Blackfoot River Subbasin

TMDL Five-Year Review

Final

State of Idaho
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August 2015

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Acknowledgments

Many temporary and permanent staff members at the Idaho Department of Environmental Quality collected and provided data used in this 5-year review. The Caribou-Targhee National Forest, Bureau of Land Management Pocatello Field Office, Idaho Soil and Water Conservation Commission, and Trout Unlimited also provided data.

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Executive Summary

This document presents a 5-year review of the *Blackfoot River TMDL Waterbody Assessment and Total Maximum Daily Load* (DEQ 2001), approved by the US Environmental Protection Agency (EPA) in 2002. This review complies with Idaho Code §39-3611(7) and addresses the water bodies in the Blackfoot River subbasin that are in Category 4a of the Integrated Report (DEQ 2014a). The current water quality status, pollutant sources, and recent pollution control efforts are described for the Blackfoot River subbasin, located in southeastern Idaho.

Watershed at a Glance

The Blackfoot River subbasin in southeastern Idaho is a watershed of the upper Snake River basin, with an area of over 1,000 square miles. The subbasin contains over 1,700 miles of streams and a large reservoir. The Blackfoot River is a major tributary of the Snake River, draining 130 miles from headwaters into the Snake River, approximately 14 miles above the American Falls Reservoir. The Blackfoot Reservoir is located in the middle of the subbasin and often serves as a dividing line between the upper and lower watersheds. Table A summarizes the pollutants, approved total maximum daily loads (TMDLs), and associated implementation plan.

Table A. Blackfoot River watershed at a glance.

Approved TMDLs	Pollutants Within Watershed
Blackfoot River—headwaters to Blackfoot Reservoir: sediment Blackfoot River—Blackfoot Reservoir to Wolverine Creek: sediment, nutrients Blackfoot River—Wolverine Creek to Main Canal: sediment and nutrients Wolverine Creek: sediment, nutrients Jones Creek: nutrients Corral Creek: sediment Grizzly Creek: sediment Meadow Creek: sediment Trail Creek: sediment Slug Creek: sediment Dry Valley Creek: sediment Angus Creek: sediment Lanes Creek: sediment Bacon Creek—Lanes Creek to US Forest Service boundary: sediment Sheep Creek: sediment Diamond Creek: sediment Brush Creek: sediment and temperature Maybe Canyon Creek: sediment	Sediment, nutrients
Implementation Plans	**Implementation Actions**
Blackfoot River TMDL Implementation Plan (DEQ 2006)	Two §319 projects on the Blackfoot River to exclude cattle from riparian corridor and install off-channel watering structures. Upper Blackfoot Confluence restored meander bends along a section on upper Lanes Creek (ID17040207SK018_02e) and lower Sheep Creek (ID17040207SK022_03).

Key Findings

TMDLs subject to 5-year review are shown in Table B. Sediment TMDLs were set at ≥80% streambank stability. Additionally, subsurface fine sediments in spawning habitats were not to exceed 25% of the total volume of sediment for particles <6.3 millimeters and 10% for particles <0.85 mm. Nutrient targets were set so that total phosphorus (TP) would not exceed 0.1 milligrams per liter (mg/L) and total inorganic nitrogen would not exceed 0.3 mg/L.

Table B. Existing TMDLs general status.

Assessment Unit Name	Assessment Unit Number	Pollutant	Implementation Plan
Blackfoot River—Blackfoot Reservoir Dam to Fort Hall Main	ID17040207SK002_05	Sediment, nutrients	Yes
Corral Creek			
- Headwaters and unnamed tributaries	ID17040207SK006_02	Sediment	Yes
- Middle	ID17040207SK006_03		
- Lower	ID17040207SK006_04		
Grizzly Creek			
- Source to mouth	ID17040207SK007_02	Sediment	Yes
- Sawmill Creek: headwaters to Grizzly Creek	ID17040207SK007_02a		
- Source to mouth	ID17040207SK007_03		
- Source to mouth	ID17040207SK007_04		
Blackfoot River			
- Trail Creek side channel near confluence with Blackfoot River.	ID17040207SK010_03	Sediment	Yes
- Headwaters to Slug Creek	ID17040207SK010_04		
- Blackfoot River	ID17040207SK010_05		
- Small section near Diamond Creek	ID17040207SK015_04		
Trail Creek (upper Blackfoot River)			
- Headwaters and unnamed tributaries	ID17040207SK011_02	Sediment	Yes
- Source to mouth (below Findlayson Ranch)	ID17040207SK011_03		
- Upper Trail Creek	ID17040207SK011_03a		
Slug Creek			
- Headwaters and unnamed tributaries	ID17040207SK012_02	Sediment	Yes
- Source to mouth (2nd and 3rd order)	ID17040207SK012_03		
- Source to mouth	ID17040207SK012_04		
Dry Valley Creek			
- Unnamed tributaries	ID17040207SK013_02	Sediment	Yes
- Dry Valley Creek	ID17040207SK013_02a		
- Chicken Creek (tributary to Dry Valley Creek)	ID17040207SK013_02b		

Assessment Unit Name	Assessment Unit Number	Pollutant	Implementation Plan
Maybe Canyon Creek—-source to mouth	ID17040207SK014_02	Sediment	Yes
Diamond Creek		Sediment	Yes
- Unnamed tributaries	ID17040207SK016_02		
- Upper Diamond Creek	ID17040207SK016_02a		
- Coyote Creek	ID17040207SK016_02b		
- Bear Canyon: headwaters to Diamond Creek	ID17040207SK016_02c		
- Timber Creek: headwaters to Diamond Creek	ID17040207SK016_02d		
- Cabin Creek	ID17040207SK016_02e		
- Stewart Canyon	ID17040207SK016_02f		
- Campbell Canyon	ID17040207SK016_02g		
- Upper Kendall Creek	ID17040207SK016_02h		
- Lower Kendall Creek	ID17040207SK016_02i		
- Lower Diamond Creek	ID17040207SK016_03		
- Middle Diamond Creek	ID17040207SK016_03a		
Lanes Creek		Sediment	Yes
- Unnamed tributaries	ID17040207SK018_02		
- Headwaters to forest service boundary	ID17040207SK018_02a		
- Daves Creek: headwaters to road crossing	ID17040207SK018_02b		
- Daves Creek: road crossing to Lanes Creek	ID17040207SK018_02c		
- Corralisen Creek	ID17040207SK018_02d		
- Forest service boundary to Lander Creek	ID17040207SK018_02e		
- Lander Creek to Chippy Creek	ID17040207SK018_03		
- Chippy Creek to Blackfoot River	ID17040207SK018_04		
Bacon Creek		Sediment	Yes
- Unnamed tributaries	ID17040207SK019_02		
- Upper Bacon Creek	ID17040207SK019_02a		
- Below forest service boundary	ID17040207SK019_02b		
- Below forest services boundary	ID17040207SK019_03		
- Below forest services boundary	ID17040207SK019_04		
Sheep Creek		Sediment	Yes
- Upper Sheep Creek: headwaters and unnamed tributaries	ID17040207SK022_02		
- Lower Sheep Creek	ID17040207SK022_03		
- Middle Sheep Creek	ID17040207SK022_03a		

Assessment Unit Name	Assessment Unit Number	Pollutant	Implementation Plan
Angus Creek			
- Unnamed tributaries	ID17040207SK023_02	Sediment	Yes
- Rasmussen Creek	ID17040207SK023_02a		
- Upper Angus Creek—headwaters to Rasmussen Creek	ID17040207SK023_02b		
- Lower Angus Creek—Rasmussen Creek to Blackfoot River	ID17040207SK023_04		
Meadow Creek			
- Headwaters and unnamed tributaries	ID17040207SK025_02	Sediment	Yes
- Headwaters to Crooked Creek	ID17040207SK025_02a		
- Headwaters to fork (including Wham Creek)	ID17040207SK025_02d		
- Crooked Creek to Clarks Cut	ID17040207SK025_03		
- Blackfoot Reservoir to Clarks Cut	ID17040207SK025_04		
Brush Creek			
- Source to mouth	ID17040207SK026_02	Sediment, temperature[a]	Yes[b]
- Source to mouth	ID17040207SK026_03		
Wolverine Creek			
- Source to Jones Creek	ID17040207SK030_02	Sediment, nutrients	Yes
- Jones Creek to mouth	ID17040207SK030_03		
Jones Creek—source to mouth	ID17040207SK031_02	Nutrients	Yes

a. All TMDLs were approved in 2002, except the Brush Creek temperature TMDL, which was approved in 2007 (DEQ 2007).
b. The *Blackfoot River TMDL Implementation Plan* (DEQ 2006) applies to TMDLs approved in 2002. Implementation plan was not submitted for the Brush Creek temperature TMDL (DEQ 2007); however, implementation for sediment in Brush Creek also applies to temperature since best management practices are the same.

The *Blackfoot River TMDL Implementation Plan* (DEQ 2006), which was compiled by the Idaho Department of Environmental Quality (DEQ), included the following contributors: Idaho Soil and Water Conservation Commission, Bureau of Land Management (BLM), Caribou-Targhee National Forest, Idaho Department of Lands, and Idaho Transportation Department. Since the Blackfoot River subbasin TMDL and implementation plan were developed, efforts have been taken to improve water quality in the subbasin. Two §319 grant-funded projects were initiated to remove cattle from the stream corridor through fencing and off-channel watering structures. On the lower Blackfoot River (ID17040207SK002_05), fencing was completed in 2010 to exclude 500–600 cattle from 520 acres of BLM ranchland. Additional fencing was constructed through 2013, increasing the total miles of fence to 17.8 miles, excluding 2,348 acres to cattle trespass, and protecting 14.36 miles of river. Additionally, off-channel watering facilities were constructed as part of this project. On the upper Blackfoot River, another §319 project is underway to exclude 3,500 cattle from portions of the Blackfoot River (ID17040207SK010_04) and Slug Creek (ID17040207SK012_04). Two miles of stream are slated for improvements, and invasive weeds will be removed from 600 acres of range and pastureland. This project is scheduled for completion by the end of 2015.

Phosphate mining companies, Simplot, NuWest, and Agrium, have collaborated with Trout Unlimited and the Idaho Conservation League to form a partnership called the Upper Blackfoot Confluence. This organization created a watershed assessment in 2012 identifying priority projects to improve native fisheries of Yellowstone Cutthroat Trout, Northern Leatherside Chub, Paiute Sculpin, and Mountain Sucker in the upper watershed. Since the assessment was developed, the Upper Blackfoot Confluence has initiated efforts to exclude cattle and restore riparian vegetation and meanders along upper Lanes Creek (ID17040207SK018_02e). The group has also installed irrigation screens in Diamond Creek (ID17040207SK016_03) and Lanes Creek (ID17040207SK018_04) to reduce entrainment of fish in irrigation diversions. In 2014, a restoration project was completed on Sheep Creek (ID17040207SK022_03) on Bear Lake Grazing Company property. Several new meander bends and pools were created, and willows and sedges were added to outside bends to stabilize banks. The group plans to install screens on the Hunsaker and Allen diversions on the upper Blackfoot River (ID17040207SK010_05) in the next 3 years (2015–2018).

Beneficial Use Reconnaissance Program (BURP) data have been collected on assessment units (AUs) included in the Blackfoot River subbasin TMDL since 1993, and data collection will continue into the future. BURP data indicate that no AUs that were included in the Blackfoot River subbasin TMDL (DEQ 2001) are now supporting cold water aquatic life as a result of TMDL implementation. BURP data did, however, identify seven AUs that are supporting cold water aquatic life and should be removed from Category 4a for sediment in the next Integrated Report. These AUs were included in the TMDL (DEQ 2001), which was based on a different accounting system of water quality limited segments. Using the AU system, all AUs within a given water body were included in the TMDL (DEQ 2001); however, some AUs were included erroneously, as BURP data showed they were not impaired. Upper Diamond Creek (ID17040207SK016_02a), Bear Canyon Creek (ID17040207SK016_02c), upper Lanes Creek (ID17040207SK018_02a), Daves Creek (ID17040207SK018_02b), upper Wolverine Creek (ID17040207SK030_02), upper Sheep Creek (ID17040207SK022_02), and middle Sheep Creek (ID17040207SK022_03a) are not impaired by excess sedimentation as evidenced by streambank erosion inventories (SEIs) completed by DEQ, and SEIs and multiple indicator monitoring completed by the Caribou-Targhee National Forest. Bear Canyon Creek (ID17040207SK016_02c), Lanes Creek (ID17040207SK018_02a), Daves Creek (ID17040207SK018_02b),upper Sheep Creek (ID17040207SK022_02), middle Sheep Creek (ID17040207SK022_03a) and Wolverine Creek (ID17040207SK030_02) should be removed from Category 4a and moved to Category 2 in the next Integrated Report. Upper Diamond Creek (ID17040207SK016_02a) is on the §303(d) list for *Escherichia coli* and temperature. Therefore, this AU cannot be placed in Category 2 as supporting beneficial uses. Recommended changes to the next Integrated Report are summarized in Table C.

Table C. Summary of recommended changes for AUs evaluated.

Stream Name	Assessment Unit Number	Pollutant	Recommended Changes to Next Integrated Report	Justification
Blackfoot River	ID17040207SK010_04	Temperature, dissolved oxygen, sediment	Keep in Category 4a for sediment and temperature. Removed from Category 5 for dissolved oxygen and list as an observed effect of temperature.	Temperature TMDL completed in Blackfoot River subbasin TMDL addendum[a] and serves as surrogate of dissolved oxygen.
Upper Diamond Creek	ID17040207SK016_02a	Sediment	Delist from Category 4a for sediment and keep in Category 5 for temperature and *E.coli.*	BURP 2007 data indicate full support of CWAL. SEI (2014) indicates stability targets are being met. AU incorporated into Diamond Creek TMDL because Blackfoot River subbasin TMDL[b] was approved (2002) before DEQ began using AU system.
Bear Canyon Creek	ID17040207SK016_02c	Sediment	Delist from Category 4a and move to Category 2.	BURP data indicate full support of CWAL. SEI indicates streambanks are meeting 80% stability target. AU was incorporated into Diamond Creek TMDL because Blackfoot River subbasin TMDL was approved (2002) before DEQ began using AU system. AU is fully supporting beneficial uses.
Lanes Creek	ID17040207SK018_02a	Sediment	Delist from Category 4a and move to Category 2.	BURP data indicate full support of CWAL. USFS 2014 data indicate streambank stability and subsurface fine sediment targets are being met. MIM 2013 data indicate streambank alteration and percent streambed fines are low. AU was incorporated into the Blackfoot River subbasin TMDL because AU system was not yet in place. AU fully supports CWAL.
Daves Creek	ID17040207SK018_02b	Sediment	Delist from Category 4a and move to Category 2.	BURP data indicate full support of CWAL. SEI indicates streambanks are meeting 80% stability target. AU was incorporated into Blackfoot River subbasin TMDL because AU system was not yet in place.

Stream Name	Assessment Unit Number	Pollutant	Recommended Changes to Next Integrated Report	Justification
Upper Sheep Creek	ID17040207SK022_02	Sediment, selenium, temperature	Delist from Category 4a for sediment. Delist from Category 5 for selenium and temperature. Move to Category 2.	BURP data indicate full support of CWAL. DEQ SEI data indicate streambank stability targets are being met and there are no other sources of excess sedimentation. AU is not impaired by excess sedimentation and should be delisted for sedimentation/siltation. Selenium exceedances are caused by inputs from South Fork Sheep Creek (ID17040207SK022_02a) below the boundary on this AU. Exceedances of selenium criteria have not been documented in this AU. There is no continuous temperature data to suggest impairment and the temperature listing was applied in error.
Middle Sheep Creek	ID17040207SK022_03a	Sediment, selenium	Delist from Category 4a for sediment. Delist from Category 5 for selenium. Move to Category 2.	BURP data indicate full support of CWAL. DEQ SEI and USFS data indicate streambank stability targets are being met and there are no other sources of excess sedimentation. AU is not impaired by excess sedimentation and should be delisted for sedimentation/siltation. Selenium exceedances are caused by inputs from South Fork Sheep Creek (ID17040207SK022_02a) below the newly proposed boundary on this AU. Exceedances of selenium criteria have not been documented in this AU above South Fork Sheep Creek.
Wolverine Creek	ID17040207SK030_02	Sediment	Delist from Category 4a for sediment and move to Category 2.	BURP data indicate full support of CWAL. SEI indicates bank stability targets are nearly being met (78% stability).

a. *Blackfoot River Subbasin Assessment and Total Maximum Daily Loads: 2013 Addendum* (DEQ 2013a)
b. *Blackfoot River TMDL Waterbody Assessment and Total Maximum Daily Load* (DEQ 2001)
Notes: total maximum daily load (TMDL); Beneficial Use Reconnaissance Program (BURP); cold water aquatic life (CWAL); *Escherichia coli* (*E. coli*) streambank erosion inventory (SEI); US Forest Service (USFS); multiple indicator monitoring (MIM)

The Caribou-Targhee National Forest completed SEIs on eight AUs in 2004 using the same methods as DEQ, and DEQ completed SEIs on nine AUs in 2008 and 2009. McNeil core samples were also completed during these monitoring efforts. In 2014, DEQ undertook an effort to collect data on AUs included in the Blackfoot River subbasin TMDL (DEQ 2001) to generate information for the 5-year review. SEIs were completed on 53 AUs and McNeil core samples were taken from 15 AUs as part of that effort. Of the 53 AUs surveyed with SEIs, 34 were not meeting targets for streambank stability set in the TMDL (DEQ 2001). All of the AUs where McNeil core samples were taken were not meeting targets for subsurface fine sediments in spawning habitats. Other AUs were not sampled because suitable spawning habitat (i.e., pool tailouts with gravel substrate) was not encountered.

Water quality data (temperature, pH, turbidity, dissolved oxygen, and conductivity) were collected with multiparameter sondes during ice-free periods in the Blackfoot River (ID17040207SK010_05) above the Blackfoot Reservoir. Data collection began in 2003 and will continue into the future. Multiparameter data were also collected in the Blackfoot River below Government Dam (referred to in Integrated Report as Blackfoot Reservoir Dam) (ID17040207SK002_05) from 2003 to 2006. Water samples for nutrients and sediment concentration analyses were taken from both locations between 2003 and 2007. Results indicate that TP and suspended sediment levels tend to be higher below the dam than in the river above. The hydrograph below the dam is altered by delivery of irrigation water. When the river above the dam experiences peak flows during spring runoff in April and May, water is typically stored in the Blackfoot Reservoir and flows below the dam tend to be low. In contrast, when flows in the river above the reservoir are low in July, August, and September, water is released for irrigation delivery, and flows are high below the dam. Likely as a result of this reversed and irregular hydrograph, water quality below the dam is degraded. For example, orthophosphate concentrations below the dam were 55% higher and total nitrogen was 344% higher than in the river above from 2003 to 2007. From 2003 to 2007, TP chronically exceeded targets set in the TMDL (DEQ (2001).

In 2014, water samples were taken from two locations on the lower Blackfoot River (ID17040207SK002_05) and from Wolverine Creek (ID17040207SK030_03) from April to September. Sampling documented that Wolverine Creek exceeded targets for TP on two occasions: April 21 and September 10. Both locations on the lower Blackfoot River exceeded TP targets on May 27. In the lower Blackfoot River and Wolverine Creek, concentrations of TP are strongly correlated with concentrations of suspended sediments. Wolverine Creek exceeded TP targets in April when sediment concentrations were elevated as discharge was increasing. TP targets were then exceeded in September when agricultural returns from the field above were contributing sediment-laden water to the creek. Wolverine Creek’s phosphorus problem is likely a result of unstable streambanks (ID17040207SK030_03 = 66% stable) from grazing practices contributing excess sediment to the stream. The lower Blackfoot River exceeded TP targets on the ascending limb of the hydrograph when water was being released for irrigation downstream. These releases mobilized sediment and increased phosphorus concentrations. Dam operations modify the hydrograph with consequences for water quality.

According to a study by the US Government Accountability Office (2013), nonpoint source pollution is difficult to address under the existing TMDL program because the Clean Water Act deals with such pollution through voluntary means. EPA and DEQ do not have the authority to compel landowners to take prescribed action to reduce pollution. Voluntary means have yet to restore beneficial uses in the Blackfoot River subbasin. Of the 64 AUs included in the Blackfoot River subbasin TMDL (DEQ 2001), 4 are currently attaining beneficial uses. These AUs were erroneously included in the TMDL when they were most likely already attaining beneficial uses. Implementation actions have only been undertaken on a small fraction of AUs included in the TMDL (DEQ 2001). Additional and far-reaching implementation activities are likely needed, some of which include potential land use management changes, increased grazing management strategies that focus on riparian and stream corridor protection, restoring hydrologic and habitat altered channels, and optimizing woody and herbaceous riparian vegetation communities. Assessment units under the Blackfoot River subbasin TMDL will struggle to meet their beneficial uses until time that sufficient resources and effort can be found to implement many of these workable strategies.

Public Participation

A draft of this 5-year review was sent to the Blackfoot watershed advisory group (WAG) via email on April 27, 2015. Larry Mickelsen of the Natural Resource Conservation Service provided comments.

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1 Introduction

The federal Clean Water Act (CWA) requires that states and tribes restore and maintain the chemical, physical, and biological integrity of the nation's waters (33 USC §1251). 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. CWA §303(d) establishes requirements for states and tribes to identify and prioritize water bodies that are water quality limited (i.e., water bodies that do not meet water quality standards). States and tribes must periodically publish a priority list (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 Code §39-3611(7) requires a 5-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.

To meet the intent and purpose of Idaho Code §39-3611(7), this report documents reviews of the *Blackfoot River TMDL Waterbody Assessment and Total Maximum Daily Load* (DEQ 2001) and addresses water bodies in the Blackfoot River subbasin that are in Idaho's most recent Category 4a of the Integrated Report (DEQ 2014a). This report reviews the approved TMDL (DEQ 2001) and *Blackfoot River TMDL Implementation Plan* (DEQ 2006) and considers the most current and applicable information in conformance with Idaho Code §39-3607, evaluates the appropriateness of the TMDL to current watershed conditions, evaluates the implementation plan, and consults with the watershed advisory group (WAG). An evaluation of the recommendations presented is provided. Final decisions for TMDL modifications are decided by the Idaho Department of Environmental Quality (DEQ) director. Approval of TMDL modifications is decided by the US Environmental Protection Agency (EPA), with consultation by DEQ.

1.1 Assessment Units

Assessment units (AUs) are groups of similar streams that have similar land use practices, ownership, or land management. Stream order is the main basis for determining AUs—even if ownership and land use change significantly, the AU usually remains the same for the same stream order.

Using AUs to describe water bodies offers many benefits primarily that all waters of the state are defined consistently. AUs are a subset of water body identification numbers, which allows them to relate directly to the water quality standards.

2 TMDL Review and Status

The Blackfoot River subbasin in southeastern Idaho (Figure 1) is a watershed of the upper Snake River basin. This watershed encompasses an area of just over 1,000 square miles and contains over 1,700 miles of streams and a large reservoir (17,000 surface acres). The Blackfoot River is a major tributary of the Snake River, draining 130 miles from headwaters into the Snake River, approximately 14 miles above the American Falls Reservoir. The Blackfoot Reservoir is located in the middle of the subbasin and often serves as a dividing line between interests in the upper and lower watersheds.

The Blackfoot River subbasin TMDL was completed in 2001 and approved in 2002 by EPA. Seventeen sediment TMDLs (Figure 2) and three nutrient TMDLs (Figure 3) were written for water bodies in the subbasin (Table 1). In 2007, a temperature TMDL was written for Brush Creek (Figure 3). A complete list of the Blackfoot River subbasin assessments, TMDLs, and implementation plans can be accessed at *deq.idaho.gov/water-quality/surface-water/tmdls/table-of-sbas-tmdls/blackfoot-river-subbasin.aspx*.

Subbasin:	Blackfoot River
HUC:	17040207
Beneficial Uses:	Cold water aquatic life, salmonid spawning, primary/secondary contact recreation, domestic water supply, agricultural water supply
Uses Affected:	Cold water aquatic life, salmonid spawning, primary/secondary contact recreation
Pollutants:	Sediment, bacteria, nutrients, selenium, dissolved oxygen, temperature
Sources:	Point sources: none Nonpoint sources: Agriculture, grazing, mining, recreation, roads

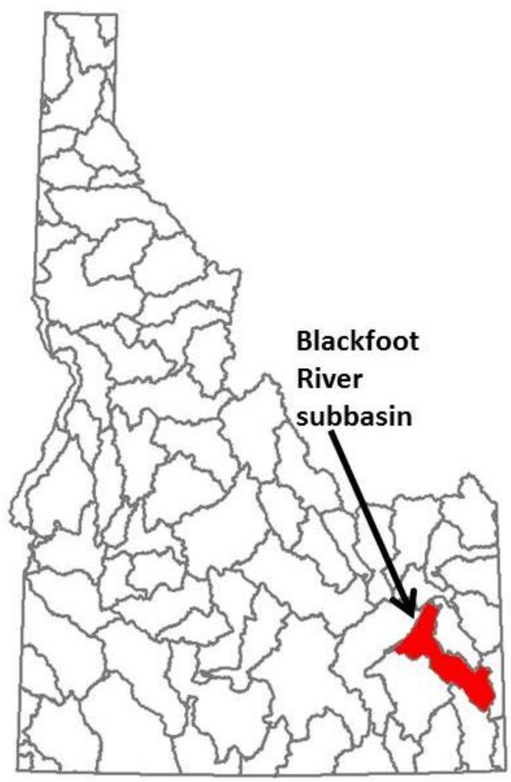

Figure 1. Location and characteristics of the Blackfoot River subbasin.

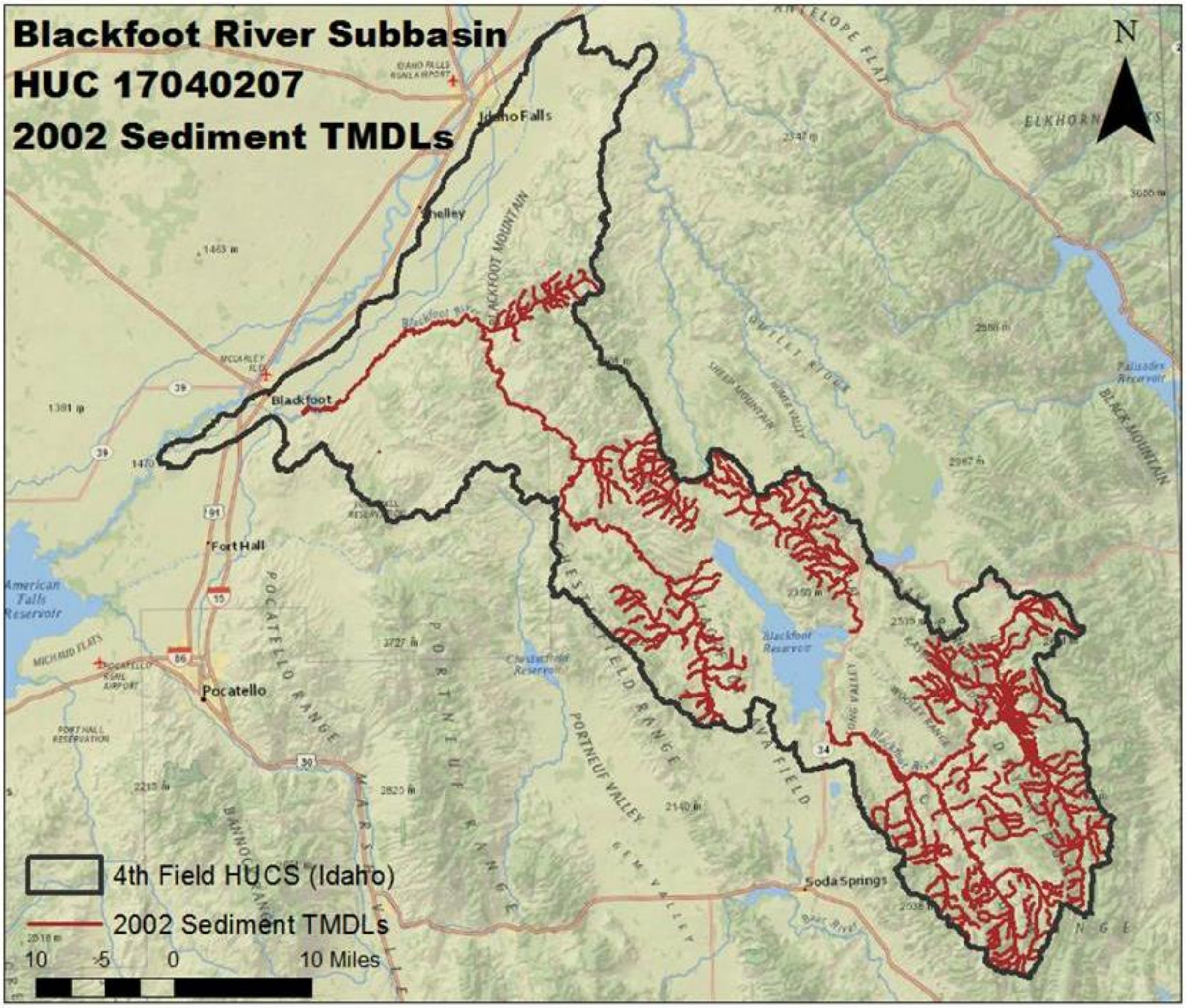

Figure 2. Water bodies with sediment TMDLs approved in 2002 in the Blackfoot River subbasin.

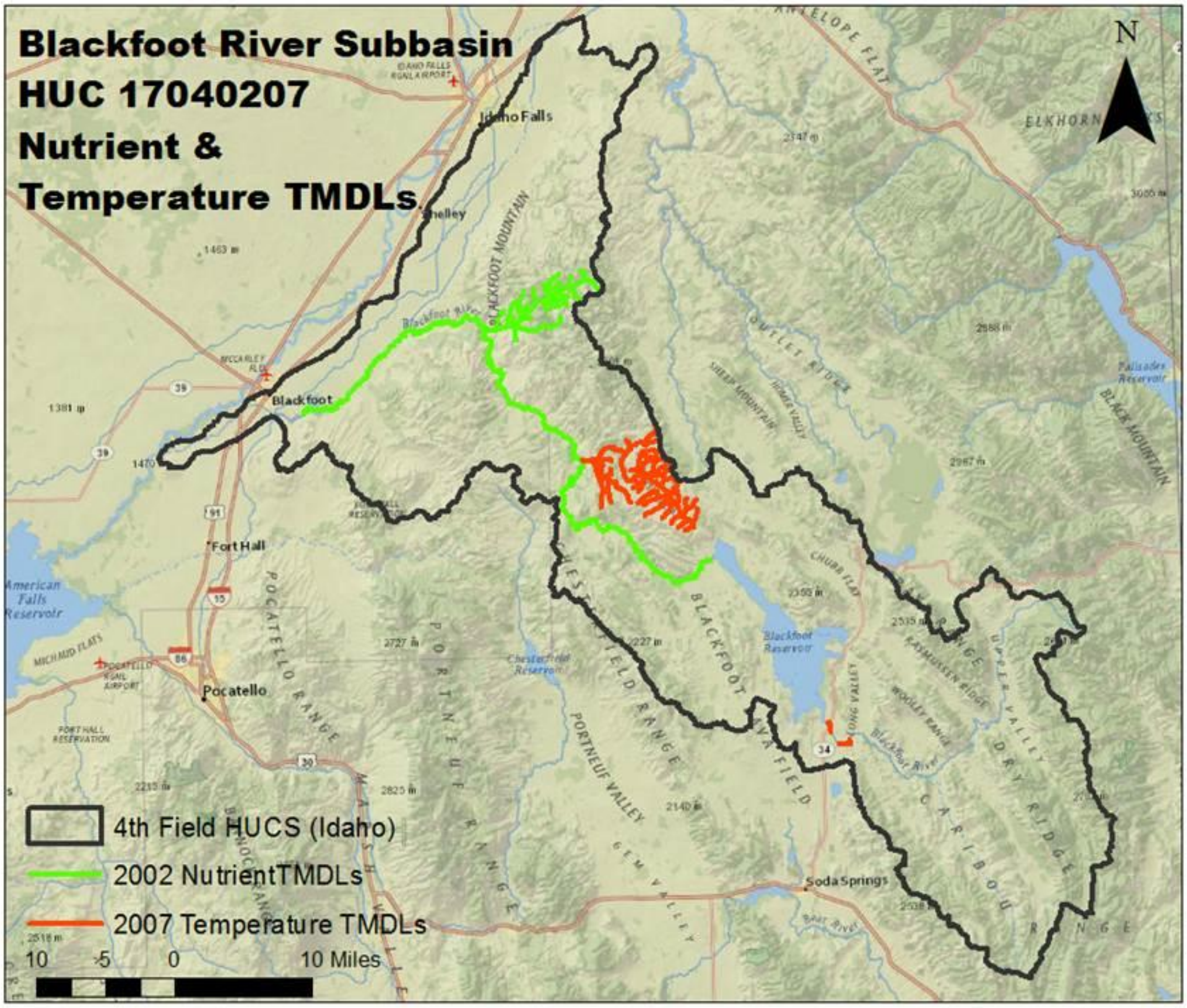

Figure 3. Water bodies with nutrient TMDLs approved in 2002 and temperature TMDLs approved in 2007 in the Blackfoot River subbasin.

Table 1. Applicable TMDLs for the Blackfoot River subbasin and associated nonpoint sources of pollution.

Assessment Unit Name	Assessment Unit Number	Pollutant	Nonpoint Sources
Blackfoot River—Blackfoot Reservoir Dam to Fort Hall Main	ID17040207SK002_05	Sediment, nutrients	Agriculture, livestock grazing, tributary mass wasting, flow alteration from dam
Corral Creek		Sediment	Livestock grazing
- Headwaters and unnamed tributaries	ID17040207SK006_02		
- Middle	ID17040207SK006_03		
- Lower	ID17040207SK006_04		
Grizzly Creek		Sediment	Livestock grazing
- Source to mouth	ID17040207SK007_02		
- Sawmill Creek: headwaters to Grizzly Creek	ID17040207SK007_02a		
- Source to mouth	ID17040207SK007_03		
- Source to mouth	ID17040207SK007_04		
Blackfoot River		Sediment	Livestock grazing, recreation, mining
- Trail Creek side channel near confluence with Blackfoot River	ID17040207SK010_03		
- Headwaters to Slug Creek	ID17040207SK010_04		
- Blackfoot River	ID17040207SK010_05		
- Small section near Diamond Creek	(ID17040207SK015_04		
Trail Creek (upper Blackfoot River)		Sediment	Livestock grazing
- Headwaters and unnamed tributaries	ID17040207SK011_02		
- Source to mouth (below Findlayson Ranch)	ID17040207SK011_03		
- Upper Trail Creek	ID17040207SK011_03a		
Slug Creek		Sediment	Livestock grazing
- Headwaters and unnamed tributaries	ID17040207SK012_02		
- Source to mouth (2nd and 3rd order)	ID17040207SK012_03		
- Source to mouth	ID17040207SK012_04		
Dry Valley Creek		Sediment	Livestock grazing, mining
- Unnamed tributaries	ID17040207SK013_02		
- Dry Valley Creek	ID17040207SK013_02a		
- Chicken Creek (tributary to Dry Valley Creek)	ID17040207SK013_02b		
Maybe Canyon Creek—-source to mouth	ID17040207SK014_02	Sediment	Mining

Assessment Unit Name	Assessment Unit Number	Pollutant	Nonpoint Sources
Diamond Creek			
- Unnamed tributaries	ID17040207SK016_02	Sediment	Livestock grazing
- Upper Diamond Creek	ID17040207SK016_02a		
- Coyote Creek	ID17040207SK016_02b		
- Bear Canyon: headwaters to Diamond Creek	ID17040207SK016_02c		
- Timber Creek: headwaters to Diamond Creek	ID17040207SK016_02d		
- Cabin Creek	ID17040207SK016_02e		
- Stewart Canyon	ID17040207SK016_02f		
- Campbell Canyon	ID17040207SK016_02g		
- Upper Kendall Creek	ID17040207SK016_02h		
- Lower Kendall Creek	ID17040207SK016_02i		
- Lower Diamond Creek	ID17040207SK016_03		
- Middle Diamond Creek	ID17040207SK016_03a		
Lanes Creek			
- Unnamed tributaries	ID17040207SK018_02	Sediment	Livestock grazing
- Headwaters to forest service boundary	ID17040207SK018_02a		
- Daves Creek: headwaters to road crossing	ID17040207SK018_02b		
- Daves Creek: road crossing to Lanes Creek	ID17040207SK018_02c		
- Corralisen Creek	ID17040207SK018_02d		
- Forest service boundary to Lander Creek	ID17040207SK018_02e		
- Lander Creek to Chippy Creek	ID17040207SK018_03		
- Chippy Creek to Blackfoot River	ID17040207SK018_04		
Bacon Creek			
- Unnamed tributaries	ID17040207SK019_02	Sediment	Livestock grazing
- Upper Bacon Creek	ID17040207SK019_02a		
- Below forest service boundary	ID17040207SK019_02b		
- Below forest service boundary	ID17040207SK019_03		
- Below forest service boundary	ID17040207SK019_04		
Sheep Creek			
- Upper Sheep Creek: headwaters and unnamed tributaries	ID17040207SK022_02	Sediment	Livestock grazing
- Lower Sheep Creek	ID17040207SK022_03		
- Middle Sheep Creek	ID17040207SK022_03a		

Assessment Unit Name	Assessment Unit Number	Pollutant	Nonpoint Sources
Angus Creek			
- Unnamed tributaries	ID17040207SK023_02	Sediment	Livestock grazing, mining
- Rasmussen Creek	ID17040207SK023_02a		
- Upper Angus Creek: headwaters to Rasmussen Creek	ID17040207SK023_02b		
- Lower Angus Creek: Rasmussen Creek to Blackfoot River	ID17040207SK023_04		
Meadow Creek			
- Headwaters and unnamed tributaries	ID17040207SK025_02	Sediment	Livestock grazing, additions of water from out of the basin
- Headwaters to Crooked Creek	ID17040207SK025_02a		
- Headwaters to fork (including Wham Creek)	ID17040207SK025_02d		
- Crooked Creek to Clarks Cut	ID17040207SK025_03		
- Blackfoot Reservoir to Clarks Cut	ID17040207SK025_04		
Brush Creek			
- Source to mouth	ID17040207SK026_02	Sediment, temperature[a]	Livestock grazing, recreation
- Source to mouth	ID17040207SK026_03		
Wolverine Creek			
- Source to Jones Creek	ID17040207SK030_02	Sediment, nutrients	Agriculture, livestock grazing, recreation, roads tributary mass wasting
- Jones Creek to mouth	ID17040207SK030_03		
Jones Creek—source to mouth	ID17040207SK031_02	Nutrients	Agriculture, livestock grazing, recreation, roads

a. All relevant TMDL targets and load allocations are published in the Blackfoot River subbasin TMDL (DEQ 2001) except Brush Creek, which is located in the *Brush Creek Temperature Total Maximum Daily Load: Addendum to the Blackfoot River Subbasin Assessment and TMDL* (DEQ 2007). This addendum was approved by the US Environmental Protection Agency in 2007.

In the Blackfoot River subbasin TMDL (DEQ 2001), targets for sediment were set at ≥80% streambank stability. Additionally, targets for a 5-year average of subsurface fines were generated. Subsurface streambed sediment <6.25 millimeters (mm) were not to exceed 25% by volume in riffles, and subsurface streambed sediment <0.85 mm were not to exceed 10% by volume in streams where salmonid spawning is a beneficial use. A separate turbidity target was generated for Dry Valley Creek (ID17040207SK013_02, and ID17040207SK013_02a). Above the mining activities, a high-flow TMDL was set not to exceed a 14-day average of 40.55 nephelometric turbidity units (NTU); a low-flow TMDL was set not to exceed a 28-day average of 24.23 NTU. Below the mining activities, a 14-day average was not to exceed a 14-day average of 4.6 NTU, and the daily maximum was not to exceed 20.15 NTU. Targets for nutrient TMDLs were set for nitrogen and phosphorus. Nitrogen was not to exceed 0.3 milligrams per liter (mg/L) of total inorganic nitrogen (TIN). Phosphorus was not to exceed 0.1 mg/L total phosphorus (TP).

In the *Brush Creek Temperature Total Maximum Daily Load: Addendum to the Blackfoot River Subbasin Assessment and TMDL* (DEQ 2007), shade targets for two Brush Creek AUs

(ID17040207SK026_02 and ID17040207SK026_03) were completed based on maximum shading under potential natural vegetation (PNV) conditions. Under this analysis, the solar load capacity is 399,308 kilowatt-hours per day (kWh/day) for April through September.

Since no known point sources of sediment, heat, or nutrients exist in the subbasin, all load allocation was attributed to nonpoint sources of pollution.

2.1 Pollutant Targets

Idaho's "Water Quality Standards" (IDAPA 58.01.02) for sediment and nutrients are narrative; no specific quantitative value is established for sediment and nutrients in Idaho code. Numeric targets for the TMDL were set using a collection of literature sources that provided information relating numeric values to the attainment of beneficial uses. Table 2 outlines numeric targets set for this TMDL and the streams for which they apply.

Table 2. Pollutant targets established for the Blackfoot River subbasin.

Water Body	Pollutant	Parameter	Numeric Target
All streams	Sediment	Streambanks	>80% stability
		Depth fines/streambed	• Sediment <6.25 mm not to exceed a 5-year mean of >25% by volume • Sediment <0.85 mm not to exceed a 5-year mean of >10% by volume
Dry Valley Creek	Sediment	Turbidity	• Upper (DV-7) ▪ High flow—not to exceed a 14-day mean of 40.55 NTU ▪ Low flow—not to exceed a 28-day mean of 24.23 NTU • Lower (DV-1) ▪ All flows - 14 day mean—not to exceed 4.6 NTU - Daily maximum—not to exceed 20.15 NTU
All streams	Nutrients	Total phosphorous	0.1 mg/L
		Total inorganic nitrogen	0.3 mg/L
Brush Creek	Temperature	Potential natural vegetation	Average for entire stream is 34%[a]

a. Actual targets for specific locations on Brush Creek are associated with specific vegetation type and stream width, located in the Brush Creek temperature TMDL addendum (DEQ 2007). Those values should be used for specific activities associated with TMDL implementation.
Notes: millimeter (mm); nephelometric turbidity unit (NTU); milligram per liter (mg/L)

2.1.1 Sediment

Sediment targets for the Blackfoot River and all sediment-listed tributaries, except Dry Valley Creek, are based on surrogate measures. They are based on the assumption that 80% bank stability corresponds with natural background sediment inputs. Additionally, support of salmonid spawning and cold water biota beneficial uses are closely tied to sediment in the streambed surface and subsurface. The subsurface sediment targets for this TMDL require that depth fines <6.25 mm not exceed a 5-year mean of 25% by volume, and depth fines <0.85 mm not exceed a 5-year mean of 10% by volume in all streams supporting or designated to support salmonid spawning in the Blackfoot River subbasin.

Site-specific water column sediment targets were set for Dry Valley Creek. Two sites in Dry Valley Creek were required to adhere to recommended targets. At the upper site (DV-7), turbidity should not exceed a 14-day average of 19.31 NTU during high flows (April and May) and a 28-day average of 12.09 NTU. For the lower site (DV-1), 14-day average and daily maximum targets were set. The turbidity targets are a 14-day average not to exceed 4.61 NTU with a daily maximum of 20.15 NTU.

2.1.2 Temperature

There are numeric water quality standards for temperature; however, for the *Brush Creek Temperature Total Maximum Daily Load: Addendum to the Blackfoot River Subbasin Assessment and TMDL* (DEQ 2007), the targets were established based on PNV. A TMDL based on PNV assumes that natural conditions may exceed the temperature criteria during critical time periods; therefore, water quality standards do not apply when natural conditions exceed the criteria (IDAPA 58.01.02.200.09). Essentially, the natural conditions became the water quality standard. The vegetation targets established for Brush Creek were based on the ability of a specific plant community to provide stream shading along various stream widths. For the Brush Creek temperature TMDL, shade targets were selected for specific reaches of the stream and vary depending on location in the stream. Specific targets for this 5-year review are provided in the Brush Creek temperature TMDL, Table 5 (DEQ 2007). The mean shade target for Brush Creek is 34%.

2.1.3 Nutrients

Nutrient targets for nitrogen and phosphorus established for the Blackfoot River subbasin TMDL (DEQ 2001) are numeric indicators that were chosen to attain beneficial uses. Nutrient targets are 0.1 mg/L TP and 0.3 mg/L TIN.

2.2 Control and Monitoring Points

The Blackfoot River subbasin TMDL (DEQ 2001) did not specifically address monitoring objectives for impaired streams. For this 5-year review, all data collected on AUs will serve as a monitoring point for the TMDL. Beneficial Use Reconnaissance Program (BURP) data will be used to assess beneficial use support status since development of the original TMDL in 2001. Data collected by the US Forest Service (USFS) and DEQ on streambank stability and subsurface fines will be used to evaluate trends in these variables in relation to time and implementation of restoration efforts and best management practices (BMPs).

The objectives of these monitoring efforts are to evaluate long-term recovery, better understand natural variability, track implementation of projects and BMPs once they are developed, and oversee the effectiveness of TMDL implementation. This monitoring and feedback mechanism is a major component of the *reasonable assurance of implementation* for the TMDL implementation plan. To the extent possible, DEQ and designated management agencies will collaborate to define data quality objectives that will guide monitoring through continued implementation of the Blackfoot River subbasin TMDL. Some of these watershed objectives include the following:

- Evaluate watershed pollutant sources.
- Refine baseline conditions and pollutant load.
- Evaluate trends in water quality data.
- Evaluate the collective effectiveness of implementation actions in reducing sediment, temperature, and nutrient loads to water bodies.
- Gather information and fill data gaps to accurately determine pollutant loads.

The only site-specific control/monitoring points outlined in the Blackfoot River subbasin TMDL were the two sites identified for Dry Valley Creek, DV-7 and DV-1. No other site-specific control or monitoring points were outlined in the TMDL. However, general monitoring points are associated with subsurface sediment, streambank stability riparian shade, and nutrients.

2.2.1 Subsurface Sediment

Subsurface sediments are monitored in habitats suitable for salmonid spawning within AUs where sediment TMDLs have been developed. McNeil core samples are collected and analyzed under the *Standard Operating Procedure for the Collection of McNeil Core Samples* (DEQ 2013b). The amount of habitat suitable for salmonid spawning should increase after implementing BMPs identified to reduce fine sediment. Concurrently, the percent of fine sediment <6.3 mm and <0.85 mm should decrease.

2.2.2 Streambank Stability

Streambank erosion inventories (SEIs) are conducted on sediment-impaired streams to evaluate overall bank stability as outlined in the *Standard Operating Procedures for Streambank Erosion Inventory to Measure Instream Stability and Estimate Annual Sediment Loads in Wadeable Streams* (DEQ 2013c).

2.2.3 Riparian Shade

Effective shade monitoring can take place on any reach throughout Brush Creek, and data can be compared to estimates of existing shade in the Brush Creek temperature TMDL (DEQ 2007). The areas with the largest disparity between existing shade estimates and shade targets should be monitored with Solar Pathfinders to verify the existing shade levels and to determine progress towards meeting shade targets. Ten equally spaced Solar Pathfinder measurements within a segment, averaged together, may suffice to determine shade levels.

In the *Blackfoot River TMDL Implementation Plan* (DEQ 2006), the Idaho Soil and Water Conservation Commission (ISWCC), Bureau of Land Management (BLM), Caribou-Targhee National Forest, Idaho Department of Lands (IDL), and Idaho Transportation Department (ITD) submitted monitoring plans of varying degrees. Specific monitoring points and schemes for riparian shade are provided in the implementation plan (DEQ 2006).

2.2.4 Nutrients

Water column nutrients should be monitored in previously established monitoring sites, in addition to downstream sites to reflect the downstream end of the nutrient TMDL segment. Continued sampling in established monitoring sites maintains consistency. Nutrient samples should be collected according to methodologies that yield the most accurate representation of water column nutrient levels.

2.3 Load Capacity

The load capacity estimates the quantity of pollutant a water body is believed to be able to receive and still maintain support of beneficial uses and meet water quality standards. Load capacities for specific pollutants are listed below, and load capacities for individual water bodies are listed in Table 3.

2.3.1 Sediment

The load capacity for sediment from streambank erosion was based on assumed natural streambank stability of ≥80%. Because it is presumed that beneficial uses were or would be supported at natural background sediment load rates, the load capacity lies somewhere between the current load level and sediment load from natural streambank erosion.

2.3.2 Temperature

The load capacity for temperature for a stream under PNV is essentially the solar load under shade targets specified for reaches within the stream.

2.3.3 Nutrients

Site-specific targets for nitrogen and phosphorous were not established in the TMDL. No information for either nutrient was reviewed on site-specific levels necessary to support beneficial uses. Load or assimilative capacity was not estimated due to lack of data. For the load analysis, assimilative capacity was considered equal to the target load. Additionally, the extent to which either nitrogen or phosphorus exceeds seasonal load capacity is unknown. For this TMDL, seasonal variation in nutrient concentrations were not applied due to the concern about American Falls Reservoir’s (14 miles downstream of the hydrologic unit code boundary) ability to act as a sink for both phosphorous and nitrogen, thereby increasing the available time for uptake by aquatic vegetation. American Falls Reservoir had a TMDL developed for chlorophyll-*a*.

2.4 Load Allocations

For the Blackfoot River subbasin, sediment, temperature, and nutrient load allocations were developed as shown in Table 3, Table 4, and Table 5.

2.4.1 Sediment

The load allocations and reductions for sediment were calculated based on an 80% bank stability target. SEIs were conducted and numeric loads and load allocations were calculated for Angus, Brush, Diamond, Lanes, Dry Valley, and Slug Creeks. Angus and Slug Creeks met the 80% bank stability target; therefore, no reductions were recommended. Load reductions were estimated for Brush, Diamond, and Lanes Creeks. Loads and load allocations were not estimated on the Blackfoot River or Bacon, Corral, Grizzly, Maybe Canyon, Meadow, Sheep, Trail, and Wolverine Creeks due to the lack of erosion data. Therefore, loads and load allocations were set based on the target of 80% bank stability. Water quality monitoring data were available for Dry Valley Creek, and targets were established for turbidity based on these data. However, the data were not used to estimate sediment load. The load allocation for Dry Valley Creek was set based on the 80% bank stability target. Table 3 summarizes sediment loads and load allocations set for water bodies in the Blackfoot River subbasin.

Table 3. Sediment loads and load allocations for water bodies in the Blackfoot River subbasin.

Assessment Unit Name	Assessment Unit Number	Existing Load	Load Capacity	Load Allocation (load capacity minus current load)	% Erosion Reduction to Meet Load Capacity
		Tons per year			
Blackfoot River—Blackfoot Reservoir Dam to Fort Hall Main	ID17040207SK002_05	Insufficient data to estimate	80% bank stability	80% bank stability	Insufficient data
Corral Creek	ID17040207SK006_02 ID17040207SK006_03 ID17040207SK006_04	Insufficient data to estimate	80% bank stability	80% bank stability	Insufficient data
Grizzly Creek	ID17040207SK007_02 ID17040207SK007_02a ID17040207SK007_03 ID17040207SK007_04	Insufficient data to estimate	80% bank stability	80% bank stability	Insufficient data
Blackfoot River—headwaters to Blackfoot Reservoir	ID17040207SK010_03 ID17040207SK010_04 ID17040207SK010_05 ID17040207SK015_04	Insufficient data to estimate	80% bank stability	80% bank stability	Insufficient data
Trail Creek	ID17040207SK011_02 ID17040207SK011_03 ID17040207SK011_03a	Insufficient data to estimate	80% bank stability	80% bank stability	Insufficient data
Slug Creek	ID17040207SK012_02 ID17040207SK012_03 ID17040207SK012_04	74.2	74.2	0	0
Dry Valley Creek	ID17040207SK013_02 ID17040207SK013_02a ID17040207SK013_02b	1,216.4	852.9	363.5	29.8
Maybe Canyon Creek	ID17040207SK014_02	Insufficient data to estimate	80% bank stability	80% bank stability	Insufficient data

Assessment Unit Name	Assessment Unit Number	Existing Load	Load Capacity	Load Allocation (load capacity minus current load)	% Erosion Reduction to Meet Load Capacity
		Tons per year			
Diamond Creek	ID17040207SK016_02 ID17040207SK016_02a ID17040207SK016_02b ID17040207SK016_02c ID17040207SK016_02d ID17040207SK016_02e ID17040207SK016_02f ID17040207SK016_02g ID17040207SK016_02h ID17040207SK016_02i ID17040207SK016_03 ID17040207SK016_03a	2,059.7	1,304.6	755.1	36.7
Lanes Creek	ID17040207SK018_02 ID17040207SK018_02a ID17040207SK018_02b ID17040207SK018_02c ID17040207SK018_02d ID17040207SK018_02e ID17040207SK018_03 ID17040207SK018_04	2,023.3	1,298.1	725.2	35.8
Bacon Creek	ID17040207SK019_02 ID17040207SK019_02a ID17040207SK019_02b ID17040207SK019_03 ID17040207SK019_04	Insufficient data to estimate	80% bank stability	80% bank stability	Insufficient data
Sheep Creek	ID17040207SK022_02 ID17040207SK022_03 ID17040207SK022_03a	Insufficient data to estimate	80% bank stability	80% bank stability	Insufficient data
Angus Creek	ID17040207SK023_02 ID17040207SK023_02a ID17040207SK023_02b ID17040207SK023_04	8.5	8.5	0	0
Meadow Creek	ID17040207SK025_02 ID17040207SK025_02a ID17040207SK025_02d ID17040207SK025_03 ID17040207SK025_04	Insufficient data to estimate	80% bank stability	80% bank stability	Insufficient data
Brush Creek	ID17040207SK026_02 ID17040207SK026_03	3,416.7	1,358.1	2,058.7	60.3
Wolverine Creek	ID17040207SK030_02 ID17040207SK030_03	Insufficient data to estimate	80% bank stability	80% bank stability	Insufficient data

2.4.2 Temperature

The Brush Creek temperature TMDL (DEQ 2007) was based on PNV, an estimate of background load. TMDL load allocation is essentially the desire to achieve background conditions. To achieve that objective, load allocations were assigned to nonpoint source activities that have or may impact riparian vegetation. Load allocations are stream reach specific and depend on the target load for a given reach. As shown in Table 4, the excess heat load experienced by Brush Creek is 89,187 kWh/day, and the reduction necessary to bring Brush Creek to the target load is 19%.

Table 4. Temperature load and load reduction estimates for Brush Creek.

Assessment Unit Name	Assessment Unit Number	Existing Load	Load Capacity	Load Allocation (load capacity minus current load)	% Load Reduction to Meet Load Capacity
		Kilowatt-hours per day			
Brush Creek	ID17040207SK026_02 ID17040207SK026_03	479,153	399,309	89,187	19

2.4.3 Nutrients

The Blackfoot River (below the reservoir to the equalizing dam) and Wolverine Creek were listed for nutrients in 1998. Loads were established for the nutrient-listed reach of the Blackfoot River, Wolverine Creek, and Jones Creek (tributary to Wolverine Creek). Water quality monitoring on Jones Creek showed that it was a significant contributor of nutrients to Wolverine Creek; therefore, load allocations were established. Loads were established by summing monthly mean data from water quality monitoring for monitoring locations on the Blackfoot River and Wolverine Creek. Loads for Jones Creek were established by determining what percentage of the TIN and TP load they contributed to Wolverine Creek. Table 5 provides the loads and load allocations for nutrient-impaired water bodies in the subbasin.

Table 5. Nutrient load and load allocations for water bodies in the Blackfoot River subbasin.

Assessment Unit Name	Assessment Unit Number	Pollutant	Existing Load	Load Capacity	Load Allocation (load capacity minus current load)	% Reduction to Meet Load Capacity
			Tons per year			
Blackfoot River—Blackfoot Reservoir to Wolverine Creek	ID17040207SK002_05	Total inorganic nitrogen	32.6	47.6	0	0
Blackfoot River—Wolverine Creek to equalizing dam	ID17040207SK002_05		87.9	110.3	0	0
Wolverine Creek	ID17040207SK030_02 ID17040207SK030_03		2.9	5.0	0	0
Jones Creek[a]	ID17040207SK031_02		2.9	5.0	0	0
Blackfoot River—Blackfoot Reservoir to Wolverine Creek	ID17040207SK002_05	Total phosphorus	9.1	15.9	0	0
Blackfoot River—Wolverine Creek to equalizing dam	ID17040207SK002_05		56.6	36.8	19.9	35
Wolverine Creek	ID17040207SK030_02 ID17040207SK030_03		8.3	1.6	6.7	81
Jones Creek[a]	ID17040207SK031_02		2.1	0.4	1.7	81

a. Load allocations on Jones Creek are based on percentage of Wolverine Creek load.

2.5 Margin of Safety

To account for uncertainty associated with the relationship between pollutant loads and beneficial use impairment, a margin of safety (MOS) is included in the load analyses. For the Blackfoot River subbasin, conservative targets were chosen, which include inherent MOS.

MOS factored into sediment load allocations was implicit and used the following conservative assumptions to develop existing sediment loads:

1. Desired bank erosion rates were representative of assumed natural background conditions.
2. Water quality targets for percent depth fines were consistent with values measured and were set by local land management agencies based on established literature values incorporating an adequate level of fry survival to provide for stable salmonid production.
3. Chosen turbidity targets were well below the concentration range of suspended sediment required to maintain a good-to-moderate fishery.

With nutrients, MOS was also implicit by virtue of the following conservative assumptions: (1) the target of 0.3 mg/L for TIN was chosen over 0.3 mg/L of total nitrate; (2) the nitrogen target of 0.3 mg/L for TIN allowed for less nitrogen than a target of 0.3 mg/L of total nitrate because

TIN also includes other forms of nitrogen (e.g., nitrite and ammonia); (3) a target of 0.3 mg/L of TIN increased the assurance that levels of available nitrogen to phosphorus would stay below 10:1. For TP, MOS was inherent in EPA's recommended target concentration of 0.1 mg/L.

MOS in the Brush Creek temperature TMDL (DEQ 2007) was considered implicit in the design. Because the target was essentially background conditions, loads (shade levels) were allocated to lands adjacent to Brush Creek at natural background levels. It was unrealistic to set shade targets at higher, or more conservative, levels. Additionally, existing shade levels were reduced to the next lower 10% class interval, which likely underestimated the actual shade in the load analysis.

2.6 Seasonal Variation

Seasonal variability was built into the sediment TMDLs by developing loads using annual average rates determined from empirical characteristics that developed over time within the influence of runoff events and peak and base flow conditions. SEIs take into account that most bank recession occurs during peak flow events, when the banks are saturated. The annual delivery of sediment is a function of bank-full discharge. It is assumed that sediment accumulation within dry channels is continuous until flow resumes and the accumulated sediment is transported and deposited. Due to variability of sediment transport in the Blackfoot River, targets for depth fines were set over a 5-year time period.

The extent to which either nitrogen or phosphorus exceeds seasonal load capacity was unknown. The tendency for the uptake of phosphorus as phosphates by sediment allows phosphorus availability throughout the growing season regardless of the time of input. Conversely, nitrogen tends to remain dissolved and will *flow through* stream systems. Lentic waters (e.g., lakes and reservoirs) act as sinks for nutrients, especially phosphorus, increasing the available time for uptake by aquatic vegetation. Thus, phosphorus or nitrogen that entered a stream in February may be bioavailable to aquatic vegetation in a reservoir in July when conditions are conducive to algal or macrophytic growth. If only the Blackfoot River was to be considered, seasonal variation in nutrient concentrations would have been applied. However, the Blackfoot River flows into the Snake River not far upstream from American Falls Reservoir and due to concerns about American Falls Reservoir, which has a TMDL for chlorophyll-*a*, no allowance for seasonal variation in nutrient load was made.

The temperature TMDL was based on average summer loads. All loads were calculated to be inclusive of the 6-month period from April through September. This time period was chosen because it represented when the combination of increasing air and water temperatures coincides with increasing solar inputs and increasing vegetative shade. The critical time period is May when spring salmonid spawning occurs, July and August when maximum temperatures exceed cold water aquatic life criteria, and October during fall salmonid spawning. Water temperature is not likely to be a problem for beneficial uses outside of this time period because of cooler weather and lower sun angle.

2.7 Reserve

If uses are supported at load levels different than those specified in the TMDL, there may be some reserve capacity to adjust the TMDL loads.

3 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, designated, and presumed uses. The *Water Body Assessment Guidance* (Grafe et al. 2002) gives a detailed description of beneficial use identification for 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 IDAPA 58.01.02.110–160., 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 these so-called *presumed uses*, DEQ will apply the numeric cold water aquatic life criteria and primary or secondary contact recreation criteria to undesignated waters.

3.1 Beneficial Uses

The only designated beneficial uses in the Blackfoot River subbasin are for the main-stem Blackfoot River (Table 6). All other beneficial uses for tributaries in the subbasin are presumed to support cold water aquatic life and secondary contact recreation.

Table 6. Beneficial uses of water bodies with TMDLs.

Assessment Unit Name	Assessment Unit Number	Designated and/or Existing Beneficial Uses
Blackfoot River—main canal to Wolverine Creek	ID17040207SK002_05	Cold water aquatic life, salmonid spawning, primary contact recreation
Blackfoot River—headwaters to Slug Creek	ID17040207SK010_04	Cold water aquatic life, salmonid spawning, primary contact recreation, domestic water supply
Blackfoot River—small section near Diamond Creek	ID17040207SK015_04	Cold water aquatic life

Beneficial uses are protected by a set of criteria, which include *narrative* criteria for pollutants such as sediment and nutrients and *numeric* criteria for pollutants such as bacteria, dissolved oxygen, pH, ammonia, temperature, and turbidity (IDAPA 58.01.02.250). Table 7 includes the most common numeric criteria used in TMDLs; Figure 4 provides an outline of the stream assessment process for determining support status of the beneficial uses of cold water aquatic life, salmonid spawning, and contact recreation.

Table 7. Common numeric criteria supportive of designated beneficial uses in Idaho water quality standards.

Parameter	Primary Contact Recreation	Secondary Contact Recreation	Cold Water Aquatic Life	Salmonid Spawning[a]
Water Quality Standards: IDAPA 58.01.02.250–251				
Bacteria				
• Geometric mean	<126 *E. coli*/100 mL[b]	<126 *E. coli*/100 mL	—	—
• Single sample	≤406 *E. coli*/100 mL	≤576 *E. coli*/100 mL	—	—
pH	—	—	Between 6.5 and 9.0	Between 6.5 and 9.5
Dissolved oxygen (DO)	—	—	DO exceeds 6.0 milligrams/liter (mg/L)	**Water Column DO**: DO exceeds 6.0 mg/L in water column or 90% saturation, whichever is greater **Intergravel DO**: DO exceeds 5.0 mg/L for a 1-day minimum and exceeds 6.0 mg/L for a 7-day average
Temperature[c]	—	—	22 °C or less daily maximum; 19 °C or less daily average **Seasonal Cold Water**: Between summer solstice and autumn equinox: 26 °C or less daily maximum; 23 °C or less daily average	13 °C or less daily maximum; 9 °C or less daily average **Bull Trout**: Not to exceed 13 °C maximum weekly maximum temperature over warmest 7-day period, June–August; not to exceed 9 °C daily average in September and October
Turbidity	—	—	Turbidity shall not exceed background by more than 50 nephelometric turbidity units (NTU) instantaneously or more than 25 NTU for more than 10 consecutive days.	—
Ammonia	—	—	Ammonia not to exceed calculated concentration based on pH and temperature.	—
EPA Bull Trout Temperature Criteria: Water Quality Standards for Idaho, 40 CFR Part 131				
Temperature	—	—	—	7-day moving average of 10 °C or less maximum daily temperature for June–September

[a] During spawning and incubation periods for inhabiting species
[b] *Escherichia coli* per 100 milliliters
[c] Temperature exemption: Exceeding the temperature criteria will not be considered a water quality standard violation when the air temperature exceeds the ninetieth percentile of the 7-day average daily maximum air temperature calculated in yearly series over the historic record measured at the nearest weather reporting station.

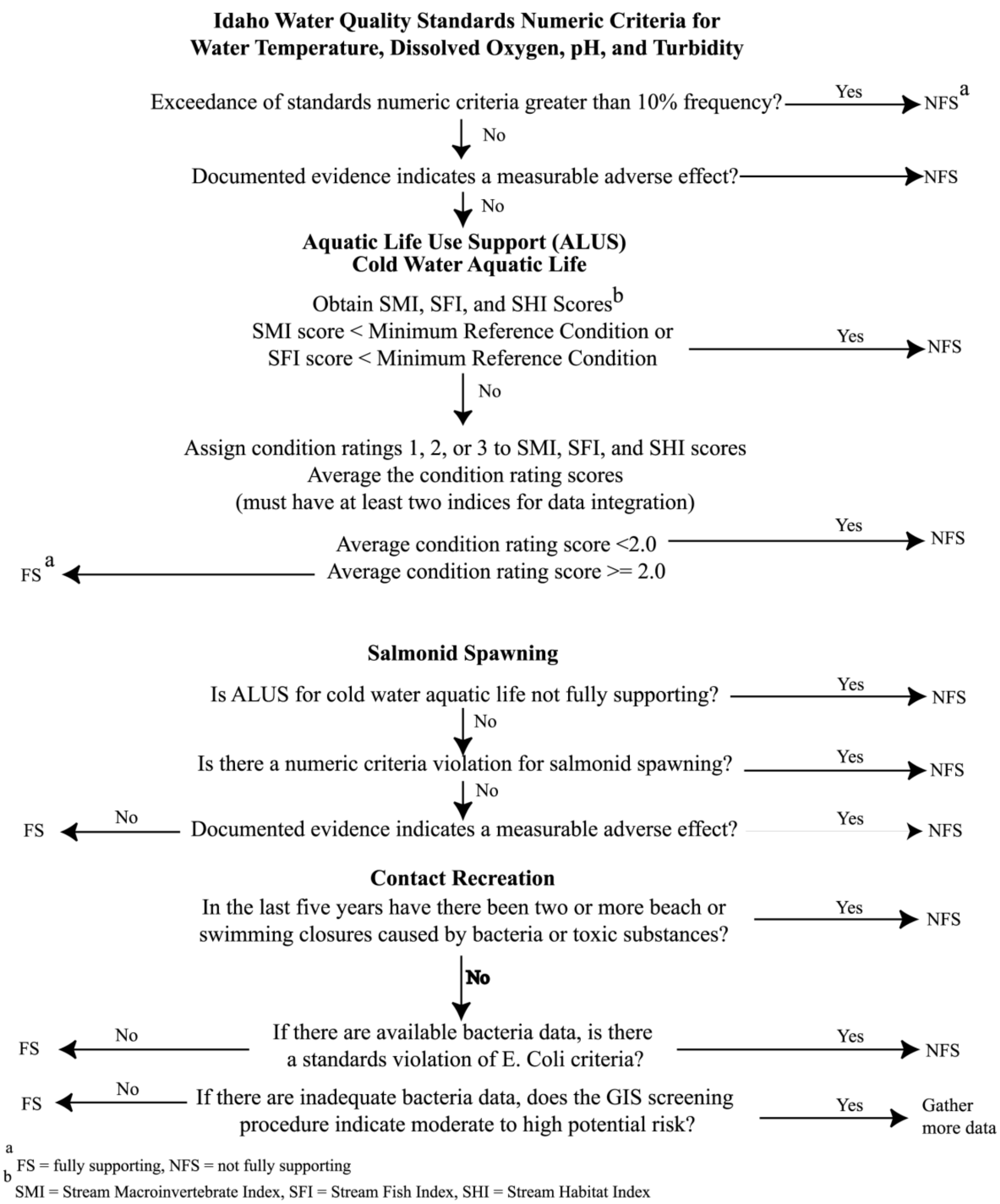

Figure 4. Determination steps and criteria for determining support status of beneficial uses in wadeable streams (Grafe et al. 2002).

3.2 Changes to Subbasin Characteristics

The Blackfoot River subbasin is contained within Caribou, Bingham, and Bonneville Counties. Caribou County contains the upper watershed, but no incorporated towns are within the watershed boundaries. Unincorporated communities in the Blackfoot River watershed include Conda, Henry, and Wayan. According to the US Census Bureau, the county’s population decreased nearly 5% between 2000 and 2010, from 7,304 to 6,963. Most of the lower watershed is within Bingham County, including the city of Blackfoot. Population in Bingham County increased 9% between 2000 and 2010 from 41,735 to 45,607. Bonneville County contains a small portion of the watershed, including the tributary of Meadow Creek. The Fort Hall Indian Reservation accounts for land on the west side of the river below the Trail Creek bridge.

Phosphate mining is a major industry in the upper watershed, and as a result, several AUs in the subbasin have been placed in Category 5 for selenium since approval of the Blackfoot River subbasin TMDL (DEQ 2001). These AUs are State Land Creek (ID17040207SK010_02a), Blackfoot River (ID17040207SK010_05), Dry Valley Creek (ID17040207SK013_02a and ID17040207SK013_03), Chicken Creek (ID17040207SK013_02b), Maybe Canyon Creek (ID17040207SK014_02), Spring Creek (ID17040207SK015_02 and ID17040207SK015_03), upper and lower Mill Creek (ID17040207SK015_02a and ID17040207SK015_02b), Sheep Creek (ID17040207SK022_02, ID17040207SK022_03, and ID17040207SK022_03a), Rasmussen Creek (ID17040207SK023_02a), and upper Angus Creek (ID17040207SK023_02b). In the 2012 Integrated Report, 15 AUs in the Blackfoot River subbasin (or 12%) were listed for selenium (DEQ 2014a).

A study conducted by the US Geological Survey (USGS) and DEQ concluded that between 2001 and 2012, selenium concentrations in the Blackfoot River near its outlet to the Blackfoot Reservoir routinely exceeded Idaho's chronic aquatic life criterion concentration of 5 micrograms per liter in May. USGS also reported that during the period of study, selenium concentrations had an upward trend during the low-flow season. The largest contributor of selenium to the Blackfoot River watershed is East Mill Creek, which enters the Blackfoot River through Spring Creek (Mebane et al. 2014).

A subsidiary of Monsanto, P4's Blackfoot Bridge Mine (near the Blackfoot River, ID17040207SK010_05), was permitted in 2011 and is expected to have a 17-year life expectancy. Ore will be recovered from three separate pits. Surface disturbance is expected to include 739 acres: 361 from pits; 186 from overburden piles; 87 from roads and related facilities; 67 from water control ponds; and 38 from topsoil stockpiles. Reclamation will include 674 acres. The design includes a drainage system and liner cap designed to prevent rain and snowmelt from contacting selenium-rich waste rock (BLM 2011). Other current mining operations in the Blackfoot River watershed include Rasmussen Ridge and Dry Valley Mines.

Historic P4 mines in the subbasin include Ballard, Henry, and Enoch Valley phosphate mines. P4 entered into a voluntary agreement with EPA, DEQ, USFS, BLM, and Shoshone-Bannock Tribes in 2009 to complete studies and develop a remedial investigation and feasibility study report for each of the three mine sites. The Ballard Mine remedial investigation report, including a risk assessment and site characterization was scheduled to be completed in 2015. Agencies will then propose a cleanup plan, seek input from the public, and select a cleanup alternative. This process will then be implemented at the other two P4 mines (DEQ 2014b).

The north and south Maybe Canyon Mines are located on the east side of Dry Valley and closed in the mid-90s. The East Mill dump of the north Maybe Canyon Mine is a significant source of selenium to Mill Creek. A USFS remedial investigation is planned to be completed for the dump site in 2015. Constructing a cap for the south Maybe Canyon Mine cross valley fill is occurring, after which a remedial investigation and feasibility study for Maybe Canyon is planned (DEQ 2014b).

Besides mining, agriculture is a major industry in the subbasin. Sheep and cattle grazing occurs on public (USFS, BLM, and state lands) and private lands in the subbasin. Grazing associations that hold large tracts of land include the Eastern Idaho Grazing Association, Bear Lake Land and Livestock, Caribou Cattle Company, and Bear Lake Grazing Company. Crops grown in the Blackfoot River subbasin include potatoes, wheat, and hay.

Restoration activities since approval of the Blackfoot River subbasin TMDL in 2002 include fencing BLM land on the lower Blackfoot River (ID17040207SK002_05) and developing off-site watering facilities. Additionally, 3,500 head of cattle will be excluded from upper Blackfoot River (ID17040207SK010_04) and Slug Creek (ID17040207SK012_04) as part of a §319 project. On Lanes Creek (ID17040207SK018_02e) and Sheep Creek (ID17040207SK022_03), the Upper Blackfoot Confluence (a partnership between Monsanto, Simplot, Agrium, Trout Unlimited, and Idaho Conservation League) has been working to exclude cattle and restore meanders and vegetation in areas degraded by grazing. Screens have been also been installed on diversions in Diamond and Lanes Creeks to reduce fish mortality and increase passage (Ashby 2014).

The Sagebrush Steppe Land Trust has secured parcels for conservation easements in the watershed. In December 2014, the land trust secured a conservation easement on a 250-acre parcel of land in the headwaters of the Little Blackfoot River and a 400-acre parcel of land west of the Blackfoot Reservoir (Ashby 2015).

3.3 Summary and Analysis of Current Water Quality Data

3.3.1 Beneficial Use Reconnaissance Program Data

DEQ’s BURP collects data on AUs to determine support of beneficial uses in subbasins throughout the state. Evaluations of BURP data are based on three facets of the ecology of wadeable streams: macroinvertebrates, stream habitat, and fish. Individual metrics within each category are used to generate a multimetric index scores. The multimetric index scores are the stream macroinvertebrate index (SMI), stream habitat index (SHI), and stream fish index (SFI). From those scores, condition rankings of 0, 1, 2, or 3 are assigned to sites based on percentile categories of reference conditions. At least two scores are needed to evaluate a stream’s support status; those scores must average 2 or greater (on a scale of 0 to 3) for beneficial uses to be considered supported.

The Blackfoot River subbasin contains 126 AUs of which 84, or 67%, have been surveyed by BURP since the program began in 1993 through 2013. Of the 84 AUs that have been assessed by BURP, most (75%) have been surveyed once or twice; 13% have been surveyed three times; 6% have been surveyed four times; and 6% have been surveyed 6 or more times (Figure 5). Brush Creek (ID17040207SK026_03) has been surveyed nine times. Most AUs have been surveyed only once or twice in BURP’s 20-year history, so it is difficult to discern water quality trends over time using BURP data. Since specific BURP sites are not repeated, it is difficult to distinguish if differing scores for the same AU are due to changing watershed conditions or site-specific attributes. Proper site selection that is characteristic of the AU is important to providing a representative assessment of water quality.

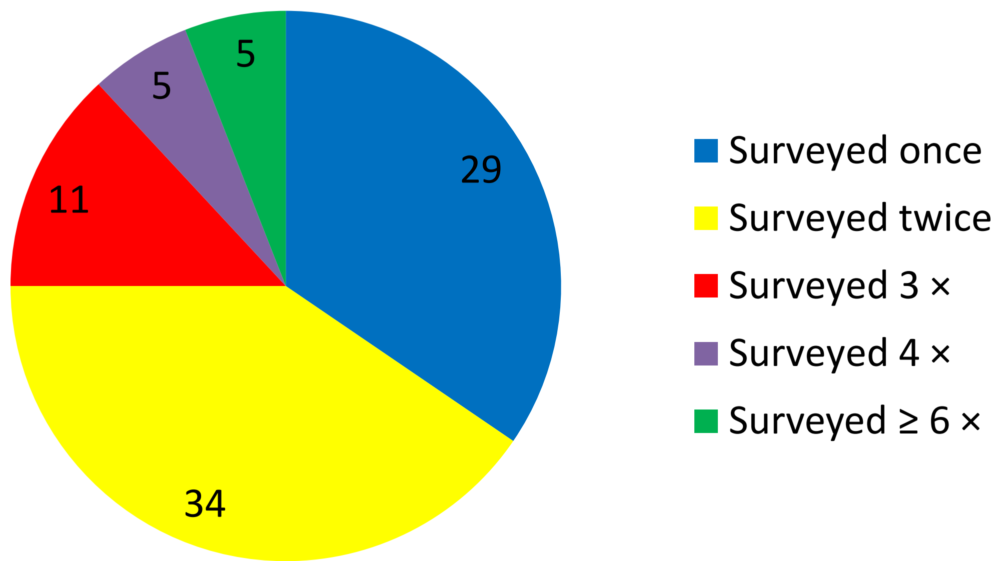

Figure 5. Number of BURP surveys conducted on AUs in the Blackfoot River subbasin from 1993 to 2013.

BURP assessments of AUs included in the Blackfoot River subbasin TMDL (DEQ 2001) and Brush Creek temperature TMDL (DEQ 2007) began in 1993 and will continue into the future. Since approval of the TMDL and addendum, no obvious changes in overall BURP scores for the AUs have been observed on the watershed scale. Table 8 displays average SMI, SFI, SHI, and average condition ranking for the water bodies. Overall, BURP scores indicate that implementing the Blackfoot River subbasin TMDL has generated no significant improvements in water quality within these AUs (Table 9). SFI was the most variable of the indices through time, likely because of the low sample size compared to the SMI or SHI. In contrast to the variability in SFI, SMI and SHI tended to fluctuate less around the mean score, with no significant trends in increasing or decreasing scores through time.

Table 8. Average index scores for BURP AU sites within the Blackfoot River subbasin, 1993–2013.

Year	*n*	SMI Score	SMI Rating	*n*	SFI Score	SFI Rating	*n*	SHI Score	SHI Rating	*n*	Average
1993	4	43.7	1.25	2	55.9	1.00	4	19.3	1.00	4	0.79
1994	6	32.8	0.67	3	35.1	0.67	6	25.5	1.00	6	0.44
1995	10	43.4	1.30	4	46.8	1.00	10	51.6	1.50	10	1.20
1996	5	33.1	1.00	0	—	—	5	40.2	1.40	5	1.00
1997	12	40.8	1.08	5	68.5	2.00	12	51.8	1.75	12	1.22
1998	6	40.0	1.17	1	57.9	1.00	6	58.3	2.17	6	1.42
1999	7	41.0	1.00	2	72.9	2.00	7	49.1	1.43	7	1.05
2000	0	—	—	0	—	—	0	—	—	0	—
2001	8	38.4	0.88	3	25.8	0.33	8	37.9	1.38	8	0.60
2002	8	51.4	1.75	1	71.5	2.00	8	56.5	1.75	8	1.60
2003	2	27.0	0.00	2	4.8	0.00	2	39.0	1.00	2	0.00
2004	3	53.0	2.00	1	65.2	1.00	3	47.7	1.00	3	1.44
2005	3	40.5	1.00	2	38.9	0.50	3	39.3	1.00	3	0.44
2006	6	56.8	2.00	5	53.2	1.40	6	54.3	2.00	6	1.72
2007	6	48.9	1.83	1	32.7	0.00	6	56.7	2.00	6	1.25
2008	8	47.4	1.75	5	32.9	0.60	8	55.8	2.00	8	0.94
2009	0	—	—	0	—	—	0	—	—	0	—
2010	4	30.7	0.75	4	18.8	0.50	4	33.8	1.25	4	0.58
2011	5	38.6	1.00	3	43.2	0.75	5	47.2	1.40	5	0.53
2012	2	40.8	1.50	0	—	—	0	—	—	0	—

Notes: Stream macroinvertebrate index (SMI); stream fish index (SFI); stream habitat index (SHI); number of AUs surveyed (*n*).

Table 9. BURP scores (1993–2013) for AUs with approved TMDLs (2002 and 2007) in the Blackfoot River subbasin.

Assessment Unit Name	Assessment Unit Number	Stream Length (miles)	BURP ID	SMI Score	SMI Rating	SFI Score	SFI Rating	SHI Score	SHI Rating	Average
Blackfoot River	ID17040107SK002_05	65.18	No BURP data	—	—	—	—	—	—	—
Corral Creek	ID17040107SK006_02	33.92	No BURP data	—	—	—	—	—	—	—
Corral Creek	ID17040107SK006_03	9.22	1994SPOCA017	13.5	0	—	—	16	1	0
			1997SPOCA048	14	0	—	—	23	1	0
			2003POCA054	24.98	0	0.03	0	33	1	0
			2008SPOCA087	29.77	0	0.03	0	43	1	0
			2010SDEQA2197	18.98	0	0.03	0	23	1	0
			2012SPOCA040	28.76	0	—	—	—	—	0
			2013SDEQA501	—	—	—	—	—	—	—
Corral Creek	ID17040107SK006_04	6.59	1994SPOCA018	30.46	0	—	—	15	1	0
			1997SPOCA047	27.76	0	20.17	0	48	1	0
			2003SPOCA055	29.10	0	9.54	0	45	1	0
			2008SPOCA088	57	3	33.62	0	68	3	0
			2010SDEQA1685	19.49	0	0.03	0	30	1	0
			2012SPOCA041	52.92	3	25.00	0	66.00	3	0
Grizzly Creek	ID17040107SK007_02	3.42	No BURP data	—	—	—	—	—	—	—
Sawmill Creek	ID17040107SK007_02a	4.90	1999SPOCA059	29.19	0	—	—	36	1	0
			2007SPOCB039	44.40	2	—	—	42	1	1.5
Grizzly Creek	ID17040107SK007_03	4.54	2001SPOCA003	26.03	0	—	—	23	1	0
			2011SPOCA046	25.69	0	—	0	32	1	0
			2011SPOCA047	—	—	—	—	—	—	—
Grizzly Creek	ID17040107SK007_04	2.78	1996SPOCA026	20.02	0	—	—	25	1	0
			2001SPOCA002	27.70	0	0.03	0	27	1	0
			2008SPOCA114	30.25	0	—	—	47	1	0
			2008SPOCA141	36.99	1	—	—	51	2	1.5
Trail Creek side channel	ID17040107SK010_03	2.68	No BURP data	—	—	—	—	—	—	—

Assessment Unit Name	Assessment Unit Number	Stream Length (miles)	BURP ID	SMI Score	SMI Rating	SFI Score	SFI Rating	SHI Score	SHI Rating	Average
Blackfoot River	ID17040107SK010_04	13.82	No BURP data	—	—	—	—	—	—	—
Trail Creek	ID17040107SK011_02	16.15	No BURP data	—	—	—	—	—	—	—
Trail Creek	ID17040107SK011_03	5.31	1996SPOCA050	34.28	1	—	—	43	1	1
			2001SPOCA004	35.87	1	14.02	0	29	1	0
			2005SPOCA032	—	—	—	—	—	—	—
Upper Trail Creek	ID17040107SK011_03a	1.08	1999SPOCA007	51.24	2	50.58	1	62	2	1.67
Slug Creek	ID17040107SK012_02	89.90	2007SPOCB045	30.60	0	—	—	58	2	0
Slug Creek	ID17040107SK012_03	4.28	1997SPOCA056	43.77	1	—	—	42	1	1
			2011SPOCA057	32.21	0	—	—	43	1	0
Slug Creek	ID17040107SK012_04	16.13	1994SPOCA012	25.35	0	0	0	39	1	0
			1994SPOCA013	12.35	0	—	—	23	1	0
			1997SPOCA055	25.77	0	—	—	36	1	0
			2001SPOCA013	25.07	0	—	—	25	1	0
			2010SDEQA1941	25.75	0	0.03	0	21	1	0
			2011SPOCA058	45.35	1	37.84	0	55	1	0
Dry Valley Creek	ID17040107SK013_02	14.88	No BURP data	—	—	—	—	—	—	—
Dry Valley Creek	ID17040107SK013_02a	6.22	2001SPOCA023	20.12	0	—	—	21	1	0
Chicken Creek	ID17040107SK013_02b	1.69	No BURP data	—	—	—	—	—	—	—
Maybe Canyon Creek	ID17040107SK014_02	5.23	1995SPOCA040	33.15	1	—	—	66	3	2
			2001SPOCA028	78.75	3			62	2	2.5
Blackfoot River	ID17040107SK015_04	0.36	No BURP data	—	—	—	—	—	—	—
Diamond Creek	ID17040107SK016_02	33.66	No BURP data	—	—	—	—	—	—	—

Assessment Unit Name	Assessment Unit Number	Stream Length (miles)	BURP ID	SMI Score	SMI Rating	SFI Score	SFI Rating	SHI Score	SHI Rating	Average
Upper Diamond Creek	ID17040107SK016_02a [a]	2.53	1993SPOCA009	27.26	0	49.58	1	26	1	0
			2002SPOCA048	58.64	2	—	—	77	3	2.5
			2007SPOCB051	65.96	3	67.20	0	69	3	2.67
Coyote Creek	ID17040107SK016_02b	2.80	1998SPOCA056	64.11	3	57.90	1	60	2	2
Bear Canyon	ID17040107SK016_02c [a]	2.44	1998SPOCA055	55.54	2	—	—	67	3	2.5
			2006SPOCA077	46.57	1	—	—	66	3	2
Timber Creek	ID17040107SK016_02d	3.21	1996SPOCA042	62.27	3	—	—	75	3	3
			2002SPOCA043	52.09	2	—	—	64	2	2
			2007SPOCB05	55.54	2	—	—	62	2	2
			2013SPOCA051	45.52	1	—	—	42	1	1
Cabin Creek	ID17040107SK016_02e	3.42	1995SPOCA044	50.23	1	—	—	62	2	1.5
Stewart Canyon	ID17040107SK016_02f	2.98	1998SPOCA054	39.82	1	—	—	79	3	2
			2004SPOCA067	38.24	1	—	—	56	1	1
Campbell Canyon	ID17040107SK016_02g	2.17	1998SPOCA057	43.22	1	—	—	66	3	2
Upper Kendall Creek	ID17040107SK016_02h	1.32	1995SPOCA048	62.85	3	56.89	1	61	2	2
			2001SPOCA027	68.94	3	63.31	1	72	3	2.33
Lower Kendall Creek	ID17040107SK016_02i	0.77	2006SPOCA030	71.31	3	73.58	2	67	3	2.67
Lower Diamond Creek	ID17040107SK016_03	12.34	1993SPOCA008	59.24	3	62.17	1	15	1	1.67
			2006SPOCA078	68.53	3	83.73	3	54	2	2.67

Assessment Unit Name	Assessment Unit Number	Stream Length (miles)	BURP ID	SMI Score	SMI Rating	SFI Score	SFI Rating	SHI Score	SHI Rating	Average
Middle Diamond Creek	ID17040107SK016_03a	10.63	1997SPOCA053	52.12	2	—	—	61	2	2
			1997SPOCA054	53.18	2	—	—	74	3	2.5
			2002SPOCA046	25.60	0	—	—	57	1	0
			2002SPOCA047	61.12	3	—	—	47	1	2
			2006SPOCA075	46.69	1	49.55	1	55	1	1
			2013SPOCA020	37.46	1	50.44	1	64	2	1.33
			2013SPOCA062	44.82	1	40.57	1	58	2	1.33
Lanes Creek	ID17040107SK018_02	18.57	No BURP data	—	—	—	—	—	—	—
Lanes Creek	ID17040107SK018_02a [a]	3.62	1993SPOCA010	30.92	0	—	—	21	1	0
			1997SPOCA051	62.28	3	—	—	63	2	2.5
			2002SPOCA044	59.71	3	71.52	2	62	2	2.33
Daves Creek	ID17040107SK018_02b [a]	2.93	1997SPOCA058	41.68	1	93.75	3	65	2	2
Daves Creek	ID17040107SK018_02c	0.67	No BURP data	—	—	—	—	—	—	—
Corralisen Creek	ID17040107SK018_02d	3.91	1999SPOCA037	65.70	3	—	—	70	3	3
Lanes Creek	ID17040107SK018_02e	3.13	No BURP data	—	—	—	—	—	—	—
Lanes Creek	ID17040107SK018_03	3.65	2004SPOCA045	57.31	2	65.20	1	39	1	1.33
Lanes Creek	ID17040107SK018_04	8.28	1997SPOCA049	40.61	1	—	—	31	1	1
			2005SPOCA033	55.25	2	60.66	1	38	1	1.33
Bacon Creek	ID17040107SK019_02	18.86	1995SPOCA046	63.14	3	75.99	2	51	1	2
Upper Bacon Creek	ID17040107SK019_02a	3.99	1995SPOCA042	53.23	2	—	—	60	2	2
Bacon Creek	ID17040107SK019_02b	2.54	1995SPOCA043	47.79	1	—	—	44	1	1
			2008SPOCA134	51.57	3	97.57	3	70	3	3
Bacon Creek	ID17040107SK019_03	1.48	No BURP data	—	—	—	—	—	—	—
Bacon Creek	ID17040107SK019_04	4.12	No BURP data	—	—	—	—	—	—	—

Assessment Unit Name	Assessment Unit Number	Stream Length (miles)	BURP ID	SMI Score	SMI Rating	SFI Score	SFI Rating	SHI Score	SHI Rating	Average
Upper Sheep Creek	ID17040107SK022_02	10.44	2013SDEQA446	64.78	3	64.95	1	61	2	2
			2013SPOCA084	64.78	3	64.95	1	61	2	2
Lower Sheep Creek	ID17040107SK022_03	1.32	1993SPOCA011	57.48	2	—	—	15	1	1.5
Middle Sheep Creek	ID17040107SK022_03a [a]	3.54	1997SPOCA052	57.39	2	97.07	3	70	3	2.67
			2002SPOCA045	84.65	3	—	—	74	3	3
			2008SPOCA113	76.14	3	—	—	73	3	3
			2013SPOCA086	59.50	3	81.60	3	63	2	2.67
Angus Creek	ID17040107SK023_02	11.31	No BURP data	—	—	—	—	—	—	—
Rasmussen Creek	ID17040107SK023_02a	6.27	1999SPOCA055	40.22	1	—	—	45	1	1
Upper Angus Creek	ID17040107SK023_02b	4.67	1995SPOCA039	13.42	0	—	—	54	1	0
			1999SPOCA056	45.15	1	95.19	3	54	1	1.67
			1999SPOCA057	26.36	0	—	—	42	1	0
			2005SPOCA023	23.06	0	—	—	37	1	0
Lower Angus Creek	ID17040107SK023_04	3.40	1995SPOCA041	21.53	0	54.43	1	26	1	0
			2006SPOCA029	68.21	3	58.95	1	57	2	2
			2008SPOCA085	55.52	3	33.37	0	57	2	0
			2013SPOCA012	44.60	1	62.54	1	55	1	1
Meadow Creek	ID17040107SK025_02	47.28	No BURP data	—	—	—	—	—	—	—
Meadow Creek	ID17040107SK025_02a	6.63	1995SPOCA052	37.11	0	0.03	0	48	1	0
			1998SIDFB010	14.81	0	—	—	39	1	0
			2001SPOCA001	24.38	0	—	—	44	1	0
			2011SPOCA039	43.56	2	0.03	0	39	1	0

Assessment Unit Name	Assessment Unit Number	Stream Length (miles)	BURP ID	SMI Score	SMI Rating	SFI Score	SFI Rating	SHI Score	SHI Rating	Average
Meadow Creek	ID17040107SK025_02d	7.54	1999SPOCA035	29.00	0	—	—	35	1	0
Meadow Creek	ID17040107SK025_03	7.19	2008SPOCA051	42.17	1	0.03	0	37	1	0
Meadow Creek	ID17040107SK025_04	9.71	1995SPOCA051	51.18	2	—	—	44	1	1.5
			2006SPOCA059	39.65	1	0.03	0	27	1	0
Brush Creek	ID17040107SK026_02	45.88	No BURP data	—	—	—	—	—	—	—
Brush Creek	ID17040107SK026_03	13.35	1996SPOCA023	33.70	1	—	—	33	1	1
			1996SPOCA027	14.98	0	—	—	25	1	0
			2002SPOCA039	36.51	1	—	—	29	1	1
			2002SPOCA040	32.86	0	—	—	42	1	0
			2004SPOCA018	63.57	3	—	—	48	1	2
			2005SPOCA026	43.19	1	17.20	0	43	1	0
			2007SPOCB011	47.52	2	—	—	57	2	2
			2010SDEQA2159	58.55	3	75.30	2	61	2	2.33
			2013SPOCA060	56.85	3	40.71	1	41	1	1.67
Wolverine Creek	ID17040107SK030_02	24.61	1994SPOCA014	58.92	2	58.65	1	32	1	1.33
			1997SPOCA028	31.82	0	90.77	3	67	3	0
			2011SPOCA003	45.95	2	91.60	3	67	3	2.67
Wolverine Creek	ID17040107SK030_03	2.54	1994SPOCA015	56.10	2	46.73	1	28	1	1.33
			1997SPOCA030	39.46	1	40.75	1	42	1	1
			2013SDEQA425	—	—	—	—	—	—	—
Jones Creek	ID17040107SK031_02	4.54	1998SPOCA098	22.30	0	—	—	39	1	0
			2007SPOCB008	49.10	2	—	—	52	2	2

a. Assessment unit should be moved to Category 2 in the next Integrated Report.
Notes: Beneficial Use Reconnaissance Program (BURP); stream macroinvertebrate index (SMI); stream fish index (SFI); stream habitat index (SHI)

While BURP data do not demonstrate improving water quality since the subbasin's TMDL development and implementation, they do identify some AUs that appear to be supporting their beneficial uses. Additional tributaries were listed under the Diamond Creek TMDL once the AU system was adopted by DEQ. Some of these AUs have BURP scores that indicate full support of beneficial uses and should be moved to Category 2 in the next Integrated Report (Table 9).

Two assessments of Upper Diamond Creek (ID17040207SK016_02a) indicated full support of beneficial uses. In 2002, the average condition rating was 2.5. In 2007, it was 2.67. This AU should be moved to Category 2 in the next Integrated Report and removed from Category 4a for sediment.

Two assessments of Bear Canyon (ID17040207SK016_02c) indicated full support of beneficial uses. During 1998 and 2006 assessments, the SHI both had a condition rating of 3. In 1998, during a stream flow of 2.35 cubic feet per second (cfs), the SMI was a 2. In 2006, when stream flow was only 0.7 cfs, the SMI was a 1, probably owing to the ephemeral nature of the water body during that year. While the SHI score remained the same, the SMI score decreased. Nevertheless, during both assessments, the average score was ≥2, demonstrating full support of beneficial uses.

Lower Kendall Creek (ID17040207SK016_02i) was assessed in 2006 and 2013. Both assessments were conducted in the upper portion of the AU, and available scores from 2006 indicate that this portion of the AU was fully supporting beneficial uses. Downstream from these BURP sites, however, riparian vegetation is sparse and the area appears to be heavily grazed (Figure 6). This AU should not be moved to Category 2 until a BURP assessment below the road indicates that the lower portion of this AU is also supporting beneficial uses.

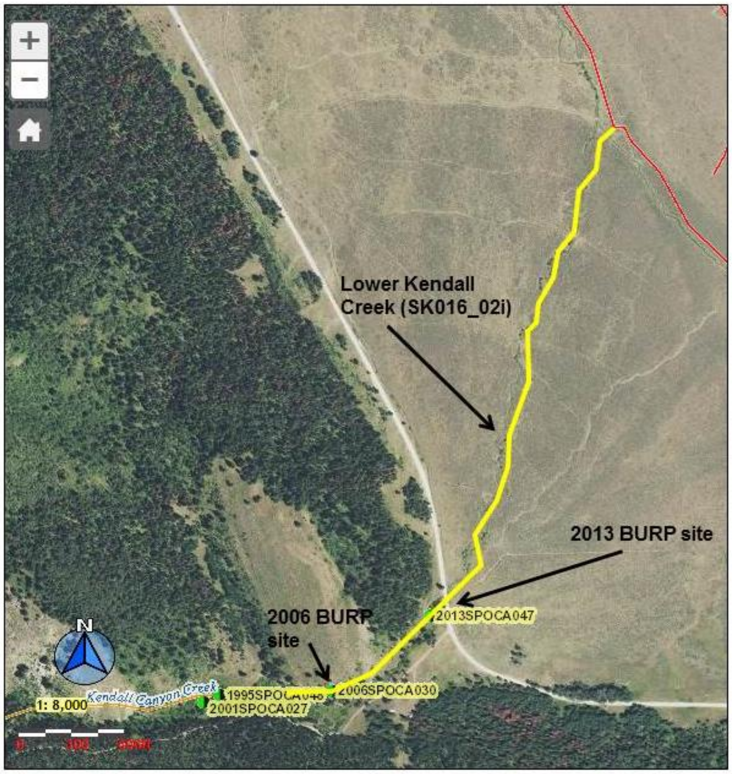

Figure 6. Aerial photo of lower Kendall Creek (ID17040207SK016_02i, highlighted in yellow), indicating that BURP sites do not accurately represent the condition of this AU.

Lanes Creek (ID17040207SK018_02a) was initially assessed by BURP in 1993. This assessment did not follow protocols now established. For example, invertebrates were only identified to family and only 130 individuals were included; current protocol calls for identifying at least 500 individuals. Bank-full and wetted widths were not measured, and Wolman pebble count was not conducted. These factors likely led to failing scores for that assessment. When the AU was reevaluated in 1997 and 2002, scores indicated full support of beneficial uses. On both occasions, SMI received a condition rating of 3. This AU is supporting beneficial uses and should be moved to Category 2 in the next Integrated Report.

Daves Creek (ID17040207SK018_02b) was assessed in 1997. The SMI condition rating was 1, and the SHI 2. The SFI score was 93.75 and the rating 3. This score and rating, however, were the result of just two Cutthroat Trout caught during the survey. Nevertheless, the average condition rating was 2, indicating full support of cold water aquatic life. This AU should be moved to Category 2 in the next Integrated Report.

Upper Sheep Creek (ID17040207SK022_02) was assessed in 2013. This survey indicates that this AU is fully supporting beneficial uses with an average condition rating of 2. This AU should be removed from Category 4a for sediment in the next Integrated Report and moved to Category 2.

Middle Sheep Creek (ID17040207SK022_03a) was assessed with BURP protocols in 1997, 2002, 2008, and 2013. Assessments indicate that this AU is fully supporting beneficial uses with average condition ratings of 2.67, 3, 3, and 2.67 in 1997, 2002, 2008, and 2013, respectively.

This AU should be removed from Category 4a for sediment and in the next Integrated Report and moved to Category 2.

3.3.2 Streambank Erosion Inventory and McNeil Core Sample Data

In 2008 and 2009, DEQ conducted SEIs and McNeil core samples for sediment on AUs in the Blackfoot River subbasin (Table 10 and Table 11). SEIs were conducted on 52 AUs, and McNeil core samples were taken in 15 AUs. SEIs attempt to document streambank erosion conditions within an AU by measuring the length of eroding and non-eroding streambanks. Additionally, when eroding banks are encountered, the height of the bank subject to erosion is measured. SEIs ideally incorporate at least 10% of an AU, and attempts are made to be as representative as possible. McNeil core samples document subsurface sediment characteristics within salmonid spawning habitats. A core is driven 4 inches deep into the stream, and all contents are removed. Sediments are then sorted by size with sieves, and the volume of sediment of various sizes is measured. Three cores are completed in salmonid spawning habitat (riffles and pool tailouts) to generate a mean percent fines <6.25 mm and <0.85 mm. Particles >63 mm are excluded from calculations because these sediments are thought to be too large to be used as spawning gravels by nonanadromous salmonids.

In 2014, EPA and DEQ funded an effort to collect watershed data on subbasins for 5-year reviews. As part of that effort, DEQ’s Pocatello Regional Office hired two environmental technicians to assist in collecting data on AUs in the Blackfoot River subbasin. Of the 53 AUs where SEIs were completed, 34, or 64%, were not meeting the TMDL target of 80% streambank stability. Percent erosive bank ranged from 0% to 76% of the length surveyed. Lateral recession rate estimates are based on condition scores documented by the surveyors and ranged from 0.015 to 0.41 feet per year. The total bank erosion rate incorporates the height and length of the erosive bank and the lateral recession rate to generate an estimate of the rate of erosion from streambanks. Bank erosion rate estimates ranged from 0 to 396 tons per mile per year.

Table 10. Streambank erosion inventory data for 2008, 2009, and 2014.

Assessment Unit Name	Assessment Unit Number	Date	Reach Length (feet)	% Erosive Bank	Lateral Recession Rate (feet/year)	Total Bank Erosion Rate (tons/mile/year)
Corral Creek	ID17040207SK006_02	6/12/2014	3,651	63[a]	0.1500	125.93
Corral Creek	ID17040207SK006_03	8/13/2009	5,239	85[a]	0.12	119.55
		6/12/2014	6,081	40[a]	0.075	39.39
Corral Creek	ID17040207SK006_04	6/11/2014	3,736	30[a]	0.1575	91.05
Grizzly Creek	ID17040207SK007_02	8/19/2008	4,896	81[a]	0.29	241.87
		6/17/2014	7,823	21[a]	0.04	9.8
Sawmill Creek	ID17040207SK007_02a	6/17/2014	4,061	28[a]	0.055	25.73
Grizzly Creek	ID17040207SK007_03	6/16/2014	3,234	42[a]	0.0575	36.74
Grizzly Creek	ID17040207SK007_04	6/16/2014	1,539	70[a]	0.0600	63.86
Blackfoot River	ID17040207SK010_04	7/28/2014	7,485	24[a]	0.1801	89.27
Trail Creek	ID17040207SK011_02	6/26/2014	2,824	6	0.0175	1.04
Trail Creek	ID17040207SK011_03	6/30/2014	2,929	12	0.055	6.59
Trail Creek	ID17040207SK011_03a	6/30/2014	571	12	0.02	3.32
Slug Creek	ID17040207SK012_02	7/1/2014	6,639	10	0.05	5.95
Slug Creek	ID17040207SK012_03	7/1/2014	2,772	25[a]	0.12	45.63
Dry Valley Creek	ID17040207SK013_02	8/6/2014	3,949	18	0.0463	14.51
Dry Valley Creek	ID17040207SK013_02a	8/6/2014	5,048	0	0.0295	1.25
Chicken Creek	ID17040207SK013_02b	8/11/2009	1,355	32[a]	0.04	13.07
		8/7/2014	1,889	0	0.025	0.05
Maybe Canyon Creek	ID17040207SK014_02	8/7/2014	2,014	15	0.0525	14.39
Blackfoot River	ID17040207SK015_04	7/30/2014	620	54[a]	0.0675	45.94
Upper Diamond Creek	ID17040207SK016_02a	7/8/2014	2,394	20[a]	0.055	11.56
Coyote Creek	ID17040207SK016_02b	8/18/2009	1,443	39[a]	0.05	17.35
		7/7/2014	1,706	18	0.0525	12.43
Bear Canyon	ID17040207SK016_02c	7/8/2014	1,309	9	0.045	7.04
Timber Creek	ID17040207SK016_02d	7/8/2014	3,055	39[a]	0.09	42.59
Cabin Creek	ID17040207SK016_02e	7/16/2014	1,901	36[a]	0.035	9.67
Stewart Canyon	ID17040207SK016_02f	7/16/2014	1,549	41[a]	0.1381	141.66
Campbell Canyon	ID17040207SK016_02g	7/7/2014	1,181	46[a]	0.105	52.75
Upper Kendall Canyon	ID17040207SK016_02h	7/2/2014	869	29[a]	0.0325	3.83
Lower Diamond Creek	ID17040207SK016_03	7/21/2014	10,227	60[a]	0.2425	228.95
Middle Diamond Creek	ID17040207SK016_03a	7/14/2014	4,874	48[a]	0.135	126.16
Daves Creek	ID17040207SK018_02b	7/14/2014	1,676	0	0.0175	0.12
Daves Creek	ID17040207SK018_02c	7/30/2014	344	32[a]	0.1125	59.56
Corralisen Creek	ID17040207SK018_02d	7/24/2014	2,198	19	0.045	19.35
Lanes Creek	ID17040207SK018_03	7/31/2014	2,458	25[a]	0.0975	47.31

Assessment Unit Name	Assessment Unit Number	Date	Reach Length (feet)	% Erosive Bank	Lateral Recession Rate (feet/year)	Total Bank Erosion Rate (tons/mile/year)
Lanes Creek	ID17040207SK018_04	7/24/2014	4,976	47[a]	0.16	143.2
Bacon Creek	ID17040207SK019_02a	10/8/2014	4,602	8	0.0175	2
Bacon Creek	ID17040207SK019_02b	7/23/2014	2,024	76[a]	0.41	395.73
Bacon Creek	ID17040207SK019_03	7/23/2014	4,093	47[a]	0.0575	28.9
Bacon Creek	ID17040207SK019_04	7/23/2014	2,683	52[a]	0.1525	143.89
Upper Sheep Creek	ID17040207SK022_02	7/9//2014	7,114	5	0.03	2.02
Lower Sheep Creek	ID17040207SK022_03	7/21/2014	768	47[a]	0.155	100.01
Middle Sheep Creek	ID17040207SK022_03a	9/23/2009	3,917	9	0.02	5.22
		7/10/2014	1,981	10	0.035	3.68
Upper Angus Creek	ID17040207SK023_02	7/9/2014	1,897	1	0.015	0
Rasmussen Creek	ID17040207SK023_02a	7/29/2008	2,007	60[a]	0.066	27.64
		7/2/2014	3,595	39[a]	0.215	102.99
Upper Angus Creek	ID17040207SK023_02b	7/2/2014	1,925	21[a]	0.05	18.24
Lower Angus Creek	ID17040207SK023_04	9/9/2009	702	0	0.03	0
		7/1/2014	2,037	7	0.045	2.52
Meadow Creek	ID17040207SK025_02a	9/9/2009	5,449	88[a]	0.16	209.43
		6/24/2014	6,101	54[a]	0.1875	178.82
Meadow Creek	ID17040207SK025_02d	6/25/2014	6,885	45[a]	0.155	131.8
Meadow Creek	ID17040207SK025_03	6/24/2014	3,880	57[a]	0.1575	155.59
Meadow Creek	ID17040207SK025_04	6/23/2014	4,418	29[a]	0.0675	35.44
Brush Creek	ID17040207SK026_02	6/11/2014	3,697	14	0.0375	7.53
Brush Creek	ID17040207SK026_03	6/4/2014	4,781	41[a]	0.0952	80.92
Wolverine Creek	ID17040207SK030_02	9/10/2009	6,000	40[a]	0.05	91.99
		6/10/2014	4,290	22[a]	0.1525	101.8
Wolverine Creek	ID17040207SK030_03	6/9/2014	1,351	34[a]	0.0825	54.67
Jones Creek	ID17040207SK031_02	7/31/2008	629	83[a]	0.16	1,131.14

a. Total maximum daily load target of <20% is not being achieved.

Table 11. McNeil core sample data (2008, 2009, and 2014) for salmonid spawning habitats.

Assessment Unit Name	Assessment Unit Number	Date	*n*	% Fines <6.25 mm	% Fines <0.85 mm	Standard Deviation % Fines <6.25 mm	Standard Deviation % Fines <0.85 mm
Corral Creek	ID17040207SK006_04	8/19/2009	3	67[a]	22[a]	6	7
Grizzly Creek	ID17040207SK007_04	8/19/2009		50[a]	21[a]	—	—
Blackfoot River	ID17040207SK010_04	7/27/2014	3	47[a]	14[a]	14	4
Trail Creek	ID17040207SK011_03a	6/26/2014	3	48[a]	28[a]	3	3
Upper Kendall Canyon	ID17040207SK016_02h	7/2/2014	3	52[a]	13[a]	4	3
Middle Diamond Creek	ID17040207SK016_03a	7/16/2014	3	43[a]	11[a]	2	2
Lower Diamond Creek	ID17040207SK016_03	7/22/2014	3	45[a]	19[a]	2	5
Daves Creek	ID17040207SK018_02c	7/30/2014	3	47[a]	16[a]	8	4
Lanes Creek	ID17040207SK018_04	7/29/2014	3	32[a]	11[a]	2	2
Bacon Creek	ID17040207SK019_02a	10/8/2014	3	40[a]	15[a]	3	6
Bacon Creek	ID17040207SK019_02b	8/18/2008	3	27[a]	17[a]	3	1
Upper Sheep Creek	ID17040207SK022_02	9/23/2009	3	69[a]	16[a]	19	4
		7/10/2014	3	49[a]	19[a]	3	5
Lower Sheep Creek	ID17040207SK022_03	7/21/2014	3	40[a]	13[a]	9	2
Middle Sheep Creek	ID17040207SK022_03a	7/30/2014	3	37[a]	9	8	2
Rasmussen Creek	ID17040207SK023_02a	7/29/2008	3	67[a]	32[a]	5	2
Angus Creek	ID17040207SK023_04	7/1/2014	3	28[a]	7	5	4
Brush Creek	ID17040207SK026_03	6/5/2014	4	49[a]	18[a]	11	6
Wolverine Creek	ID17040207SK030_02	9/10/2009	3	43[a]	13[a]	4	2
		6/10/2014	3	46[a]	15[a]	3	3
Wolverine Creek	ID17040207SK030_03	6/9/2014	3	42[a]	13[a]	9	3
Jones Creek	ID17040207SK031_02	7/31/2008	3	50[a]	17[a]	9	3

a. Total maximum daily load target is not being met.
Notes: number of samples(*n*); millimeter (mm); micrometer (µm)

In 2014, SEIs were completed for AUs within land owned by different entities. Nineteen SEIs were completed on USFS land, 15 on state land, 12 on private land, 1 on BLM land, and 2 were completed within Idaho Fish and Game's wildlife management area. Two SEIs were completed on land owned by multiple entities and one was completed on land owned by the US government. Streambank conditions differed significantly by landownership. For example, percent erosive bank was significantly higher on private and state-owned land than land managed by USFS (Figure 7). On average, USFS land had 20.5% erosive banks, nearly meeting the 80%

stability target of the Blackfoot River subbasin TMDL (DEQ 2001). Meanwhile private and state land had 36.4% and 38.8% erosive banks, well above targets set in the TMDL. Efforts to reduce streambank erosion in the Blackfoot River subbasin should focus on private and state land because, in general, these areas tend to have higher levels of streambank instability than USFS-managed lands.

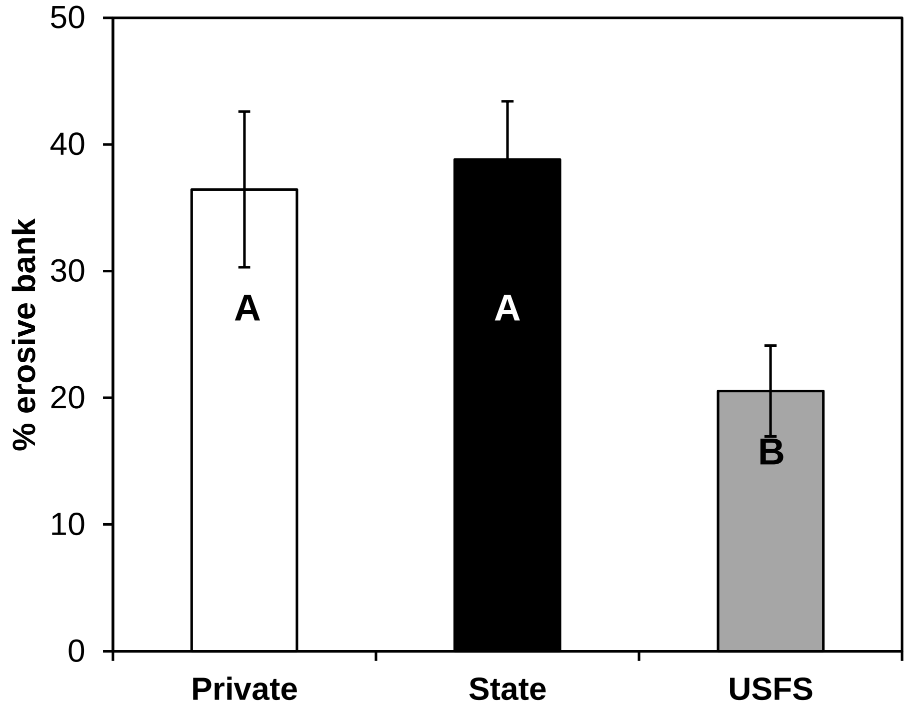

Figure 7. Mean (± 1 standard error) percent erosive streambank from 2014 SEIs by major landownership (*n* = 12 private, *n* = 15 state of Idaho, and *n* = 19 US Forest Service). Bars with different letters represent significant differences ($p < 0.05$).

McNeil core samples were completed in the Blackfoot River subbasin TMDL AUs in 2008, 2009, and 2014 (Table 11). In 2014, of the 15 AUs where McNeil core samples were completed, all exceeded the targets for percent subsurface fines in salmonid spawning habitats documented in the TMDL (DEQ 2001). On average, percent fine <6.25 mm composed 43% of the volume of subsurface sediments in salmonid spawning habitats, compared to the 25% target. Percent fines <0.85 mm consisted of an average of 15% of the total volume of subsurface sediments in salmonid spawning habitats. Two AUs, middle Sheep Creek (ID17040207SK022_03a) and lower Angus Creek (ID17040207SK023_04) met the <10% target for percent fines <0.85 mm.

3.3.3 Water Column Data

Water column data have been collected in the Blackfoot River watershed since 2003. Data consists of continuous water temperature, specific conductivity, pH, dissolved oxygen, and turbidity parameters, and both depth-integrated and grab samples analyzed for ammonia, nitrate + nitrite (N+N), total Kjeldahl nitrogen (TKN), dissolved orthophosphate (OP), TP, and total suspended sediment concentration (TSSC) or total suspended sediment (TSS). TSS and

TSSC are significantly related (y = 1.0376x + 0.4676, R^2=0.98; p<0.001, n=16) in Blackfoot River samples.

3.3.4 Main Stem Blackfoot River

Water samples were collected from 2004 to 2007 from the Blackfoot River at China Hat (ID17040207SK010_05) and downstream of Government Dam (ID17040207SK002_05). Samples were analyzed for ammonia as N, N+N, TKN, OP, TP, and TSSC. Near-continuous measurements of temperature, specific conductivity, pH, dissolved oxygen, and turbidity also were recorded on the Blackfoot River at China Hat and downstream of Government Dam. Data were collected at the Government Dam county road bridge from 2003 to 2006 and at the China Hat bridge from 2004 until present. These data indicate differences in both water quality and physicochemical parameters between sites.

Sediment and nutrient concentrations were greater downstream of Blackfoot Reservoir than upstream at China Hat (Table 12). For example, suspended sediment concentrations were 50% higher below the dam than in the river above. Mean OP was 55% higher, and mean total nitrogen was 344% higher below the dam than above. At Government Dam, TP exceeded the TMDL target concentration of 0.1 mg/L chronically between 2003 and 2007. At China Hat, most TP values were below the target; though exceedances were observed on four occasions (Figure 8).

Additional data were collected in July and November 2006, and September 2007 at China Hat, Government Dam, and two downstream sites: Trail Creek Road bridge and Little Indian Road bridge near Blackfoot (Table 13). These data also indicate a large increase in all constituent concentrations from China Hat to immediately downstream of Government Dam and a general decline in OP and most other constituents moving downstream from Government Dam. Nutrient uptake may account for this declining downstream trend during these sample periods. The TP increase at Little Indian Road bridge in July 2006 is likely associated with increased suspended sediment at that site.

Table 12. Main stem Blackfoot River water quality data at China Hat and downstream of Government Dam, 2004–2007.

Site	Ammonia	N + N	TKN	TN	OP	TP	TSS or SSC
	Milligrams per liter						
Blackfoot River at China Hat							
Mean	0.007	0.031	0.278	0.245	0.020	0.057	14
Median	0.003	0.005	0.236	0.180	0.010	0.035	7
Standard deviation	0.010	0.062	0.219	0.242	0.021	0.059	15
Blackfoot River at Government Dam							
Mean	0.117	0.084	1.226	1.088	0.031	0.146	21
Median	0.085	0.060	1.265	1.147	0.025	0.122	13
Standard deviation	0.10	0.10	0.45	0.65	0.03	0.07	21

Notes: nitrate + nitrite (N + N); total Kjeldahl nitrogen (TKN); total nitrogen (TN); orthophosphate (OP); total phosphorus (TP); total suspended sediment (TSS); suspended sediment concentration (SSC)

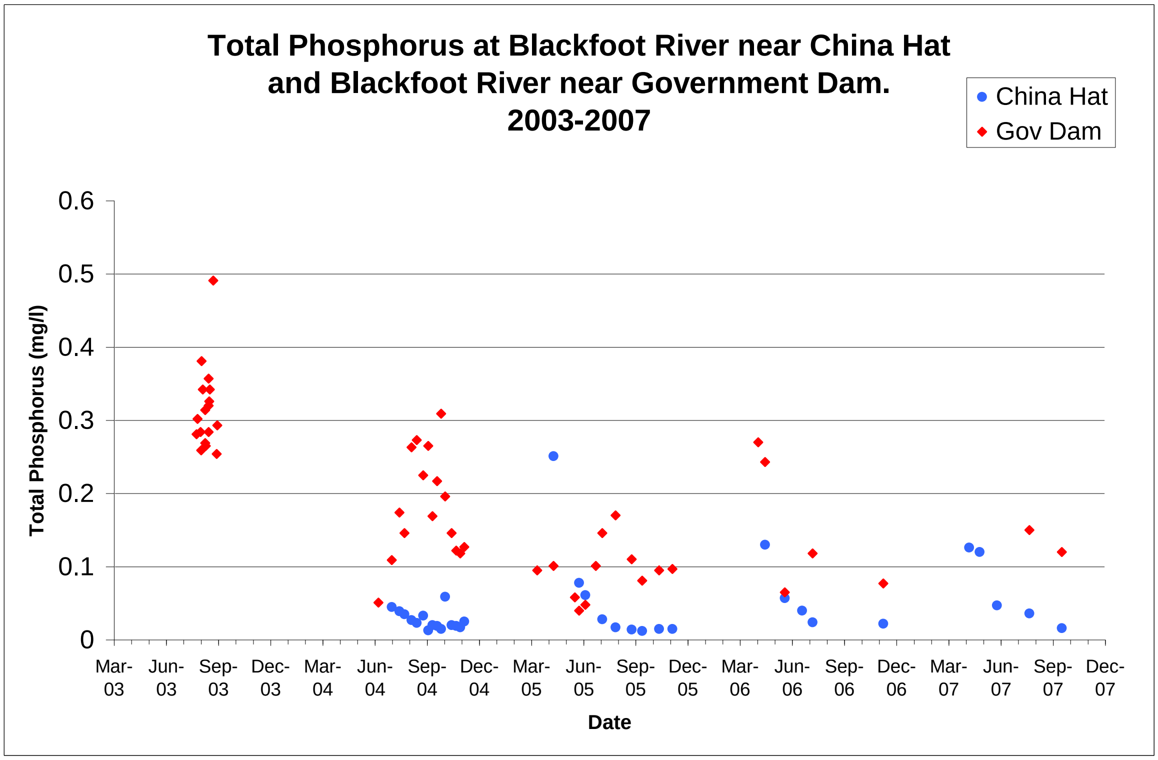

Figure 8. Total phosphorus concentrations at Blackfoot River at China Hat and downstream of Government Dam, 2003–2007. Target is 0.1 mg/L.

These data indicate that in July 2007, the target TP concentration was exceeded at Government Dam and Little Indian Road bridge. An additional exceedance in TP was observed in September 2007 at Government Dam, although no other sites along the river exceeded the target at this time. Target concentrations of TIN (ammonia + nitrate + nitrite) were exceeded at Government Dam in July 2007.

Table 13. Water quality data from various locations along the Blackfoot River in July 2006 and September 2007. Additional samples taken at all sites except Trail Creek Road bridge in November 2006 also shown.

Site	Date	Ammonia	N + N	TKN	TN	OP	TP	TSSC
		Milligrams per liter						
China Hat	7/17/2006	<0.005	0.02	0.07	0.09	0.007	0.024	6
Government Dam	7/17/2006	0.179	0.06	1.70	1.76	0.028	0.118[a]	11
Trail Creek Bridge	7/172006	0.021	0.03	0.97	1.00	0.017	0.084	11
Little Indian Road	7/17/2006	<0.005	<0.01	1.10	1.10	0.011	0.120[a]	46
China Hat	11/16/2006	<0.005	0.08	0.28	0.36	<0.01	0.022	10
Government Dam	11/16/2006	0.066	0.62	0.96	1.58	0.040	0.077	7
Little Indian Road	11/16/2006	<0.005	0.40	0.38	0.78	<0.01	0.028	11
China Hat	9/20/2007	<0.01	<0.01	<.1	<0.1	<0.01	0.016	2
Government Dam	9/20/2007	0.06	0.06	1.80	1.86	0.015	0.120[a]	27
Trail Creek Bridge	9/20/2007	0.01	<.01	0.77	0.77	<.01	0.048	10
Little Indian Road	9/20/2007	0.03	<.01	0.84	0.84	<.01	0.046	11

a. Exceeds total maximum daily load target.

Notes: nitrate + nitrite (N + N); total Kjeldahl nitrogen (TKN); total nitrogen (TN); orthophosphate (ortho P); total phosphorus (TP); total suspended sediment (TSS); total suspended sediment concentration (TSSC)

Differences in sediment concentrations above and below the reservoir were also documented in the continuous record. TSSC was predicted from turbidity data using the following equations based on extensive water sampling:

- Government Dam—TSSC = 1.0843 x turbidity + 1.6998, $R^2 = 0.88$; $p<0.001$, $n=37$
- China Hat—TSSC = 1.7288 x turbidity + 0.4894, $R^2 = 0.93$; $p<0.001$, $n=35$.

Figure 9 illustrates TSSC above and below the Blackfoot Reservoir in 2004. Although runoff in 2004 was not very high, a marked difference exists in TSS concentrations between sites. Water is typically held in the reservoir during spring runoff and released during the irrigation season, significantly changing the hydrograph and water quality below the reservoir. Above the dam, TSSC never exceeded 100 mg/L and exceeded 50 mg/L only for a short time during peak runoff. In contrast, below the dam TSSC frequently exceeded 100 mg/L and sometimes exceeded 150 mg/L.

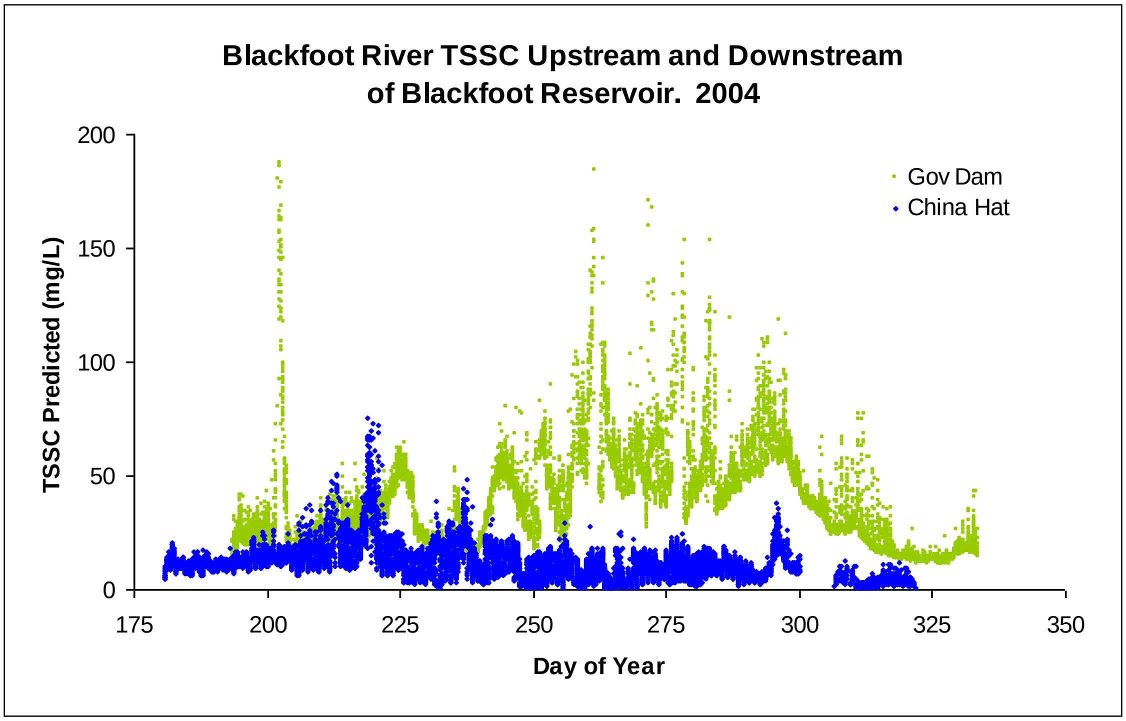

Figure 9. Estimated TSSC (from turbidity records) for the Blackfoot River upstream (China Hat—blue) and downstream (Government Dam—green) of Blackfoot Reservoir, 2004.

A more typical annual TSSC record is shown in Figure 10. In this 2008 example, TSSC was approximately 130 mg/L at the peak of runoff. Median values for all data were significantly lower (Table 14). For the period of record reviewed (2004–2006), median TSSC values were greater at Government Dam for the nonrunoff period. Median TSSC concentration values at Government Dam during the runoff period were higher than the nonrunoff TSSC concentrations at China Hat, although the river downstream of the dam does not exhibit a typical runoff pattern.

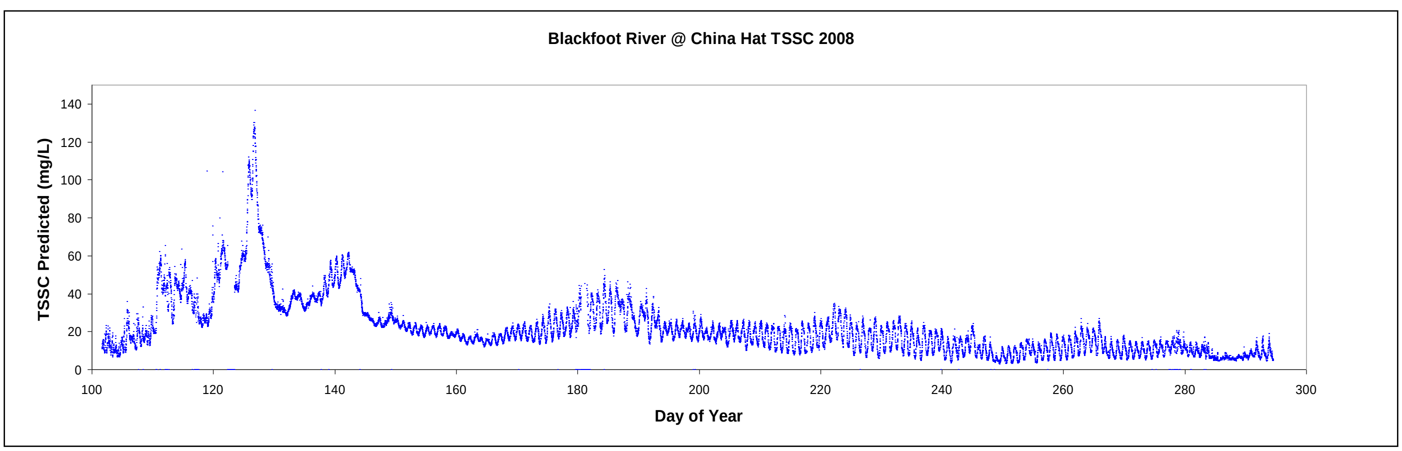

Figure 10. Blackfoot River TSSC (predicted from turbidity) above Blackfoot Reservoir at China Hat, 2008.

Using the continuous turbidity record and TSSC estimates TP was predicted at China Hat and downstream of Government Dam. Continuous TP concentrations were predicted from TSSC data using the following equations:

- Government Dam—TP = TSSC x 0.0022 + 0.104, $R^2 = 0.80$; $p<0.001$, $n=52$
- China Hat—TP = TSSC x 0.0036 + 0.0071, $R^2 = 0.82$; $p<0.001$, $n=41$.

A summary of statistics over the monitoring period is displayed in Table 14. Predicted TP at Government Dam was greater than TP at China Hat at all times during continuous monitoring, indicating export of TP from the reservoir during these periods. At Government Dam, mean predicted TP exceeded the TMDL target. Exceedances were likely during periods of runoff and nonrunoff. At China Hat, mean predicted TP did not exceed the target outlined in the TMDL. However, exceedances were likely during runoff periods.

Maximum water temperature was lower at downstream Government Dam than at China Hat. The Blackfoot River reach upstream of Blackfoot Reservoir has a temperature TMDL, which was approved in 2013. Dissolved oxygen fell below 6 mg/L at both sites; however, exceedances were more numerous and greater at China Hat than at Government Dam. The Blackfoot River reach upstream of Blackfoot Reservoir is on the §303(d) listed for dissolved oxygen because of these exceedances.

Table 14. Summary of continuous monitoring data; predicted TSS and TP, 2004–2006.

Period	Government Dam			China Hat		
	Value	**Predicted TSS (mg / L)**	**Predicted TP (mg/ L)**	**Value**	**Predicted TSS (mg / L)**	**Predicted TP (mg / L)**
Runoff period = July 15–August 9, 2004; April 7–June 6, 2006	Mean	14	0.13	Mean	28	0.06
	Median	5	0.11	Median	23	0.05
	SD	18	0.04	SD	19	0.04
	Max	187	0.48	Max	112	0.24
	Min	2	0.10	Min	3	0.01
	n=	7,120	7,121	n=	7,982	7,982
Nonrunoff period = July 6–14, August 10, Nov. 23, 2004; March 14, April 6, June 7, Nov. 17, 2005	Mean	23	0.15	Mean	7	0.02
	Median	18	0.14	Median	6	0.02
	SD	18	0.04	SD	5	0.01
	Max	145	0.40	Max	70	0.15
	Min	2	0.10	Min	1	0.01
	n=	23,566	23,566	n=	26,579	26,579

Notes: total suspended sediment (TSS); total phosphorus (TP); standard deviation (SD); number of measurments (n)

3.3.5 Summary of Continuous Water Quality Data at China Hat 2004–2014

Water quality in the Blackfoot River at China Hat (ID17040207SK010_05) has been monitored since 2004 with multiparameter sondes. The continuous records of turbidity, temperature, and dissolved oxygen were rated and corrected according to USGS protocols (Wagner et. al 2006). Confidence intervals at 95% were generated for daily and monthly data according to the formula (± 1.96 × standard deviation). A 95% confidence interval has a 95% chance that the true mean for the 10-year period of record is contained within the interval. Means and confidence intervals can be used to characterize water quality at the site and identify deviations from *background conditions* in the future.

Above the Blackfoot Reservoir at China Hat, the Blackfoot River generally has low turbidity (Figure 11). Peak turbidity coincides with peak stream flows in April and May and then subsides to typically under 10 NTUs for the rest of the summer and fall. At this location, the Blackfoot River only surpassed 100 NTUs once in its 11-year period of record (2010). Typically, peak turbidity is 35 NTUs and occurs on April 20. Monthly mean turbidity and confidence intervals are presented in Table 15. Using the site-specific equations for China Hat above, TSSC and TP concentrations were predicted from mean monthly turbidity values.

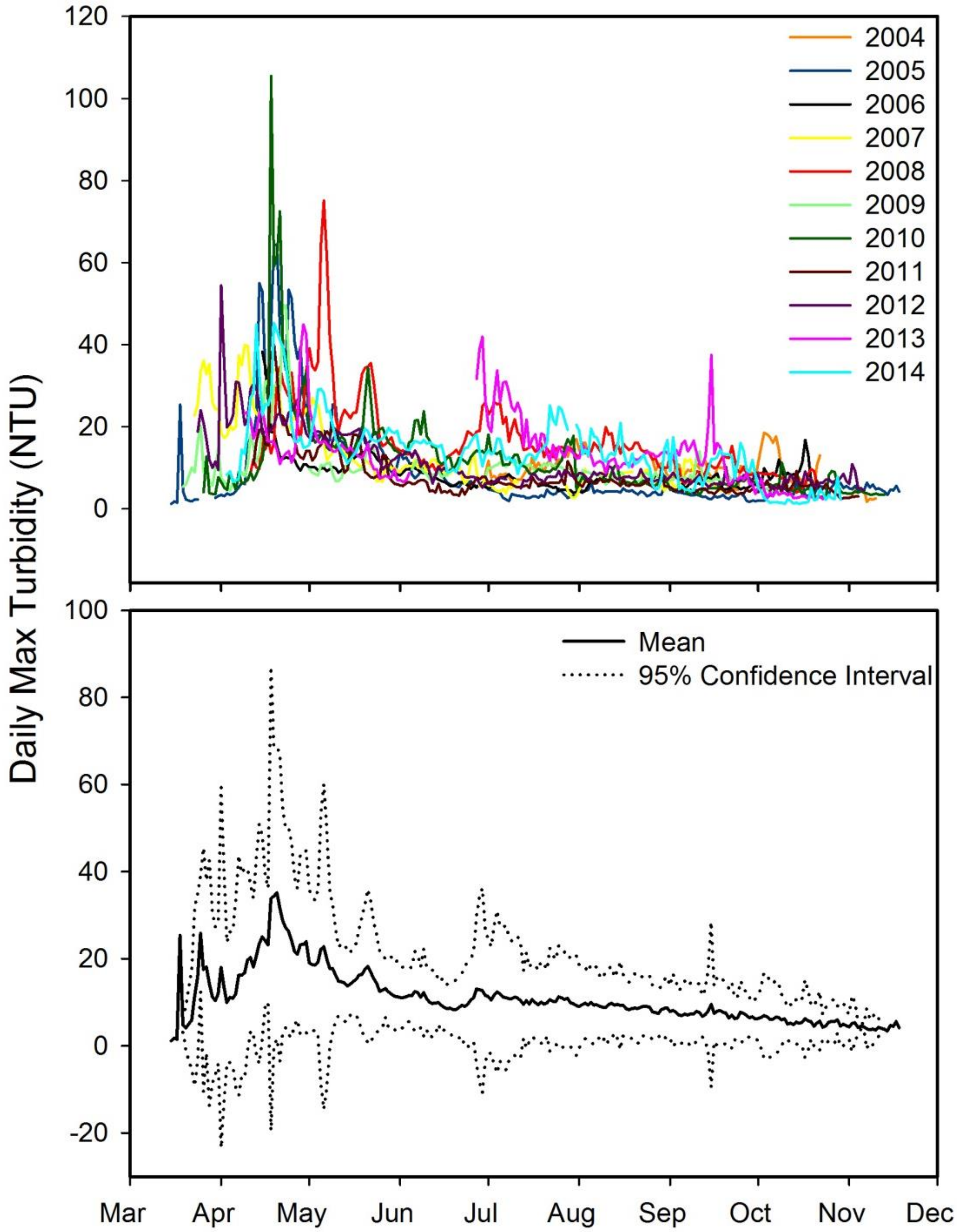

Figure 11. Daily maximum turbidity in the Blackfoot River at China Hat for all years with records (above) and mean (± 95% confidence intervals, below).

Table 15. Mean monthly turbidity and predicted TSSC and TP values, 2004–2014.

Month	Number of Years in Record	Mean Turbidity (NTUs)	Predicted Mean TSSC	Predicted Mean TP
			Milligrams per liter	
March	4	8.7 (-7.8 to 25.2)	15.6	0.063
April	10	17.3 (11.4 to 23.1)	30.4	0.116
May	10	13.0 (3.7 to 22.4)	23.0	0.090
June	11	8.1(1.6 to 14.6)	14.4	0.059
July	11	6.7 (-0.6 to 12.1)	12.1	0.051
August	11	5.5 (1.6 to 9.3)	9.9	0.043
September	11	4.3 (1.7 to 6.9)	7.9	0.036
October	10	3.7 (0.6 to 6.8)	6.8	0.032
November	5	3.0 (0.6 to 5.5)	5.7	0.028

Notes: Numbers in parenthesis are 95% confidence intervals; nephelometric turbidity unit (NTU); total suspended sediment concentration (TSSC); total phosphorus (TP)

Idaho sets water quality standards to protect the beneficial uses. To protect cold water aquatic life, the daily maximum water temperature is not to exceed 22 °C, and the daily average temperature is not to exceed 19 °C. In the Blackfoot River at China Hat, maximum water temperatures typically occur in mid to late July (Figure 12). Exceedances of both standards (daily maximum and daily average) are common in July and August in the 11-year period of record (Table 16 and Table 17). The number of daily average water temperatures exceeding the standard varies from year to year, and within our records, does not appear to be systematically increasing or decreasing. Water temperature criteria were not exceeded in 2011, an exceptionally high water year. Peak streamflow in this year was the highest in the 11-year period that water temperatures were continuously recorded.

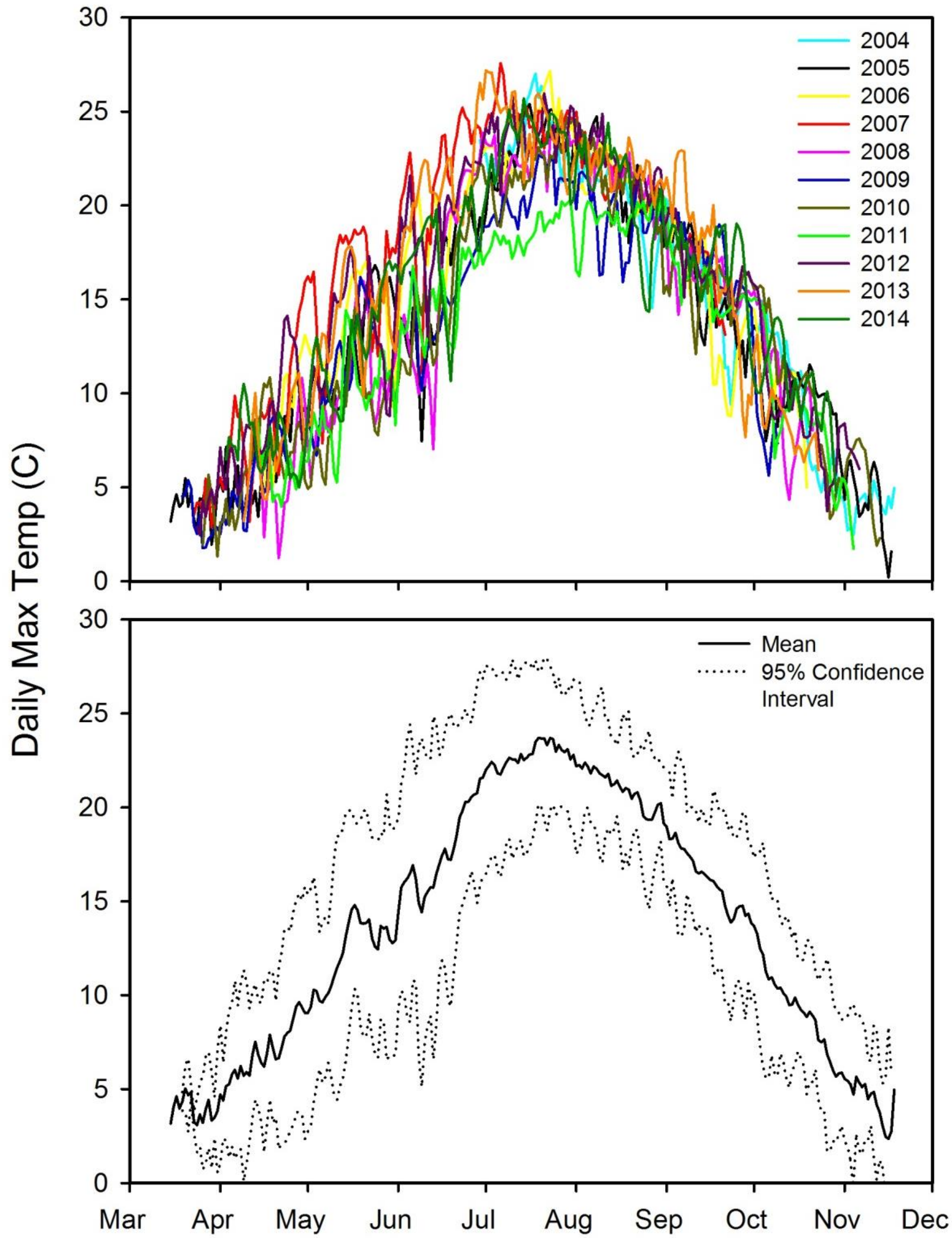

Figure 12. Daily maximum temperature in the Blackfoot River at China Hat for all years with records (above) and mean (± 95% confidence intervals, below).

Table 16. Mean monthly water temperatures (°C) and number of days exceeding state water quality standard for average daily temperature (19 °C) in the Blackfoot River at China Hat 2004–2014.

	Water Temperatures (°C)											
Month	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**Mean**
March	—	1.0	—	2.1	—	0.6	1.0	—	2.8	—	—	1.5
April	—	3.7	7.1	6.7	2.6	3.0	4.0	4.7	7.2	5.4	5.5	5.0
May	—	11.1	12.0	12.9	9.0	9.8	8.0	8.3	11.2	11.5	10.9	10.5
June	—	14.1	17.1	17.3	14.3	12.8	14.1	13.2	16.5	17.1	15.1	15.2
July	20.4	20.1	21.0	21.7	19.8	18.2	18.9	17.0	20.5	20.7	20.0	19.9
August	18.2	18.4	17.8	19.0	18.5	16.9	18.1	16.9	18.9	18.9	17.8	18.1
September	13.0	12.8	11.9	14.2	13.2	14.5	12.6	13.6	13.9	14.7	14.4	13.5
October	7.9	7.8	8.9	—	7.9	6.2	8.0	7.6	6.9	6.5	8.2	7.6
November	1.9	3.0	—	—	—	—	3.9	2.7	4.9	—	—	3.3
Exceedances	41	37	31	56	38	8	24	0	43	46	36	—

Table 17. Monthly mean of daily maximum water temperature and number days exceeding state water quality standards for daily maximum temperature (22 °C) in the Blackfoot River at China Hat 2004–2014.

	Daily Maximum Water Temperature (°C)											
Month	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**Mean**
March	—	4.1	—	4.2	—	3.3	3.4	—	3.9	—	—	3.8
April	—	6.4	8.8	8.6	5.7	5.5	6.5	6.2	8.5	7.3	7.2	7.1
May	—	12.5	13.5	15.9	10.4	11.3	9.3	9.7	13.2	13.6	12.5	12.2
June	—	15.7	19.1	21.2	16.2	14.9	15.7	15.0	19.6	20.8	17.5	17.6
July	23.7	23.1	24.0	24.7	22.8	20.6	21.9	18.6	24.0	24.4	23.4	22.8
August	20.5	21.3	21.1	21.5	21.7	19.5	21.2	19.3	22.2	22.1	20.7	21.0
September	15.3	15.4	14.8	16.3	16.1	17.3	15.8	15.8	16.8	17.1	17.2	16.2
October	9.6	9.8	10.9		10.2	7.9	10.2	9.1	9.1	8.6	10.4	9.6
November	5.8	6.0	—	—	—	—	7.0	3.0	14.0	—	—	7.2
Exceedances	38	37	31	58	40	5	26	0	56	56	37	—

Idaho's water quality standards require that dissolved oxygen is not below 6 mg/L. Like temperature, dissolved oxygen criteria exceedances are common in the Blackfoot River at China Hat in July and August (Figure 13). The lowest number of annual exceedances occurred in 2009 and 2011, when flows were higher than average (Table 18).

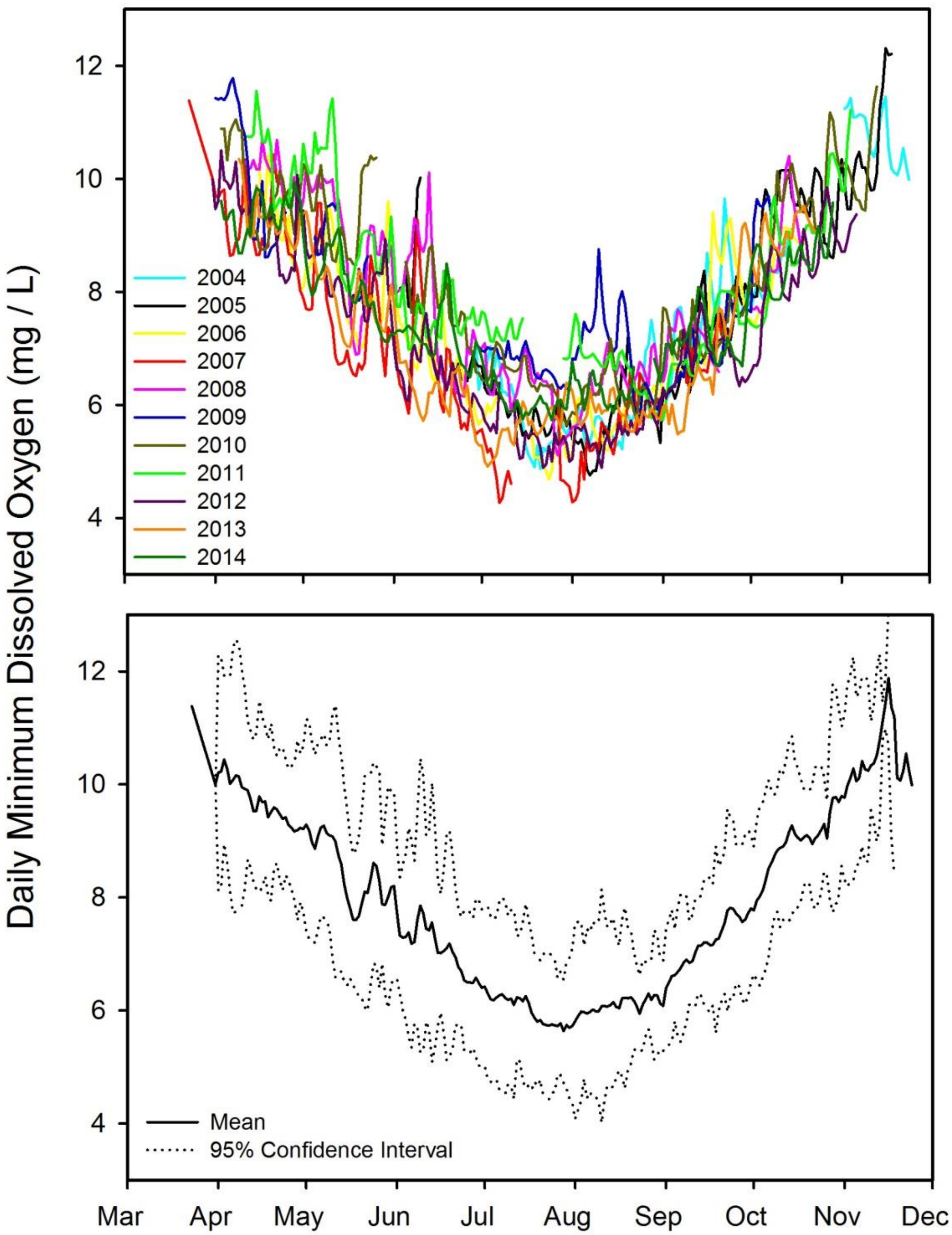

Figure 13. Daily minimum dissolved oxygen concentrations in the Blackfoot River at China Hat for all years with records (above) and mean (± 95% confidence intervals, below).

Table 18. Monthly mean of daily minimum dissolved oxygen concentration and number of documented days under the state water quality standard for this parameter (6 mg/L) in the Blackfoot River at China Hat 2004–2014.

Month	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Mean
	Milligrams per liter											
April	—	—	9.3	9.2	10.1	10.2	9.8	10.3	9.4	9.3	9.4	9.6
May	—	—	8.2	7.5	9.0	8.9	9.5	9.4	8.2	8.0	8.1	8.5
June	6.7	7.5	6.9	6.6	7.6	7.0	7.7	7.6	6.5	6.3	7.2	7.1
July	5.8	5.9	5.3	4.9	6.3	6.7	6.4	7.2	5.4	5.6	6.1	6.0
August	5.9	5.6	5.8	5.6	6.4	7.0	6.2	6.6	5.5	5.9	6.3	6.1
September	7.6	7.2	7.6	6.9	7.1	7.0	7.3	7.1	6.8	6.8	7.2	7.2
October	8.3	9.4	8.4		8.7	9.3	9.4	8.9	8.4	9.0	8.5	8.8
November	10.8	10.5	—	—	—	—	10.2	10.4	9.0	—	—	10.2
Exceedances	42	38	38	47	11	4	11	6	58	67	17	—

USGS maintains a gaging station on the Blackfoot River above the reservoir near Henry, Idaho, (gage 1306300) that typically operates from April to November. Table 19 displays average monthly discharge (April to September) for years that DEQ collected water quality parameters. To examine potential relationships between temperature, dissolved oxygen concentration, and flow, we built scatter plots with these variables. July and August values are used because the majority of water quality standard exceedances (temperature and dissolved oxygen) take place during this time. We used average daily flows from the USGS gage, maximum daily water temperature, and minimum dissolved oxygen concentration recorded with sondes at China Hat in this analysis.

Table 19. Average monthly discharge in the Blackfoot River at USGS gage 1306300 and average monthly discharge for the 11-year period that water quality parameters were collected by DEQ.

Month	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Mean
	Cubic feet per second											
April	213	313	555	234	167	307	226	266	330	224	292	284
May	127	389	453	115	409	567	248	936	200	178	302	357
June	122	283	177	55	224	394	274	667	107	86	156	231
July	63	117	99	27	98	180	109	303	65	59	62	107
August	43	79	62	15	56	110	70	166	44	38	58	67
September	43	63	54	26	47	81	61	117	42	42	49	57
April–September mean	102	207	233	78	167	273	165	409	131	104	153	—

Average daily flows in July and August, 2004–2014, ranged from 446 cfs on July 1, 2011, to 6 cfs on August 14, 2007. Exceedances of state water quality standards for temperature and dissolved oxygen only occurred when average daily flows dropped below 150 cfs (Figure 14). Above 150 cfs, the thermal mass of water was sufficient to insulate against water temperatures rising in excess of 22 °C. Because the solubility of oxygen in water increases as temperature decreases, the main control on dissolved oxygen concentration in the Blackfoot River at China Hat is temperature (Figure 15). Biological activity (i.e., respiration rates) may explain some of the scatter around the line in Figure 15. When flows are below 150 cfs, air temperatures more strongly influence water temperatures, so greater scatter occurs in daily maximum water temperatures and subsequently daily minimum dissolved oxygen concentrations below that point (Figure 14).

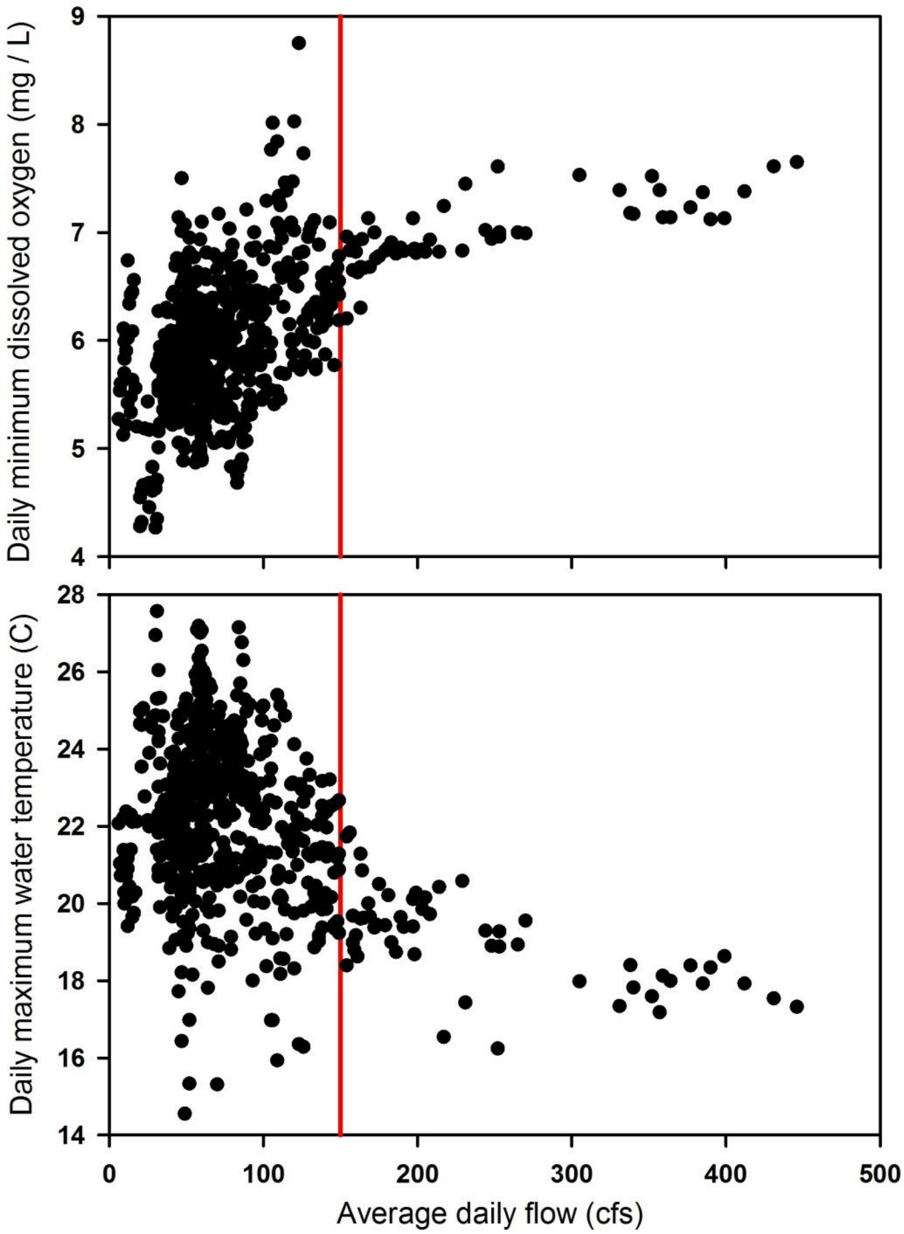

Figure 14. July and August average daily flows versus daily minimum concentration of dissolved oxygen (above) and daily maximum water temperature (below). Red lines indicated 150 cfs, below which water quality standards are not met for daily minimum dissolved oxygen and daily maximum water temperatures occur.

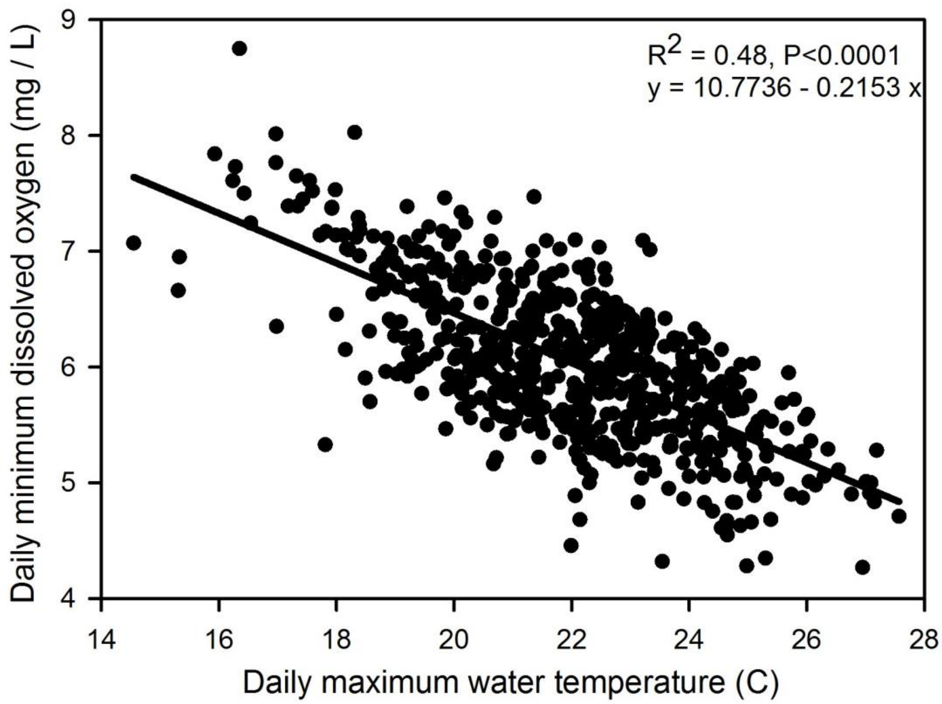

Figure 15. Relationship between daily maximum water temperature and daily minimum dissolved oxygen concentration for days in July and August 2004–2014.

To examine the influence of flow on the insulating capacity of water, we correlated maximum air temperature at Grace, Idaho, (the closest weather station) to maximum water temperature in the Blackfoot River at China Hat, after binning the data into 50 cfs increments. We observed that maximum air temperature was significantly correlated with maximum water temperature until flow exceeded 150 cfs (Figure 16). After flow exceeded 150 cfs, no significant relationship occurred between air and water temperatures. For flows up to 100 cfs, maximum air temperature at Grace explained about 30% of the variability in daily maximum water temperatures at China Hat. For flows between 100 and 150 cfs, the relationship was weaker, but air temperature still explained 14% of the variability in maximum water temperatures. As the volume of the river increases, so does its thermal inertia and insulating capacity. Maintaining adequate flows in the Blackfoot River would help reduce exceedances of temperature and dissolved oxygen water quality standards.

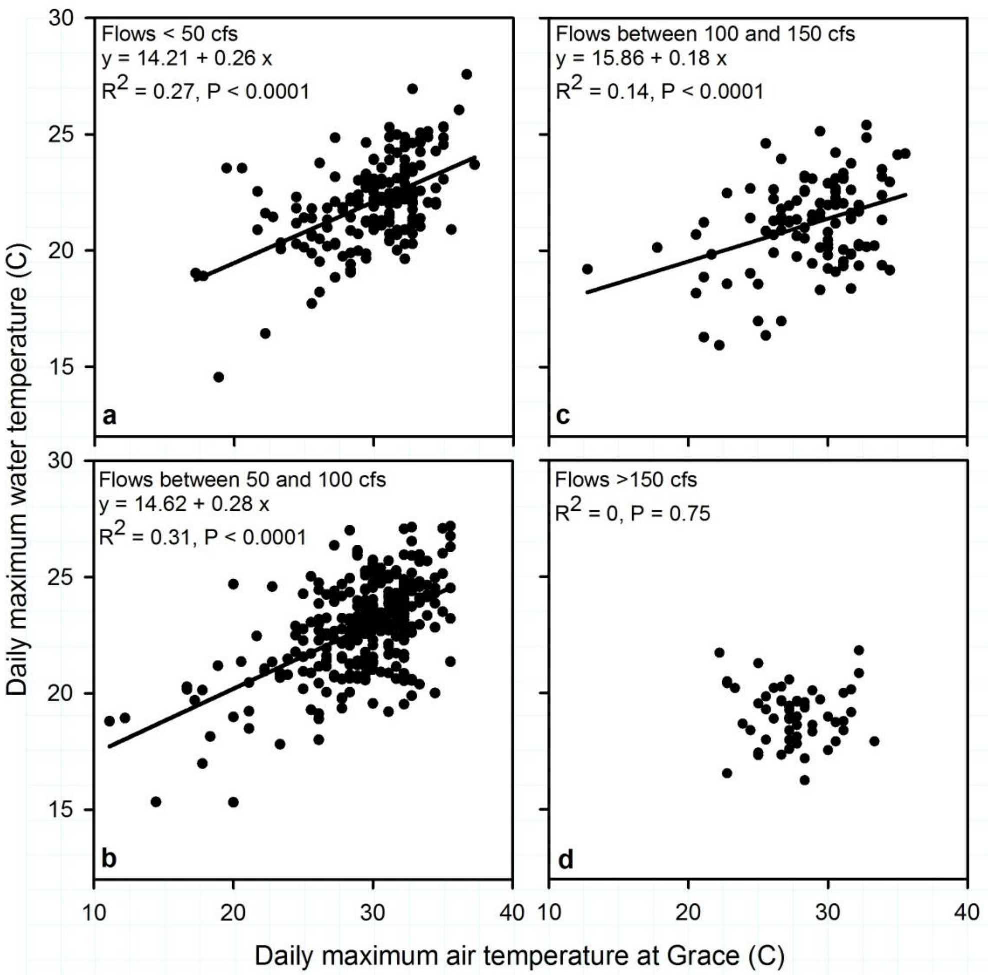

Figure 16. Relationship between daily maximum air temperature at Grace, Idaho, and daily maximum water temperature in the Blackfoot River at China Hat at different levels of flow (a. <50 cfs, b. between 50 and 100 cfs, c. between 100 and 150 cfs, and d. >150 cfs) in July and August 2004–2014.

3.3.6 Water Column Data for 2014

In 2014, a study was conducted on streams with nutrient TMDLs to document current water quality conditions as part of the 5-year review. Samples were taken from April through September in the main stem Blackfoot River (ID17040207SK002_05) at Trail Creek bridge and the USGS gage downstream from Wolverine Creek. Additional samples were taken from Wolverine Creek (ID17040207SK030_03) near its confluence with the main stem Blackfoot River. Sampling documented exceedances of the 0.1 mg/L target for TP in the main stem Blackfoot River in late May and in Wolverine Creek on two occasions (late April and early September, Table 20). The target of 0.3 mg/L TIN was not exceeded during this study.

Table 20. Water sampling data for 2014.

Site	Date	TSS	NH_4	TKN	Nitrate-nitrite	TP	PO_4	TIN	Discharge (cfs)
					(mg/L)				
Trail Creek bridge	4/21/2014	7.7	0.053	0.5	<0.01	0.073	0.022	0.053	90.76
USGS gage	4/21/2014	36	0.083	0.56	<0.01	0.095	0.02	0.083	95.44
Wolverine Creek	4/21/2014	67	0.067	0.9	0.064	0.14[a]	0.015	0.131	9.37
Trail Creek bridge	4/30/2014	<5[a]	<.10	0.58	<.01	0.04	0.008	0	91.14
USGS gage	4/30/2014	<5[a]	<.01	0.45	<.01	0.032	0.006	0	95.94
Wolverine Creek	4/30/2014	50	0.01	0.35	0.055	0.08	0.006	0.065	9.88
Trail Creek bridge	5/14/2014	26	<.01	0.69	<0.1	0.078	0.012	0	179.77
USGS gage	5/14/2014	24	<.01	0.64	<.01	0.069	0.01	0	184.07
Wolverine Creek	5/14/2014	48	0.01	0.36	0.032	0.081	0.009	0.042	8.60
Trail Creek bridge	5/27/2014	51	<.01	0.71	<.01	0.1[b]	0.011	0.71	502.81
USGS gage	5/27/2014	100	0.011	0.95	<.01	0.18[b]	0.012	0.011	505.25
Wolverine Creek	5/27/2014	30	0.016	0.3	0.045	0.066	0.011	0.061	4.94
Trail Creek bridge	6/16/2014	22	<.01	0.63	<.01	0.07	0.01	0	636.18
USGS gage	6/16/2014	37	<.01	0.67	<.01	0.078	0.016	0	638.94
Wolverine Creek	6/16/2014	23	<.01	0.21	0.014	0.046	0.012	0.014	5.51
Trail Creek bridge	7/17/2014	15	<.01	0.88	<.01	0.084	<.005[a]	0	558.21
USGS Gage	7/17/2014	16	<.01	0.8	<.01	0.068	<.005[a]	0	558.93
Wolverine Creek	7/17/2014	5.6	<.01	0.18	0.027	0.038	0.02	0.027	1.45
Trail Creek bridge	8/11/2014	13	<.01	0.79	0.049	0.078	0.016	0.049	342.55
USGS gage	8/11/2014	9.4	<.01	0.7	0.069	0.057	0.012	0.069	343.5
Wolverine Creek	8/11/2014	6.4	<.01	0.18	0.047	0.048	0.022	0.047	1.91
Trail Creek bridge	9/10/2014	10	0.055	1	0.017	0.083	0.008	0.072	222.79
USGS gage	9/10/2014	7.7	0.014	0.7	0.016	0.054	0.009	0.03	223.5
Wolverine Creek	9/10/2014	43	<0.01	0.42	0.098	0.12	0.032	0.098	1.35

a.indicates that value was below detection limit
b. Exceeds total maximum daily load target.
Notes: total suspended sediment (TSS); ammonium (NH_4); total Kjeldahl nitrogen (TKN); total phosphorus (TP); phosphate (PO_4); total inorganic nitrogen (TIN); cubic feet per second (cfs); US Geological Survey (USGS)

Elevated TP levels were correlated with high suspended sediment (Figure 17). This is not surprising given that the principal reservoir of phosphorus is rock and sediment, and phosphorus readily adsorbs to charged particles such as clays (Allan and Castillo 2007). Discharge below the dam is controlled by releases for irrigation from the Government Dam. Both exceedances in the main stem Blackfoot River occurred when flows were elevated to deliver water for irrigation downstream (Figure 18). These exceedances took place on the ascending limb of the hydrograph.

Although discharge was greater at later sampling dates, TSS and TP were not as elevated, likely because sediment was already flushed on the ascending limb of the highly modified hydrograph below the dam (Figure 18).

In Wolverine Creek, TSS and TP were highest and TP exceeded its target outlined in the Blackfoot River subbasin TMDL (DEQ 2001) on April 21, 2014, when discharge was elevated. Wolverine Creek is heavily grazed and has bank stability below target levels (66%, Table 10). Bank erosion during peak flows likely contributed excess sediment and associated phosphorus to the stream during this time. Wolverine Creek again exceeded target levels of TP on September 10, 2014. Although flow was low during this time, Wolverine Creek was receiving inputs of agricultural return flows above its confluence with the main stem Blackfoot River. A waterfall was created as water flowed from an above field to the canyon below. This water likely carried high levels of sediment and phosphorus to Wolverine Creek.

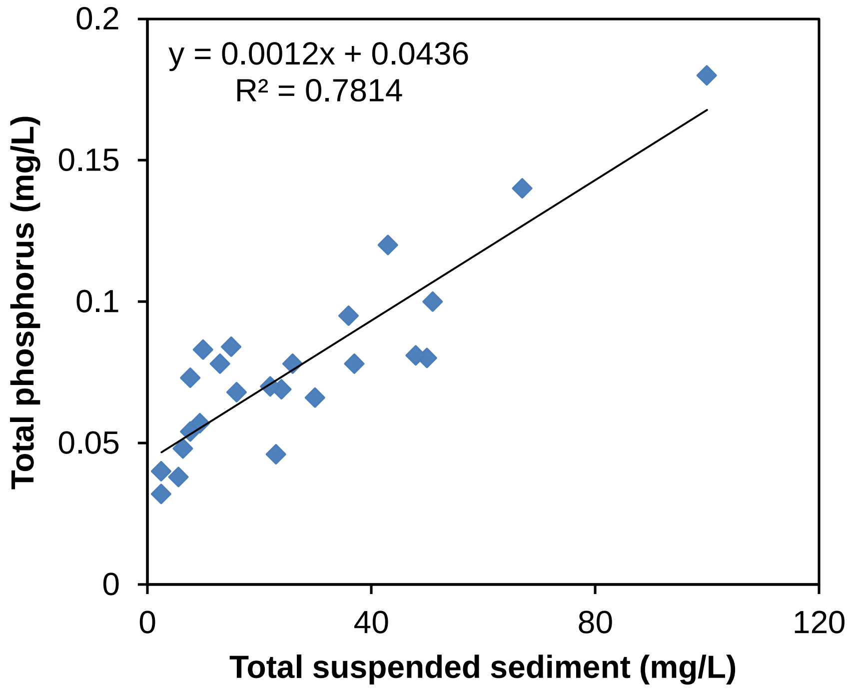

Figure 17. Relationship between TSS and TP in water samples taken from the main stem Blackfoot River at Trail Creek bridge, USGS gage, and Wolverine Creek between April and September 2014.

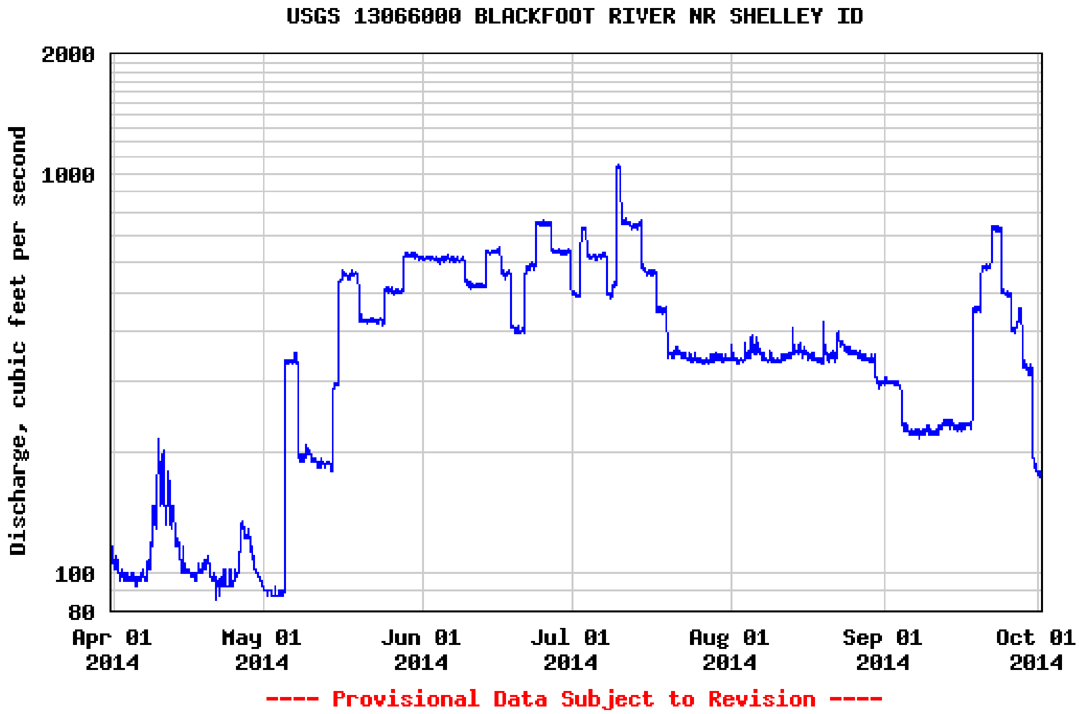

Figure 18. Spring through fall 2014 flows in the Blackfoot River below Wolverine Creek.

3.3.7 Caribou-Targhee National Forest Monitoring Data

In 2004, the Caribou-Targhee National Forest conducted SEIs and collected McNeil core samples on streams in the Blackfoot River subbasin within the national forest boundary (Higginson 2008). Methods were the same as those used by DEQ at the time. Results are shown in Table 21. Results indicate that on forest land, stability targets were met at 67% of AUs sampled. Bank stability targets were not being met at Dry Valley, Maybe Canyon, and Diamond Creeks.

In 2012 and 2013, the Caribou-Targhee National Forest conducted multiple indicator monitoring (MIM) on stream sections in the Blackfoot River subbasin that are within the national forest boundary. MIM protocol uses multiple indicators to monitor the impacts of livestock on wadeable streams. Some of the measurements are relevant to streams with sediment TMDLs. Along designated monitoring areas, MIM protocols measure streambank stability and percent of substrate that are fines (<8 mm). MIM protocols also measure streambank alteration, which is the percent of lines within a grid where evidence of livestock impacts (i.e., hoofprints) is obvious. Streambank alteration is measured along the entire reach surveyed. D16, D50, and D84 refer to the distribution of substrate sizes as measured by a pebble count. The D16 particle is the size that corresponds to 16% of the substrate being smaller. D50 is the median particle size, and D84 is the particle size where 84% of the substrate is smaller. Table 22 displays monitoring results for stream segments in the Blackfoot River subbasin. In 2012 and 2013, streambank stability targets were not being met at Coyote, Lanes, and Corralisen Creeks. Streambank alteration measurements did not correlate well with streambank stability measurements. For example, Kendall Canyon had the highest streambank alteration levels observed in Blackfoot River AUs sampled with MIM. However, bank stability still met the standard outlined in the Blackfoot River subbasin TMDL (DEQ 2001).

Table 21. SEI and McNeil core sample results for streams monitored by the Caribou-Targhee National Forest, 2004.

Assessment Unit Name	Assessment Unit Number	Date	Average Streambank Stability (%)	% Fines <6.3 mm	% Fines <0.85 mm
Blackfoot River—in Narrow, upstream of forest boundary	ID17040207SK010_04	6/24/2004	89	15	5
Trail Creek—upstream of forest boundary	ID17040207SK011_02	7/13/2004	89	76	39
Slug Creek—upstream of forest boundary	ID17040207SK012_04	2004	80	No suitable habitat	
Dry Valley Creek—upstream of forest boundary	ID17040207SK013_02a	7/13/2004	58	76	39
Maybe Canyon Creek—upstream of forest boundary	ID17040207SK014_02	8/10/2004	69	36	13
Diamond Creek—upstream of forest boundary	ID17040207SK016_03a	7/27/2004	68	38	14
Lanes Creek—upstream of forest boundary	ID17040207SK018_02a	7/15/2004	92	16	4
Sheep Creek—upstream of forest boundary	ID17040207SK022_03a	8/17/2004	84	32	9
Angus Creek—upstream of forest boundary	ID17040207SK023_02b	7/8/2004	81	59	26

Note: millimeter (mm)

Table 22. Caribou-Targhee National Forest MIM data for streams in the Blackfoot River subbasin.

Assessment Unit Name	Assessment Unit Number	Date	Upstream Latitude	Upstream Longitude	Streambank Stability (%)	Streambank Alteration (%)	% Fines	D16 (mm)	D50 (mm)	D84 (mm)
Coyote Creek	ID17040207SK016_02b	10/12/2012	42.7481	-111.2184	60	24	47	0.9	6.36	32
Kendall Canyon	ID17040207SK016_02h	10/12/2012	42.7779	-111.2892	85	37	19	5.3	16.21	33
Timothy Creek	ID17040207SK017_02a	7/17/2013	42.8149	-111.2343	88	0	26	1.5	24.97	64
Lanes Creek	ID17040207SK018_02a	7/10/2013	42.9425	-111.2287	69	3	20	1.8	28.61	74
Corralisen Creek	ID17040207SK018_02d	10/4/2012	42.9152	-111.2674	61	25	71	0.5	1.6	11
Olsen Creek	ID17040207SK021_02a	6/26/2013	42.9134	-111.3644	91	6	99	0.3	1.05	2
Sheep Creek	ID17040207SK022_02	7/17/2013	42.8984	-111.3983	99	1	30	1.2	12.24	30

Notes: D16, D50, and D84 refer to the distribution of substrate sizes as measured by a pebble count; millimeter (mm)

3.3.8 Stream-by-Stream Summaries

Summaries of the AUs assessed are provided below. For supporting BURP, SEI, McNeil core sample, streambank stability, and MIM data, refer to Table 9, Table 10, Table 21, and Table 22.

3.3.8.1 Blackfoot River (Blackfoot Reservoir Dam to Fort Hall Main)

This section of the Blackfoot River (ID17040207SK002_05) was included in the Blackfoot River subbasin TMDL (DEQ 2001) for sediment and nutrients. Suspended sediment levels were elevated above levels observed above the dam at China Hat in 2004–2006. Subsequently, TP levels were elevated above levels observed at China Hat. Water quality studies documented exceedances of the TP target occurring from 2003 to 2007. A DEQ water quality study documented an exceedance of the TP target on May 27, 2014. This AU is listed in Category 4c (waters impaired by pollution) in the most recent Integrated Report (DEQ 2014a) for other flow regime alterations because its flows are controlled primarily by releases from the Government Dam.

3.3.8.2 Corral Creek (Headwaters to Mouth)

This stream has 2nd-, 3rd-, and 4th-order segments (ID17040207SK006_02, ID17040207SK006_03, and ID17040207SK006_04). Corral Creek is heavily grazed by cattle and sheep on state and private land. The 2nd-order segment of Corral Creek has never been surveyed by BURP. A 2014 SEI indicated that current bank stability was 37%, well below the target of 80%. Banks were largely uncovered and trampled, and the streambed was covered in silt. Cow trails were evident throughout the reach. The 2nd-order segment of Corral Creek is on the current §303(d) list (Category 5 of the Integrated Report) for *Escherichia coli* (*E. coli)*.

Since the Blackfoot River subbasin TMDL (DEQ 2001) was approved in 2002, two segments of Corral Creek have been surveyed. The 3rd-order segment of Corral Creek (ID17040207SK006_03) was surveyed by BURP in 2003, 2008, 2010, 2012, and 2013. On all occasions where scoring data are available, this AU received a condition rating of 0, indicating that this AU is not supporting cold water aquatic life. The 2014 SEI documented 60% bank stability, which is below the target. This AU is devoid of riparian shrubs and willows and appears to be over-widened. Heavy macrophyte growth exists, and the channel substrate is primarily silt. The 3rd-order segment of Corral Creek is on the current §303(d) list for *E. coli* and is in Category 4c for physical substrate habitat alterations.

The 4th-order segment of Corral Creek (ID17040207SK006_04) was surveyed by BURP in 2003, 2008, 2010, and 2012. While all surveys had an average condition rating of 0 because they received SFIs of 0, SHI and SMI ratings from 2008 and 2012 received scores of 3. Both the 2008 and 2012 surveys took place near the confluence of Corral Creek and the Blackfoot River. Near its confluence with the Blackfoot River, Corral Creek drops into a canyon that is heavily willowed and steeper than the upstream meadow. In this area, banks were more stable than above the canyon, and percent fines in Wolman pebble counts were low. Still no salmonids were observed. The absence of salmonids is likely due to high water temperatures. Upstream of the canyon, Corral Creek is over-widened and has little riparian vegetation to provide shade. In the 2008, 2010, and 2012 surveys, water temperatures exceeded 22 °C. These data indicate that this

AU is likely exceeding temperature criteria, and continuous temperature data should be collected to assess it for temperature. Above the canyon, conditions in Corral Creek are poor. In the 2003 and 2010 BURP surveys, SMI condition ratings were 0, and SHI condition ratings were 1. In 2014, an SEI documented bank stability of 70%, and grazing impacts on bank stability were noted. The 4th-order segment of Corral Creek received a TMDL for *E. coli* in the Blackfoot River subbasin TMDL addendum (DEQ 2013a).

3.3.8.3 Grizzly Creek (Headwaters to Mouth)

Grizzly Creek flows into Corral Creek and is made up of four AUs (ID17040207SK007_02, ID17040207SK007_02a, ID17040207SK007_03, and ID17040207SK007_04). Grizzly Creek is primarily on state land with the remaining landownership in private holdings. This area is grazed by sheep and cattle. The 2nd-order segment of Grizzly Creek has never been monitored by BURP. In 2008, DEQ's SEI reported that bank stability in this AU was only 21%. In 2014, a much longer reach was surveyed and indicated that bank stability was 79% although much of the channel bed was mud and water was mostly stagnant.

Sawmill Creek (ID17040207SK007_02a) was monitored by BURP in 2007, and scores indicated this AU was not fully supporting cold water aquatic life. In 2014, bank stability was 72%, not meeting the 80% target of the Blackfoot River subbasin TMDL (DEQ 2001). This area is grazed, and trampled banks are contributing excess sediment to the stream. Sawmill Creek received a TMDL for *E. coli* in the Blackfoot River subbasin TMDL addendum (DEQ 2013a) and is listed in Category 4c for physical substrate habitat alterations.

The 3rd-order segment of Grizzly Creek (ID17040207SK007_03) was monitored by BURP in 2011 and received an average condition rating of 0, indicating the AU was not supporting cold water aquatic life. In 2014, bank stability was 58%, not meeting TMDL targets. This AU is heavily grazed, banks are trampled, and the stream is over-widened. Grizzly Creek is in Category 4c for physical substrate habitat alterations.

The 4th-order segment of Grizzly Creek (ID17040207SK007_04) was monitored by BURP in two places in 2008. Both surveys indicated that this AU was not supporting cold water aquatic life. In 2014 bank stability was 30%. Banks were trampled and slumping. In 2008, sediment <6.3 mm made up 50% of the volume of sediment in spawning habitats, and sediment <0.85 mm made up 21% of the total volume.

3.3.8.4 Blackfoot River (Headwaters to Blackfoot Reservoir)

This section of the Blackfoot River contains three AUs (ID17040207SK010_03, (ID17040207SK010_04, and ID17040207SK015_04) and is included in the Blackfoot River subbasin TMDL (DEQ 2001) for sediment. The side channel of the Blackfoot River, (ID17040207SK010_03) near Trail Creek has not been surveyed by BURP. This AU was not surveyed in the 2014 monitoring effort or past monitoring efforts by DEQ or USFS.

The AU, ID17040207SK010_04, begins at the confluence of Lanes and Diamond Creeks and continues until its confluence with Slug Creek. USFS completed McNeil core samples and an SEI in 2004 in the Narrows section on USFS land. They documented that sediment <6.3 mm composed 15% of the total volume of sediment within salmonid spawning habitats, and fines

<0.85 mm composed 5%, meeting the targets of the Blackfoot River subbasin TMDL (DEQ 2001). Bank stability within the survey reach was 89%, meeting the bank stability target as well. In 2014, DEQ conducted two SEIs within this AU. One was conducted in the Narrows on USFS land and indicated that within the reach, bank stability targets were being met (84% stable banks). On Idaho Fish and Game and state land above the Narrows, bank stability targets were not being met with 70% bank stability. McNeil core samples for sediment on Idaho Fish and Game and USFS lands indicated fine sediments <6.25 mm averaged 47% of subsurface sediment volume, and sediments <0.85 mm averaged 14%, both above targets in the TMDL (DEQ 2001). This section of the upper Blackfoot River was included in the Blackfoot River subbasin TMDL addendum (DEQ 2013a). As part of that process, the AU was assigned a heat load capacity of 1,671,144 kWh/day with a required reduction of 16%. This AU is on the most current §303(d) list for dissolved oxygen and selenium. In the TMDL addendum (DEQ 2013a), it was proposed that dissolved oxygen be listed as an observed effect of temperature exceedances. This change should be incorporated in the next Integrated Report.

ID17040207SK015_04, a small section of the Blackfoot River near Diamond Creek, was surveyed with an SEI in 2014. This AU is within Idaho Fish and Game property and contained no spawning habitat to collect McNeil core samples. Within the surveyed reach, erosive bank accounted for 54% of the total streambank length well above the target in the TMDL (DEQ 2001).

3.3.8.5 Trail Creek (Headwaters to Mouth)

This stream contains three AUs (ID17040207SK011_02, ID17040207SK011_03, and ID17040207SK011_03a) with sediment TMDLs approved in 2002. The 2nd-order segment of Trail Creek (ID17040207SK011_02) has not been surveyed by BURP. The upper portion of the drainage is on USFS land and was included in a 2004 USFS study (Higginson 2008). Bank stability was 89%, although percent subsurface fines in salmonid spawning habitats were high; 76% of the volume of sediment was <6.3 mm; and 39% was <0.85 mm. In 2014, bank stability was 94%, above the target of 80%. This AU contains many beaver dams and ponds and does not appear to be impacted by excess sediment. We recommend that this AU be surveyed by BURP in a free-flowing segment to assess if it is supporting cold water aquatic life.

Lower Trail Creek (ID17040207SK011_03) has not been surveyed by BURP since the approval of the sediment TMDL in 2002, likely because it is all on private land. In 2014, an SEI indicated that bank stability was 88%; however, the streambed was mostly composed of fine sediments. Other portions of Trail Creek may be contributing excess sediment to the stream, and historic land use may have caused the buildup of fine sediment in the bed. Further, the stream is over-widened and lacks riparian shrubs. The low slope of the stream and its modified form makes it prone to fine sediment buildup. Although the banks are fairly stable, this stream may take decades to recover unless it is actively manipulated. Diversions also lead to a modified hydrograph that may influence the flushing of fines from the bed. This AU is listed in Category 4c for low flow alterations. No McNeil core samples were taken because no spawning habitat exists due to excess sediment. Instead of a bank stability target, a channel form, width-to-depth ratio target may be more appropriate for this AU.

Upper Trail Creek (ID17040207SK011_03a) has not been assessed by BURP since the sediment TMDL was approved in 2002. When it was surveyed in 1999, the AU had SMI and SHI condition ratings of 2 with an SFI of 1, indicating it was not supporting cold water aquatic life. Three Cutthroat Trout, three Brook Trout, and three Speckled Dace were observed. One of the Cutthroat Trout and all three Brook Trout were <100 mm, demonstrating that salmonid spawning is an existing use. This AU should be surveyed again by BURP. In 2014, bank stability was 88%, and unlike lower Trail Creek, excess fine sediment was not observed. Sediment <6.3 mm composed 48% of the volume of sediment in spawning habitats, and sediment <0.85 mm accounted for 28% of the total volume.

3.3.8.6 Slug Creek (Headwaters to Mouth)

This stream has 2nd-order (ID17040207SK012_02), 3rd-order (ID17040207SK012_03), and 4th-order (ID17040207SK012_04) segments. The 2nd-order segment (ID17040207SK012_02) of Slug Creek was surveyed by BURP in 2007 and received an average condition rating of 0 because the SMI condition rating was also 0. Small 2nd-order reaches that were surveyed with an SEI in 2014 indicated that bank stability was high (90%). Slug Creek is a low-gradient drainage that is likely to accumulate sediment and is not able to flush it. The failing SMI rating in 2007 may have been due to the lack of univoltine taxa. The survey was conducted on an unnamed tributary to Johnson Creek at a flow of 0.72 cfs. This stream may be impacted by high fine sediment levels in the channel, but bank instability may not be contributing excess sediment to the stream.

The 3rd-order segment of Slug Creek (ID17040207SK012_03) was surveyed by BURP in 2011 and received an average condition rating of 0. Like the 2nd-order segment of Slug Creek, the 3rd-order segment lacks the power to flush fines from the bed. Further, it is overwidened by grazing, decreasing the power of the channel. Bank stability in Slug Creek is 75% below the target of 80% in 2014. This AU is listed in Category 4c for physical substrate habitat alterations.

The 4th-order segment of Slug Creek (ID17040207SK012_04) was surveyed by BURP in 2010 and 2011. Both times it received an average condition rating of 0. This AU was not sampled with an SEI in 2014 because landowner permission was not obtained. This AU is listed in Category 4c for low flow alterations because of diversions and physical substrate habitat alterations.

3.3.8.7 Dry Valley Creek (Upper Dry Valley)

Dry Valley Creek contains three AUs (ID17040207SK013_02, ID17040207SK013_02a, and ID17040207SK013_02b). Dry Valley Creek (ID17040207SK013_02) has not been surveyed by BURP. It includes many ephemeral channels that go subsurface and then reemerge. We surveyed two segments with an SEI in 2014. One was heavily grazed, and the channel was degraded by cows. This segment went subsurface after the survey reach. The other segment had historic beaver activity and quite stable banks. Overall, bank stability in this AU was 82%, meeting the target.

The AU, ID17040207SK013_02a, drains above and through the upper end of the Dry Valley running on the western margin of mine pit D, cutting back to the east on the south end of mine pit C and running on the eastern margin of pit C. The reach along pit C was constructed in the early 2000’s and is intermittent (the stream was relocated eastward as C pit operations mined through the original channel). Mining operations are complete and reclamation is ongoing. In 2004, this AU was part of a USFS study that documented fine sediments: <6.3 mm comprised

76% of the volume of sediment in spawning habitats, and sediment <0.85 mm comprised 39%. An SEI by DEQ in 2004 documented 58% bank stability (Higginson 2008). Some areas of the channel are engineered and the hillsides are subject to failure because stable vegetation has not yet taken hold. Although bank stability was near 100% in 2014, the channel may be subject to overland erosion that is deposited in the stream. Further in the valley, the channel is in a meadow and does not have enough gradient to flush fines from the bed. This AU has not been surveyed by BURP since 2001. We recommend that this AU be resurveyed by BURP to document current biological conditions. This AU is on the current §303(d) list for selenium and is in Category 4c for physical substrate habitat alterations.

Chicken Creek (ID17040207SK013_02b) sits on the northwest margin of mine pit B and was reclaimed over 15 years ago. Grazing is not allowed. In 2008, DEQ documented bank stability of 68%. Bank stability increased 100% between the 2008 survey and 2014. Although bank stability was high in 2014, the streambed is primarily fine sediment. This AU should be assessed with BURP protocols to document the biological condition of the stream post reclamation. This AU is on the current §303(d) list for selenium.

3.3.8.8 Maybe Canyon Creek (Headwaters to Mouth)

Maybe Canyon Creek (ID17040207SK014_02) drains the Maybe Canyon Mine and was last monitored by BURP in 2001. This AU is listed in Category 5 for selenium and has a sediment TMDL (DEQ 2001). In 2014, bank stability was 85%. However, in some sections the stream is highly entrenched with banks over 2 meters high. This AU should be monitored by BURP to assess its current biological condition.

3.3.8.9 Diamond Creek (Headwaters to Mouth)

Diamond Creek is a major tributary to the upper Blackfoot River. The Blackfoot River begins at the confluence of Diamond and Lanes Creek. Diamond Creek has 12 AUs that were included in the Blackfoot River subbasin TMDL (DEQ 2001) for sediment (ID17040207SK016_02, ID17040207SK016_02a, ID17040207SK016_02b, ID17040207SK016_02c, ID17040207SK016_02d, ID17040207SK016_02e, ID17040207SK016_02f, ID17040207SK016_02g, ID17040207SK016_02h, ID17040207SK016_02i, ID17040207SK016_03, and ID17040207SK016_03a). Headwaters and unnamed tributaries to Diamond Creek (ID17040207SK016_02) have not been monitored by BURP and were not monitored as part of the 2014 5-year review monitoring effort. This AU is on the current §303(d) list for *E. coli*.

Upper Diamond Creek (ID17040207SK016_02a) was last monitored by BURP in 2007 when it received an average condition rating of 2.67, indicating full support of cold water aquatic life. BURP scores also indicated full support of cold water aquatic life in 2002. In 2014, an SEI documented that bank stability was right at the target of 80% stability as outlined in the TMDL (DEQ 2001). Beaver activity occurs in the area. This AU should be removed from Category 4a for sedimentation/siltation. This AU is on the current §303(d) list for *E. coli* and temperature, which are the sole sources of impairment.

Coyote Creek (ID17040207SK016_02b) has not been monitored by BURP since the TMDL (DEQ 2001) was approved in 2002. In 1998, Coyote Creek was monitored by BURP and had an average condition rating of 2, indicating full support of cold water aquatic life. In 2009, an SEI by DEQ indicated that bank stability was 61%. In 2014, an SEI indicated that bank stability was 82% within the surveyed reach. Beaver activity was noted, and the creek bed was dry as observed by the BURP crew in 2013. In 2012, this AU was monitored by the Caribou-Targhee National Forest with MIM protocols. Data indicate that in the MIM reach, bank stability targets were not being met as stability was 60%. Streambank alteration by livestock was 24%, and fine sediments (<8 mm) composed 47% of the streambed substrate. This AU is heavily impacted by livestock grazing in some areas, which is likely contributing excess sediment to the stream. This stream should be reevaluated by BURP to document its current biological condition.

Bear Canyon (ID17040207SK016_02c) was monitored by BURP in 2006 and received a condition rating of 2, indicating full support of cold water aquatic life. In a 2014 SEI, bank stability was 91%, meeting the TMDL target (DEQ 2001). This AU is supporting cold water aquatic life, and TMDL targets are being met. This AU should be moved to Category 2 in the next Integrated Report.

Timber Creek (ID17040207SK016_02d) was monitored by BURP in 2007 and 2013. The 2013 condition ratings indicate that cold water aquatic life is not being supported. Further, BURP scores indicate a decreasing trend in cold water aquatic life scores, from 3 in 1996 to 1 in 2013. In 2014, this stream had bank stability of 61%, not meeting TMDL targets. Unstable streambanks are likely contributing excess sediment to this stream and may be impacting beneficial uses. The 2013 BURP notes indicate “signs of cows very evident. Cow feces in and near stream, trampled banks, and sparse vegetation.” This AU should remain in Category 4a until streambank stability targets are met.

Cabin Creek (ID17040207SK016_02e) has not been monitored by BURP since 1995. In 2014, an SEI indicated that, on private property below the Forest boundary, bank stability was 64%. This stream is physically altered in this reach and should be placed in Category 4c for physical substrate habitat alterations. It is dammed and has a man-made pond. Below the pond, the creek runs through a field in a ditch, not its original channel. The ditch is where the SEI was conducted because it most accurately represented potential sediment contributions to the AU below. Conditions on the Forest are likely different from conditions on private land below. However, current biological or habitat data are not available on the Forest section of this AU.

Stewart Canyon (ID17040207SK016_02f) was last monitored by BURP in 2004 when it received an average condition rating of 1, indicating that cold water aquatic life was not being supported. In 2014, a SEI measured a bank stability of 59%. By the Diamond Creek Road, this AU is fenced off from livestock. Above the fence, impacts from livestock on bank stability conditions are very evident. Numerous cutbanks and cow trails occur throughout the stream. Sedimentation is still impacting this stream.

Campbell Canyon (ID17040207SK016_02g) is located on USFS land and has not been monitored by BURP since 1998 when it received an average condition rating of 2. In 2014, Campbell Canyon was heavily impacted by slumping and undercut banks. Bank stability was 54%, not meeting the target of the TMDL (DEQ 2001). We recommend that Campbell Canyon be surveyed by BURP to assess its current biological condition.

Upper Kendall Creek (ID17040207SK016_02h) has not been monitored by BURP since the TMDL was approved in 2002. Surveys in 1995 and 2001 both indicated full support of cold water aquatic life. In 2014, bank stability was 71%. Sediment <6.3 mm made up 53% of the total volume of sediment in spawning habitat, and sediment <0.85 mm made up 13%. TMDL (DEQ 2001) targets are not being met in the AU. In 2012, this AU was monitored by the Caribou-Targhee National Forest with MIM protocols. While streambank stability within the reach was 85%, streambank alteration was high at 37%, indicating heavy use by livestock. We recommend that this AU be monitored by BURP to better assess its current biological condition.

Lower Kendall Creek (ID17040207SK016_02i) was assessed by BURP in 2006 and 2013, and both score indicated support of cold water aquatic life. Both of the BURP surveys took place in the upper portion of the AU and may not represent conditions below the road. Below the road, the stream runs through a field that is heavily grazed. An SEI was not conducted on this AU in 2014. This AU should not be moved to Category 2 until a BURP assessment below the road indicates that the lower portion of this AU is also supporting beneficial uses.

Middle Diamond Creek (ID17040207SK016_03a) was surveyed by BURP in 2006 and in two places in 2013. All scores indicate that this AU is not supporting cold water aquatic life. The 2004 data from the USFS indicate that bank stability was 68% within the reach surveyed. The 2004 McNeil core sampling values indicate that sediment <6.3 mm composed 38% of the total volume of sediment in spawning habitats, and sediment <0.85 mm composed 14%. An SEI in 2014 indicates that bank stability is 52%, not meeting targets of the TMDL (DEQ 2001). McNeil core samples in spawning habitats indicate that sediments <6.3 mm account for 43% of the total volume of sediment, and sediment <0.85 mm account for 11%. Recent data do not indicate improvements in sedimentation conditions in this AU. Middle Diamond Creek received a TMDL for *E. coli* in the Blackfoot River subbasin TMDL addendum (DEQ 2013a) and is on the current §303(d) list for temperature.

Lower Diamond Creek (ID17040207SK016_03) was assessed by BURP in 2006, and scores indicated full support of cold water aquatic life. In a 2014 SEI, however, banks were trampled and sloughing, and overall bank stability was measured at 40%. Riparian shrubs were lacking, and the area was heavily impacted by grazing. The 2006 survey took place on state land right below the USFS boundary. Below this point, the stream flows onto private land where grazing impacts are apparent. Lower Diamond Creek received a TMDL for *E. coli* in the TMDL addendum (DEQ 2013a). It is on the current §303(d) list for temperature.

3.3.8.10 Lanes Creek (Headwaters to Mouth)

Lanes Creek is made up of eight AUs (ID17040207SK018_02, ID17040207SK018_02a, ID17040207SK018_02b, ID17040207SK018_02c, ID17040207SK018_02d, ID17040207SK018_02e, ID17040207SK018_03, and ID17040207SK018_04). The 2nd-order segment of Lanes Creek (ID17040207SK018_02) has not been monitored by BURP, and an SEI has not been completed.

Upper Lanes Creek (ID17040207SK018_02a) was last assessed by BURP in 2002, and it received an average condition rating of 2.3, indicating full support of cold water aquatic life. The AU was listed erroneously when the TMDL was converted to AUs. This AU is on USFS land and is largely inaccessible to recreationalists because of a locked gate on private land that blocks access to the forest above. This stream appears to be supporting beneficial uses of cold water aquatic life as it also received a passing score in 1997. In 2004, USFS monitored this AU and observed 92% streambank stability. In spawning habitats, fines <6.3 mm composed 16% of the total volume of sediment, and fines <0.85 mm composed 4%. Both measures indicate that this AU is meeting targets of the Blackfoot River subbasin TMDL (DEQ 2001). In a 2013 MIM survey by Caribou-Targhee National Forest, streambank stability was below the 80% target at 69%. However, streambank alteration was low at 3%; fines <8 mm composed only 20% of the streambed sediments. Overall, these data indicate that this AU is supporting the beneficial use of cold water aquatic life. We recommend that this AU be moved to Category 2 in the next Integrated Report. This AU was not monitored with a SEI in 2014 because of inaccessibility.

Upper Daves Creek (ID17040207SK018_02b) was last monitored by BURP in 1997, when it received an average condition rating of 2, indicating full support of cold water aquatic life. In that survey, fine sediments in the Wolman pebble counts were not elevated. Within the wetted width, sediments <2.5 mm made up 14% of particles, and sediments <6 mm made up 26% of particles. A 2014 SEI documented bank stability of 100%. This AU is not impacted by excess sedimentation and available biological data indicates that it supports cold water aquatic life. This AU should be moved to Category 2 in the next Integrated Report.

Lower Daves Creek (ID17040207SK018_02c) has never been assessed by BURP. It is located on private land that is grazed. A 2014 SEI indicated that bank stability targets were not being met as bank stability was 68%. McNeil core samples were obtained from spawning habitats. In sediment cores, sediments <6.3 mm on average made up 47% of the volume of sediment, and sediments <0.85 mm made up 16% of the volume. Both measures did not meet targets set in the TMDL (DEQ 2001). This AU should be monitored by BURP to document current biological conditions.

Corralisen Creek (ID17040207SK018_02d) begins on USFS land, flows into BLM land, and joins Lanes Creek on state land. This AU was last surveyed by BURP in 1999 when scores indicated it was fully supporting cold water aquatic life. In 2012, a MIM survey by Caribou-Targhee National Forest indicated that within the reach, streambank stability was 61%, and streambank alteration by livestock was 25%. Fines <8 mm composed 71% of the streambed sediments. A 2014 SEI indicated that streambank stability was 81%, meeting the target of the TMDL (DEQ 2001). MIM data, however, indicate that some areas are impacted by livestock grazing and fine sediments are excessive. This AU should remain in Category 4a and should be resurveyed by BURP to document current biological conditions.

Lanes Creek (ID17040207SK018_02e) lies below the USFS boundary on private land and has never been monitored by BURP. Currently, this AU is being actively restored to reduce erosion and improve aquatic habitat. The Upper Blackfoot Confluence (a partnership between Monsanto, Simplot, and Agrium) and conservation organizations (Trout Unlimited and Idaho Conservation League) worked with Caribou Cattle Company to install riparian exclusion fence and restore meanders in the creek (Ashby 2014). This AU should be monitored by BURP as the restoration project matures to document conditions overtime and assess the support status of cold water aquatic life. This AU is listed in Category 4c for physical substrate habitat alterations.

The 3rd-order segment of Lanes Creek (ID17040207SK018_03) was monitored by BURP in 2004. It had an average condition rating of 1.33, indicating it was not fully supporting cold water aquatic life. A 2014 SEI indicated that bank stability (75%) was not meeting the target of 80%. Large cutbanks were contributing excess fine sediment to the stream, and heavy beaver activity (dams and ponds) was observed. McNeil core samples for sediment were not taken because no suitable habitat exists. This AU is listed in Category 4c for physical substrate habitat alterations.

The 4th-order segment of Lanes Creek (ID17040207SK018_04) was monitored by BURP in 2005 and received an average condition rating of 1.33, indicating it was not supporting cold water aquatic life. In 2014, bank stability was 53%, well below target stability. In spawning habitats, sediments <6.3 mm composed 32% of the volume of sediment, and sediments <0.85 mm composed 11%. This AU is impacted by grazing and is mostly devoid of stabilizing riparian shrubs. In some areas, the stream is also over-widened. This AU is listed in Category 4c for physical substrate habitat alterations.

3.3.8.11 Bacon Creek (Below USFS Boundary)

This stream contains five AUs (ID17040207SK019_02, ID17040207SK019_02a, ID17040207SK019_02b, ID17040207SK019_03, and ID17040207SK019_04). Bacon Creek (ID17040207SK019_02) has not been assessed by BURP since 1995 when it received an average condition rating of 2, indicating full support of cold water aquatic life. It was not assessed with an SEI in 2014. We recommend that this AU be monitored with BURP protocols to access its current biological condition.

Upper Bacon Creek (ID17040207SK019_02a) was also last monitored with BURP protocols in 1995 when it received a passing average condition rating of 2. This AU is mostly on USFS land and is less impacted by grazing than the private land below. In 2014, bank stability was 92%, meeting the target of the Blackfoot River subbasin TMDL (DEQ 2001). McNeil core samples in spawning habitats documented that sediment <6.3 mm composed 40% of the volume of sediment, and sediment <0.85 mm composed 15%. Existing data, although dated, indicates support of cold water aquatic life. This AU should be resurveyed by BURP to document its current biological condition.

Bacon Creek (ID17040207SK019_02b) below the USFS boundary is diverted from its original course and runs into a highly entrenched channel that is subject to heavy erosion. As a result, this AU is listed in Category 4c for physical substrate habitat alterations. This AU was monitored by BURP in 2008, and the data indicate that the AU was fully supporting cold water aquatic life with an average condition rating of 3. The survey location was not representative of the AU because it was right below the USFS boundary. Below the USFS boundary, most of the AU is heavily impacted by grazing and flow alteration. In the 2014 SEI, bank stability was only 24%. This AU is likely contributing significantly to the sediment load of the lower AUs. In 2008, McNeil core samples measured sediment <6.3 mm accounting for 27% of the total volume of sediment, and sediment <0.85 mm accounting for 17%. These cores, also taken from just below the USFS boundary, are more representative of the AU upstream.

Bacon Creek (ID17040207SK019_03) has never been monitored by BURP, likely because it is on land owned by Bear Lake Grazing Association. In 2014, however, access was obtained, and a SEI was performed. Bank stability was well below the target at 53%. This AU is heavily impacted by grazing. Riparian shrubs are absent, and the channel bottom is mostly composed of thick silt and macrophytes. No spawning habitat exists to sample with McNeil cores. We recommend that this AU be monitored by BURP to assess its biological condition. This AU is listed in Category 4c for physical substrate habitat alterations.

The 4th-order segment of Bacon Creek (ID17040207SK019_04) has never been monitored by BURP and is wholly contained within land owned by the Bear Lake Grazing Association. In 2014, an SEI was completed on this AU and documented bank stability of 48%, well below the target. Grazing is heavily impacting this AU, and it is likely receiving sediment inputs from the impacted AUs above. The bed is mostly silt and is covered by macrophytes. No riparian shrubs exist to provide bank stability or shade the stream. This AU is listed in Category 4c for physical substrate habitat alterations.

3.3.8.12 Sheep Creek (Headwaters to Mouth)

Sheep Creek contains three AUs (ID17040207SK022_02, ID17040207SK022_03, and ID17040207SK022_03a). Additionally, a fourth AU will be added in the 2014 Integrated Report. The U. S. Board of Geographic Names, at its December 12, 2013 meeting, approved a proposal to make official the name South Fork Sheep Creek for a previously unnamed tributary of Sheep Creek in Caribou County. South Fork Sheep Creek (ID17040207SK022_02a) will be separated from the other second-order segments of Sheep Creek (ID17040207SK022_02). South Fork Sheep Creek will be placed in Category 5 for selenium.

Upper Sheep Creek (ID17040207SK022_02) was first listed as an impaired water quality segment (WQLS 2321) on the 1994 303(d) list for sediment and subsequently assigned a TMDL as part of the Blackfoot TMDL approved by EPA on April 3, 2002. However, the original listing was focused on Lower Sheep Creek (ID17040207SK022_03), primarily below the USFS boundary on private lands. To confirm that Upper Sheep Creek is not impaired by excess sediment, the reach was monitored in 2013 (2013SPOCA084) and received an average score of 2.0, which according to Idaho's Water Body Assessment Guidance is fully supporting. The habitat data showed the streambank stability to be excellent with an average of 95% covered and stable, percent fines showing only 16.2% of the substrate consisting of material less than or equal to 2.5 millimeters in size, and no evidence of other sources of excess sediment. According to DEQ's Guide to Selection of Sediment Targets for Use in Idaho TMDLs, most impairment is noted when percent fines of this size are greater than 30% of the substrate. In 2014, an SEI and McNeil core samples for sediment were completed on this AU. Bank stability was meeting the target at 95%. In spawning habitats, sediment <6.3 mm composed 49% of the sediment volume, and sediment <0.85 mm accounted for 19%. In 2009, DEQ documented that sediment <6.3 mm accounted for 69% of the total volume of sediment, and sediment <0.85 mm accounted for 16% of the total volume in spawning habitats. This reach where the sediment cores were taken, however, is low-gradient and impacted by beaver activity. Therefore, DEQ is delisting sediment from Category 4a and moving this AU into Category 2-fully supporting assessed uses.

Upper Sheep Creek (ID17040207SK022_02) is also in Category 5 for temperature. The temperature listing was erroneously applied to this AU. DEQ has no continuous temperature data suggesting that Upper Sheep Creek is impaired by excess temperatures. Continuous temperature data on Lower Sheep Creek (ID17040207SK022_03) from June to October 2002 documented no exceedances of water quality standards. Further, BURP data indicate that cold water aquatic life is being supported. Therefore, DEQ is also delisting Upper Sheep Creek for temperature and moving this AU into Category 2-fully supporting assessed uses.

Middle Sheep Creek (ID17040207SK022_03a) is mostly on USFS land and was monitored by BURP in 2008 and 2013. All scores indicated full support of cold water aquatic life with an average condition rating at or above 2.67. Unstable banks do not seem to be adding excess sediment to the stream. In 2004, USFS documented bank stability of 84%, and in 2009 and 2014, DEQ measured bank stability at 91% and 90%. In 2013, the Caribou-Targhee National Forest documented streambank stability of 99% with MIM protocols. All measures met targets in the Blackfoot River subbasin TMDL (DEQ 2001). McNeil core sampling in 2014 indicated that in spawning habitats, sediment <6.3 mm made up 37% of the total volume of sediment, and sediment <0.85 mm made up 9%. These measures were similar to those observed in 2004 by the Caribou-Targhee National Forest that documented sediment <6.3 mm made up 32% of the total volume of sediment, and sediment <0.85 mm made up 9%.

Middle Sheep Creek (ID17040207SK022_03a) was first listed as an impaired water quality segment (WQLS 2321) on the 1994 303(d) list for sediment and subsequently assigned a TMDL as part of the Blackfoot TMDL approved by EPA on April 3, 2002. However, the original listing was focused on Lower Sheep Creek (ID17040207SK022_03) which is below the USFS boundary on private lands. Since then, water quality monitoring has been conducted confirming that Middle Sheep Creek (ID17040207SK022_03a) supports its beneficial uses. In 2008, Middle Sheep Creek was monitored (BURP site 2008SPOCA133) and received an average score of 3.0, which according to Idaho's Water Body Assessment Guidance is fully supporting. The habitat data showed the streambank stability to be excellent with an average of 94.5% covered and stable which exceeds the established TMDL target of 80% stability. Although the percent fines measured within the wetted width were 32% of the substrate, slightly above the recommended target of 30%, a high density of Yellowstone cutthroat trout, brook trout, and sculpin have been observed. Then in the fall of 2009, DEQ and IDFG surveyed fish in the middle reach of Sheep Creek. A total of 3 fish species were sampled above the mining activities—39 Yellowstone cutthroat trout (38 from middle reach, 1 from upper reach), 22 brook trout from the middle reach and 37 sculpin (22 from middle reach, 15 from upper reach). The mean length of sampled Yellowstone cutthroat was 120 mm (range = 60 - 146 mm). Brook trout had a mean length of 93 mm (range = 80 – 102 mm), (Fish Tissue Selenium Concentrations in Sheep Creek, Upper Blackfoot River Watershed, Caribou Co., Idaho, Idaho Dept. of Environmental Quality, Dec. 2009). Furthermore, the upstream segment—AU ID17040207SK022_02—is fully supporting its beneficial uses, demonstrating that the upper reach is not a source of impairment to the downstream reach. Based on aforementioned data, DEQ proposes to delist sediment from Category 4a and move this AU into Category 2 – fully supporting all assessed uses

Water quality data collected as part of DEQ’s annual synoptic sampling event (DEQ Area-Wide Annual sampling) in the Blackfoot River since 2006 were not collected on Middle Sheep Creek (ID17040207SK022_03a). The data was collected on the downstream reach—AU ID17040207SK022_03—which is below the confluence of AU ID17040207SK022_02a (South Fork Sheep Creek) and the source of the selenium impairment. There is no readily available data to suggest that Middle Sheep Creek (above the confluence of the South Fork Sheep Creek) is impaired by selenium and the biological data collected in 2008 resulted in an average score of 3.0 which is considered fully supporting according to Idaho's Water Body Assessment Guidance. Therefore, DEQ is delisting selenium from Category 5 for this AU.

Lower Sheep Creek (ID17040207SK022_03) is mostly on private land which has historically been heavily grazed. It has not been monitored by BURP since 1993, when it received an average condition rating of 1.5, indicating that cold water aquatic life was not being supported. When surveyed with an SEI in 2014, bank stability was well below the TMDL target at 53%. Banks were trampled, and some were bare. Sediment <6.3 mm accounted for 40% of the volume of sediment in spawning habitats, and sediment <0.85 mm accounted for 13%. This AU should be monitored by BURP to document current biological conditions. Lower Sheep Creek is also listed in Category 5 for selenium based on DEQ's water sampling data. It is in Category 4c for physical substrate habitat alterations. Lower Sheep Creek upstream of Lanes Creek Road to the Forest boundary (Bear Lake Grazing Association land) was the focus of a stream channel restoration effort in the fall of 2014 by the Blackfoot River Confluence group. Restoring the habitat in the reach of Sheep Creek to its confluence with Lanes Creek may eventually lead to a full restoration of beneficial use support in this Blackfoot River tributary.

Since 2006, DEQ has been collecting water quality data as part of the annual spring-time synoptic sampling regime. The data collected on Lower Sheep Creek (ID17040207SK022_03) at Lanes Creek Road has shown that 5 of 10 years have exceeded the 4-day average concentration of 0.005 mg/L chronic selenium criteria. Additional water quality data collected by Agrium and Monsanto on the South Fork of Sheep Creek (ID17040207SK022_02a) drainage confirmed that South Fork Sheep Creek-which sits below both Agrium's Rasmussen Ridge Complex and Monsanto's Horseshoe Overburden Disposal Area (and is tributary to this AU)-is the primary contributor to selenium impairment in the Sheep Creek drainage.

3.3.8.13 Angus Creek (Headwaters to Mouth)

Angus Creek is composed of four AUs (ID17040207SK023_02, ID17040207SK023_02a, ID17040207SK023_02b, and ID17040207SK023_04) included in the Blackfoot River subbasin TMDL (DEQ 2001) for sediment. The 2nd-order segment of Angus Creek (ID17040207SK023_02) has not been monitored by BURP. In 2008, it was noted that no suitable habitat existed for salmonid spawning. In 2014, an SEI measured 99% bank stability within this AU. This AU is on the current §303(d) list for *E. coli*. Unnamed second-order segments of Angus Creek (ID17040207SK023_02) include No Name Creek, which has been studied extensively by consultants working on behalf of Agrium/Nu-West. In a GEI Consultants 2014 report, No Name Creek is described as an intermittent stream. No fish were observed during electrofishing surveys in August 2008 and July 2011. SMI scores for samples collected in June and September 2013 in various locations of No Name Creek were 0s and 1s. Some of these samples were collected outside of the BURP season (July 1 – September 31) and SMI scores are not appropriate for intermittent stream reaches. SHI scores for various locations were also 0s and 1s (GEI Consultants 2014). Since No Name Creek is intermittent, DEQ does not use BURP indices to make assessment calls.

Rasmussen Creek (ID17040207SK023_02a) has not been monitored by BURP since the Blackfoot River subbasin TMDL (DEQ 2001) was approved in 2002. Within a reach surveyed in 2008, bank stability was only 40%. At that time, sediments <6.3 mm composed 67% of the volume of sediments in spawning habitats, and sediments <0.85 mm composed 32%. In 2014, an SEI indicated bank stability at 61%, not meeting the TMDL target of 80%. This AU should be monitored by BURP to document current biological conditions. This AU is on the current §303(d) list for selenium and is in Category 4c for physical substrate habitat alterations.

Angus Creek (ID17040207SK023_02b) was monitored by BURP in 2005 when it received an average condition rating of 0, SMI of 0, and SHI of 1. In 2004, this AU was monitored by the USFS. Within their survey, 81% bank stability was measured. Sediments <6.3 mm composed 59% of total sediment volume in spawning habitats, and sediments <0.85 mm composed 26%. In 2014, this AU was surveyed by DEQ to generate data for the 5-year review. Bank stability was measured at 79%. Although banks are relatively stable, the streambed is composed of mostly silt. This stream may be suffering from sedimentation from historic land use, and some areas may be contributing disproportionately to erosion of the banks and sedimentation of the streambed. This AU received a TMDL for *E. coli* in the Blackfoot River subbasin TMDL addendum (DEQ 2013a). It is listed in Category 4c for physical substrate habitat alterations and is on the current §303(d) list for temperature and selenium.

Lower Angus Creek (ID17040207SK023_04) was monitored by BURP in 2006, 2008, and 2013. In 2006, this AU received a passing average condition rating of 2, indicating support of cold water aquatic life. In 2008, the SMI was 3, and the SHI was 2. The AU failed, however, because of the SFI of 0. The SFI was erroneously based on 24 fish marked as no data. The 2013 condition ratings indicate that cold water aquatic life is not being supported with a score of 1. During the electrofishing survey, fish included Mountain Sucker, Cutthroat Trout, Mountain Whitefish, and Mottled Sculpin. SEIs in 2008 (100%) and 2014 (93%) indicated that on the Wildlife Management Area, banks are mostly stable. McNeil core samples collected in 2014 indicated that fine sediment levels were quite low in spawning habitats. Sediments <6.3 mm composed 28% of the total volume of sediment, and sediment <0.85 mm accounted for 7% of the total volume. This AU is contained on State, USFS, private, and Idaho Department of Fish and Game land (IDFG). The IDFG's Wildlife Management Area has been actively managed for fish and wildlife with little if any livestock grazing for nearly 20 years. However, upstream portions of the AU appear to be impacted by grazing as evidenced by fence line contrast apparent from aerial imagery. This AU is in Category 4c for physical substrate habitat alterations and is on the current §303(d) list for *E. coli* and temperature. Lower Angus should remain in Category 4a for sediment.

3.3.8.14 Meadow Creek (Headwaters to Mouth)

Meadow Creek consists of five AUs (ID17040207SK025_02, ID17040207SK025_02a, ID17040207SK025_02d, ID17040207SK025_03, and ID17040207SK025_04) that were included in the Blackfoot River subbasin TMDL (DEQ 2001) for sediment. AU, ID17040207SK025_02, includes unnamed tributaries and has not been surveyed by BURP or sampled with an SEI. Meadow Creek (ID17040207SK025_02a) has been surveyed once, in 2011, since the TMDL (DEQ 2001) was approved in 2002. This survey documented low bank stability and no salmonids in the electrofishing survey. The SFI condition rating was 0, causing the average condition rating to be 0. In a 2014 SEI, bank stability was 46%, well below the target level. The stream is over-widened and lacks riparian shrubs.

The 2nd-order segment of Meadow Creek (ID17040207SK025_02d) has not been surveyed by BURP since approval of the TMDL in 2002. A 2014 SEI documented bank stability of 55%. This small stream is heavily impacted by livestock, and no riparian shrubs were documented.

The 3rd-order segment of Meadow Creek (ID17040207SK025_03) was surveyed by BURP in 2008 and received an average condition rating of 0. No salmonids were documented in the electrofishing survey, and grazing impacts were noted. In the 2014 SEI, bank stability was low at 43%. Banks were largely trampled by cows and uncovered. Like the upstream segments, this AU lacks riparian shrubs.

The 4th-order segment of Meadow Creek (ID17040207SK025_04) begins with its confluence with Clarks Cut, a trans-basin diversion that delivers water from Gray's Lake to the Blackfoot Reservoir via Meadow Creek. Clarks Cut also delivers excess sediment to this AU. Meadow Creek (ID17040207SK025_04) was surveyed by BURP once since the TMDL was approved in 2002. In 2006, the average condition rating was 0. The SFI condition rating was 0, and no salmonids were observed. In the 2014 SEI, bank stability was higher than upstream segments at 71% but still below the target of 80%. During the SEI, the water was high and rich in tannins, likely due to inputs from Clarks Cut.

3.3.8.15 Brush Creek (Headwaters to Mouth)

Brush Creek flows into the lower Blackfoot River and is composed of 2nd-order (ID17040207SK026_02) and 3rd-order (ID17040207SK026_03) segments. The 2nd-order segment has not been monitored by BURP. In 2014, bank stability was 86%, meeting the targets of the Blackfoot River subbasin TMDL (DEQ 2001). This AU should be monitored by BURP to assess its biological condition.

The 3rd-order segment of Brush Creek (ID17040207SK026_03) has been monitored by BURP on several occasions since the TMDL (DEQ (2001) was approved in 2002. On some occasions, condition ratings indicate support of cold water aquatic life (2004, 2007, and 2010). However on other occasions, scores indicate that cold water aquatic life was not fully supported (2005 and 2013). A 2014 SEI indicated that bank stability targets set in the TMDL are not being achieved. Bank stability was 59%. Sediments <6.3 mm composed an average of 49% of the total volume of sediment in spawning habitats, and sediment <0.85 mm composed 18%. This AU is on private and state land and is impacted by grazing.

3.3.8.16 Wolverine Creek (Headwaters to Mouth)

Wolverine Creek has two AUs, 2nd-order (ID17040207SK030_02) and 3rd-order (ID17040207SK030_03) segments, included in the Blackfoot River subbasin TMDL (DEQ 2001) for sediment and nutrients. The 2nd-order segment was assessed by BURP in 2011 and received an average passing score of 2.67. An SEI in 2014 indicated that bank stability was 78%, nearly the target of 80%. McNeil core sample data indicate that fine subsurface sediment in spawning habitats have remained relatively constant over 14 years. In 2000, percent fines <6.3 mm constituted 42% of the sediment volume. In 2009, they accounted for 43% of the volume of sediment and in 2014, 46%. Percent fines <0.85 mm comprised 16%, 13%, and 15% of the volume of sediment in spawning habitats during the same years. Although fine sediment in spawning habitats are above levels recommended in the TMDL, during the 2011 BURP survey, seven Cutthroat Trout <100 mm were documented, suggesting that salmonid spawning is an existing use being supported. Further, surface fine sediments were not elevated in the Wolman pebble count conducted by BURP in 2011. Within the wetted width, sediments <2.5 mm accounted for 8% of the particles measured, and sediments <6 mm accounted for 22%. Because recent biological indicators document full support of cold water aquatic life and salmonid spawning, we recommend that this AU be moved to Category 2 in the next Integrated Report as fully supporting beneficial uses.

The 3rd-order segment of Wolverine Creek (ID17040207SK030_03) has not been surveyed by BURP since 1997. Data from 2014 indicate that this AU is not meeting targets set in the Blackfoot River subbasin TMDL (DEQ 2001). For example, bank stability was 66%, well below the 80% target. McNeil core sampling documented that sediment <6.3 mm composed 42% of the total volume of sediment, and sediment <0.85 mm accounted for 13%. Further, water samples documented two exceedances of the target for TP in 2014. These exceedances were likely due to low bank stability causing excess erosion during spring runoff and return agriculture flows in September contributing excess sediment to the stream. This AU is also in Category 4c (waters impaired by pollution) for low flow alterations and physical substrate habitat alterations.

3.3.8.17 Jones Creek (Headwaters to Mouth)

This 2nd-order stream (ID17040207SK031_02) flows into Wolverine Creek and was included in the Blackfoot River subbasin TMDL (DEQ 2001) for nutrients. Jones Creek was last sampled by BURP in 2007 and received an average condition rating of 2. In 2013, the flow in this small stream was too low to sample with BURP protocols. In a conversation with a landowner in 2014, he characterized the stream as intermittent and said it was not currently running. In a 2008 SEI, the stream had 17% bank stability and was documented as highly entrenched, with an average erosive bank height of 10.6 feet. Excess bank erosion is likely the source of excess phosphorus output to Wolverine Creek. This stream was included in the Blackfoot River subbasin TMDL addendum (DEQ 2013a) for sediment.

3.3.9 Outside Studies of Water Quality in the Blackfoot River

In 2006, the Center for Ecological Research and Education at Idaho State University conducted a biofilm study in the upper Snake River basin that included two sites on the Blackfoot River (Marcarelli et al. 2009). The study explored the nutrient limitation of biofilm biomass in the basin in relationship to human-caused impacts. Nutrient-diffusing substrates were augmented with no nutrients (control), nitrogen alone, phosphate alone, and the combination of nitrogen and phosphorus to test the effects of nutrient additions on the biomass of biofilm. Substrates were incubated in the river and then collected for analysis of chlorophyll-*a* (a measure of the biomass of autotrophs) and total organic matter (a measure of the biomass of autotrophs and heterotrophs).

Table 23 displays water quality results during deployment periods in 2006. The upper site was located above the reservoir, and the lower site was located below the dam and below the confluence with Wolverine Creek. The study documented one exceedance of the TMDL for nitrogen during the October–November period at the lower site.

Table 23. Water characteristics at bioassay study sites on the Blackfoot River, 2006 (Marcarelli et al. 2009).

Site	July					October–November				
	Discharge (m^3/s)	Temp (°C)	Turbidity (NTU)	DIN (mg/L)	PO_4-P	Discharge (m^3/s)	Temp (°C)	Turbidity (NTU)	DIN (mg/L)	PO_4-P
Upper	2.9	21.5	4.4	0.02	0.01	1.4	5.3	6.6	0.08	0.01
Lower	16.4	21.8	NA	0.01	0.01	3.7	NA	NA	0.40[a]	0.01

a. Exceeds total maximum daily load target.
Notes: cubic meters per second (m^3/s); nephelometric turbidity unit (NTU); dissolved organic nitrogen (DIN); milligrams per liter (mg/L); phosphate-phosphorus (PO_4-P); Not applicable (NA)

On control substrates, both chlorophyll-*a* and the autotrophic index (a measure of the ratio of organic matter to chlorophyll-*a*) did not differ significantly between the sites on the upper and lower river. In July 2006, chlorophyll-*a* at both sites was primarily limited by nitrogen and secondarily limited by phosphorus. Organic matter above the reservoir was not significantly limited by nutrients in July. At the lower site, however, nitrogen limited organic matter during the same time period. During the October–November deployment when background nitrogen was higher (Table 23), nutrients did not significantly limit chlorophyll-*a* at either site. Organic matter in the upper river, however, was colimited by nitrogen and phosphorus.

Results from this study indicate that nitrogen is the most common limiting nutrient in the Blackfoot River, especially during the summer when background concentrations were lower. Another study of nutrient limitation on biofilms in Idaho, confirms that nitrogen is frequently the limiting nutrient in the upper Snake River highlands, including the Blackfoot River subbasin (Thomas et al. 2003). Efforts to control algal growth should focus on reducing nitrogen concentrations especially during summer months (Marcarelli et al. 2009).

A study that compared the status of salmonid fishes and hydrologic integrity in 41 watersheds of the Greater Yellowstone Ecosystem found that the status of native and existing salmonids and the hydrologic integrity of the Blackfoot River watershed were poor (Van Kirk and Benjamin 2001).

In 2012, Trout Unlimited completed an assessment of the upper Blackfoot River watershed to identify those areas where priority projects would improve fisheries of Yellowstone Cutthroat Trout, Leatherside Chub, Paiute Sculpin, and Mountain Sucker. By generating maps of native fish values, water quality impacts, watershed disturbance, and sensitive terrestrial habitats, Trout Unlimited outlined catchment limiting factors, conservation objectives, and strategies for fishery improvement (Table 24) (Trout Unlimited 2012). The assessment is found at *http://www.tu.org/sites/default/files/science/pdfs/Blackfoot%20River%20Watershed-Assessment.pdf*. Since assessment development, the Upper Blackfoot Confluence, Trout Unlimited, and the Idaho Conservation League, undertook restoration activities on Lanes Creek (ID17040207SK018_02e) and installed screens on Diamond and Lanes Creeks to improve fish passage and decrease mortality.

Table 24. Trout Unlimited overview of recommended restoration plan strategies for each identified restoration complex in the upper Blackfoot River watershed (Trout Unlimited 2012).

Restoration Complex	Limiting Factors	Conservation Objective	Strategies
Main stem Blackfoot River	- Water quality - Habitat fragmentation	Improve migratory corridor for adfluvial Yellowstone Cutthroat Trout and habitat for fluvial life forms.	- Riparian restoration - Channel restoration - Barrier removal or modification
Slug, Trail, Dry Valley Creeks	- Water quality - Loss of riparian habitat - Habitat fragmentation - Summer low flows (Slug Creek) - Brook Trout	Improve habitat and restore native fish and assemblage. Secure habitat for sensitive nongame species in Slug Creek.	- Riparian restoration - Barrier removal or modification - Nonnative species eradication - Agreements not to divert or downstream water rights transfers
Sheep and Angus Creeks	- Water quality - Loss of riparian habitat - Habitat fragmentation - Brook Trout	Improve habitat for migratory Yellowstone Cutthroat Trout.	- Riparian restoration - Barrier removal or modification
Lanes Creek	- Water quality - Loss of riparian habitat - Habitat fragmentation - Brook Trout	Improve spawning and rearing habitat for Yellowstone Cutthroat Trout and restore native fish assemblage.	- Riparian restoration - Barrier removal or modifications - Nonnative species eradications
Diamond Creek Complex	- Water quality - Loss of riparian habitat - Habitat fragmentation - Brook Trout	Improve spawning and rearing habitat for Yellowstone Cutthroat Trout and restore native fish assemblage.	- Riparian restoration - Channel restoration - Barrier removal or modification - Nonnative species eradication

3.4 Beneficial Use Recommendations

The Blackfoot River subbasin contains 126 AUs. Only eight AUs are currently fully supporting beneficial according to the 2012 Integrated Report (DEQ 2014a). Twenty-one AUs are in Category 3 as unassessed and 97 are not supporting beneficial uses (Figure 19). AUs supporting beneficial uses account for 6% of AUs in the watershed, well below the state average of 25%. Unassessed AUs account for 17% of AUs in the Blackfoot River subbasin while they account for 34% statewide.

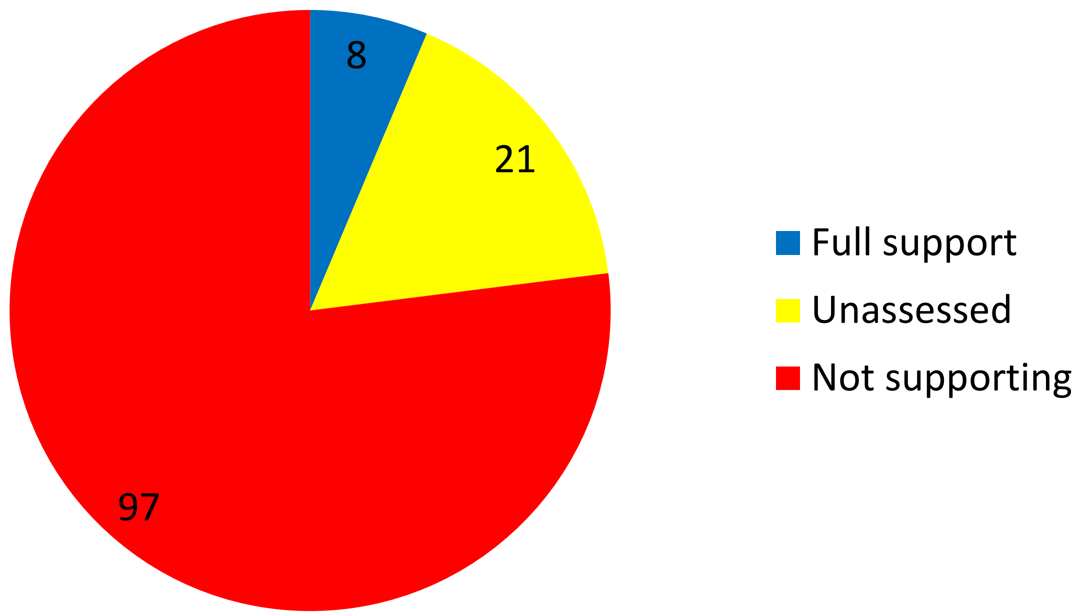

Figure 19. Status from 2012 Integrated Report of 126 AUs in Blackfoot River subbasin.

As part of this 5-year review, AUs included in the Blackfoot River subbasin TMDL (DEQ 2001) were evaluated to assess whether they are currently supporting beneficial uses. First, BURP data were reviewed. If condition ratings indicated that cold water aquatic life was being supported, streambank stability scores and available USFS data were evaluated. If streambank stability scores indicated that TMDL goals were being met and BURP data confirmed that cold water aquatic life was currently being supported, an AU was recommended for delisting.

The TMDL (DEQ 2001) was approved in 2002, which was before DEQ adopted the AU system of identifying water bodies. As a result, AUs that may have never been water quality limited were included in the TMDL. For example, Diamond Creek was included in the TMDL for sediment. When DEQ adopted the AU system, the following Diamond Creek AUs were included in the TMDL: ID17040207SK016_02, ID17040207SK016_02a, ID17040207SK016_02b, ID17040207SK016_02c, ID17040207SK016_02d, ID17040207SK016_02e, ID17040207SK016_02f, ID17040207SK016_02g, ID17040207SK016_02h, ID17040207SK016_02i, ID17040207SK016_03, and ID17040207SK016_03a. For sediment, an overall load capacity was set for all the AUs that make up Diamond Creek. Since Diamond Creek is now broken into 12 AUs, AUs that are supporting beneficial uses and not contributing excess sediment to Diamond Creek should be placed in Category 2 in the next Integrated Report as fully supporting beneficial uses.

4 Review of Implementation Plan and Activities

In 2006, DEQ assembled the *Blackfoot River TMDL Implementation Plan* (DEQ 2006) from the following participating stakeholders:

- Idaho Soil and Water Conservation Commission (ISWCC)
- Bureau of Land Management (BLM)
- Caribou–Targhee National Forest
- Idaho Department of Lands (IDL)
- Idaho Transportation Department (ITD)

ISWCC developed priorities and a time line for TMDL implementation on agricultural land in the Blackfoot River subbasin (Table 25 and Table 26).

Table 25. Critical areas for implementation activities by watershed or subwatershed in the Blackfoot River subbasin (DEQ 2006).

Priority	Watershed or Subwatershed	Implementation Tiers			
		Tier 1	Tier 2	Tier 3	Tier 4
		Riparian Acres	Crop and Pasture Acres	Range Acres	Animal Facilities
High	Wolverine Creek	250	9,700	9,440	4
	Lower Blackfoot River	843	18,599	1,835	5
Medium	Brush Creek	81	2,114	10,094	2
	Middle Blackfoot River	819	5,643	27,672	7
	Lanes Creek	3,408	1,813	24,949	3
	Upper Blackfoot River	1,676	9,206	20,175	15
Low	Slug Creek	512	3,992	8,145	8
	Diamond Creek	508	0	2,312	2
Total		8,942	52,660	129,483	55

Table 26. Estimated time line for TMDL agricultural implementation (DEQ 2006).

Task	Output	Milestone
Evaluate the project areas	Assessment report	2008
Develop conservation plans and contracts	Completed plans and contracts	2010
Finalize best management practice (BMP) designs	Completed BMP plans and designs	2012
Design and install approved BMPs	Certify BMP installations	2015
Track BMP installations	Implementation progress reports	2017
Evaluate BMP and project effectiveness	Complete project effectiveness reports	2020

IDL contributed to the implementation plan and outlined a time line to complete resource assessments of endowment grazing leases with the subbasin. IDL's resource assessment procedures included completing proper functioning condition estimates for all perennial streams on a lease. IDL planned to complete grazing management plans with the goal of achieving at least proper functioning condition status for all perennial streams. Tasks were identified to help achieve water quality standards on Idaho endowment lands (Table 27).

Table 27. Idaho Department of Lands implementation tasks for Idaho endowment lands (DEQ 2006).

Idaho Department of Lands	
Task	**Milestone**
Prepare grazing management planning units/allotments so that water quality standards will be met within a reasonable length of time.	One year following the completion of the review schedule listed in DEQ (2006).
Implement grazing management plans on management planning units/allotments.	Next year following development of grazing management plan.
Perform BMP/ grazing management review/inspection on selected management planning units/allotments	Annually in September/ October
Develop and implement site specific monitoring of selected management planning units/ allotments.	Annually

The BLM Pocatello Field Office identified the Blackfoot River, Wolverine Creek, and Jones Creek as high priority areas for TMDL implementation (Table 28). On the land surrounding these streams, BLM identifies three goals: (1) 80% streambank stability, (2) riparian/wetland areas moving towards proper functioning condition, and (3) 4-inch stubble height on key riparian species. On the lower Blackfoot River, riparian exclusionary fencing and off-site watering facilities were installed as outlined in Section 4.1 “Accomplished Activities.”

Table 28. BLM high priority streams in the Blackfoot River subbasin.

§303(d)-Listed Stream	BLM Length (miles)	Pollutant
Blackfoot River	22	Sediment, nutrients
Wolverine Creek	2	Sediment, nutrients
Jones Creek	0.5	Nutrients

Medium priority streams included Brush, Dry Valley, Lanes, Meadow, and Trail Creeks; BLM land encompasses less than 1 mile of each creek (Table 29). On these streams, goals were the same as for high priority streams in Table 28, but since BLM manages less stream length, implementation activities by other entities are needed to achieve water quality standards.

Table 29. BLM medium priority streams in the Blackfoot River subbasin.

§303(d)-Listed Stream	BLM Length (miles)	Pollutant
Brush Creek	0.3	Sediment
Dry Valley Creek	0.25	Sediment
Lanes Creek	0.25	Sediment
Meadow Creek	0.25	Sediment
Trail Creek	0.4	Sediment

The Caribou-Targhee National Forest also prepared a portion of the implementation plan (DEQ 2006). Streams included in the Blackfoot River subbasin TMDL (DEQ 2001) that are within the forest boundary include the Blackfoot River and Trail, Slug, Dry Valley, Maybe Canyon, Angus, Lanes, Bacon, Sheep, and Diamond Creeks. In the implementation plan, the Caribou-Targhee National Forest outlines how it is working with the county to reduce sediment inputs from the road through the Blackfoot River Narrows and along Trail Creek. The implementation plan stated that all actions have been implemented, and no action was scheduled or anticipated at the time for the Blackfoot River and Trail, Angus, Bacon, Sheep, or Diamond Creeks. Revised grazing standards were anticipated for Slug Creek. Contaminant releases to Dry Valley and Maybe Canyon Creeks were to be investigated and mimimized from the south Maybe Canyon and Dry Valley Mines. The implementation plan outlined Caribou-Targhee National Forest monitoring of bank stability and subsurface fines for each of the AUs within their boundaries.

IDL explained how it controls pollution from timber harvest through the BMPs outlined in the "Rules Pertaining to the Idaho Forestry Practices Act" (IDAPA 20.02.01). IDL also explained how it controls pollution from mining through BMPs identified in its Manual of Best Management Practices for the Mining Industry in Idaho (1992).

ITD outlined how it plans to reduce sediment inputs to the Blackfoot River subbasin in the implementation plan. ITD's environmental planner from District 5 attends Blackfoot River WAG meetings when they are invited. ITD spends approximately 5% to 10% of project costs on erosion and sediment control devices, mitigation, and monitoring.

4.1 Responsible Parties

Table 30 outlines the federal, state, and local governments, individuals, or entities that are involved in or responsible for implementing the Blackfoot River subbasin TMDL (DEQ 2001).

Table 30. Designated management agencies and their responsibility for implementing the Blackfoot River subbasin TMDL.

Designated Management Agency	Resource Responsibility
Idaho Soil and Water Conservation Commission	Agriculture
Bureau of Land Management	BLM Land
Caribou-Targhee National Forest	USFS Land
Idaho Department of Lands	State endowment lands, timber harvest, and mining
Idaho Department of Transportation	Roads

4.2 Accomplished and Planned Activities

Under the §319 grant program, projects to improve water quality have been implemented on the Blackfoot River. On the lower Blackfoot River (ID17040207SK002_05), subgrant S393 excluded 500–600 cattle from 520 acres of ranchland and implemented a prescribed grazing plan over 770 acres (DEQ 2014c). This project took place on BLM land and participants included Three Rivers Resource Conservation and Development Council, North Bingham Soil Conservation District, and Eastern Idaho Grazing Association. The total project budget was $218,747 of which $93,500 was contributed through §319 grant funding administered by DEQ. Two off-channel watering troughs have been installed and exclusionary fencing completed in 2010 prevents cattle from accessing the river. The project was originally intended to fence off portions of Brush Creek (ID17040207SK026_03), but the landowners decided not to complete this portion of the project. Fencing and watering troughs are being maintained by the Eastern Idaho Grazing Association, and a 2013 stream erosion control inventory (similar to SEI) estimated that 145 tons of sediment load were reduced (DEQ 2014c).

BLM has constructed a total of 17.8 miles of fence on along the Blackfoot River (ID17040207SK002_05) below the reservoir. These fences have excluded a total of 2,348 acres from grazing and cattle trespass and have protected 14.36 miles of river.

Under subgrant S430, 3,500 head of cattle will be excluded from the upper Blackfoot River (ID17040207SK010_04) and Slug Creek (ID17040207SK012_04). The project goal is to reduce the impact of four animal facilities on the Blackfoot River and Slug Creek by improving 2 miles of stream length and eliminating invasive weeds on 600 acres of range and pastureland. Off-site watering facilities will be installed and exclusionary fencing will be constructed. The project is scheduled to be completed by the end of 2015 (DEQ 2014d).

On Lanes Creek (ID17040207SK018_02e), the Upper Blackfoot Confluence with the Natural Resources Conservation Service (NRCS) has been working to exclude cattle and restore meanders and vegetation in areas degraded by grazing. Screens have been also been installed on diversions in Diamond and Lanes Creeks to reduce fish mortality and increase passage (Ashby 2014).

Trout Unlimited completed a restoration project on Sheep Creek (ID17040207SK022_03) within land owned by Bear Lake Grazing Company in 2014. Several new meander bends and pools were added to the project and multiple haul truckloads of willows and sedges were incorporated into every outside bend to help stabilize the banks. Additionally Trout Unlimited is working to screen Hunsaker and Allen diversions on the upper Blackfoot River (ID17040207SK010_05) within the next 3 years (2015–2018) (M. Woodard, Trout Unlimited, personal communication).

The NRCS has also been working with private landowners on numerous projects since 2004 in the upper Blackfoot River watershed including stream restoration projects, implementing livestock grazing plans, offsite water developments, use exclusions, noxious weed management plans, and permanent Grassland Reserve and Wetland Reserve Easements (L. Mickelsen, NRCS, personal communication). Agricultural conservation practices implemented in the Blackfoot River were summarized by the ISWCC and are presented in Table 31. Additionally, there are currently 25,609 acres of land in the Blackfoot watershed under the Conservation Reserve Program administered by the Farm Service Agency (G. Hitz, ISWCC, personal communication).

Table 31. Accounting of agricultural conservation practices implemented by the FSA, NRCS, and ISWCC in the Blackfoot River watershed.

	Tier 1 (Riparian)	Tier 2 (Crop & Pasture)	Tier 3 (Range)	Tier 4 (Animal Facilities)
Fencing (ft)	29,894	842	10,574	--
Planting (ac)	--	100	168	--
Critical Area Planting (ac)	7	--	--	--
Prescribed Grazing (ac for 1yr period)	5,431	28	15,647	--
Rotation of Livestock Supplement and Feeding Areas (ac.)	--	524	662	--
Brush Manangement (ac.)	--	--	6,877	--
Livestock Watering Facility (no.)	32	--	41	--
Waste Storage (no.)	--	--	--	20
Streambank & Shore Protection (ft)	19,668	--	--	--
Dam,Diversion (no.)	1	--	--	--

	Tier 1 (Riparian)	Tier 2 (Crop & Pasture)	Tier 3 (Range)	Tier 4 (Animal Facilities)
Diversion (ft)	2,945	--	--	--
Grade Stabilization Structure (no.)	154	--	--	--
Structure for Water Control (no.)	2	--	--	--
Irrigation - Flood to Sprinkler (ac)	--	102	--	--
Irrigation Water Management (ac./1yr period)	--	475	--	--
Heavy Use Area Protection (ac.)	--	--	500	--
Pest Management (ac.)	1,901	28	2,581	--
Stream Habitat Improvement and Management (ac.)	3	--	--	--
Use Exclusion (ac.)	487	--	--	--
Channel Bank Vegetation (ac.)	5	--	--	--
Permanent Conservation Easement (ac.)	728	--	--	--
Channel Stabilization (ft.)	1,390	--	--	--
Pipeline (ft.)	36,176	2,404	56,234	--
Spring Development (no.)	13	--	--	--
Nutrient Management (ac.)	--	28	--	--

4.3 Future Strategy and Time Frame

DEQ will continue to work with landowners and federal and state agencies to improve water quality in the Blackfoot River subbasin. To address sediment pollution, the major concern in the watershed, BMPs must be implemented on private and state land more aggressively. SEIs completed in 2014 document that most AUs with sediment TMDLs are still impacted by unstable banks, mostly because of livestock grazing. AUs on private and state lands had significantly lower bank stability than AUs on USFS land. IDL should work with lessees to develop proposed management plans demonstrating that bank stability will be increased and streambank alteration will be reduced on endowment lands that include water bodies with sediment TMDLs. DEQ should use §319 funds to improve stream conditions on private land as well. Additional management strategies on State Endowment and private lands, needs to occur so that AUs with TMDLs are moving towards support of beneficial uses. This support will be assessed by DEQ's ambient water quality monitoring program (BURP) and other water quality measurements taken by DEQ.

5 Summary of Five-Year Review

5.1 Review Process

For the 5-year review, DEQ data were the primary source of information. BURP data were used to assess the current biological condition of AUs included in the Blackfoot River subbasin TMDL (DEQ 2001). SEIs, McNeil core samples for sediment, and water quality data were used to assess if TMDL targets are being met. The Caribou-Targhee National Forest contributed McNeil core samples for sediment, SEIs, and MIM data, which was incorporated into our assessments of current conditions in AUs with TMDLs. Trout Unlimited provided information about projects conducted for the Upper Blackfoot Confluence. Resource and workload constraints at IDL did not allow for a timely contribution to DEQ of data on lands under their jurisdiction.

5.2 Changes in Subbasin

Water quality has not significantly improved in the Blackfoot River subbasin since the TMDL (DEQ 2001) was approved in 2002. In most cases, AUs under the TMDL are not supporting beneficial uses such as cold water aquatic life, and excess bank erosion is still contributing to sedimentation in many AUs. AUs contained on state and private lands are the most severely impacted. Seven AUs have BURP scores that indicate the beneficial uses are being supported, and these AUs should be removed from Category 4a and placed in Category 2 if they are not on the §303(d) list for other pollutants. These AUs are tributaries to Diamond Creek: Upper Diamond Creek (ID17040207SK016_02a) and Bear Canyon (ID17040207SK016_02c) and tributaries to Lanes Creek: Lanes Creek (ID17040207SK018_02a) and Daves Creek (ID17040207SK018_02b). Upper and Middle Sheep Creek (ID17040207SK022_02 and ID17040207SK022_03a) also has BURP scores that indicate cold water aquatic life is being supported. Based on proposed changes to the boundaries of these AU in the 2014 Integrated Report, we recommend moving these AUs to Category 2. Wolverine Creek (ID17040207SK030_02) is also supporting beneficial uses and should be moved to Category 2.

5.3 TMDL Analysis

The Blackfoot River subbasin TMDL (DEQ 2001) included targets for sediment and nutrients. Sediment targets were set with a surrogate measure of streambank stability of 80% or greater. Additionally, subsurface fine sediment targets were set for areas of salmonid spawning. Nutrient TMDLs were set at 0.1 mg/L TP and 0.3 mg/L TIN. Since no point sources received a load allocation in the TMDL, these targets seem valid. In the Blackfoot River subbasin, excess sedimentation is mostly the result of bank erosion caused by livestock. Excess phosphorus in water bodies in the Blackfoot River watershed is linked to excess sedimentation. We cannot determine if these targets are appropriate to support beneficial uses since they mostly have not been achieved in the Blackfoot River subbasin due to lack of adequate implementation. In addition, implementation practices that have been put in place and maintained may not have had sufficient time for hydrologic and biologic processes to fully recover those stream reaches. Table 32 summarizes recommended changes for the AUs reviewed.

Table 32. Summary of recommended changes for AUs reviewed.

Stream Name	Assessment Unit Number	Pollutant	Recommended Changes to Next Integrated Report	Justification
Blackfoot River	ID17040207SK010_04	Temperature, dissolved oxygen, sediment	Keep in Category 4a for sediment and temperature. Removed from Category 5 for dissolved oxygen and list as an observed effect of temperature.	Temperature TMDL completed in Blackfoot River subbasin TMDL addendum[a] and serves as surrogate of dissolved oxygen.
Upper Diamond Creek	ID17040207SK016_02a	Sediment	Delist from Category 4a for sediment and keep in Category 5 for temperature and *E.coli.*	BURP 2007 data indicate full support of CWAL. SEI (2014) indicates stability targets are being met. AU incorporated into Diamond Creek TMDL because Blackfoot River subbasin TMDL[b] was approved (2002) before DEQ began using AU system.
Bear Canyon Creek	ID17040207SK016_02c	Sediment	Delist from Category 4a and move to Category 2.	BURP data indicate full support of CWAL. SEI indicates streambanks are meeting 80% stability target. AU was incorporated into Diamond Creek TMDL because Blackfoot River subbasin TMDL was approved (2002) before DEQ began using AU system. AU is fully supporting beneficial uses.
Lanes Creek	ID17040207SK018_02a	Sediment	Delist from Category 4a and move to Category 2.	BURP data indicate full support of CWAL. USFS 2014 data indicate streambank stability and subsurface fine sediment targets are being met. MIM 2013 data indicate streambank alteration and percent streambed fines are low. AU was incorporated into the Blackfoot River subbasin TMDL because AU system was not yet in place. AU fully supports CWAL.
Daves Creek	ID17040207SK018_02b	Sediment	Delist from Category 4a and move to Category 2.	BURP data indicate full support of CWAL. SEI indicates streambanks are meeting 80% stability target. AU was incorporated into Blackfoot River subbasin TMDL because AU system was not yet in place.

Stream Name	Assessment Unit Number	Pollutant	Recommended Changes to Next Integrated Report	Justification
Upper Sheep Creek	ID17040207SK022_02	Sediment, selenium, temperature	Delist from Category 4a for sediment. Delist from Category 5 for selenium and temperature. Move to Category 2.	BURP data indicate full support of CWAL. DEQ SEI data indicate streambank stability targets are being met and there are no other sources of excess sedimentation. AU is not impaired by excess sedimentation and should be delisted for sedimentation/siltation. Selenium exceedances are caused by inputs from South Fork Sheep Creek (ID17040207SK022_02a) below the boundary on this AU. Exceedances of selenium criteria have not been documented in this AU. There is no continuous temperature data to suggest impairment and the temperature listing was applied in error.
Middle Sheep Creek	ID17040207SK022_03a	Sediment, selenium	Delist from Category 4a for sediment. Delist from Category 5 for selenium. Move to Category 2.	BURP data indicate full support of CWAL. DEQ SEI and USFS data indicate streambank stability targets are being met and there are no other sources of excess sedimentation. AU is not impaired by excess sedimentation and should be delisted for sedimentation/siltation. Selenium exceedances are caused by inputs from South Fork Sheep Creek (ID17040207SK022_02a) below the newly proposed boundary on this AU. Exceedances of selenium criteria have not been documented in this AU above South Fork Sheep Creek.
Wolverine Creek	ID17040207SK030_02	Sediment	Delist from Category 4a for sediment and move to Category 2.	BURP data indicate full support of CWAL. SEI indicates bank stability targets are nearly being met (78% stability).

a. *Blackfoot River Subbasin Assessment and Total Maximum Daily Loads: 2013 Addendum* (DEQ 2013a)
b. *Blackfoot River TMDL Waterbody Assessment and Total Maximum Daily Load* (DEQ 2001)
Notes: total maximum daily load (TMDL); Beneficial Use Reconnaissance Program (BURP); cold water aquatic life (CWAL); *Escherichia coli* (*E. coli*) streambank erosion inventory (SEI); US Forest Service (USFS); multiple indicator monitoring (MIM)

5.4 Review of Beneficial Uses

Only a small fraction of AUs in the Blackfoot River subbasin have designated beneficial uses in Idaho's water quality standards. When beneficial uses are not designated, DEQ presumes they should support cold water aquatic life and recreation. In the most recent Integrated Report (DEQ 2014a), just 8 of 126 AUs in the Blackfoot River subbasin are included as fully supporting beneficial uses. DEQ plans to designate AUs for salmonid spawning using the report, *Geography and Timing of Salmonid Spawning in Idaho* (Miller et al. 2014). The report was used to identify water bodies where McNeil core samples would be taken for the 5-year review.

5.5 Water Quality Criteria

No water quality criteria have changed that affect the Blackfoot River subbasin TMDL (DEQ 2001). AUs received TMDLs for pollutants that only have narrative water quality criteria. More research is needed to assess if targets for subsurface fine sediments in spawning habitats can be achieved in the Blackfoot River subbasin given its underlying geology and soil type. Unfortunately, few unimpaired water bodies exist to use as a reference for this type of study.

5.6 Watershed Advisory Group Consultation

The Blackfoot River watershed advisory group (WAG) consists of twenty one members representing state and federal government, agriculture, industry, and nonprofit organizations. This group was contacted via email on April 27, 2015. A draft of the 5-year review was provided to them for their input and comment. Comment was received from Dean Smith of the NRCS. He suggested that NRCS projects be included in the review and his comments were incorporated. Other members of the WAG provided information throughout the review process.

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