitoring site on Wolf Lodge Creek was from a bridge on Wolf Lodge Creek Road upstream o where Wolf Lodge Creek flow into a grazing/wetland area at the mouth. Nutrient and TSS concentrations were highest during spring runoff. On April 22, TP was 0.110 mg/L, dissolved ortho-P was 0.010 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 13: Unnamed Creek into Powderhorn Bay — 2009 Monitoring Results



* = TSS outside data quality objectives

Figure 14: 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 15: Beauty Creek — Total Phosphorus Load

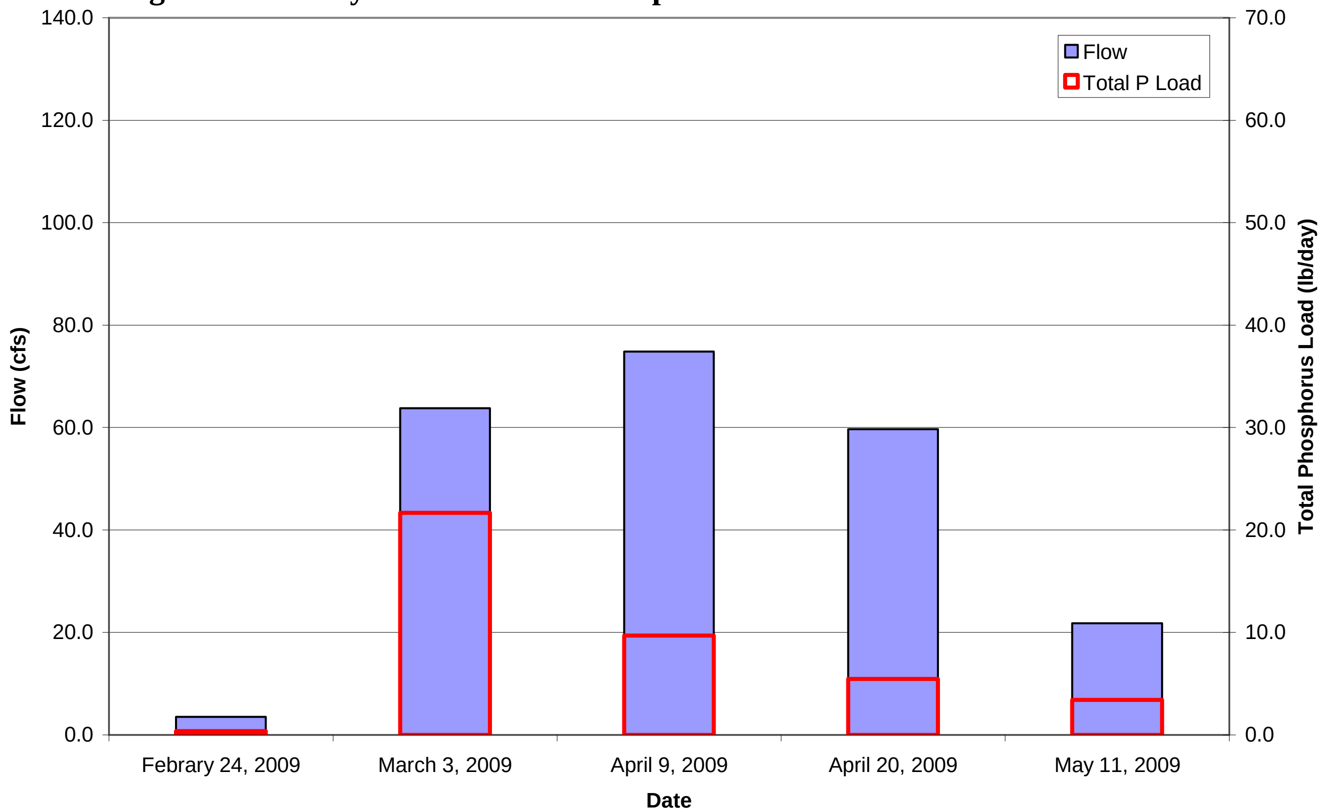


Figure 16: Bellgrove Creek — Total Phosphorus Load

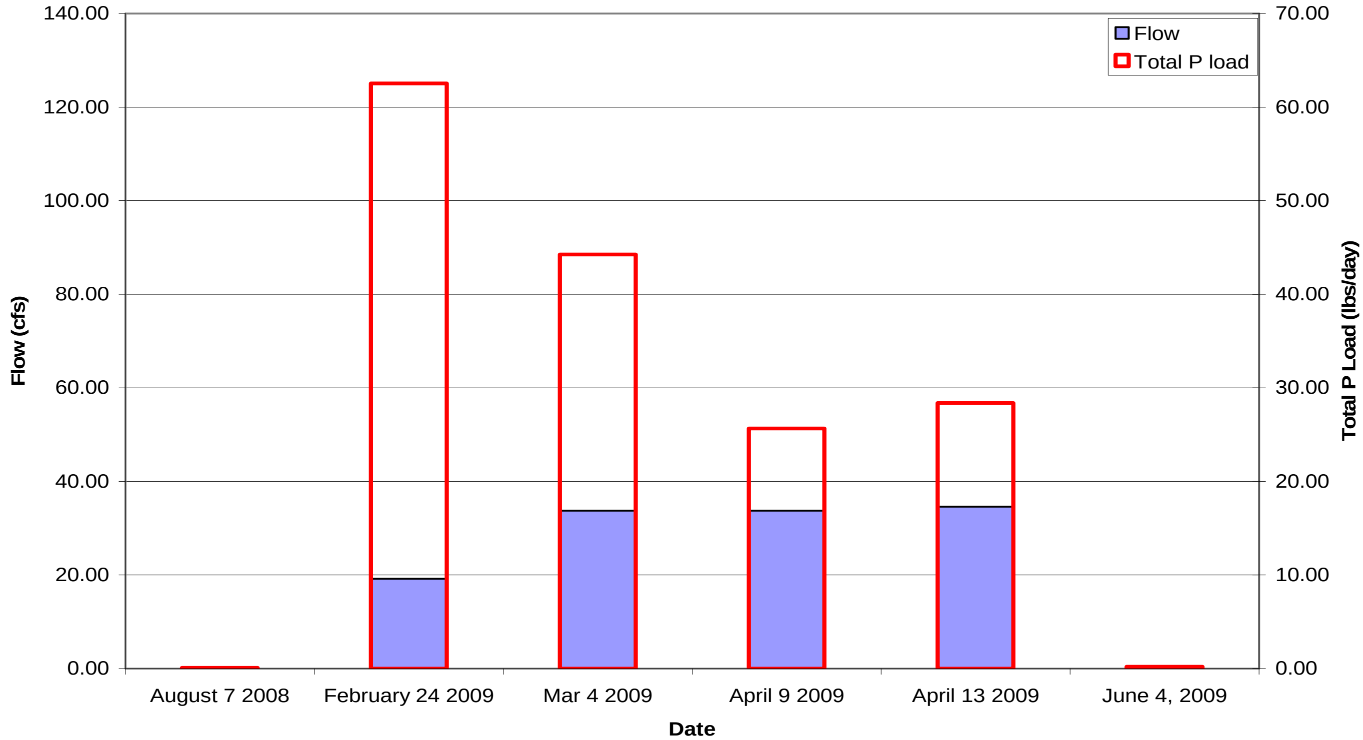


Figure 17: Blue Creek — Total Phosphorus Load

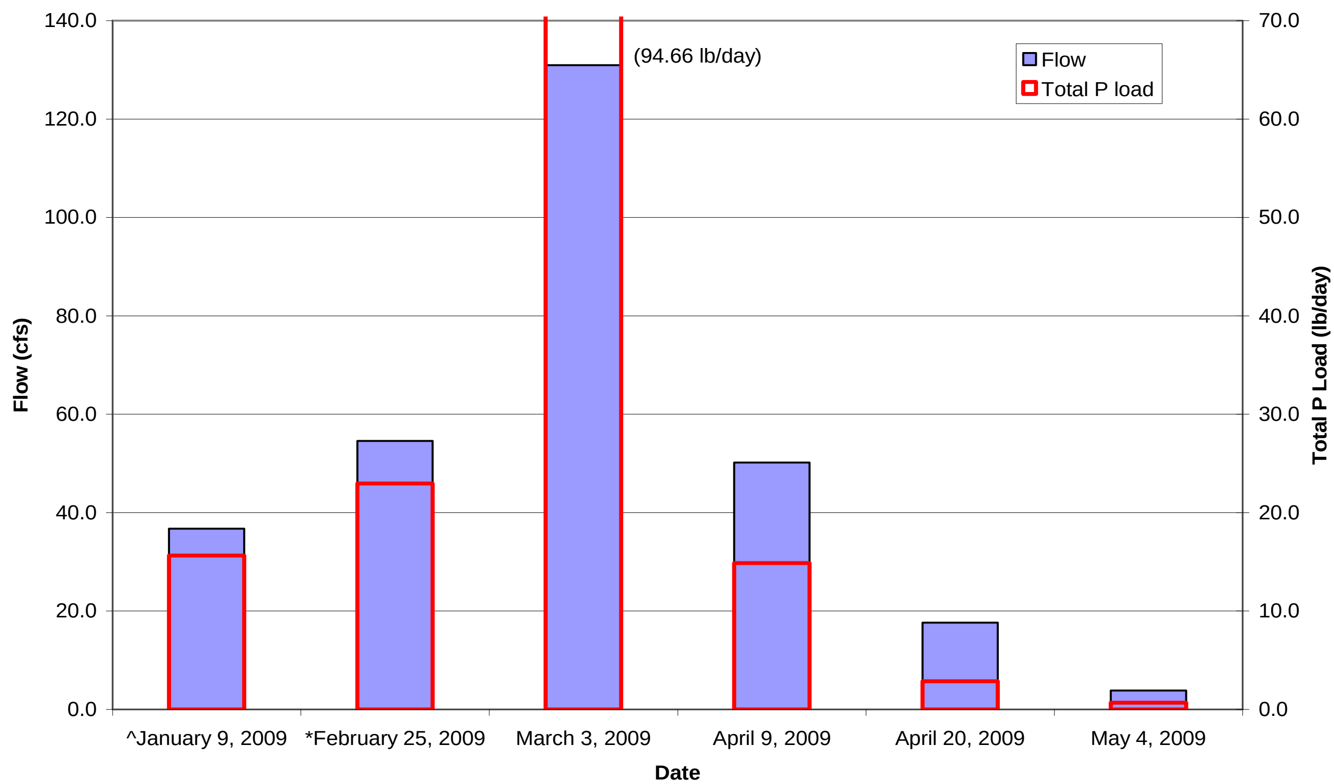


Figure 18: Carlin Creek — Total Phosphorus Load

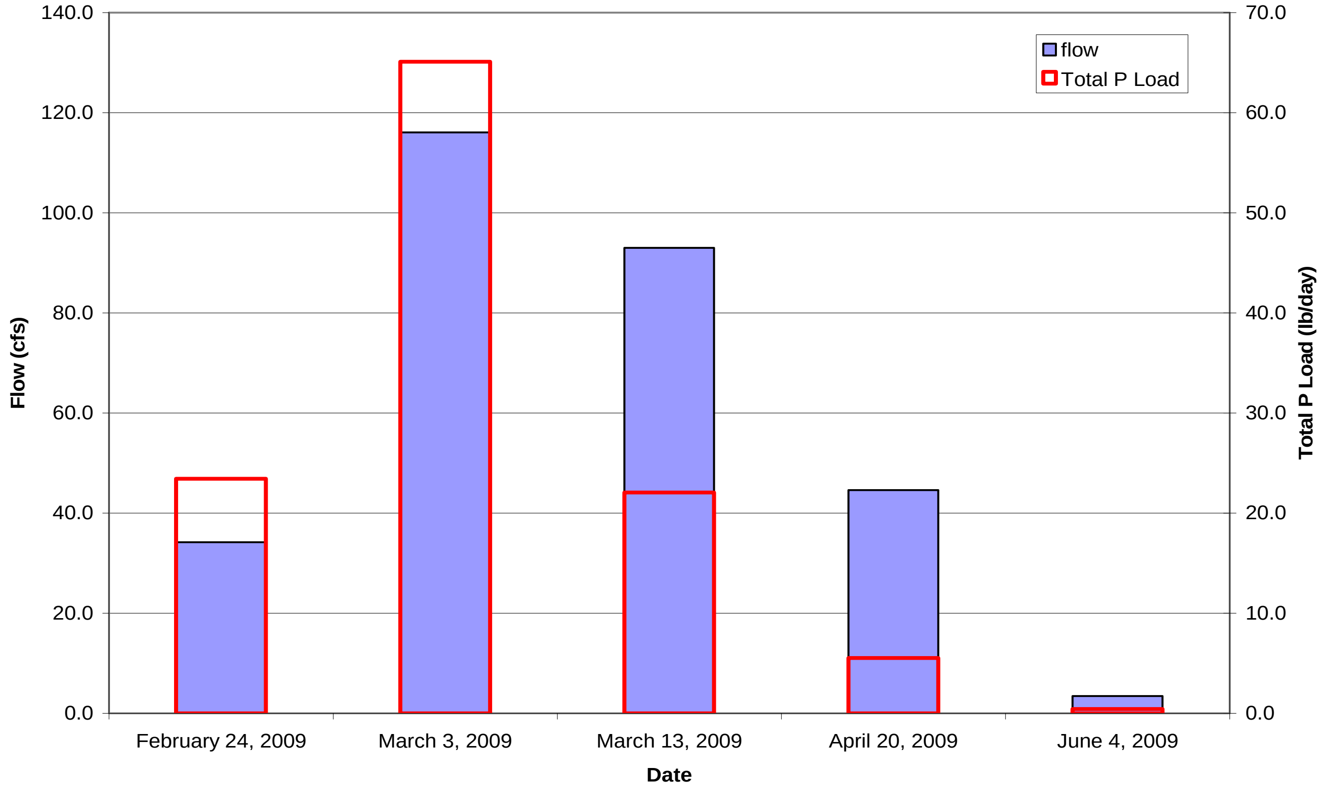


Figure 19: Fernan Creek — Total Phosphorus Load

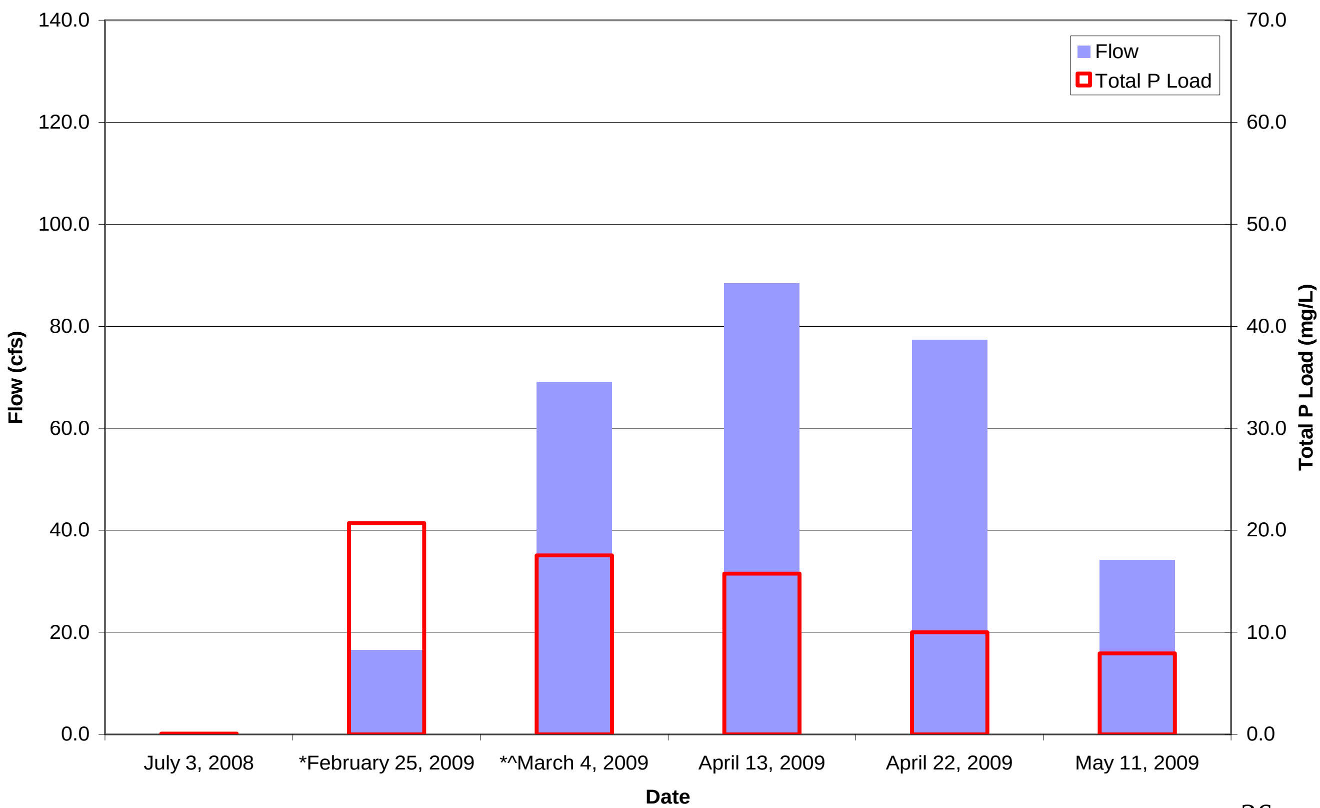


Figure 20: Gotham Creek — Total Phosphorus Load

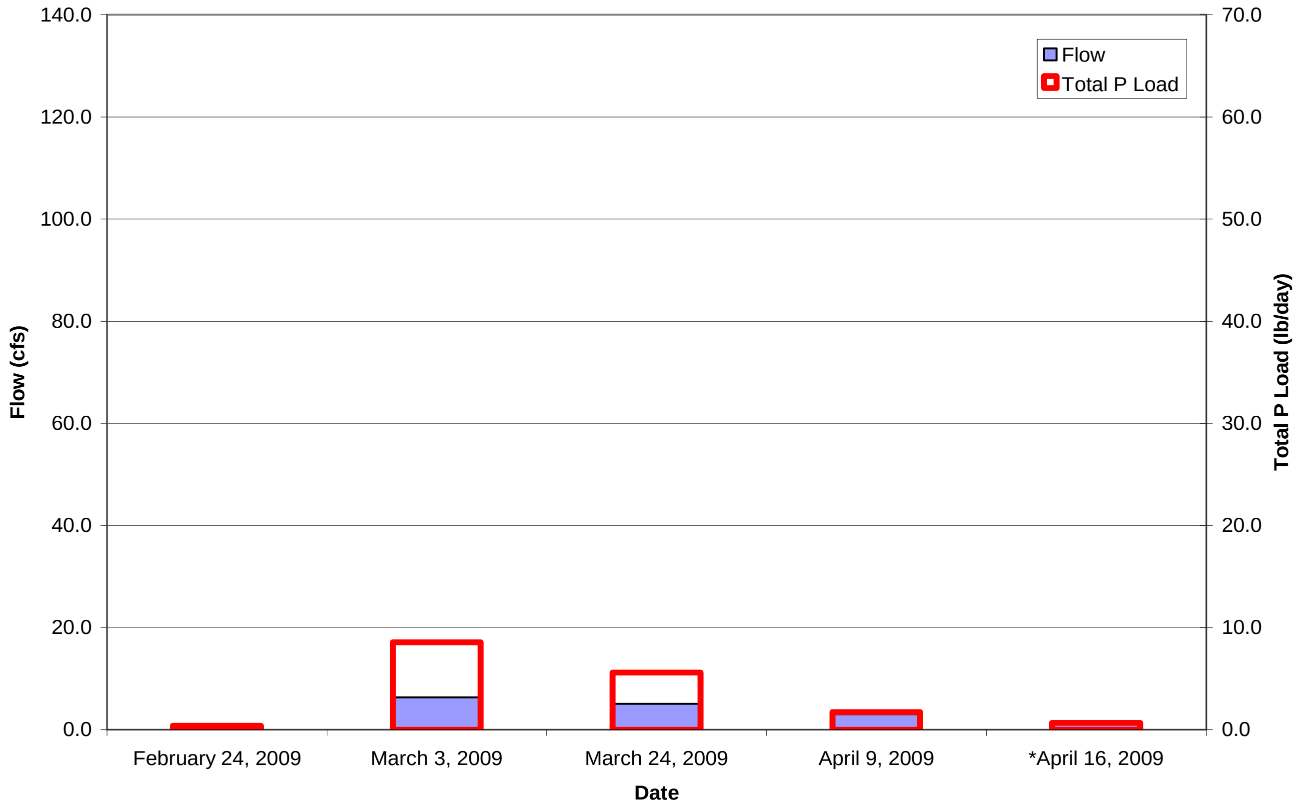


Figure 21: Mica Creek — Total Phosphorus Load

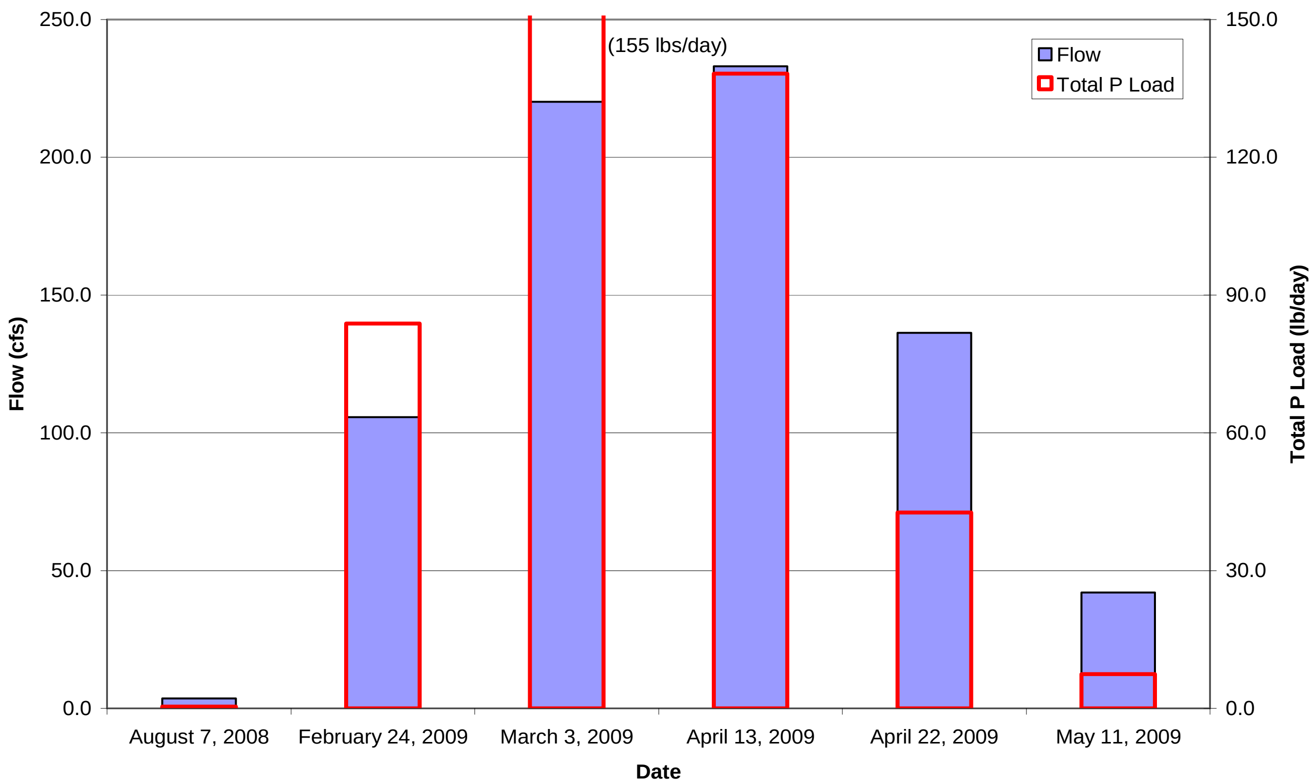


Figure 22: Neachen Creek — Total Phosphorus Load

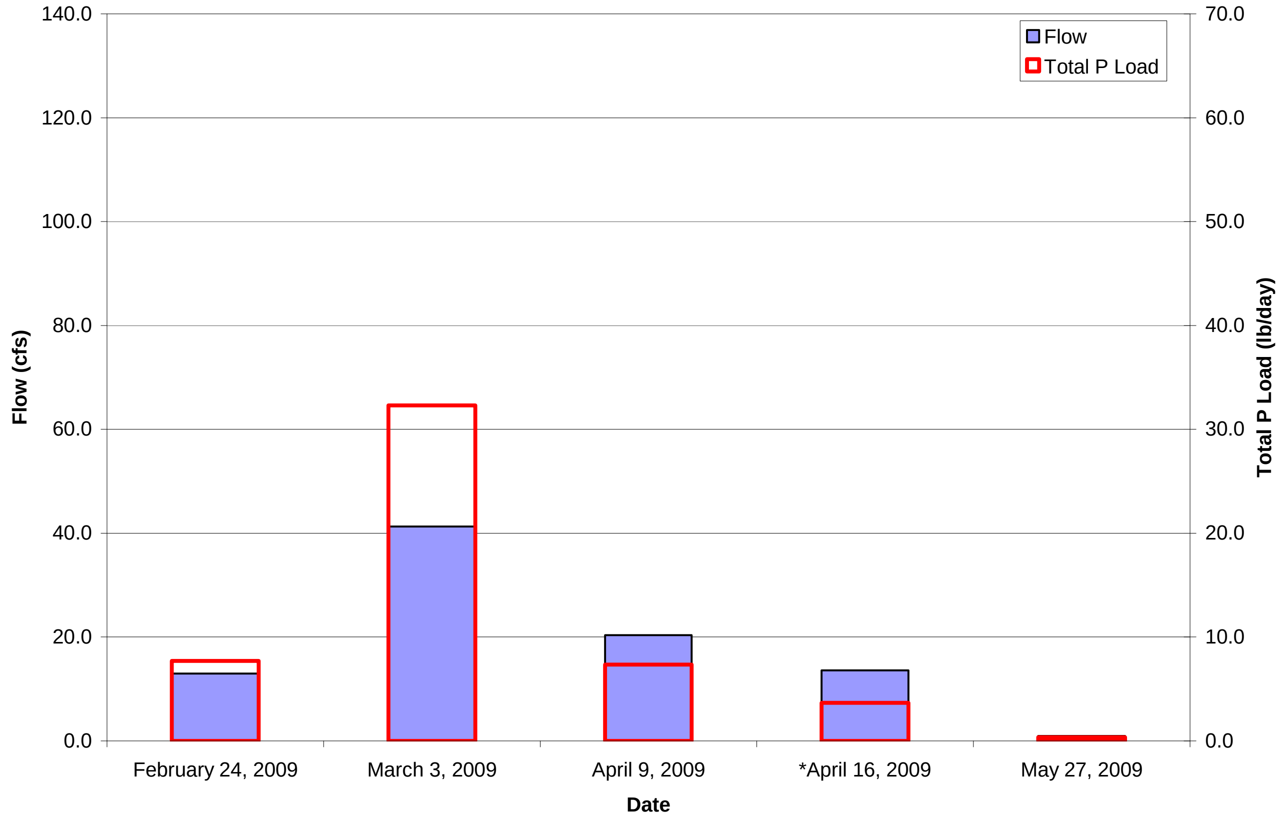


Figure 23: Stinson Creek — Total Phosphorus Load

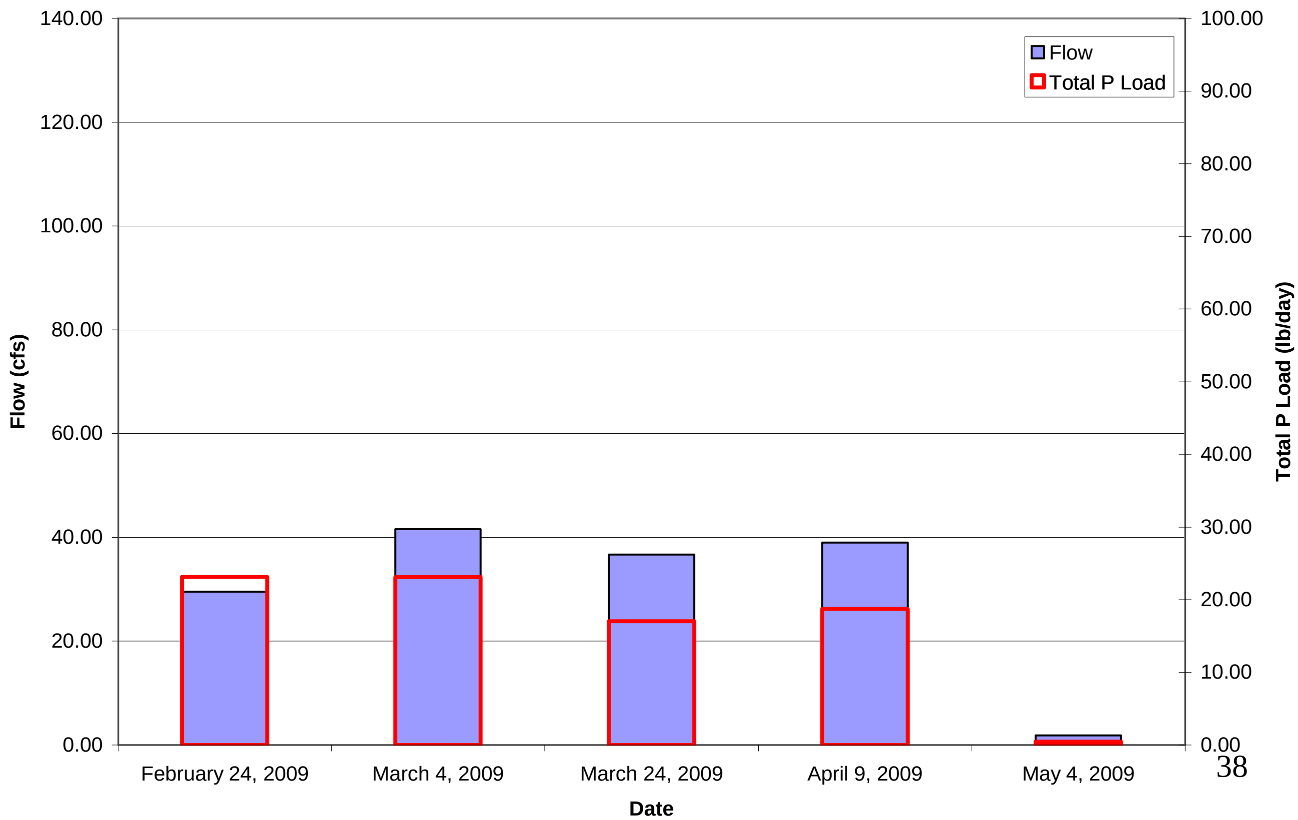


Figure 24: Turner Creek — Total Phosphorus

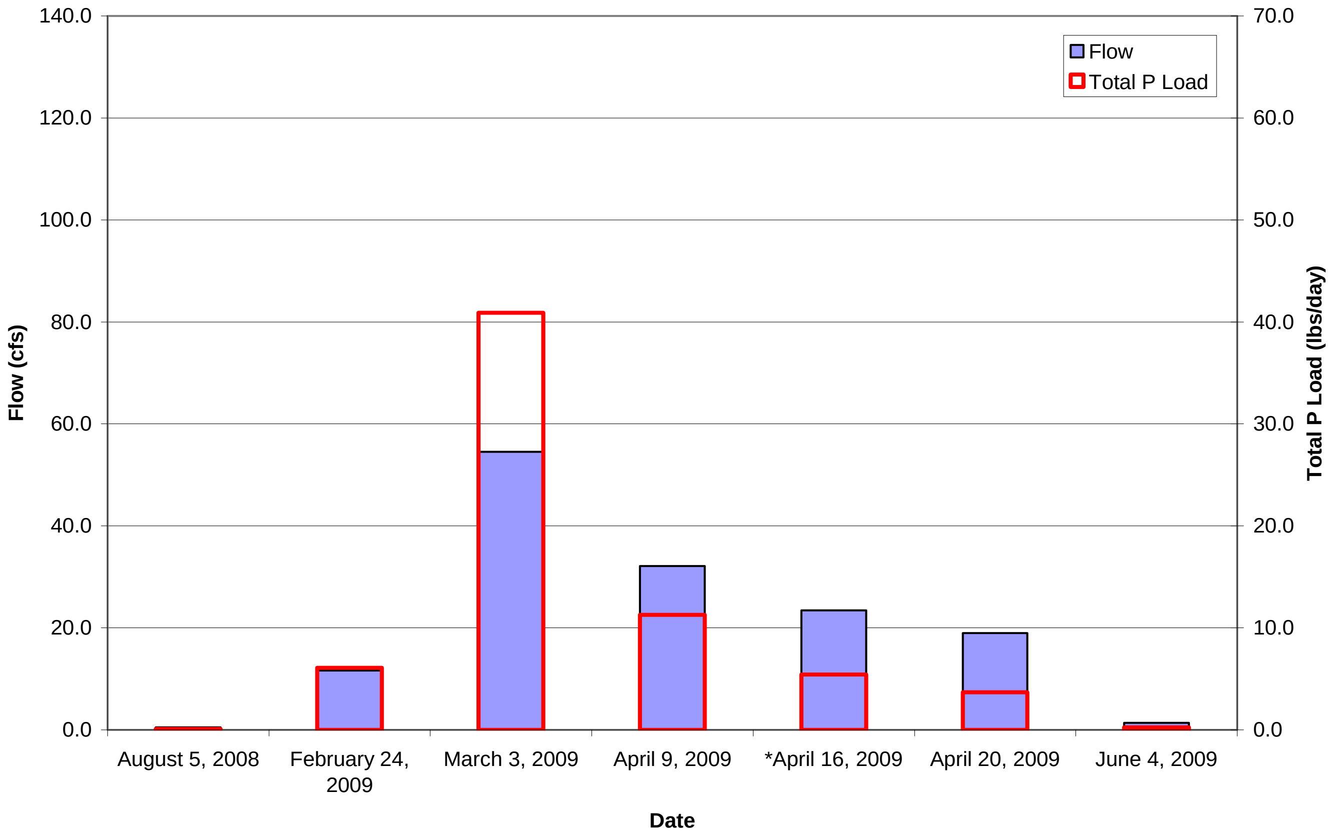


Figure 25: Unnamed Tributary to Bennett Bay Total Phosphorus Load

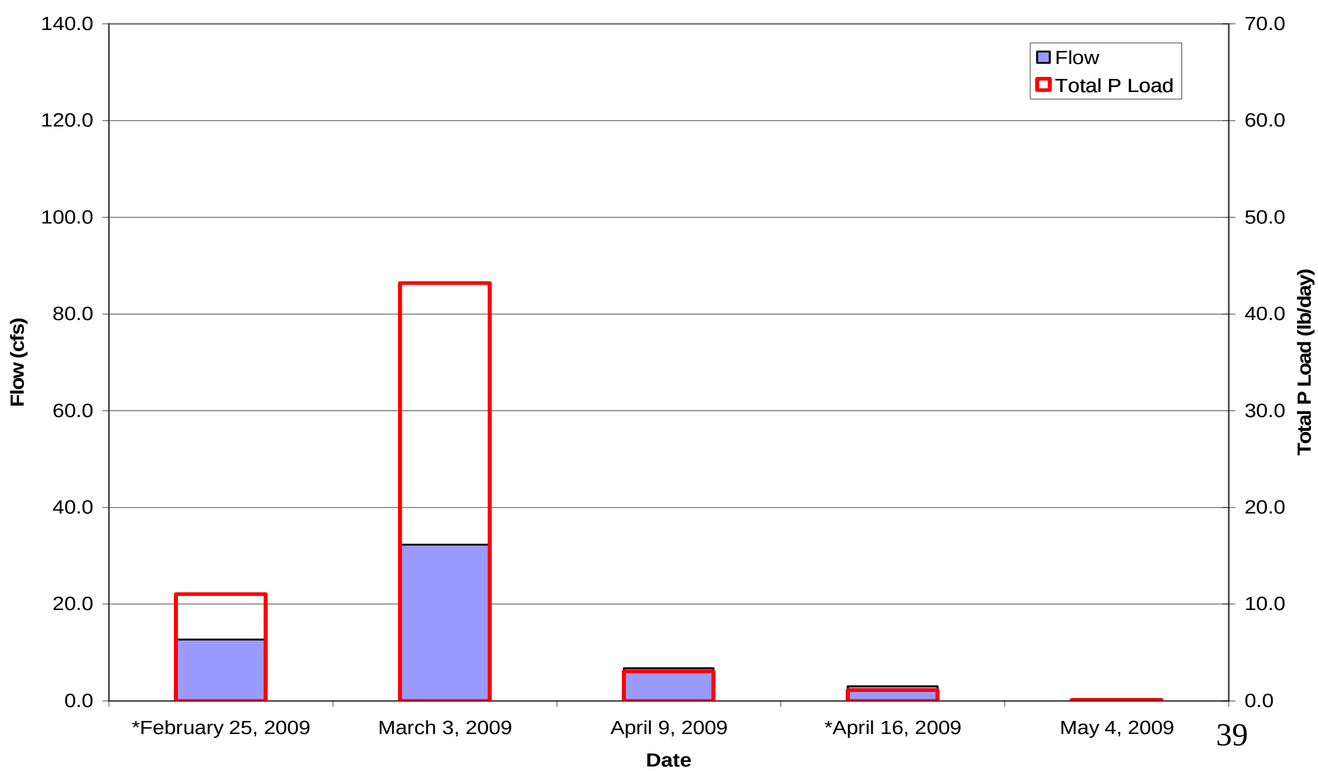


Figure 26: Unnamed Creek to Powderhorn Bay

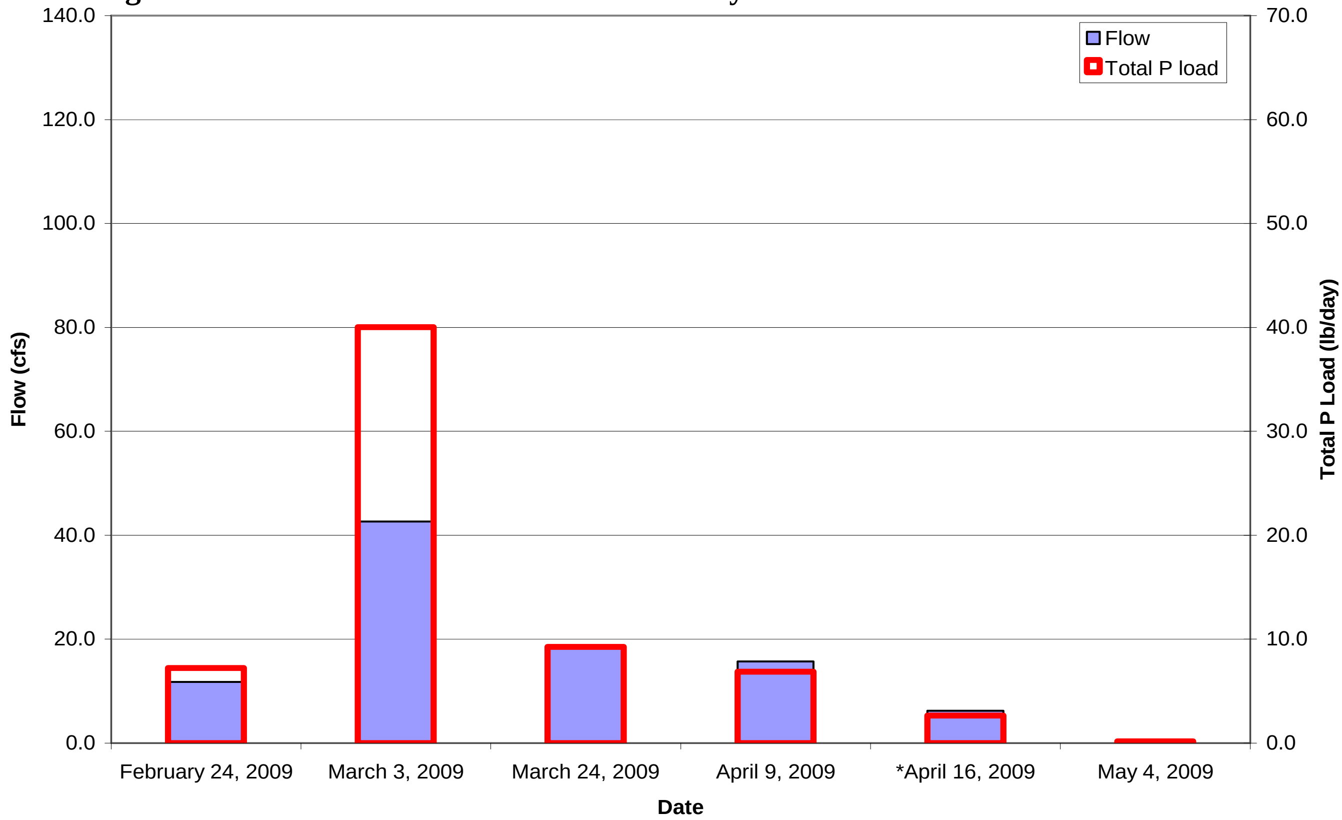
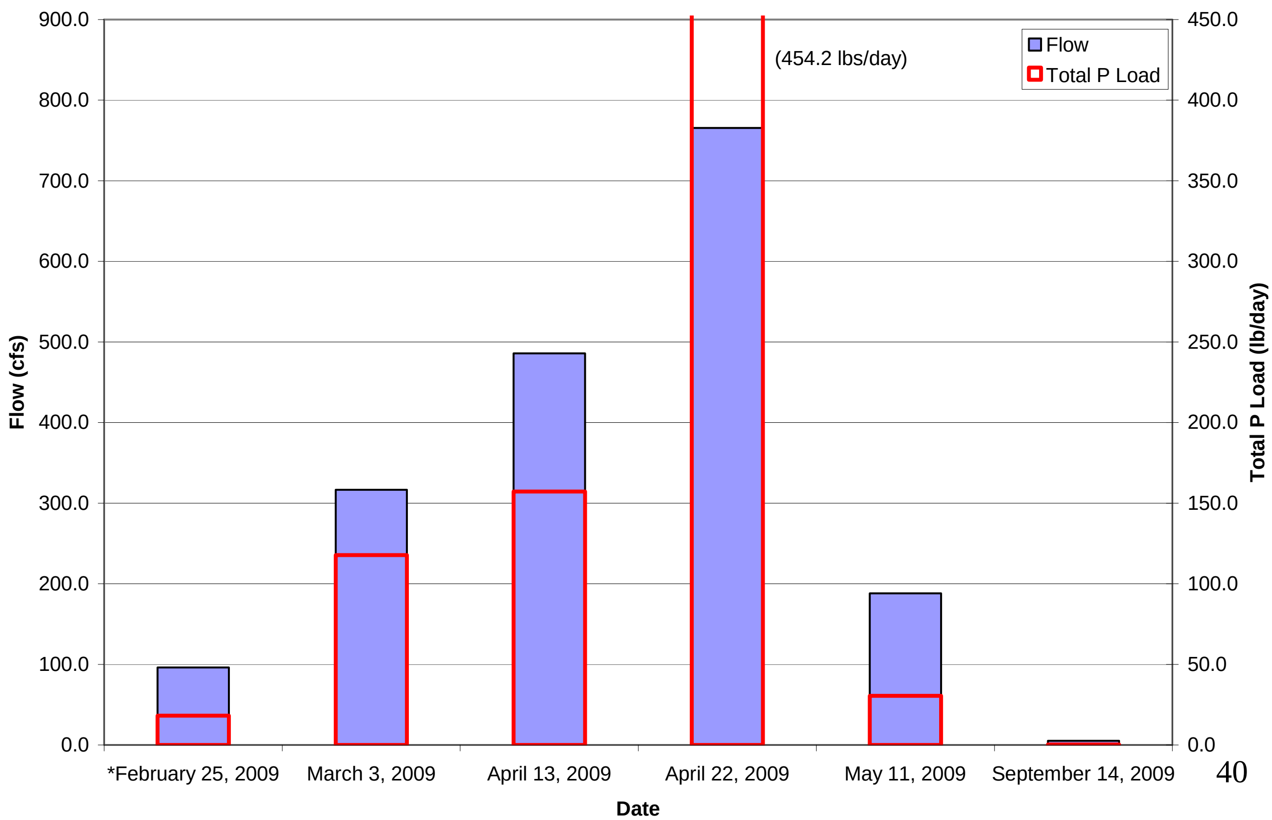


Figure 27: Wolf Lodge Creek — Total Phosphorus Load



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 4: 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 5: [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 6: [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

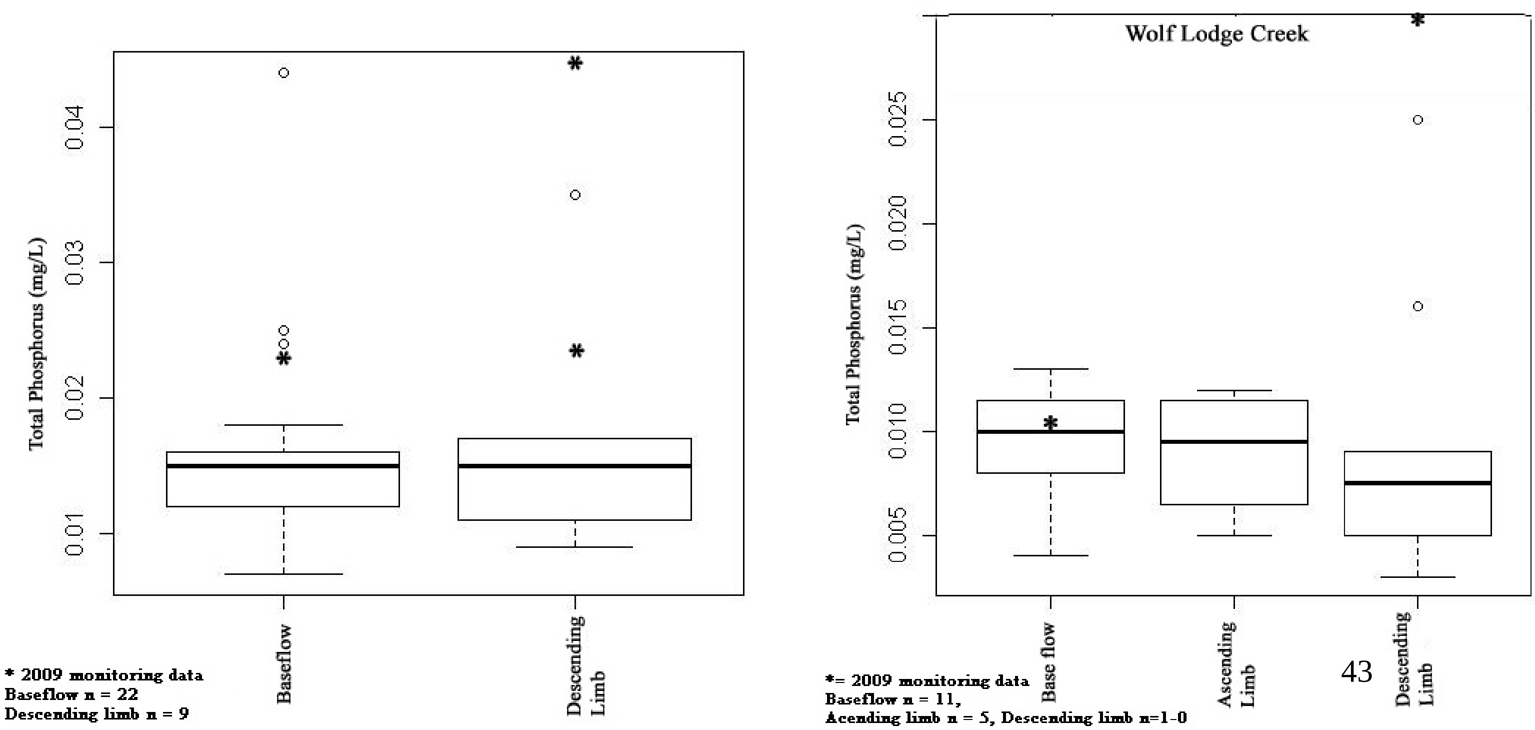
TP loads. Results of the comparison show an order of magnitude difference in the loads (Table 7). This discrepancy may be explained by the difference in TP concentration and flow between 1991-1992 and 2009.

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 7: 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 28: 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 29: Map of deltaic sediments between 2128 and 2182 on tributaries to Coeur d'Alene Lake.

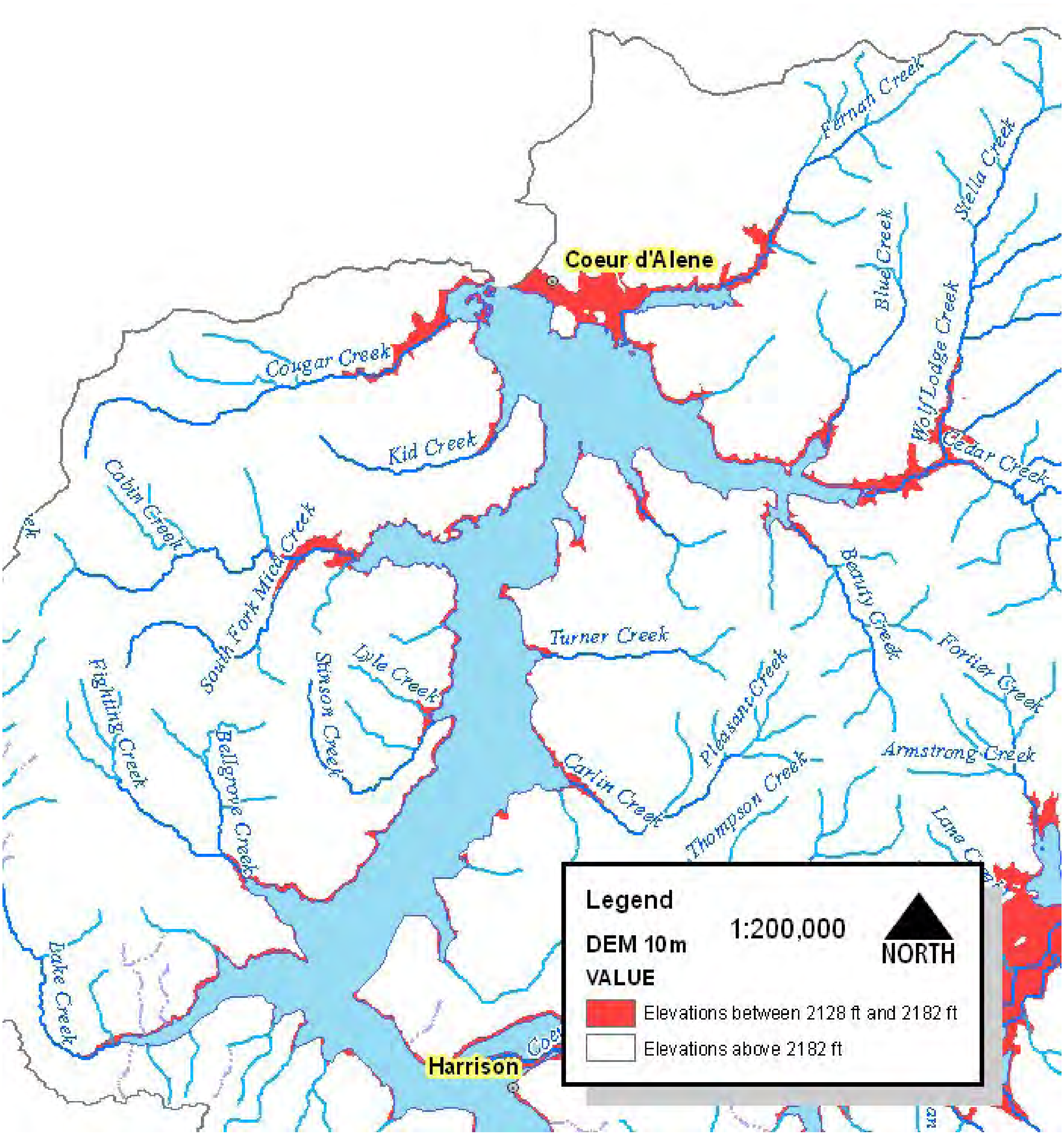
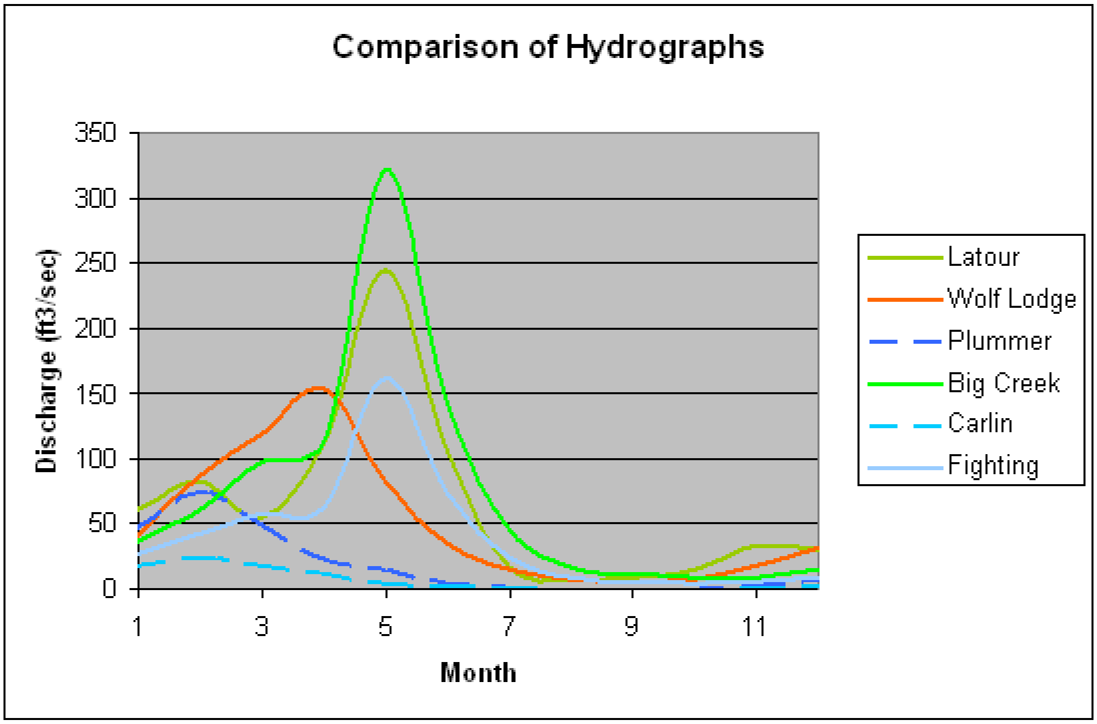


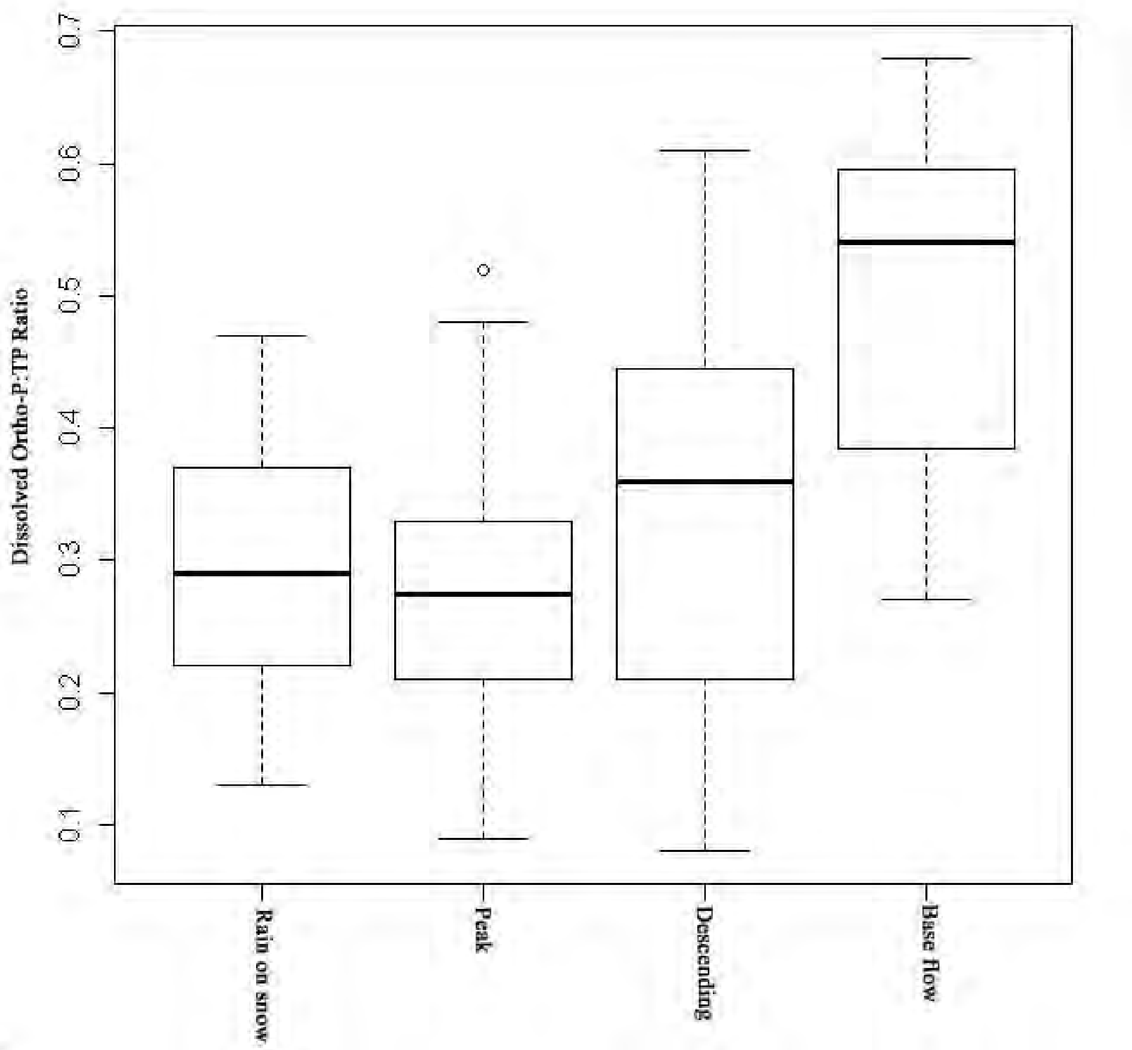
Figure 30: Comparison of hydrographs from creeks in the Coeur d'Alene watershed.



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 31: 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 8. 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 9. 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