

Bear River Basin

**Addendum to the Bear River/Malad Subbasin Assessment and Total Maximum Daily
Load Plan for HUCs 16010102, 16010201, 16010202, 16010204**



Department of Environmental Quality

July 2011

Revised February 2013

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Bear River Basin Total Maximum Daily Load

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Daily Load Plan for HUCs 16010102, 16010201, 16010202, 16010204**

July 2011
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Acknowledgments

This addendum was completed with the help and guidance of the DEQ Pocatello Regional Office surface water quality staff and the Bear River Basin Advisory Group. Idaho Association of Soil and Water Conservation District provided water quality monitoring data on Co-Op Creek and Dairy Creek. Steven Smith of the Soil Conservation Commission provided insight, expertise and assisted with land access. The City of Soda Springs provided additional instream nutrient data from the Bear River near their waste water treatment facility. The City of Grace provided additional discharge flow information for their waste water treatment plant.

DEQ appreciates these contributions to the Bear River Basin TMDL Addendum.

Cover photo was provided by Idaho Department of Environmental Quality and was taken in September 2006 below the Oneida Reservoir in the Oneida Narrows.

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Abbreviations, Acronyms, and Symbols

§303(d)	Refers to section 303 subsection (d) of the Clean Water Act, or a list of impaired water bodies required by this section	cm	centimeters
μ	micro, one-one thousandth	CWA	Clean Water Act
§	Section (usually a section of federal or state rules or statutes)	CWAL	cold water aquatic life
ADB	assessment database	DEQ	Department of Environmental Quality
AFO	animal feeding operation	DO	dissolved oxygen
AU	assessment unit	DOP	dissolved orthophosphorus
AWS	agricultural water supply	DWS	domestic water supply
BAG	Basin Advisory Group	ECC	Environmental Coordination Committee
BLM	United States Bureau of Land Management	EPA	United States Environmental Protection Agency
BMP	best management practice	F	Fahrenheit
BU	beneficial use	FPA	Idaho Forest Practices Act
BURP	Beneficial Use Reconnaissance Program	GIS	Geographical Information Systems
C	Celsius	HUC	Hydrologic Unit Code
CAFO	confined animal feeding operation	I.C.	Idaho Code
CFR	Code of Federal Regulations (refers to citations in the federal administrative rules)	IDAPA	Refers to citations of Idaho administrative rules
cfs	cubic feet per second	IDL	Idaho Department of Lands
		LA	load allocation
		LC	load capacity
		m	meter

m³	cubic meter	TMDL	total maximum daily load
mi	mile	TP	total phosphorus
mi²	square miles	TSS	total suspended solids
mg/L	milligrams per liter	t/y	tons per year
mm	millimeter	U.S.	United States
MOS	margin of safety	U.S.C.	United States Code
n.a.	not applicable	USDA	United States Department of Agriculture
NA	not assessed	USFS	United States Forest Service
NB	natural background	USGS	United States Geological Survey
NPDES	National Pollutant Discharge Elimination System	WAG	Watershed Advisory Group
NRCS	Natural Resources Conservation Service	WBAG	<i>Water Body Assessment Guidance</i>
NTU	nephelometric turbidity unit	WLA	wasteload allocation
PCR	primary contact recreation	WQS	water quality standard
SBA	subbasin assessment	WWTP	waste water treatment plant
SCR	secondary contact recreation		
SFI	DEQ's Stream Fish Index		
SHI	DEQ's Stream Habitat Index		
SMI	DEQ's Stream Macroinvertebrate Index		
SS	salmonid spawning		
SSC	Suspended Sediment Concentration		
TKN	total Kjeldahl nitrogen		

Executive Summary

This TMDL analysis has been developed to address the water bodies in the Bear River Basin that are on Idaho's §303(d) list and that were not addressed in the original Bear River Basin TMDL approved in June 2006. Additionally, this assessment includes an evaluation of current mainstem Bear River water quality and includes revised wasteload allocations for the 6 municipal point source dischargers in the basin.

This document only addresses the aforementioned waters and municipal point source dischargers. It supercedes Section 3.4.1 of the 2006 TMDL. Additionally, load analyses in Tables 10, 11, 12, 13 and 16 replace those in Table 1-4 of the 2006 TMDL. For more information about the Bear River Basin (an assessment describing the physical, biological, and cultural setting; water quality status; pollutant sources; and recent pollution control actions in the Bear River Basin, located in southeastern Idaho; Figure 1), see the *Bear River / Malad River Subbasin Assessment and Total Maximum Daily Load Plan* that was approved by the EPA in 2006. An electronic version of this document is available on the Idaho DEQ webpage at: www.deq.idaho.gov/bear-river-basin-malad-river-subbasin.

Regulatory Requirements

This document has been prepared in accordance with federal and state regulations, as described in the following.

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



Figure 1. Bear River Basin Location.

Bear River Basin at a Glance

The *Bear River Basin*, which is located in northeastern Utah, southeastern Idaho, and southwestern Wyoming, comprises 7,500 square miles of mountain and valley lands including 2,700 in Idaho, 3,300 in Utah, and 1,500 in Wyoming. The Bear River crosses state boundaries five times and is the largest river in the western hemisphere that does not empty into an ocean. It ranges in elevation from 4,211 to over 13,000 feet and is unique as it is entirely enclosed by mountains, thus forming a huge basin with no external drainage outlets. The Bear River is the largest tributary to the Great Salt Lake. Figure 1 illustrates the Bear River Basin.

The original Bear River Basin SBA/TMDL focused on the Idaho portion of the Bear River from the Idaho-Wyoming line to the Idaho-Utah state line and included numerous tributary waters as well as the mainstem Bear River. Approximately 170 of 550 mainstem Bear River miles are in the Idaho portion of the basin.

There are five subbasins that make up Bear River Basin in Idaho (Figure 2). These include: Central Bear (HUC #16010102); Bear Lake (HUC #16010201); Middle Bear (HUC #16010202); Little Bear-Logan (HUC #16010203); and Lower Bear-Malad (HUC #16010204). The Little Bear-Logan subbasin does not contain waters evaluated in this document.

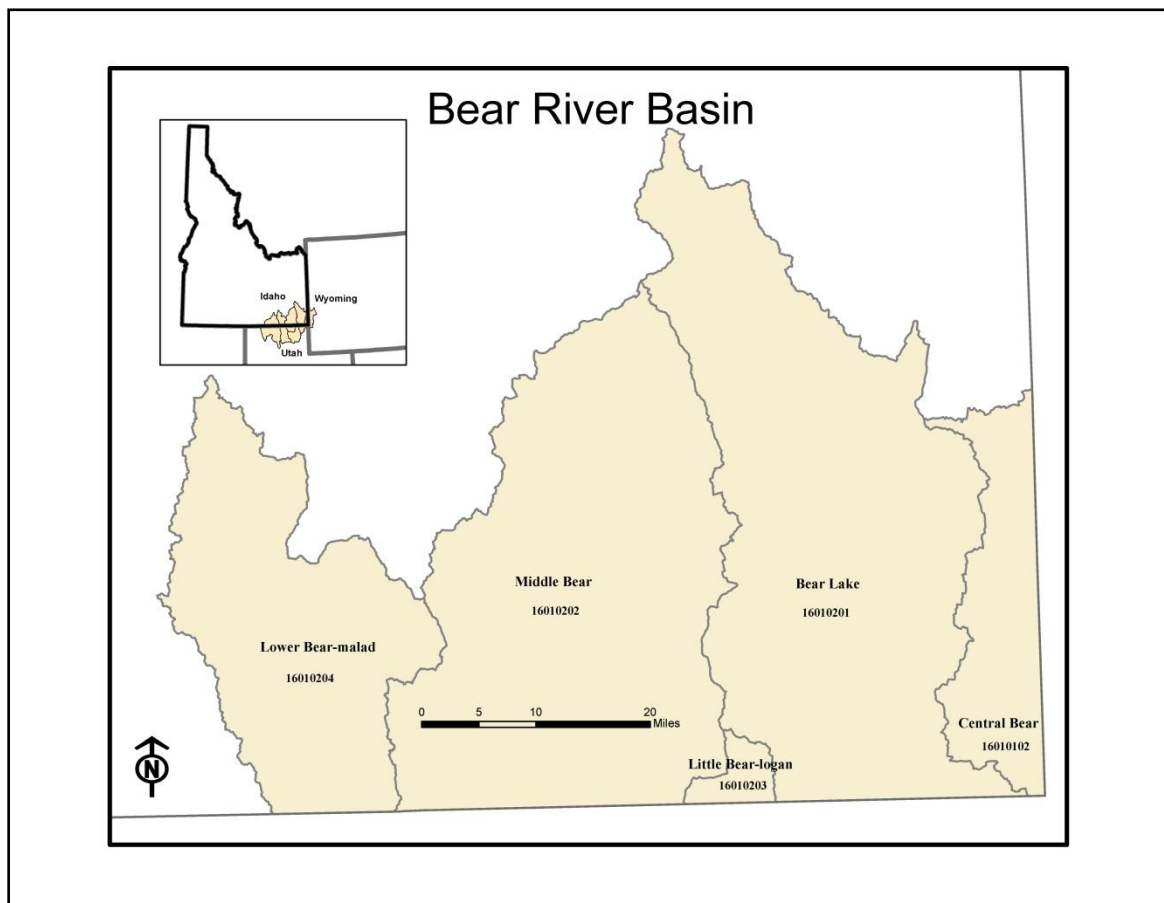


Figure 2. Location of Bear River Basin Subbasins in Idaho.

Key Findings

During development of the original Bear River Basin Assessment and TMDL, there were several streams with identified data gaps. At the time, sufficient data did not exist for the full development of load allocations. Dry Creek, Dairy Creek, Preuss Creek, Snowslide Creek, Co-op Creek, Strawberry Creek, and Dairy Creek were provisionally deferred for TMDL development at a later date. One of the purposes of this TMDL Addendum is to address those waterbodies. Table 1 provides a list of the 2010 303(d) listed segments that were not addressed as part of the original Bear River Basin SBA/TMDL. 2010 303(d) listed waterbodies that are not carryover from the 2002 303(d) list will be addressed at a later date. The purpose of this document is to address those waterbodies specifically identified and committed for TMDL development in the original Bear River Basin SBA/TMDL. Additionally, this Addendum revises wasteload allocations for six municipal wastewater treatment plants located in the Bear River Basin (see also Table 1).

Table 1. 2010 §303(d) Segments in the Bear River Basin addressed in the Addendum.

Water Body Name	Assessment Unit ID Number	§2010 303(d) Boundaries	Pollutants	Listing Basis
Bear River	ID16010201BR002_06	Ovid Cr confluence to Alexander Reservoir	Total suspended solids, Total phosphorus	Carried forward to 2010 IR
Bear River	ID16010202BR009_06	Alexander Reservoir Dam to Densmore Creek	Total phosphorus	Carried forward to 2010 IR
Cub River	ID16010202BR002_04	Maple Cr to Border	Total phosphorus	Carried forward to 2010 IR
Worm Cr	ID16010202BR005_02b	Glendale Reservoir to Border	Total phosphorus	Carried forward to 2010 IR
Dry Creek	ID16010102BR005_02	Dip Creek to Thomas Fk.	Sedimentation/siltation, Cause unknown	Low BURP Score
Dry Creek	ID16010102BR005_02a	(including Dip Creek) to USFS boundary	Sedimentation/siltation	Low BURP Score
Preuss Creek	ID16010102BR006_02	USFS boundary to Geneva ditch	Sedimentation/siltation	Low BURP Score
Beaver Creek	ID16010102BR006_02a	headwaters to Preuss Creek	Combined biota/habitat bioassessments	Low BURP Score
Preuss Creek	ID16010102BR006_02b	(includes Fish Creek) headwaters to USFS boundary	Sedimentation/siltation	Low BURP Score
Co-Op Creek	ID16010201BR008_02	Source to mouth	Sedimentation/siltation, Total phosphorus	Low BURP Score
Upper Co-Op Creek	ID16010201BR008_02a	Source to mouth	Sedimentation/siltation, Total phosphorus	Low BURP Score
Snowslide Creek	ID16010201BR020_02f,	lower	Combined biota/habitat bioassessments	Low BURP Score
Snowslide Creek	ID16010201BR021_02	Source to mouth	Sedimentation/siltation	Low BURP Score
Strawberry Creek	ID16010202BR007_02a	Headwaters to Mink Creek	Sedimentation/siltation, Fishes Bioassessment, Habitat Assessment	Low BURP Score
Dairy Creek	ID16010204BR011_02	Source to mouth	Combined biota/habitat bioassessments	Low BURP Score
Dairy Creek	ID16010204BR011_03	Source to mouth	Sedimentation/siltation	Low BURP Score

Since approval of the original TMDL, adequate data has been collected to complete an assessment and development of load allocations for the aforementioned streams, except sediment/siltation in Dairy Creek (ID16010204BR011_03). Table 2 provides a summary of assessment outcomes and recommended changes to the §303(d) list as a result of this TMDL addendum.

Table 2. Summary of assessment outcomes.

Water Body	Assessment Units	Listed Pollutant	TMDL(s) Completed	TMDL Type	Recommended Changes to the Next Integrated Report	Justification
Bear River – Ovid Cr confluence to Alexander Reservoir	ID16010201BR002_06	Total suspended solids, Total phosphorus	Total phosphorus, Total suspended solids (TSS)	Revised	Retain in 4a	Revised TMDL, WLAs for Montpelier, Georgetown, Soda
Bear River – Alexander Reservoir Dam to Densmore Creek	ID16010202BR009_06	Total suspended solids, Total phosphorus	Total phosphorus	Revised	Retain in 4a	Revised TMDL, WLA for Grace
Cub River – Maple Cr to Border	ID16010202BR002_04	Total suspended solids, Total phosphorus	Total phosphorus	Revised	Retain in 4a	Revised TMDL, WLA for Franklin
Worm Cr – Glendale Reservoir to Border	ID16010202BR005_02b	Sedimentation/siltation, Total phosphorus	Total phosphorus	Revised	Retain in 4a	Revised TMDL, WLA for Preston
Dry Creek – Dip Creek to Thomas Fk.	ID16010102BR005_02,	Sedimentation/siltation, Cause unknown	Bank stability (sediment), Total Phosphorus	New	Move to 4a of Integrated Report, Delist Cause Unknown and replace with TP	TMDLs Completed, Cause unknown determined to be TP
Dry Creek (including Dip Creek) to USFS boundary	ID16010102BR005_02a	Sedimentation/siltation	Bank stability (sediment), Total Phosphorus	New	Move to 4a of Integrated Report	TMDLs Completed, though unlisted for TP, TP determined to be impairment
Preuss Creek USFS boundary to Geneva ditch	ID16010102BR006_02	Sedimentation/siltation	Bank stability (sediment)	New	Move to 4a of Integrated Report	TMDL Completed
Beaver Creek – headwaters to Preuss Creek	ID16010102BR006_02a	Combined biota/habitat bioassessments	Bank stability (sediment)	New	Move to 4a of Integrated Report, Delist Combined Biota/Habitat Bioassessments and replace with Sediment	TMDL Completed
Preuss Creek (includes Fish Creek) headwaters to USFS boundary	ID16010102BR006_02b	Sedimentation/siltation	Bank stability (sediment)	New	Move to 4a of Integrated Report	TMDL Completed
Co-Op Creek – source to mouth	ID16010201BR008_02	Sedimentation/siltation, Total phosphorus	None	N/A	Delist for sediment and TP and move to 4c of Integrated Report for low flow alterations	Flaws in original listing. BURP data shows Full support, lower reach dewatered due to irrigation withdrawals.

Water Body	Assessment Units	Listed Pollutant	TMDL(s) Completed	TMDL Type	Recommended Changes to the Next Integrated Report	Justification
Upper Co-Op Creek	ID16010201BR008_02a	Sedimentation/siltation, Total phosphorus	None	N/A	Delist for sediment and TP and move to 2 of Integrated Report	Flaws in original listing. BURP data shows support, lower reach de-watered due to irrigation withdrawals.
Snowslide Creek -lower	ID16010201BR020_02f	Combined biota/habitat bioassessments	Bank stability (sediment)	New	Delist Combined biota/Habitat bioassessments and replace with Sediment. Move to 4a of Integrated Report	TMDL Completed, though unlisted for sedimentation/siltation, sediment determined to be impairment
Snowslide Creek – source to mouth	ID16010201BR021_02	Sedimentation/siltation	Bank stability (sediment)	New	Move to 4a of Integrated Report	TMDL Completed
Strawberry Creek	ID16010202BR007_02a	Fishes Bioassessments, Habitat Assessment, Sedimentation/siltation	Bank stability (sediment), Total Phosphorus	New	Move to 4a of Integrated Report, Delist Fishes Bioassessments and Habitat Assessment	TMDLs Completed, though unlisted for TP, TP determined to be impairment
Dairy Creek	ID16010204BR011_02	Combined biota/habitat bioassessments	None	N/A	Delist Combined biota/habitat bioassessments. Move to 3 of Integrated Report	Unassessed -2005, 2008 BURP sites dry
Dairy Creek	ID16010204BR011_03	Sedimentation/siltation	Total Phosphorus	New	Retain in 5 for further assessment of sediment. Move to 4a for TP	TSS not found to be impairing AU, TMDL Completed, though unlisted for TP, TP determined to be impairment

Dry Creek, a tributary to Thomas Fork is on the §303(d) list for nutrients and sedimentation/siltation (Figure 3). In the original Bear River Basin SBA/TMDL data were not sufficient for a load analysis of either sediment or nutrients; therefore no TMDLs were completed in 2006. Water chemistry was measured on Dry Creek in June and October 2006. Based on these data, a 1% reduction in total phosphorus is recommended during spring runoff and a 0% reduction is prescribed during base flow. TSS measurements for these two monitoring events were not utilized in the development of a load allocation since more extensive streambank and depth fine data were available. Streambank and substrate conditions indicate that sediment is a pollutant of concern in Dry Creek. Streambank erosion inventories conducted in 2008 showed that streambanks on Dry Creek were 44% erosive and depth fines yielded a result of 48.66% fine material in streambed substrate where salmonid spawning is most likely to occur. Therefore, a 54% reduction in streambank erosion is recommended in this TMDL.

Preuss Creek, a tributary to Thomas Fork is on the §303(d) list for habitat alteration and sedimentation/siltation (Figure 3). Like flow alteration, habitat alteration is not considered a pollutant therefore a TMDL was not written for that impairment. In 2006 data were not sufficient for a load analysis of sediment; therefore no TMDL was calculated. In 2008 DEQ staff collected data on the condition of streambanks on Preuss Creek and determined that the banks were 24% stable (76% unstable), well below the established target of 80% stable. A load allocation of 437 tons per year was assigned which calls for a 74% reduction in sediment from streambank erosion.

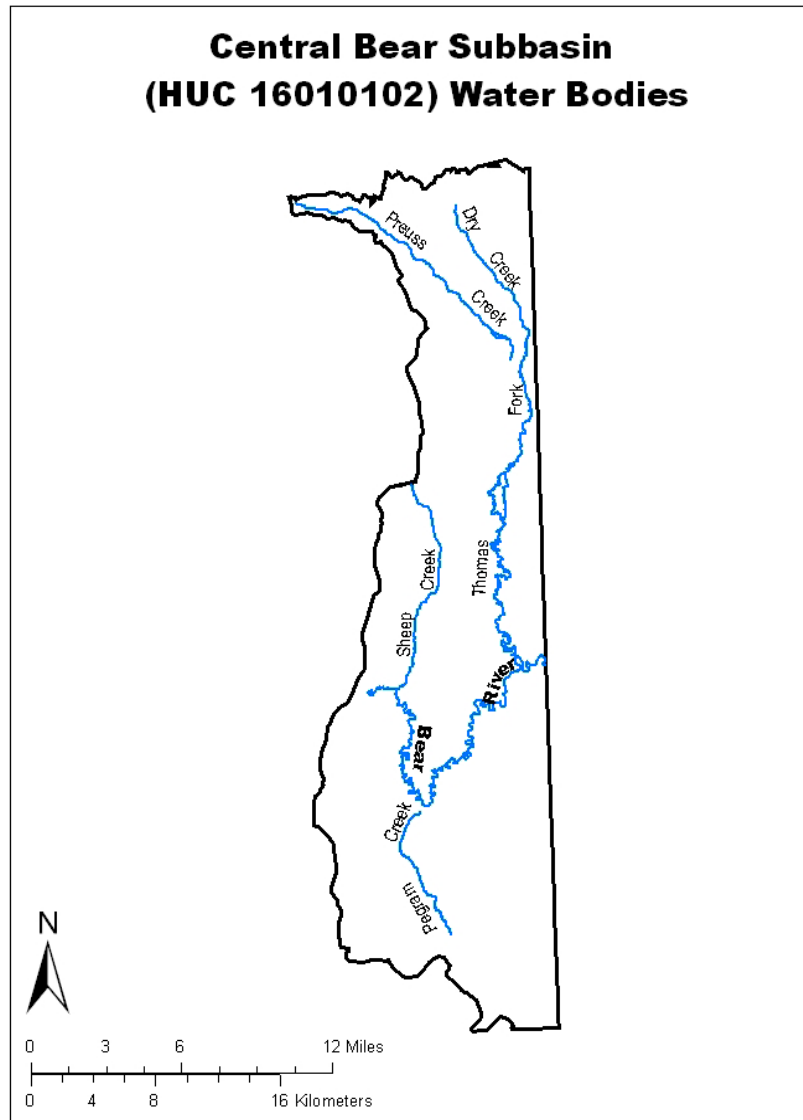


Figure 3. Central Bear Subbasin waterbodies.

Snowslide Creek, a tributary to Montpelier Creek is listed for sedimentation/siltation (Figure 4). In 2006 data were not sufficient for a load analysis of sediment; therefore no TMDL was calculated. To develop a load analysis, streambank erosion data were collected in 2009. Results indicated streambanks were 46% percent erosive along most of the stream and 80% unstable in an isolated segment in the middle of the stream. Depth fine measurements were taken in 2009 and bottom substrate showed 49 % fine material. The load allocation is 58 tons/year of sediment from Snowslide Creek. The current load is 177 tons/year.

Co-Op Creek, a tributary to Stauffer Creek is listed for nutrients and sedimentation/siltation (Figure 4). In 2006 data were not sufficient for a load analysis of either sediment or nutrients; therefore no TMDLs were calculated. Assessment of BURP data show that that the stream supports beneficial uses above a major water diversion upstream of Nounan Road (AU ID16010201BR008_02a). BURP data below this diversion (AU ID16010201BR008_02), indicate that the stream was dewatered at the time of the BURP assessments. Based on this

information, there were flaws in the original listing for both the upper (ID16010201BR008_02a) and lower (ID16010201BR008_02) sections of the stream. It is proposed that both of the AU's associated with this stream be delisted. The upper AU should be delisted based on flaws in the original listing because it supports beneficial uses based on BURP data and the lower delisted for nutrients and sediment and re-listed with low flow alterations as the cause of impairment. Additionally, data were collected on Co-Op Creek by the IASCD in 2008 and on two occasions by the DEQ in 2006 (June and October). In all 12 monitoring events, water quality targets for TSS and TP were not exceeded. These findings further suggest that Co-Op Creek should not be on the 303(d) list for sediment and nutrients.

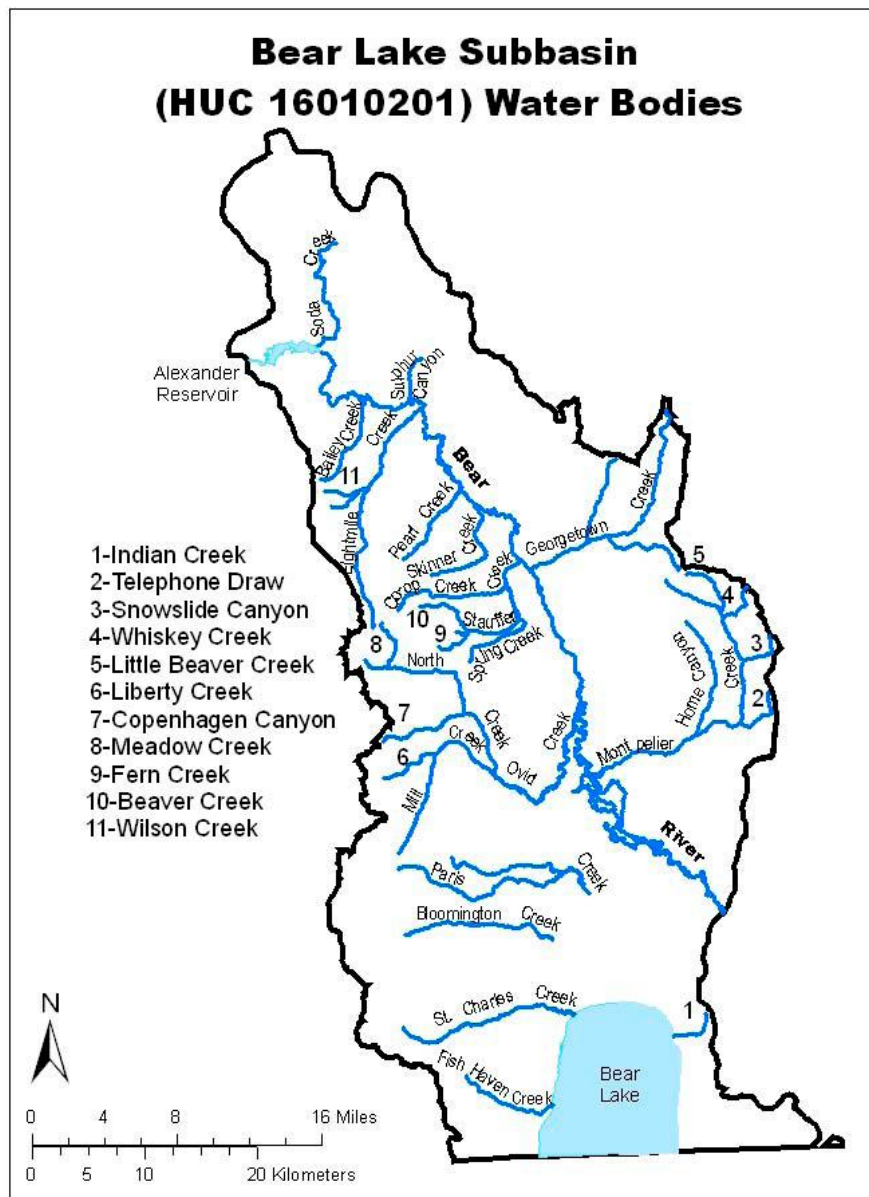


Figure 4. Bear Lake Subbasin waterbodies.

Strawberry Creek, a tributary to Mink Creek is on the 2010 §303(d) list for sedimentation/siltation (Figure 5). Assessment of BURP data indicates the stream is not supporting its beneficial uses. In 2006 data were not sufficient for a load analysis of sediment, nutrients, or any other possible pollutant; therefore, no TMDL was developed. In June and October 2006 DEQ collected water column data and results showed that the TP and TSS targets were exceeded during spring runoff. To further assess the stream, DEQ collected streambank erosion and subsurface fines data in 2009. These results indicate exceedances in the target value for depth fines in spawning habitat in three locations (upper, middle, lower) and streambank conditions exceeded the target value in the lower reach of the stream. Based on these data, a 75% reduction in streambank erosion in prescribed areas was recommended. Although Strawberry Creek is unlisted for TP, further analyses of data indicate it is impaired by TP. A 46% reduction in TP is called for during spring runoff.

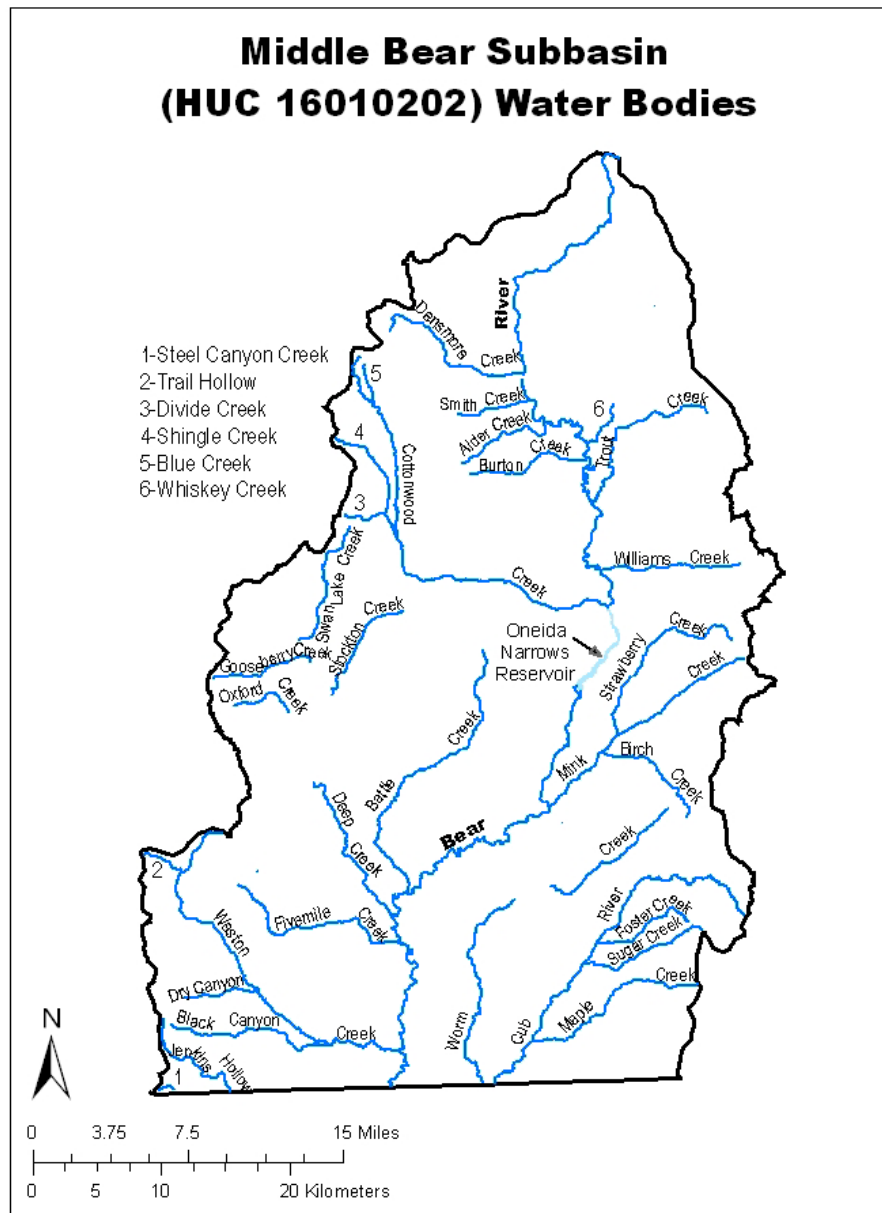


Figure 5. Middle Bear Subbasin Waterbodies.

Dairy Creek, a tributary to Wright Creek is on the §303(d) list for combined biota/habitat bioassessments and sedimentation/siltation (Figure 6). The 2nd order assessment unit (ID16010204BR011_02) is presently listed for combined biota/habitat bioassessments; however, BURP sites in this assessment unit were dry in 2005 and 2008. Therefore the AU could not be assessed and will be moved to Category 3 of the next Integrated Report.

Assessment of BURP data confirms that the 3rd order assessment unit (ID16010204BR011_03; listed for sediment/siltation) of Dairy Creek is not supporting beneficial uses. In 2006, data were not sufficient for load analyses of sediment, nutrients, or any other possible pollutant; therefore, no TMDL was calculated. To develop a load analysis,

water column data were collected by the IASCD in 2005 and 2006. The stream was monitored 28 times and of those 28 events, the TP target was exceeded 64% of the time and TSS concentrations never exceeded the target value. Even under base flow conditions, exceedingly high concentrations of dissolved orthophosphorus were present. Therefore, although Dairy Creek is not on the §303(d) list for TP, it is impaired by TP. Based on these data a 42% reduction in TP is called for during high flow and a 34% reduction in TP is prescribed during base flow conditions. Since TSS targets were not exceeded, a reduction in water column sediment is not recommended in this TMDL. Further investigation is necessary to determine if a sediment problem remains in Dairy Creek.

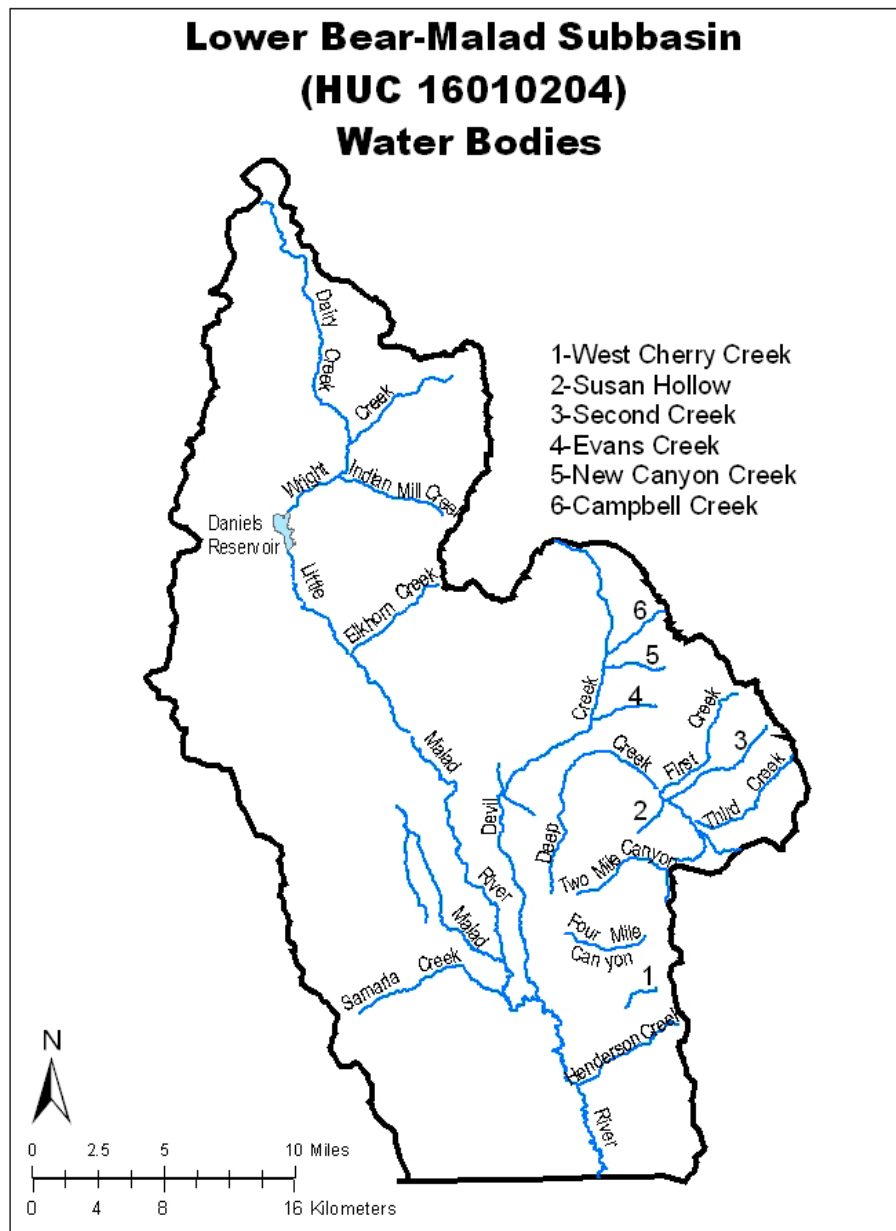


Figure 6. Malad River Subbasin waterbodies.

There are six municipal wastewater dischargers in the Bear River Basin; Montpelier, Georgetown, Soda Springs, Grace, Preston, and Franklin (Figure 7). As part of this review, current (generally the past 5 years) available data from discharge monitoring reports (DMRs), the Tri-State Water Quality Monitoring program, and municipalities were analyzed in order to revise wasteload allocations. Based on Bear and Cub River data, these water bodies are generally meeting TMDL total phosphorus targets. Wastewater treatment plant (WWTP) discharges to these waterbodies are not presently impacting water quality to an extent that reductions will be required. Present wasteloads from Montpelier, Georgetown, Soda Springs, Grace, and Franklin are recommended as target wasteload allocations. Data from Worm Creek at Preston indicate this waterbody is not meeting TMDL targets for total phosphorus; therefore, a wasteload reduction will be necessary at this WWTP.

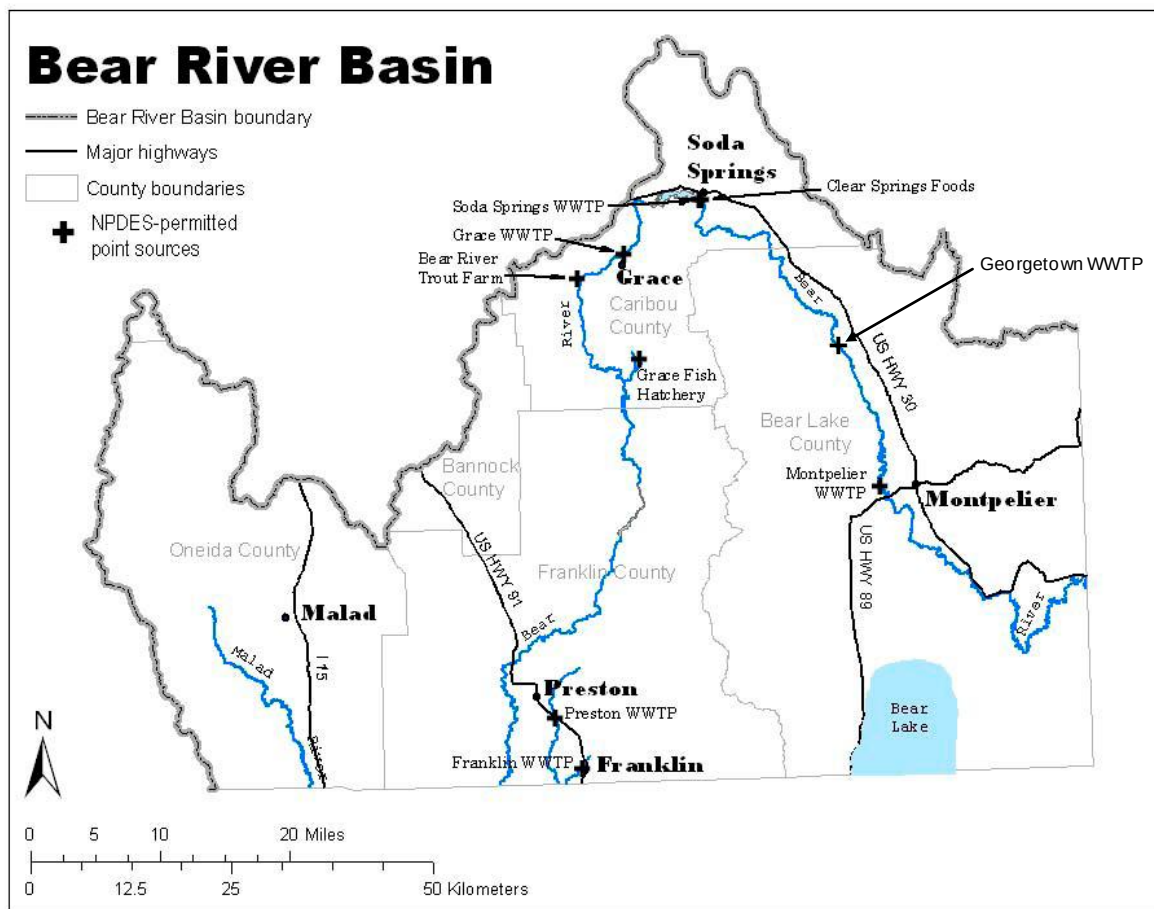


Figure 7. Bear River Basin point source discharge facilities.

Public Participation

In compliance with Idaho Code §39-3611(8), the development of the Bear River Basin Addendum to the Bear River SBA/TMDL included public participation by the Bear River Basin Advisory Group (BAG) and other interested parties. The following is summary of the public process:

BAG Meetings (relative to the Bear River Basin TMDL Addendum)

May 7, 2009: topic covered was a summary of tributary waters that were deferred from original SBA/TMDL, their current status, water quality data, and field monitoring strategy for summer of 2009.

July 9, 2009: topic covered was discussion of existing wasteload allocations (WLA) and current water quality data and how it related to a restructuring of existing WLAs.

November 12, 2009: topics covered were a discussion of load allocations for tributary waters and wasteload allocations for municipal dischargers. BAG was notified that a draft document would be available for their review in the near future.

Bear River BAG meeting minutes, agendas, and presentations for the abovementioned meetings are available on the BAG webpage at:

http://www.deq.idaho.gov/about/regions/bear_river_bag/index.cfm.

Public Comment Period for the Bear River TMDL Addendum

The public comment period on the Bear River TMDL Addendum was from 15 April through 17 May 2010. Comments were received from the cities of Preston, Grace and Franklin. The U.S. Environmental Protection Agency also commented on the addendum. The news release follows:

News Release

MEDIA CONTACT

Melissa Thompson

DEQ Pocatello Regional Office

(208) 236-6160

DEQ seeks comment on water quality improvement plans for water bodies in Bear River Basin/Malad River Subbasin

POCATELLO — The Idaho Department of Environmental Quality (DEQ) is seeking public comment on plans developed to ensure water quality standards are met in various waterbodies in the Bear River Basin/Malad River Subbasin.

The *Addendum to the Bear River Basin/Malad River Subbasin Assessment* prescribes water quality improvement plans, known as Total Maximum Daily Loads (TMDLs), for five waterbodies that were not addressed in the original 2006 assessment due to a lack of data. Adequate data have since become available.

TMDLs are proposed to control excess sediment in Dry, Preuss, Snowslide, and Strawberry Creeks. In addition, TMDLs to control excess nutrients are proposed for Dairy, Dry, and Strawberry Creeks. The goal of the actions is to restore the waterbodies to conditions supporting their beneficial uses: cold water aquatic life, salmonid spawning, and primary contact recreation.

In light of recent data, DEQ also proposes to remove both the lower and upper segments of Co-Op Creek from the state's list of waterbodies impaired by excess sediment and nutrients and to relist the lower segment for flow alteration only.

Lastly, DEQ proposes to establish limits for Georgetown's discharge of total phosphorus and total suspended solids and has revised the total phosphorus wasteload allocations for Montpelier, Soda Springs, Grace, Preston and Franklin wastewater treatment plants.

The document is available for review at DEQ's Pocatello Regional Office and in PDF format on DEQ's Web site at www.deq.idaho.gov/public/comment.cfm.

Submit written comments by 5 p.m.MST, Monday, May 17, 2010, electronically on DEQ's Web site or by mail, fax or email to:

Melissa Thompson

DEQ Pocatello Regional Office

444 Hospital Way #300

Pocatello, ID 83201

Fax: 208-236-6168

1 Subbasin Assessment – Watershed Characterization

Information regarding the Subbasin Assessment – Watershed Characterization may be found in the 2006 Bear River/Malad River Subbasin Assessment and Total Maximum Daily Load Plan, Section 2.1, Characterization of the Watershed, pages 34-62.

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2 Subbasin Assessment - Water Quality Concerns and Status

Information regarding the Subbasin Assessment – Water Quality, Sections 2.1-2.3 may be found in the 2006 Bear River/Malad River Subbasin Assessment and Total Maximum Daily Load Plan, Section 2.1, Characterization of the Watershed, pages 63-154.

2.4 Summary and Analysis of Existing Water Quality Data

A detailed summary and analysis of existing water quality data for the Bear River Basin, respectively. DEQ monitored Strawberry, Co-Op, and Dry Creeks (Table 5) in June and October of 2006.

Co-Op Creek is on the §303(d) list for total phosphorus and sedimentation/siltation as pollutants. The IASCD monitored this stream, near the Nounan Road crossing, on 11 different occasions in 2008 (Table 3). Of those 11 monitoring events, concentrations did not exceed the total suspended sediment (TSS) or total phosphorus (TP) target values established in the original Bear River Basin SBA/TMDL. DEQ monitored Co-Op Creek in June 2006 (Table 5) and target values for TSS and TP were not exceeded at that time. Target values established for TSS were 80 mg/L during runoff and 60 mg/L during base flow and the TP target is 0.075 mg/L.

Table 3. IASCD water quality data collected on Co-Op Creek.

DATE	D.O. (mg/L)	TEMP (C)	% SAT	COND (microS)	TDS (mg/L)	pH	TIME	Q (cfs)	NO2+ NO3:N (mg/L)	SSC (mg/L)	TPHOS (mg/L)	NH3 (mg/L)	OPHOS (mg/L)	E. coli	comments
2-Jun-08	9.61	7.6	80	107.5	53	7.9	1026	3.6	0.025	22	0.05	<.05	<.01	18.3	
16-Jun-08	9.06	11.1	82	159.6	78	7.9	1140	3.3	0.025	16	0.04	<.05	0.02	156.5	
26-Jun-08	9.19	10.7	83	398	195	7.6	1154	4.5	0.025	14	0.04	<.05	0.01	261.3	wheelie irrigating over creek
7-Jul-08	9.31	9.9	82				1110	3.6	0.025	8	0.04	<.05	<.01	128.1	forgot meter...no pH, Cond, or TDS
24-Jul-08	9.29	11	84	192.6	94	7.5	1046	1.1	0.06	10	0.04		<.01	172	
4-Aug-08	7.93	13	74	207.3	102	7.5	1103	0.1	0.09	13	0.04		0.01	235.9	
18-Aug-08	8.25	11.8	86	216.2	106	7.8	1136	0.5	0.08	5	0.06		0.03	1733	
4-Sep-08	11.27	7.2	93	209.9	103	7.9	1125	0.6	0.06	3	0.03		<.01	43.5	
15-Sep-08	10.53	7	87	276.9	136	8	1145	0.4	0.11	1	0.03		<.01	105.4	
1-Oct-08	9.83	8.6	84	330	162	8.2	1230	0.2	0.09	14	0.03		<.01	517.2	
9-Oct-08															no flow
23-Oct-08	12.78	-0.5	86	420	206	8.8	1310		0.025	7	0.03		<.01	63.8	
9-Dec-08															frozen

Dairy Creek AUs ID16010204BR011_02 and ID16010204BR011_03 are §303(d) listed for combined biota/habitat bioassessments and sedimentation/siltation, respectively, in the 2010 Integrated Report. IASCD monitored this stream 28 times from March 2005 to November 2006 (Table 4). Of those 28 events, the TP target was exceeded 64% of the time and the TSS (SSC) targets of 60 and 80 mg/L during low and high flow, respectively, was not exceeded.

Table 4. IASCD water quality monitoring data for Dairy Creek.

DATE	D.O. (mg/L)	TEMP (C)	%SAT	COND (microS)	TDS (mg/L)	pH	TIME	Q (cfs)	NO2+ NO3:N (mg/L)	SCC (mg/L)	TPHOS (mg/L)	NH3 (mg/L)	OPHO S (mg/L)
21-Mar-05	13.52	6	106.6	553	281	8.37	1320	0.08	0.67	14	0.19	0.025	0.16
7-Apr-05	12.98	6.2	104.6	532	272	8.22	1155	4.87	0.47	0	0.24	0.025	0.16
21-Apr-05	12.94	7.9	109	620	313	8.33	1208	2.82	0.53	13	0.12	0.025	0.09
2-May-05	12.08	13.5	114.5	660	330	8.59	1245	1.08	0.57	49	0.11	0.025	0.06
18-May-05	14.18	13	134.5	631	316	8.5	1300	1.17	0.44	8	0.15	0.13	0.1
1-Jun-05	12.92	17	134.3	843	418	8.58	1400	1.14	0.025	28	0.13	0.025	0.07
16-Jun-05	11.79	16.8	120.3	1003	511	8.42	1207	0.05	0.55	8	0.13	0.025	0.1
27-Jun-05	12.58	15	124.5	1040	524	8.31	1125	0					
11-Jul-05	11.24	15.7	113.4	945	480	8	1215	0.28	0.73	11	0.08	0.025	0.07
21-Jul-05	10.38	13.6	100.1	949	479	8.02	1000	0.3	0.85	21	0.1	0.06	0.06
4-Aug-05	10.9	13.7	104.6	988	498	8.07	1145	0.21	1.06	23	0.06	0.025	0.04
17-Aug-05	9.96	14.1	96.8	931	474	8.07	1205	0.17	0.74	34	0.06	0.025	0.06
31-Aug-05	Q too low to sample												
14-Sep-05	Q too low to sample												
16-Oct-05	15.63	7.5	129.5	938	488	8.5	1305	0.26	0.68	14	0.03	0.025	0.02
10-Apr-06	12.76	8.1	108	505	258	8.05	1455	6.27	0.67	29	0.2	0.025	0.14
25-Apr-06	15.39	10.5	138.6	505	261	8.43	1315	7.26	0.48	7	0.08	0.025	0.05
8-May-06	13.4	10.5	121	531	268	8.35	1145	3	0.64	6	0.09	0.025	0.05
23-May-06	9.58	14.7	94.3	586	294	8.46	1145	1.83	0.57	8	0.05	0.025	0.06
5-Jun-06	9.96	18.6	106.4	645	326	836	1312	0.03	1.78	17	0.12	0.025	0.09
15-Jun-06	8.53	9.4	74.3	680	348	8.22	1040	0.06	2.16	77	0.16	0.07	0.09
27-Jun-06	not sampled - no Q												
11-Jul-06	7.04	14.8	69.5	573	294	8.14	1055	0.86	0.98	18	0.1	0.15	0.07
24-Jul-06	5.96	17.8	62.5	554	290	8.09	1205	0.34	0.67	49	0.19	0.025	0.09
7-Aug-06	6.65	15.6	67.1	596	311	8.17	1310	0.15	0.56	54	0.17	0.025	0.08
21-Aug-06	6.81	12.9	64.5	470	237	8.41	1230	0.61	0.52	32	0.1	0.025	0.04
7-Sep-06	7.35	13.6	70.8	519	267	8.21	1340	0.65	0.52	26	0.11	0.025	0.04
26-Sep-06	9.49	5.8	75.8	513	272	8.39	1135	1.06	0.67	8	0.06	< 0.05	0.04
9-Oct-06	8.22	9.6	72.2	648	333	8.24	1403	0.48	0.31	23	0.17	0.025	0.12
19-Oct-06	9.21	4.4	71.1	503	256	8.2	1145	0.89	0.77	12	0.09	0.025	0.04
7-Nov-06	10.13	5.4	80.1	500	261	8.24	1150	0.27	0.45	28	0.12	0.05	0.04

Both Dry Creek AUs ID16010102BR005_02 and ID16010102BR005_02a are §303(d) listed for sedimentation/siltation, while the _02 AU is also listed for cause unknown. DEQ conducted water quality monitoring on Dry Creek on 6/28/06 and 10/31/06 (Table 5). In June 2006 the TP target was slightly exceeded with a value of 0.076 mg/L. The sediment target value was not exceeded during either sampling event.

Listed for sedimentation/siltation, low flow alterations and physical substrate alterations, Strawberry Creek was monitored by the DEQ in June and October 2006 (Table 5). Of the two monitoring events, the TP target was exceeded in June 2006 with a value of 0.138 mg/L. TSS measurements yielded a slight exceedance of 81 mg/L in the spring.

Table 5. DEQ water quality monitoring on Strawberry, Co-Op and Dry Creeks.

Waterbody	Date	Latitude	Longitude	Time	Flow (cfs)	Temp (°C)	Cond ($\mu\text{S}/\text{cm}^2$)	DO% SAT	DO (mg/l)	pH	Turb (NTU)	NH3 (mg/l)	NO2+NO3:N (mg/l)	TKN (mg/l)	OPHOS (mg/l)	TP (mg/l)	TSS (mg/L)
Strawberry	28-Jun-06	42.2437	111.7141	1200	6.81	13.14	435		10.23	7.84	29.4	0.022	0.56	0.47	0.049	0.138	81
Strawberry	31-Oct-06	42.2437	111.7141	1025	0.8	7.31	554	91.2	10.96	7.91	1.6	<0.005	0.78	0.36	0.04	0.054	<2.0
Co-op	28-Jun-06	42.4522	111.43443	1515	4.11	15.35	187		8.00	8.05	11.2	0.018	0.02	0.21	0.007	0.043	27
Co-op	31-Oct-06	Coop Creek was dry this day at 1300h															
Dry	28-Jun-06	42.4022	111.05565	1400	4.73	18.3	411		8.24	8.52	15.5	<0.005	0.02	0.22	0.029	0.076	20
Dry	31-Oct-06	42.4022	111.05565	1200	1	0.34	476	77.7	11.23	8.27	7.1	<0.005	<0.01	0.35	0.03	0.062	15

Mainstem Bear River Water Chemistry Data

Since 2006, the mainstem Bear River has been monitored quarterly at 21 locations as part of a collaborative Tri-State monitoring agreement amongst Utah, Wyoming and Idaho. Figure 8 shows these Bear River water quality monitoring locations. For purpose of this analysis, only data from Idaho locations were utilized. These locations are Site 6 – Wyoming/Idaho border, through Site 17 – Idaho/Utah border. Idaho water quality data are found in Appendix B.

Evaluation of phosphorus levels using the Tri-State Monitoring data set for Idaho sites (Figure 9) indicate the TMDL TP target (0.075 mg/L) is exceeded by mean, but not median concentrations as the river enters Idaho at the Wyoming border. After flow is diverted through Mud Lake and then out of Bear Lake, target concentrations are met at Pescadero and then slightly exceeded (median does not exceed) as the river enters Alexander Reservoir (TP target = 0.05 mg/L upstream of lakes and reservoirs). Alexander Reservoir stores phosphorus as evidenced by decreased concentrations and loads downstream near Grace. Above Oneida Reservoir, TP exceeds the target of 0.05 mg/L. Oneida Reservoir sequesters sediment; therefore downstream concentrations are much lower than upstream. At the Idaho-Utah border, TP concentrations vary considerably with sediment inputs; however, the median concentration meets Utah's TMDL target of 0.05 mg/L.

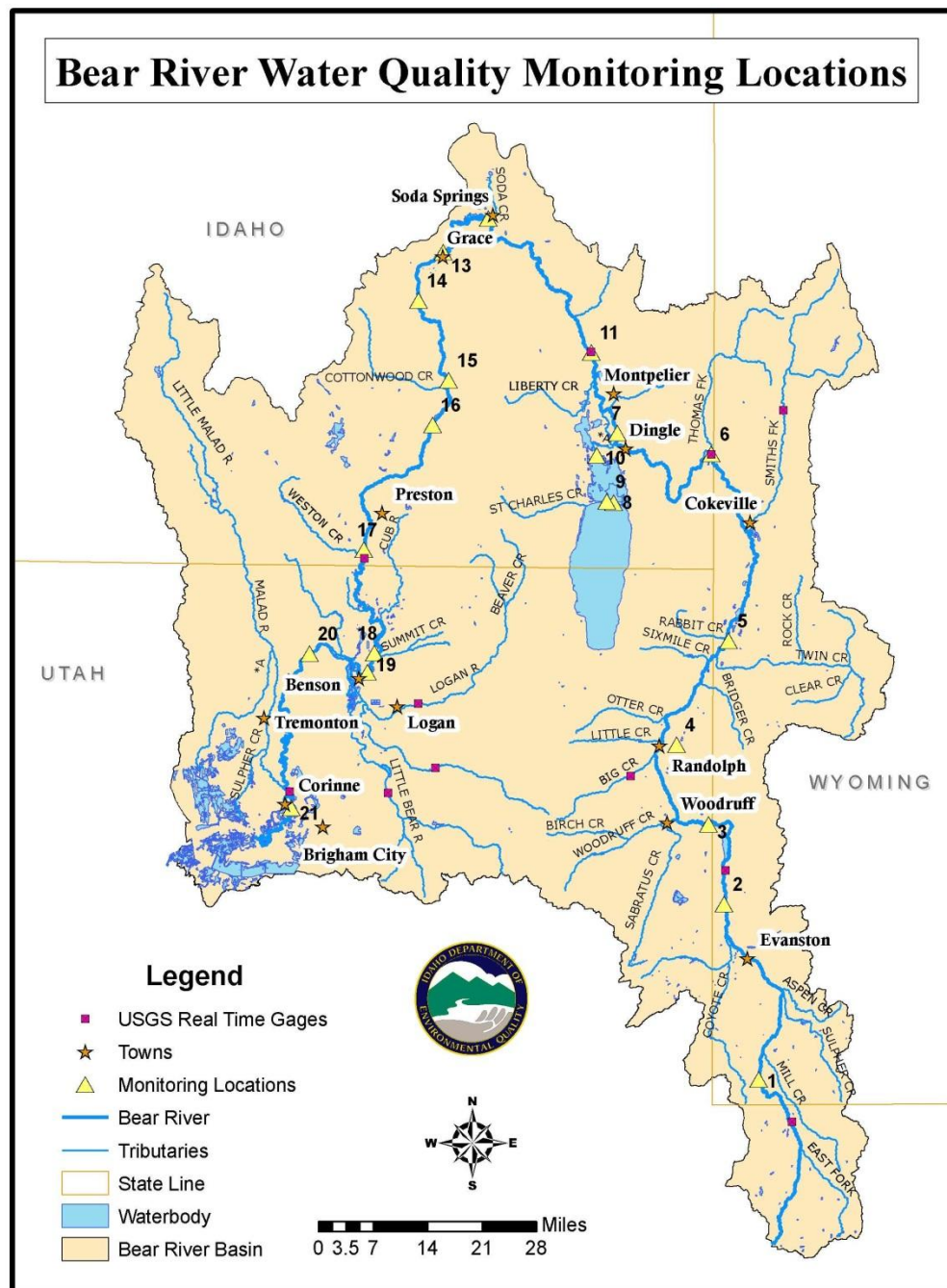


Figure 8. Mainstem Bear River Water Quality Monitoring Locations.

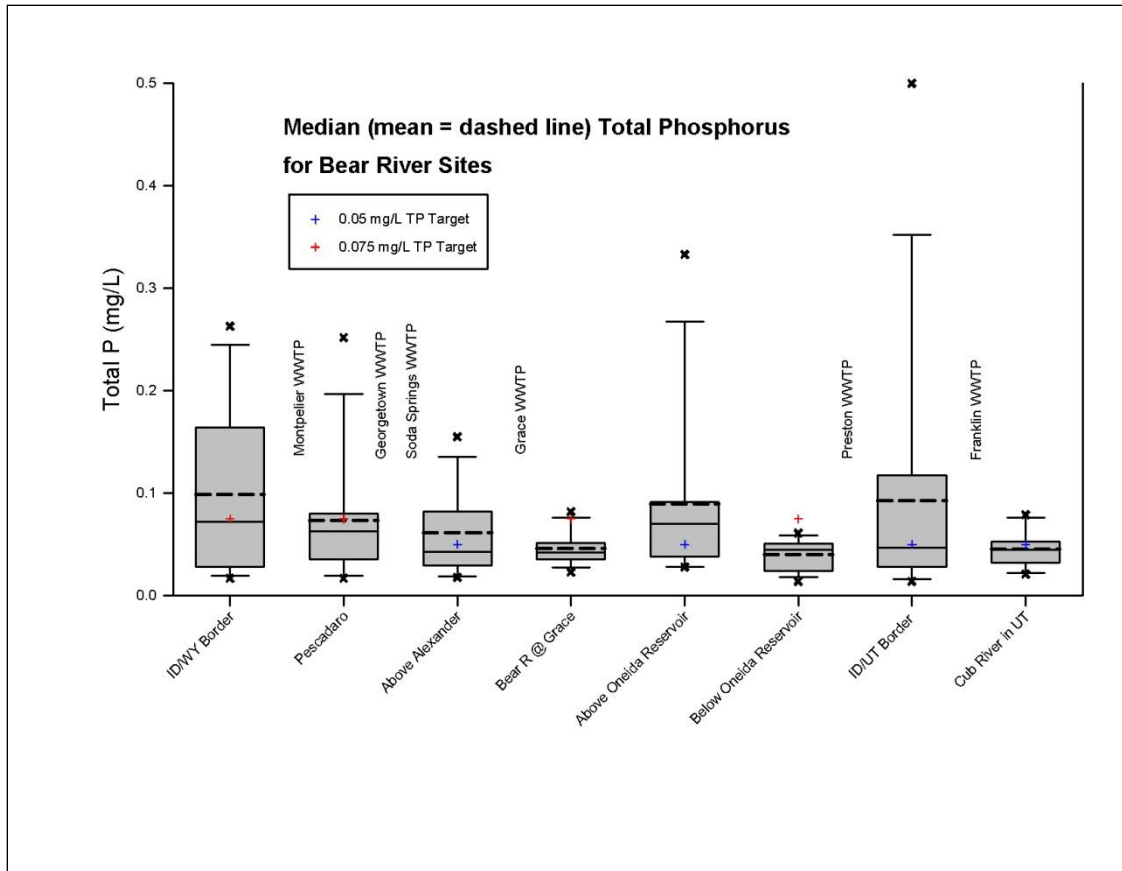


Figure 9. Total phosphorus median (solid bar) and mean (dashed bar) concentrations at selected Bear River Sites in Idaho, using Tri-State monitoring data from 2006-2009. Boxes indicate 25th and 75th percentiles, whiskers indicate 5th and 95th percentiles, and outliers are indicated by asterisks. Wastewater treatment plants (WWTP) are shown relative to their locations along the Bear and Cub River sites. Cub River data is from USGS gage 10096000 (near Franklin) and UT DEQ data.

Sediment contributes significantly to TP concentrations. There is a significant relationship ($y = 0.0012x + 0.0286$; $R^2 = 0.885$, $p < 0.05$) between TP and total suspended sediment (TSS; Figure 10). At TSS concentrations > 38 mg/L, the TP TMDL target of 0.075 mg/L is exceeded. Likewise, TSS concentrations must be ≤ 18 in order to meet a TP target of 0.05 mg/L. With the exception of the Bear River above Oneida, median TP concentrations along the Bear River (Figure 11) meet TMDL targets in Idaho (Figure 11). It is evident that increases in total phosphorus do not correspond to proportional increases in dissolved orthophosphorus (DOP; Figure 11). Therefore, higher TP concentrations appear to be mostly associated with sediment-derived phosphorus, rather than sources of DOP. The difference between DOP upstream and downstream of Oneida Reservoir is not significant ($t = 1.49$, $t_{\text{critical}} = 2.18$).

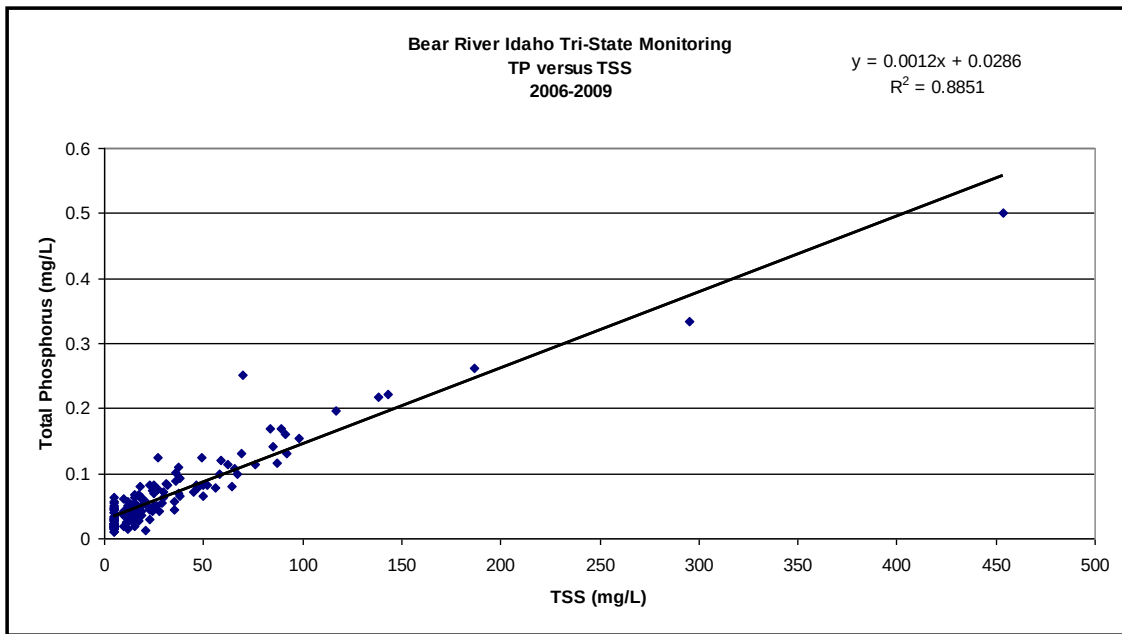


Figure 10. Regression of TP on TSS for Bear River Tri-State monitoring sites.

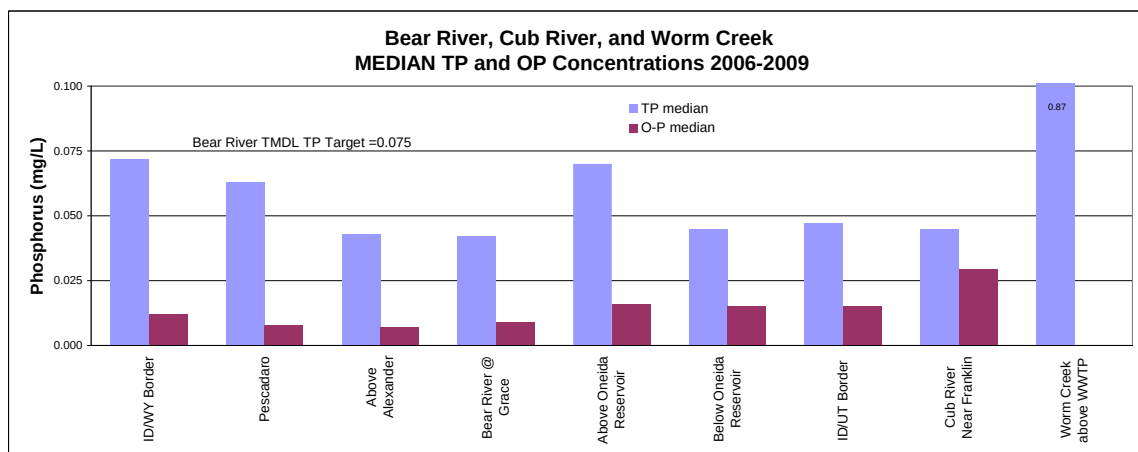


Figure 11. Median total phosphorus and orthophosphorus concentrations at selected Bear River sites in Idaho, using Tri-State monitoring data from 2006-2009.

Subsurface Fines

Determining the composition of surface and depth fine sediment in spawning habitat is used as a complimentary target to track changes in sediment loading over time. Since it is believed that surface fines can easily be swept away by spawning fish, subsurface sediment core samples are more biologically meaningful. Research has shown that subsurface fine sediment composition is important to egg and fry survival, Hall (1986), Reiser and White (1988). McNeil and Ahnell (1964) state that, “size composition of bottom materials greatly influences water quality by affecting rates of flow within spawning beds and ranges of exchange between intergravel and stream water”.

According to Bjornn, et al. (1998) “Salmonid embryo survival and fry emergence are inversely related to the amount of fine sediment in stream substrates.” Fine sediment can decrease the amount of dissolved oxygen (DO) available to developing embryos by impeding flow of water through the substrate and through the oxidation of organic material in fine sediment. Low oxygen availability from excess fine sediment has been associated with smaller and less developed emergent fry.”

McNeil Sediment Core samples can describe size composition of bottom materials in identified salmonid spawning locations. McNeil Sediment Core samples are collected by isolating a small area of the stream bottom from the current with an open stainless steel cylinder (12 in). The cylinder is worked to a depth of approximately 4-6 inches into the spawning habitat. Substrate is then removed from the cylinder, washed through a series of ten sieves (63 to .053 mm diameter openings), and then measured via volumetric displacement. Three sediment core samples are obtained for each site and averaged to calculate the percentage of depth fines at the sample location. The percentage of intergravel fines less than 6.35 mm (1/4 in) in diameter is correlated with expected fry survival. DEQ has a target for volcanic, granitic, and sedimentary watersheds that is <28% fine sediment (<6.35 mm diameter) in identifiable spawning habitat. Channel morphology provides flow dynamics that result in fine sediment levels less than 28% in unperturbed conditions. Excessive fine sediment inputs or disturbed channel morphology are indicated by fine sediment compositions above 28%.

In 2008 and 2009 McNeil depth fine sampling was conducted in six locations on upper, middle, and lower Strawberry Creek, Dry Creek, and Snowslide Creek (Table 6). The DEQ-established target of <28% fine sediment was exceeded in all six locations. Of the six locations, the two on upper and middle Strawberry Creek were in relatively undisturbed areas on USFS property and just below the USFS boundary, respectively. Despite no riparian grazing apparent on this reach, McNeil sediment core samples yielded results well above the target value with outcomes of 61.77% at the upper site and 43.71% at the middle site. Highway 36 parallels Strawberry Creek throughout, and there are areas with relatively little buffer between the road and the stream. It is most likely that the excessive streambed sediment is attributable to wintertime road sanding. Figure 12, Figure 14, and Figure 15 provide an illustration of the McNeil sediment core sample locations on Snowslide Creek, Dry Creek, and Strawberry Creek, respectively. McNeil computation sheets are in Appendix C.

Table 6. DEQ sediment core sample locations and percentage of depth fines.

Stream	Site Description	Location (DD)	Sample Date	% Fine Material <6.35mm (0.25") ¹
Dry Creek	Approximately 0.5 miles upstream of USFS boundary	N 42.42328° W-111.06949°	8/28/08	48.66%
Snowslide Creek	Lower, near mouth	N 42.39291° W-111.1702°	8/12/09	49.34%
Strawberry Creek - Upper	Upper, on USFS property	N 42.30883° W-111.64156°	8/26/09	61.77%
Strawberry Creek - Middle	Middle, on road easement off of Hwy 36	N 42.27943° W-111.70051°	8/11/09	43.71%
Strawberry Creek - Lower	Lower, on horse ranch property	N 42.25715° W-111.7154°	9/8/09	78.14%

Streambank Assessments

Streambank assessments were not part of the original Bear River Basin SBA/TMDL however DEQ utilizes streambank erosion inventories to assess current erosion conditions within a stream. This method is very useful in identifying load reductions necessary to achieve desired future conditions that are expected to restore beneficial uses to a stream.

DEQ streambank erosion inventories are conducted in accordance with methods outlined in proceedings from the Natural Resource Conservation Service (NRCS) Channel Evaluation Workshop (NRCS 1983). The NRCS technique measures streambank/channel stability, length of active eroding banks, and bank angles. Streambank and channel stability field measurements are used to ascertain the long-term lateral recession rate. The recession rate is determined from field evaluation of streambank characteristics that are assigned a categorical rating ranging from 0 to 3. The categorical ratings are summed to a cumulative rating. From the cumulative rating a lateral recession rate is assigned ranging from slight at 0.01 ft/yr. to very severe at 0.5 + ft/yr. An average volume of eroded bank is obtained with the estimated recession rate. By applying a measured or estimated standard bulk density based on composition of streambank material an estimate of tons of sediment from streambank erosion is obtained for comparison to other reaches or for applying a load allocation based on a prescribed reference condition.

Appendix D outlines the method for conducting streambank erosion inventories. It is assumed that natural background sediment loading rates from bank erosion equate to 80% bank stability as described in Overton et al. (1995), where banks are expressed as a percentage of the total estimated bank length. Natural condition streambank stability potential is generally 80% or greater for Rosgen A, B, and C channel types in plutonic, volcanic, metamorphic, and sedimentary geology types. Therefore, an 80% bank stability target based on streambank erosion inventories shall be the target for sediment.

In 2008 and 2009 streambank erosion inventories were conducted by DEQ to evaluate streambank conditions on Dry, Preuss, Strawberry and Snowslide Creeks. None of the streams evaluated met the 80% streambank stability target. All of the streams monitored had less than 50% bank stability with the most erosive banks over 80% unstable on certain sections of Strawberry and Snowslide Creeks. Table 7 shows results of inventories conducted by DEQ and Figure 12 through Figure 15 indicate locations of the erosion inventories.

Table 7. Streambank erosion inventory locations, percent erosive banks and associated recession rates for select streams in the Bear River Basin.

Stream	Date	Reach Beginning Location (DD)	Total Inventoried (ft)	Erosive Banks (ft)	% Erosive	Average Erosive Bank Height (ft)	Average Recession Rate (ft/yr)
Dry Creek	8/19/08	N42.42438°, W111.07067°	1072	469	44	3.52	0.5
Preuss Creek	8/28/08	N42.46196°, W111.16673°	1087	827	76	3	0.135
Strawberry Creek	9/8/09	N42.25722°, W111.7152°	2417	1958	81	8.3	0.16
Snowslide Creek – Upper	7/1/09	N42.39754°, W111.139936°	1536	702	46	4.11	0.045
Snowslide Creek - Middle	7/1/09	N42.396752°, W111.146°	486	390	80	11.18	0.27

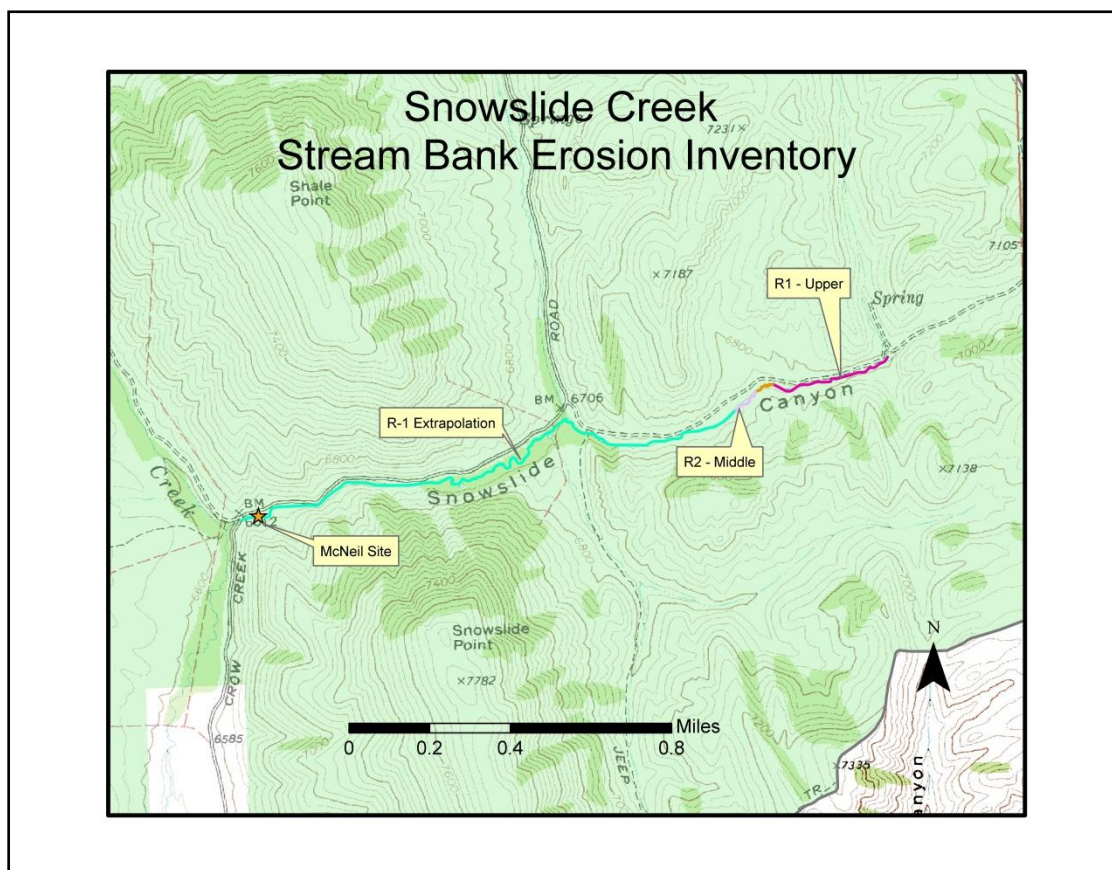


Figure 12. Snowslide Creek Streambank Erosion Inventory information and McNeil sample location.

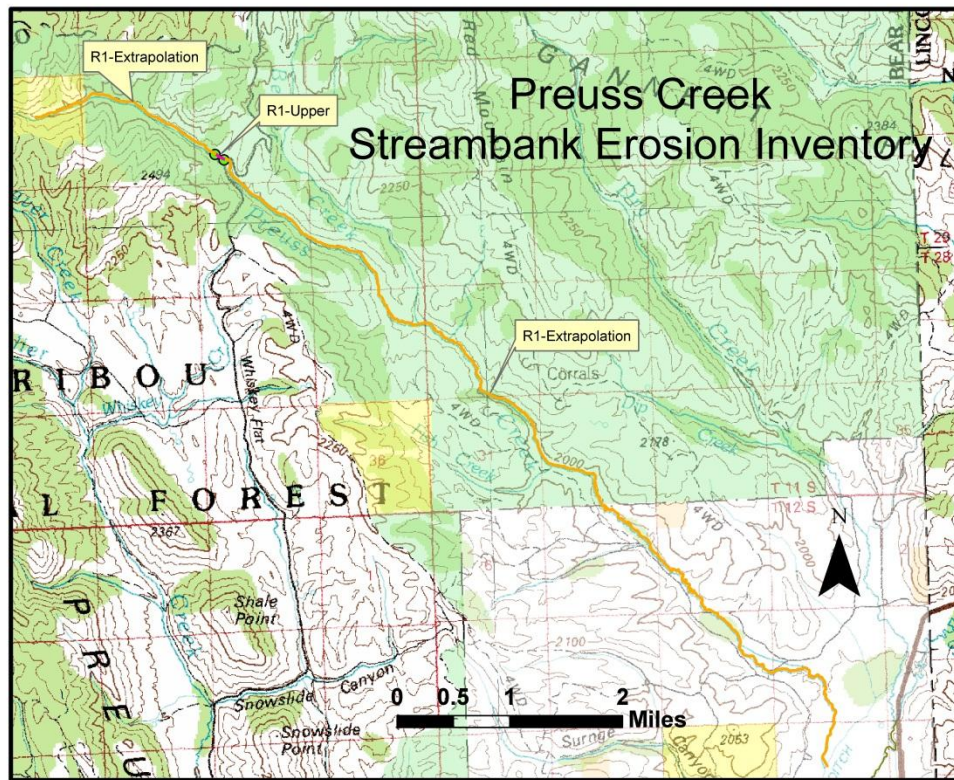


Figure 13. Preuss Creek Streambank Erosion Inventory information.



Figure 14. Dry Creek Streambank Erosion Inventory Information and McNeil location.

3 Subbasin Assessment – Pollutant Source Inventory

Information regarding the Subbasin Assessment – Pollutant Source Inventory may be found in the 2006 Bear River/Malad River Subbasin Assessment and Total Maximum Daily Load Plan, Section 2.3, Pollutant Source Inventory, pages 128-148.

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

Information regarding the Subbasin Assessment – Summary of Past and Present Pollution Control Efforts may be found in the 2006 Bear River/Malad River Subbasin Assessment and Total Maximum Daily Load Plan, Section 2.4, Summary of Past and Present Pollution Control Efforts, pages 149-154.

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5 Total Maximum Daily Load(s)

A TMDL prescribes an upper limit (or *load capacity*) on discharge of a pollutant from all sources to assure water quality standards are met. This load capacity (LC) can be represented by an equation:

$$LC = MOS + NB + LA + WLA$$

Where:

Current load = the current concentration of the pollutant in the water body

MOS = margin of safety. Because of uncertainties regarding quantification of loads and the relation of specific loads to attainment of water quality standards, 40 CFR Part 130 requires a margin of safety, which is effectively a reduction in the load capacity available for allocation to pollutant sources.

NB = natural background. When present, NB may be considered part of load allocation (LA), but it is often considered separately because it represents a part of the load not subject to control. NB is also effectively a reduction in the load capacity available for allocation to human-made pollutant sources.

LA = the load allocation for all nonpoint sources

WLA = the wasteload allocation for all point sources

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

5.1. In-stream Water Quality Targets

In-stream water quality targets for total phosphorus and suspended sediment were established for the Bear River Basin in the Bear River Basin SBA/TMDL approved by EPA in 2006.

Water quality targets for streambank erosion and depth fines were not established in the original SBA/TMDL document. Methodologies used to establish those targets are described below.

5.1.1. Design Conditions

A detailed discussion of design conditions for TSS and TP in the Bear River Basin is provided in the Bear River Basin SBA/TMDL approved by EPA in 2006. Design conditions for streambank sediment loading is described below.

To quantify the seasonal and annual variability and critical timing of sediment loading, climate and hydrology must be considered. This sediment analysis characterizes sediment loads using average annual rates determined from empirical characteristics that developed over time within the influence of peak and base flow conditions. Annual erosion and sediment delivery are functions of a climate where wet water years typically produce the highest sediment loads. Additionally, the annual average sediment load is not distributed equally throughout the year. Erosion typically occurs during a few critical months in the spring (generally April – June).

5.1.2. Target Selection

Target values for total phosphorus (TP) and total suspended sediment (TSS) were established in the Bear River SBA/TMDL. A discussion detailing the methodology for the selection of those targets is provided in the Bear River Basin SBA/TMDL.

The water quality target for TP is 0.075 mg/L, except for water flowing into lakes and reservoirs or into Utah, where the target is 0.05 mg/L. The TP target for Dairy, Dry and Strawberry creeks is 0.075 mg/L. The target for TSS depends upon the hydrologic time period. A concentration of 80 mg/L TSS was used during lower (March – April) and upper basin runoff (May – July) and 60 mg/L TSS during summer (August – October) and winter base flow (November – February) was used. These targets (or lower existing TSS concentrations) apply to all streams associated with this TMDL Addendum. Targets for sediment from streambank erosion were not discussed in the Bear River SBA/TMDL. A discussion of the methodology behind that target selection is described below.

Target selection of sediment is dependent on existing narrative criteria [IDAPA 58.01.02.200.08]. Sediment targets for this subbasin are based on streambank erosion quantitative allocations in tons/mile/year. The reduction in streambank erosion prescribed in this TMDL is directly linked to the improvement of riparian vegetation density to armor streambanks; thereby reducing lateral recession, trapping sediment and reducing stream energy, which in turn reduces stream erosivity and instream sediment loading. It is assumed that by reducing chronic sediment, there will be a decrease in subsurface fine sediment that will ultimately improve the status of beneficial uses.

It is assumed that natural background sediment loading rates from bank erosion equate to 80% bank stability as described in Overton and others (1995), where banks are expressed as a percentage of the total estimated bank length. Natural condition streambank stability potential is generally 80% or greater for Rosgen (Rosgen 1996) A, B, and C channel types in plutonic, volcanic, metamorphic, and sedimentary geology types. Therefore, an 80% bank stability target based on streambank erosion inventories shall be the target for sediment.

Unnatural streambed sediment size composition can directly impair spawning success, egg survival to emergence, rearing habitat, and fish escapement from the streambed. It is necessary to reduce the component of subsurface fine sediment less than 6.35 mm to

below 28% of total subsurface sediment. This sediment particle size parameter should be considered as part of target monitoring to evaluate any significant shift in subsurface fine particle frequency distribution.

5.1.3. Monitoring Points

A detailed discussion of water column monitoring points for the Bear River Basin is provided in the Bear River Basin SBA/TMDL approved by EPA in 2006. In addition, the Tri-State Water Quality Monitoring Plan (DEQ 2006) discusses monitoring points, parameters, and ongoing efforts to monitor water quality in the basin. Monitoring points for subsurface sediment and streambank erosion are discussed below.

Subsurface sediment substrate monitoring points shall occur in habitat determined suitable for salmonid spawning within listed stream segments using the McNeil core sediment sampling method. The amount of habitat suitable for salmonid spawning will increase after the implementation of management practices identified to reduce fine sediment.

Streambank erosion inventories/assessments shall occur on sediment-impaired streams to evaluate overall bank stability.

5.2. Load Capacity

A detailed discussion of load capacity for TSS and TP in the Bear River Basin is provided in the Bear River Basin SBA/TMDL approved by EPA in 2006.

The load capacity for sediment from streambank erosion shall be based on assumed natural streambank stabilities of greater than or equal to 80% (Overton et al 1995). Because it is presumed that beneficial uses were or would be supported at natural background sediment loading rates, the loading capacity lies somewhere between the current loading level and sediment loading from natural streambank erosion.

- Natural background loading rates are not necessarily the loading capacities. An adaptive management approach will be used to provide reductions in sediment loading based on best management practice (BMP) usage coupled with data collection and monitoring to determine the loading point at which beneficial uses are supported.
- The estimated capacity is directly related to the improvement of riparian vegetation density and structure as well as maintenance of roads and stream crossings. Increased vegetative cover provides a protective covering of streambanks, reduces lateral recession, traps sediment, and reduces bank erosion.

Loading capacities Dairy, Strawberry, and Dry creeks are given in Table 8.

Table 8. Total phosphorus loading capacities for Dairy, Strawberry, and Dry creeks. There are no NPDES discharges to these streams.

Stream	Average Flow (cfs)	Average T Phos (mg/L)	Current Load (lb/day)	LC (lb/day)	Load Allocation (lb/day)	Load Reduction (lb/day)	% Reduction
Dairy Creek							
Runoff (April – June)	3.27	0.13	2.30	1.32	1.32	0.97	42%
Base Flow (July – March)	0.37	0.11	0.23	0.15	0.15	0.08	34%
Strawberry Creek							
Runoff (6/28/06)	6.81	0.138	5.08	2.76	2.76	2.32	46%
Base Flow (10/31/06)	0.815	0.054	0.24	0.33	0.24	0	0%
Dry Creek							
Runoff (6/28/06)	4.73	0.076	1.94	1.92	1.92	0.03	1%
Base Flow (10/31/06)	1.04	0.062	0.35	0.42	0.35	0	0%

5.3. Estimates of Existing Pollutant Loads

Regulations allow that loadings “...may range from reasonably accurate estimates to gross allotments, depending on the availability of data and appropriate techniques for predicting the loading,” (Water quality planning and management, 40 CFR § 130.2(I)). An estimate must be made for each point source. Nonpoint sources are typically estimated based on the type of sources (land use) and area (such as a subwatershed), but may be aggregated by type of source or land area. To the extent possible, background loads should be distinguished from human-caused increases in nonpoint loads.

Estimated existing pollutant loads for streambank sediment are based on streambank erosion inventories conducted by DEQ in 2008 and 2009. Current sediment loading-rates for Dry, Strawberry, Snowslide, and Preuss Creeks are quantitatively estimated in tons/year, as shown in Table 19.

Phosphorus and suspended sediment loads entering the tributary waters are determined based on monitoring data collected by the DEQ and IASCD. Phosphorus and suspended sediment loads for tributary waters were calculated for both runoff and base flow conditions. All loads were calculated in lbs/day based on averaging analytical results and stream flow data at the time of collection for the each hydrologic period (runoff, base

flow). See Table 19 and Table 20 for estimates of existing TP and TSS loads for tributary waters.

Phosphorus wasteload allocations for point source dischargers were calculated based on daily monitoring report (DMR) TP concentration (mg/L) and flow (cfs) data to determine a load in lbs/day.

5.4. Wasteload Allocation

There are five municipalities and three trout farming facilities that hold NPDES discharge permits for the Bear River (cities of Montpelier, Soda Springs, Grace, Clear Springs Foods, Bear River Trout Farm, and Grace Fish Hatchery), Cub River (City of Franklin), and Worm Creek (City of Preston). There are no other NPDES-permitted point discharges in the watershed (except for Monsanto Company's thermal discharge into Soda Creek).

Bear River Hydrology

Bear River's hydrology differs considerably from historical conditions. The river was diverted to Bear Lake from Stewart Dam via the Rainbow Canal for storage purposes in 1918. Water stored in Bear Lake is pumped from the lake to the historic Bear River channel via the Bear Lake Outlet Canal, an approximately 12-mile long ditch exiting the north shore of the lake near Lifton. This water is delivered to downstream users in Idaho and Utah after traveling through three major hydroelectric facilities located in Idaho. Figure 16 and Figure 17 illustrate the "normal" hydrograph at the Idaho-Wyoming border versus the modified hydrograph apparent at Pescadero (downstream of the Bear Lake Outlet Canal-Bear River confluence). Storage and delivery of water delays peak flows approximately 1 month at this site.

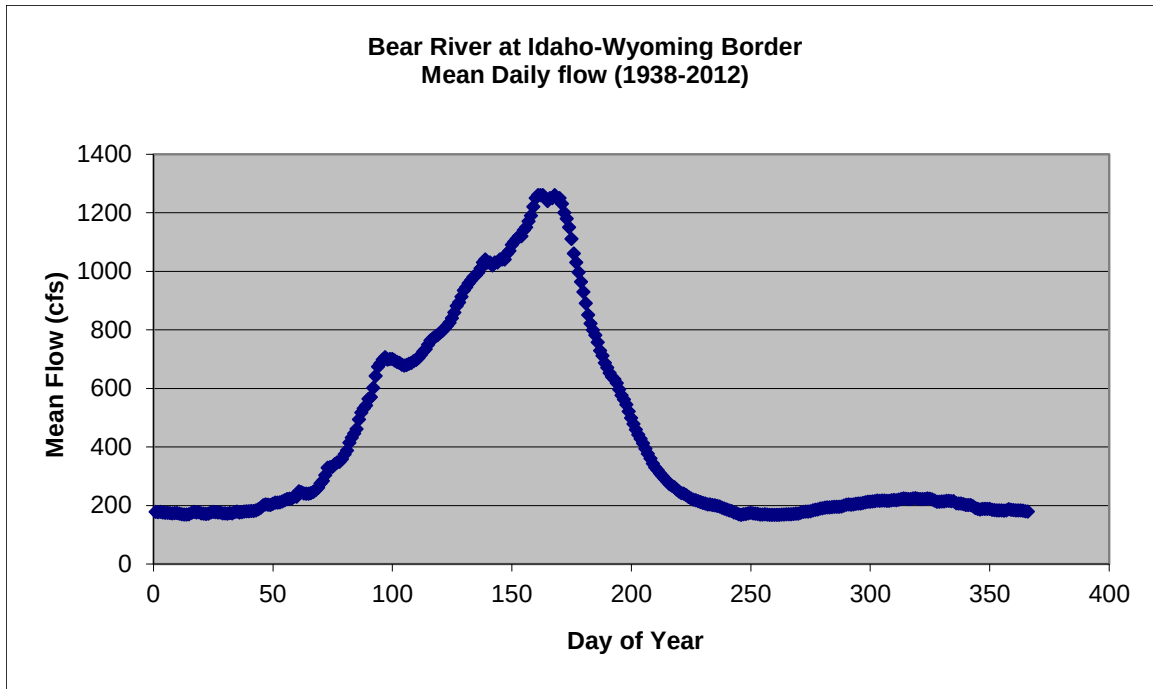


Figure 16. Hydrograph of daily mean flow for Bear River at ID-WY Border (upstream of Bear Lake).

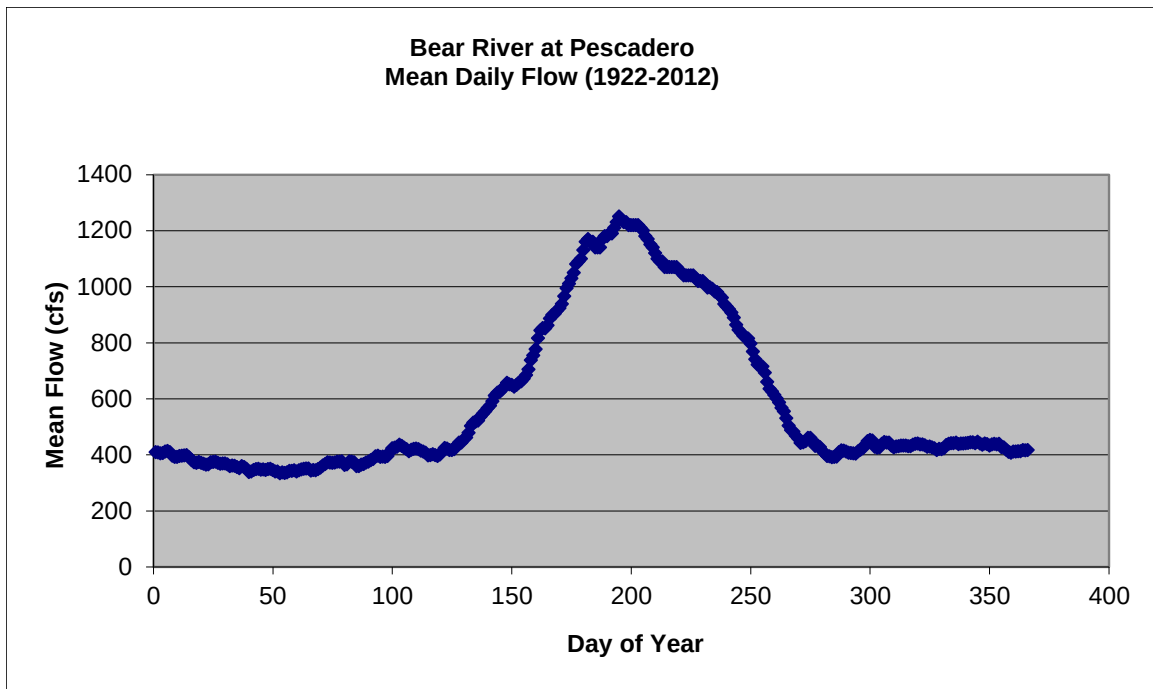


Figure 17. Hydrograph of daily mean flow for Bear River at Pescadero (downstream of Bear Lake Outlet).

Additionally, water delivery from Bear Lake to Bear River via the Bear Lake Outlet Canal can entrain considerable sediment from the canal. Flow at Bear River sites (Figure 18) generally increases downstream, with the exception of the Grace site, which is downstream of the Last Chance irrigation diversion.

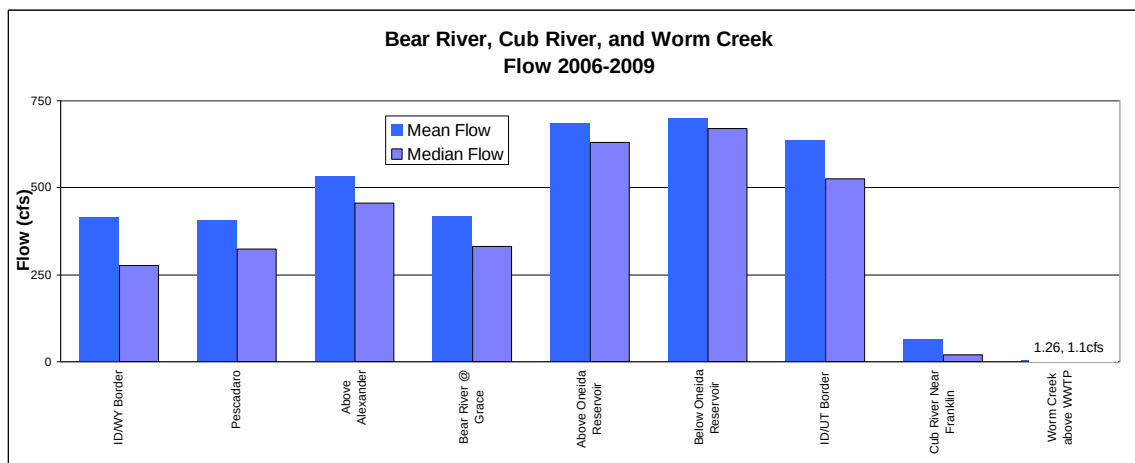


Figure 18. Mean and median flow at selected sites on the Bear River in Idaho, 2006-2009. Based on flows during Tri-State Monitoring events, USGS flow in Cub River near Preston, and Preston DMR data.

Total Phosphorus Concentrations and Loads

To determine appropriate waste water treatment facility wasteload allocations, total phosphorus conditions along the Bear River were evaluated incorporating 2004-2009 Tri-State Monitoring and DMR data (Figure 19). NPDES discharges comprised a small portion of the TP load at all Bear River sites, while the Preston WWTP discharge approximately doubled Worm Creek's TP load. Franklin's WWTP discharge comprised a significant portion of the Cub River TP load at times.

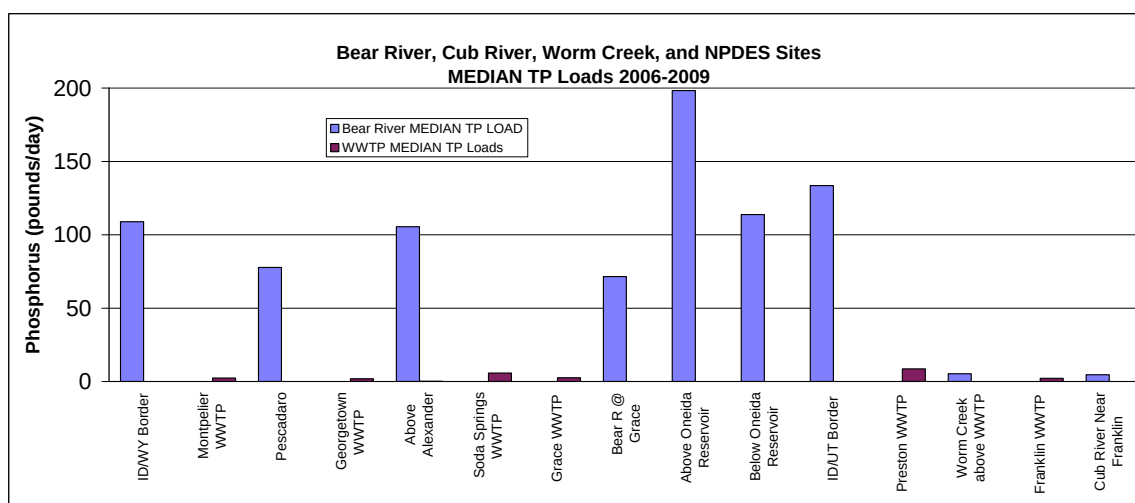


Figure 19. Median total phosphorus loads based on all Tri-State Monitoring data and associated flows for selected Bear River and wastewater treatment plants (based on DMR data 2004-2009 and flow study from Grace). Preston and Franklin WWTPs discharge to Worm Creek and Cub River, respectively. Cub River concentrations from UT DEQ via STORET.

Further analyses incorporated United States Geologic Survey (USGS), Pacificorp and Tri-State Monitoring data. Phosphorus, sediment and flow data were measured at various times throughout the year by these entities from 1990 - 2011. These data were evaluated based on season and time periods (for example, growing season measurements for 1990-2003). To determine growing and non-growing season conditions, near-continuous dissolved oxygen (% saturation) data from the Bear River at the Utah border (2004-2005) and a high quality near-continuous data set from Blackfoot River at China Hat (2006-2008; near Soda Springs) were reviewed to determine the onset of daily DO percent saturation exceeding 100% (indicating significant daytime photosynthesis). The onset of increased biological activity generally began in mid-April through mid-May and persisted through September. Therefore, May through September was considered the growing season, as plant growth occurs predominantly during this period.

Using the long term USGS flow data available for the Bear River at Pescadero, the Idaho-Utah border and Cub River, monthly loading capacities were calculated and compared to existing median concentrations and loads (Table 9 - Table 11, and Table 18). Existing median TP loads were calculated using 10th percentile monthly flow and median TP values measured during growing and non-growing seasons.

The oldest data set evaluated was USGS monitoring at the Idaho-Utah border (part of the Idaho Statewide Water Quality Network). These data indicate a growing season median TP concentration level of 0.060 mg/L TP from 1991 through 2003. Data collected for 401- Certification purposes from 2004-2005 by PacifiCorp are similar, with a median of 0.059 mg/L TP near the Utah border. More recent Tri-State Monitoring data (2006-2012) had a median of 0.051 mg/L TP at the Idaho-Utah border and downstream of Oneida Reservoir. During the growing season, median TP loading is less than loading capacity on mainstem Bear River sites (Figure 20).

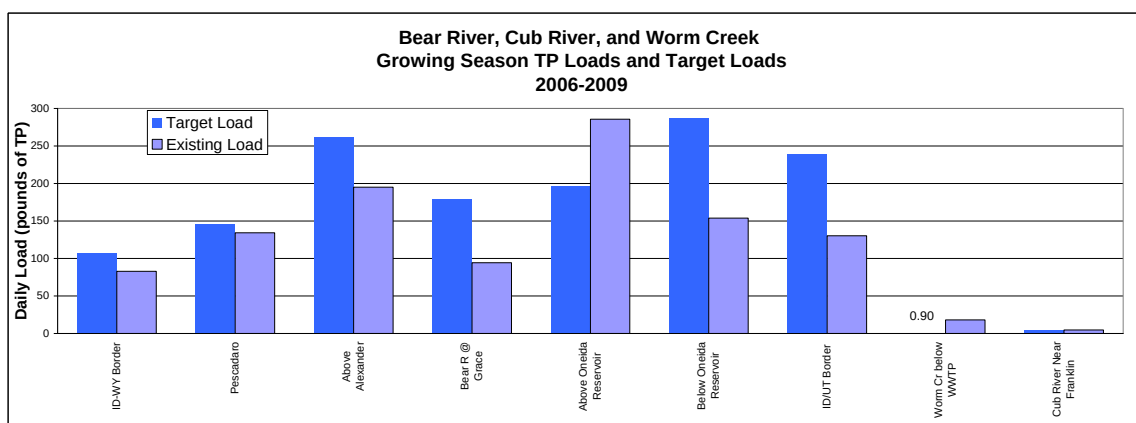


Figure 20. Median growing season TP loads and target loads for Bear River, 2006-2009.

Loads were calculated for the Pescadero and Idaho-Utah border Bear River sites. Additionally, loads were calculated for the Above Alexander site using the Pescadero USGS site's flow record. 10th percentile daily mean flows for the period of record were used in conjunction with TP concentrations from Tri-State Monitoring data to develop actual loads for comparison purposes (Table 9 - Table 11).

Table 9. TP Loading capacity for Bear River at Pescadero USGS gage 10068500, 1922-2012.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
10th percentile Q (cfs)	54.7	60.0	87.3	115.8	221.5	409.4	774.2	650.0	226.6	54.0	67.0	62.2
10th percentile LC (lb/day)	22	24	35	47	90	166	314	263	92	22	27	25
10th percentile Existing Load ¹ (lb/day)	15	17	24	32	93	172	326	274	95	15	18	17
Montpelier WLA (lb/day)	1.65	1.65	1.65	1.65	1.65	1.65	1.65	1.65	1.65	1.65	1.65	1.65
Georgetown WLA (lb/day)	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67
Total WLAs (lb/day)	2.32	2.32	2.32	2.32	2.32	2.32	2.32	2.32	2.32	2.32	2.32	2.32
Nonpoint 10th percentile LA (lb/day)	20	22	33	45	87	163	311	261	89	20	25	23
Total Allocations	22	24	35	47	90	166	314	263	92	22	27	25
Green highlight indicates months during biologically-active period												
¹ existing loads use median concentrations calculated for 2006-2012 growing and non-growing season												

Table 10. TP Loading capacity for Bear River at Above Alexander using Pescadero USGS Gage 10068500 Flow Data, 1922-2012.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
10th percentile Q (cfs)	54.7	60.0	87.3	115.8	221.5	409.4	774.2	650.0	226.6	54.0	67.0	62.2
10th percentile LC ¹ (lb/day)	20.0	21.4	28.8	36.5	65.0	115.7	214.2	180.7	66.4	19.8	23.3	22.0
10th percentile Existing Load ² (lb/day)	9.2	10.0	14.6	19.4	88.5	163.6	309.4	259.7	90.5	9.0	11.2	10.4
Soda Springs WLA (lb/day)	5.82	5.82	5.82	5.82	5.82	5.82	5.82	5.82	5.82	5.82	5.82	5.82
Clear Springs Foods WLA (lb/day)	4.6	4.6	4.6	2.05	2.05	2.05	2.05	2.05	2.05	4.6	4.6	4.6
Total WLAs (lb/day)	10.42	10.42	10.42	7.87	7.87	7.87	7.87	7.87	7.87	10.42	10.42	10.42
Nonpoint 10th percentile LA (lb/day)	9.5	11.0	18.3	28.6	57.1	107.9	206.3	172.8	58.5	9.3	12.9	11.6
Green highlight indicates months during biologically-active period												
¹ LC calculations include flows from point sources (19.23 cfs combined) in addition to 10th percentile flows listed, since gage is upstream of outfalls												
² existing loads use median concentrations calculated for 2006-2012 growing and non-growing season												

Table 11. TP Loading capacity for Bear River at Idaho-Utah border USGS gage 10092700 (1970-2012).

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
10th percentile Q (cfs)	350.4	371.6	494.3	479.6	382.0	470.5	493.7	499.9	324.5	283.9	322.3	336.4
10th percentile LC (lb/day)	94.6	100.3	133.5	129.5	103.1	127.0	133.3	135.0	87.6	76.7	87.0	90.8
10th percentile Existing Load ¹ (lb/day)	91	96	128	124	116	142	149	151	98	74	84	87
Grace WLA (lb/day)	2.36	2.36	2.36	2.36	2.36	2.36	2.36	2.36	2.36	2.36	2.36	2.36
Bear River Trout Farm WLA (lb/day)	5.4	5.4	5.4	8	8	8	3.6	3.6	3.6	3.6	3.6	3.6
Grace Fish Hatchery WLA (lb/day)	1.32	1.32	1.32	0.99	0.99	0.99	0.51	0.51	0.51	0.46	0.46	0.46
Total WLAs (lb/day)	9.08	9.08	9.08	11.35	11.35	11.35	6.47	6.47	6.47	6.42	6.42	6.42
Nonpoint 10th percentile LA (lb/day)	86	91	124	118	92	116	127	129	81	70	81	84
Total Allocations	95	100	133	129	103	127	133	135	88	77	87	91
Green highlight indicates months during biologically-active period												
¹ existing loads use median concentrations calculated for 2006-2012 growing and non-growing season												

Loading capacity analyses using monthly 10th percentile low flow scenarios were done for key locations on the Bear and Cub rivers. 10th percentile flows represent conditions under which total phosphorus might most impact these waterbodies. In unregulated systems, lowest flows often occur during the growing season (i.e., summer-fall); however, in the Bear River from Bear Lake to the Idaho-Utah border, summer-fall water deliveries from Bear Lake generally significantly increase flows during the growing season. Under low(10th percentile) flow scenarios, flows are actually very high when TP load capacity on the Bear River is exceeded during the growing season. TP load capacities outside the growing season are not exceeded (Table 9 - Table 11). Load capacity exceedences during the growing season would likely not occur if irrigation deliveries entraining considerable sediment were not occurring during summer months. In other words, most TP in the system is sediment-derived and little suspended sediment is mobilized at low flows. Further analysis indicated very low flows are possible in the Cub River during the growing season (Table 18). These potential low flows necessitate adhering to historically low TP inputs, especially during the growing season.

Total Suspended Sediment Concentrations and Loads

The City of Georgetown WWTP presently does not have an NPDES permit. This Addendum sets forth both TP and TSS loads for that facility. Georgetown and Montpelier WWTPs discharge to the Bear River upstream of the Pescadero gaging/sampling site. Tri-State Monitoring data (2006-2012) indicate median TSS concentrations of 37 and 17 mg/L during runoff and non-runoff periods, respectively. These concentrations are less than the TMDL targets of 80 and 60 mg/L for runoff and non-runoff periods, respectively. A loading capacity analysis for the Bear River at Pescadero is presented in Table 12, indicating minimal loading from point sources in this reach. As there are no other TSS WLA revisions, this Addendum does not address loading analyses for other reaches of the Bear River.

Table 12. TSS Loading capacity for Bear River at Pescadero using USGS gage 10068500 flow data, 1922-2012.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
10th percentile Q (cfs)	55	60	87	116	222	409	774	650	227	54	67	62
10th percentile LC (lb/day) ¹	17723	19440	28285	50026	95688	176861	334433	210600	73418	17490	21721	20166
10th percentile Existing Load ² (lb/day)	5021	5508	8014	23137	44256	81798	154675	59670	20802	4955	6154	5714
Montpelier WLA (lb/day)	41	41	41	41	41	41	41	41	41	41	41	41
Georgetown WLA (lb/day)	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
Total WLAs (lb/day)	46.5	46.5	46.5	46.5	46.5	46.5	46.5	46.5	46.5	46.5	46.5	46.5
Nonpoint 10th percentile LA (lb/day)	17676	19394	28239	49979	95642	176814	334386	210554	73372	17443	21674	20119
Total Allocations	17723	19440	28285	50026	95688	176861	334433	210600	73418	17490	21721	20166

¹LC based on runoff target of 80 mg/L and non-runoff target of 60 mg/L

²existing loads based on median TSS concentrations (2006-2012)

Wasteload Allocations

Recent data (2006-2012) indicate the TP target of 0.05 mg/L (overall median = 0.051 mg/L, growing season median = 0.056) is being met at the Utah border. The target is occasionally exceeded during specific sampling events; however, these excursions are clearly attributable to high suspended sediment (see discussion above on page 28 and Figure 10). Load allocations and WLA's are based on meeting in-stream TP targets year around, including during the critical growing season. Wasteload allocations are annual averages, unless allocations vary during the year, in which case the wasteload allocations are averages for the seasonal periods specified by the allocations. NPDES permit limits based on the WLAs should be expressed in the permits in a manner consistent with these averaging periods. As available, 2004-2009 DMR data were summarized for effluent TP concentrations, flows, and loads. Table 13 gives daily total phosphorus wasteloads and allocations for all WWTPs associated with the Bear River TMDL. Table 14 gives daily total suspended sediment wasteloads and allocations for Georgetown and Montpelier WWTPs, to account for the new allocation for Georgetown WWTP in this Addendum.

Table 13. Current daily total phosphorus (TP) wasteloads, critical reach flows and revised wasteload allocations for wastewater treatment plants on the Bear River.

WWTP	receiving water/ management reach	critical reach flow (10th Pctl cfs)	WWTP effluent mean Q (cfs)	current mean TP waste load (lb/day)	current TP WLA ¹ (lb/day)	revised TP concentration (mg/L)	revised TP WLA (lb/day)	Reach 10th pctl Q Daily LC for TP	WLA % of 10th pctl Q LC	Waste load reduction required
Montpelier ²	Bear River/ MR 2	54.7	2.00	1.65	0.26	1.24	1.65	22.0	8%	0%
Georgetown ³	Bear River/ MR 2	54.7	0.034	0.67	NA	0.075	0.67	22.0	3%	0%
Soda Springs ⁴	Bear River/ MR2	54.7	1.53	5.82	0.21	0.70	5.82	19.8	29%	0%
Grace	Bear River/ MR3	283.9	0.237	2.36	0.09	1.85	2.36	76.7	3%	0%
Preston ^{5,4}	Worm Creek	2.03	1.18	12.27	0.45	0.075	0.48	2.0	24%	96%
Franklin ^{6,4} May - February	Cub River/ u.s. of UT border	1.7	0.176	0	0.02	0.05	0.048	0.5	10%	0%
Franklin ^{6,4} March-April	Cub River/ u.s. of UT border	21.9	0.176	3.56	0.02	3.74	3.56	6.0	59%	0%
¹ Current TP WLA from Table 3-15 Bear River TMDL 2006 - WLAs for 20 years hence. Current instream TP concentration target = 0.075 mg/L for Montpelier, Grace, and Preston; instream target for Soda Springs and Franklin = 0.05 mg/L.										
² Montpelier flow given as flow when discharging (approximately 45 days/year during 2006-2009).										
³ Georgetown target load and 0% reduction contingent on direct discharge to mainstem Bear River. If discharge continues to the small stream adjacent to the WWTP, the daily TP load shall be 0.034 cfs x 0.075 mg/L TP x 5.4 = 0.014 #/day or 0.413 #/month. Average monthly concentration shall be 0.075 mg/L.										
⁴ WWTP flows included for this location's calculation of LC, due to dischargers being located downstream of gage.										
⁵ Preston target load calculated based on Worm Creek target concentration of 0.075 mg/L TP and monthly average outfall concentration of 0.075 mg/L TP. Since flow data are limited, critical flow is the mean Q given in DMR (2000-2012).										
⁶ Franklin discharges to the Cub River only during March - April when lagoon capacity is exceeded. Critical flow for March - April is given as the lower 10th percentile of those months. Effluent is land-applied during the growing season.										

Total phosphorus wasteloads are based on recent data from DMR reports, additional data provided by municipalities, and DEQ sampling.

Table 14. Current daily total suspended sediment (TSS) wasteloads, critical reach flows and revised wasteload allocations for wastewater treatment plants on the Pescadero reach of Bear River.

WWTP	receiving water/ management reach	critical reach flow (10th Pctl cfs)	WWTP effluent mean Q (cfs)	current mean TSS waste load (lb/day)	current TSS WLA (lb/day)	revised TSS concentration (mg/L)	revised TSS WLA (lb/day)	Reach 10th pctl Q Daily LC for TSS ²	WLA % of 10th pctl Q LC	Waste load reduction required
Montpelier ¹	Bear River/ MR 2	54.7	2.00	8.4	41	30	41	17723	0.23%	0%
Georgetown	Bear River/ MR 2	54.7	0.034	3.6	NA	30	5.5	17723	0.03%	0%
¹ Montpelier's TSS WLA is unchanged from the 2006 TMDL.										
² LCs are based on non-runoff (60 mg/L) target from the 2006 TMDL.										

Montpelier WWTP – Growing season TP loads at Pescadero (Figure 20) indicate the Bear River TMDL TP target is being met under Montpelier WWTP's present discharge regime; therefore, Montpelier's WWTP TP load will be set at current levels. It is anticipated that potential additional loading from future growth will be accommodated by upgrades to the WWTP, thus improving phosphorus removal and maintaining this TP load.

Soda Springs WWTP- Median TP concentrations from Tri-State Monitoring data indicate the TMDL target is being met downstream of this site. Additional data provided to DEQ by the City of Soda Springs indicate no significant difference ($t=0.24$, $t_{critical}=2.2$) in upstream versus downstream TP (Table 15). Based on this information, Soda Spring's WWTP TP wasteload will be set at present levels. It is anticipated that potential additional loading from future growth will be accommodated by upgrades to the WWTP; thus improving phosphorus removal and maintaining this TP load.

Table 15. Total Phosphorus concentrations (mg/L) measured above and below the Soda Springs WWTP, 2002-2005.

Date	TP - Bear River above WWTP	TP - Bear River below WWTP	Plant effluent TP
6/4/2002	0.07	0.07	1.12
8/20/2002	0.05	0.05	1.09
11/12/2002	0.05	0.05	0.62
3/18/2003	0.06	0.05	1.02
6/10/2003	0.13	0.06	
8/5/2003	0.1	0.11	0.79
11/11/2003	0.05	0.05	0.79
3/30/2004	0.05	0.05	
6/8/2004	0.07	0.07	0.79
6/15/2005	0.11	0.09	0.76
9/13/2005	0.05	0.05	
10/26/2005	0.05	0.05	0.81
Mean	0.070	0.063	0.866
Median	0.055	0.050	0.790

Georgetown WWTP - This WWTP presently discharges to a small, unnamed tributary of the Bear River which flows approximately 1 mile to its confluence with the Bear River. For purposes of this analysis and waterbody allocation of phosphorus and TSS loadings, we considered the mainstem Bear River as the receiving water (Table 16). In order for the WLA to apply, discharge must be directly to the Bear River, west of the facility. Future growth must be accommodated by improvements to the WWTP, with concentration reductions maintaining this TP load. If discharge continues to the unnamed tributary stream, TP discharge concentrations should be held to the target concentration of 0.075 mg/L. As Georgetown WWTP does not presently have a TSS WLA, technology-based TSS limits apply and are given in Table 16.

Table 16. TP and TSS WLAs for Georgetown WWTP.

WWTP	receiving water/management reach	Total Phosphorus					Total suspended solids			
		WWTP effluent mean Q (cfs)	Mean concentration (mg/L)	Current wasteload (lbs/ day)	Revised WLA (lbs/day) ¹	Waste load reduction required	Mean concentration (mg/L)	Current wasteload (pounds/ day)	Current WLA (lbs/day)	Waste load reduction required
Georgetown	Small Stream adjacent to WWTP	0.034	3.64	0.67	0.014	98%	20.5	3.6	5.5	0%
Georgetown	Bear River/ MR 2	0.034	3.64	0.67	0.67	0% ¹	20.5	3.6	5.5	0%

¹Georgetown target load and 0% reduction contingent on direct discharge to mainstem Bear River. If discharge continues to the small stream adjacent to the WWTP, the daily TP load shall be 0.034 cfs x 0.075 TP x 5.4 = 0.014 #/day.

Grace WWTP – Growing season TP loads at Grace (Figure 20) indicate the TP target is being met downstream of the WWTP under Grace WWTP’s present discharge regime. Therefore, Grace’s WWTP TP wasteload will be set at current levels. Future growth must be accommodated by improvements to the WWTP, with concentration reductions maintaining this TP load. TP concentrations at Grace (downstream of the WWTP) were meeting the TMDL target. Although TP concentrations measured above Oneida Reservoir (median TP = 0.070 mg/L) are greater than the TMDL target (0.05), this sampling location is approximately 30 miles downriver of the City of Grace’s discharge and growing season TP loads exceed the target (Figure 20) at that location because of sediment-derived TP (median TSS = 31 mg/L). This indicates exceedances are due to sediment-derived TP. Future reductions in TSS through non-point source implementation actions in this river reach also will generate additional reductions in sediment-derived TP.

Preston WWTP – Preston WWTP discharges directly into Worm Creek- a tributary of the Cub River (confluence in Utah). Worm Creek regularly exceeds TMDL TP targets above and below Preston’s WWTP. DMR data collected upstream and downstream of the WWTP indicate TP concentrations increase significantly downstream of the WWTP (median upstream TP = 0.87, downstream = 1.50 mg/L). Given the TP concentration upstream of the WWTP is an order of magnitude > the TMDL target of 0.075 mg/L, the proposed Preston WWTP target is based on the TMDL target of 0.075 mg/L TP. This

will require a reduction in load from the present average of 9.4 pounds/day to 0.48 pounds/day (Table 17).

Table 17. Loading capacity for Worm Creek at Preston, using DEQ and Preston DMR data (2000-2012).

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Minimum Q ¹ (cfs)	2.03	2.03	2.03	2.03	2.03	2.03	2.03	2.03	2.03	2.03	2.03	2.03
Minimum Q ¹ LC (lb/day)	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Minimum Q ¹ Existing Load* (lb/day)	12.94	12.94	12.94	12.94	11.73	11.73	11.73	11.73	11.73	12.94	12.94	12.94
Preston WLA (lb/day)	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48
Total WLAs (lb/day)	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48
Nonpoint Minimum Q ¹ LA (lb/day)	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34
Total Allocations	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Green highlight indicates months during biologically-active period												
¹ Minimum flow used is the sum of mean daily effluent flow (1.18 cfs) from Preston's DMR data and the lowest Worm Creek flow measured during 2000-2003 monitoring (0.85 cfs in Sept. 2003). This combined flow of 2.03 cfs is a conservative estimate of low flow, given that StreamStats (USGS) calculated the 7Q10 flow at 8.17 cfs.												
*existing loads use median concentrations calculated for growing and non-growing season												

Franklin WWTP – This WWTP discharges to the Cub River downstream of Franklin. Data collected downstream on the Cub River by Utah DEQ indicate low concentrations of TP (median = 0.045 mg/L). Using available flow data from Cub River at Preston, loads were calculated and indicate the TP target is being met downstream of Franklin WWTP during normal flow periods; however, 30 Q 10 and 10th percentile flows are approximately 1-2 cfs during June – August (Table 18). Therefore the load is set at present discharge levels during higher flow months (March and April) in the non-growing season only. Franklin has historically land-applied effluent during the growing season; therefore, a WLA based on 0.05 mg/L TP end of pipe limit is applied to these months. Future growth must be accommodated by improvements to the WWTP, with concentration reductions or increased storage for land application to meet TP load allocations.

Table 18. Loading capacity for Cub River at Franklin (Above Maple Creek) USGS Gage 10096000, 1939-1952.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
10th percentile Q (cfs)	16.4	19.4	21.9	83.3	215.5	26.0	2.3	1.7	2.1	3.3	3.9	9.6
10th percentile LC ¹ (lb/day)	4.5	5.3	6.0	22.5	58.2	7.1	0.7	0.5	0.6	0.9	1.1	2.6
10th percentile Existing Load ² (lb/day)	2.7	3.1	3.6	13.5	59.4	7.2	0.6	0.5	0.6	0.5	0.6	1.6
Franklin WLA (lb/day)	0.05	0.05	3.56	3.56	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Total WLAs (lb/day)	0.05	0.05	3.56	3.56	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Nonpoint 10th percentile LA (lb/day)	4.4	5.2	2.4	19.0	58.2	7.0	0.6	0.5	0.6	0.9	1.0	2.6
Total Allocations	4.5	5.3	6.0	22.5	58.2	7.1	0.7	0.5	0.6	0.9	1.1	2.6
Green highlight indicates months during biologically-active period												
¹ LC calculations include flows from WWTP (0.176 cfs), since gage is located upstream of outfall												
² existing loads use median concentrations calculated for growing (0.051 mg/L) and non-growing (0.030 mg/L) season from STORET												

5.5. Load Allocation

Suspended sediment, TP, and streambank erosion load allocations were developed for 303(d) listed tributary waters that were not addressed in the original Bear River Basin SBA/TMDL. There are no NPDES discharges to these streams; therefore no WLAs are

given. Where limited water column data were available, sediment load allocations were developed from streambank erosion inventories. Table 19 provides a summary of load analyses of streambank sediment for Strawberry, Preuss, Snowslide, and Dry creeks.

Table 19. Streambank sediment load analysis for Snowslide, Preuss, Dry, and Strawberry Creek.

Stream	Current Load Existing Erosion (tons/year)	Load Capacity/Load Allocation Proposed Erosion (tons/year)	Load Reduction (tons/year)	% Reduction
Snowslide Creek	117.12	57.55	59.57	51
Preuss Creek	1662.5	437.04	1225.46	74
Dry Creek	1991.24	910.28	1080.96	54
Strawberry Creek	1052.17	259.76	792.41	75

There are no NPDES discharges to these streams.

Total Phosphorus load allocations were developed based on the highest current loading and/or the target load (load capacity) as calculated based on flow during two different hydrologic time frames, base flow and runoff. Base flow (July – March) and runoff (April- June) conditions were determined by evaluating flow data and TP concentrations for the entire data set. Table 20 provides a summary of the TP load analyses for Dairy, Strawberry, and Dry creeks. There are no NPDES discharges to these streams.

Table 20. Total Phosphorus load analysis for Dairy, Co-Op, Strawberry, and Dry Creeks.

Stream	Average Flow (cfs)	Average T Phos (mg/L)	Current Load (lb/day)	Target Load (lb/day)	Load Allocation (lb/day)	Load Reduction (lb/day)	% Reduction
Dairy Creek							
Runoff (April – June)	3.27	0.13	2.30	1.32	1.32	0.97	42%
Base Flow (July – March)	0.37	0.11	0.23	0.15	0.15	0.08	34%
Strawberry Creek							
Runoff (6/28/06)	6.81	0.138	5.08	2.76	2.76	2.32	46%
Base Flow (10/31/06)	0.815	0.054	0.24	0.33	0.24	0	0%
Dry Creek							
Runoff (6/28/06)	4.73	0.076	1.94	1.92	1.92	0.03	1%
Base Flow (10/31/06)	1.04	0.062	0.35	0.42	0.35	0	0%

Snowslide Creek - In 2009 DEQ conducted streambank erosion inventories and McNeil depth fine sampling on this moderately-grazed tributary to Montpelier Creek. Results of

the erosion inventory showed that the majority of the stream was 46% erosive and a small section in the middle was 80% erosive. Depth fine monitoring further substantiated findings of excess sediment in salmonid spawning habitat with 49% fine sediment in streambed substrate. Currently, it is estimated that 177 tons of sediment per year enter Snowslide Creek from streambank erosion, calling for a 51% reduction in streambank sediment (Table 19).

Dry Creek – Dry Creek is §303(d)-listed for sedimentation/siltation and cause unknown. Water chemistry was measured on Dry Creek in June and October 2006. Based on those data, a 1% reduction in total phosphorus is recommended during spring runoff and a 0% reduction is prescribed during base flow (Table 20). Streambank and substrate conditions indicated that sediment was a pollutant of concern in Dry Creek. Streambank erosion inventories conducted in 2008 showed that streambanks on Dry Creek were 44% erosive and depth fines yielded a result of 48.66% fine material in streambed substrate where salmonid spawning is most likely to occur. Therefore, a 54% reduction in streambank erosion is recommended in this TMDL (Table 19).

Preuss Creek (including Beaver Creek) – Preuss Creek AUs (Figure 3) ID16010102BR006_02, ID16010102BR006_02a and ID16010102BR006_02b are on the §303(d) list for sedimentation/siltation and physical substrate habitat alterations (_02 only) and combined biota/habitat biosassessments (_02a only). In 2008 DEQ staff collected data on the condition of streambanks on Preuss Creek and determined that the banks were 76% unstable, well below the established target of 80% stable. A load allocation of 437 tons per year was assigned, which calls for a 74% reduction in sediment from streambank erosion (Table 19).

Strawberry Creek – Strawberry Creek is on the §303(d) list for sedimentation/siltation, low flow alterations and physical substrate alterations. In June and October 2006 DEQ collected water column data and results showed that the TP and TSS targets were exceeded during spring runoff. To further assess the stream, DEQ collected streambank erosion and subsurface fine data in 2009. These results yielded exceedances in the target value for depth fines in spawning habitat in three locations (upper, middle, lower) and streambank conditions exceeded the target value in the lower reach of the stream. Based on these data, a 75% reduction in streambank erosion in prescribed areas was recommended (Table 19). A 46% reduction in TP (Table 20) is called for.

Dairy Creek – Dairy Creek (ID16010204BRO11_03) is on the §303(d) list for sedimentation/siltation, while the second order reach (ID16010204BRO11_02) is listed for combined biota/habitat assessments, but was dry during 2005 and 2008, precluding BURP assessment. To develop a load analysis for the 3rd order AU, water column data were collected by the IASCD in 2005 and 2006. The stream was monitored 28 times and of those 28 events, the TP target was exceeded 64% of the time and TSS concentrations never exceeded the target value. Based on these data a 42% reduction in TP is called for during high flow and a 34% reduction in TP is prescribed during base flow conditions (Table 20). Since TSS targets were not exceeded, a reduction in water column sediment is not recommended at this time. Further investigation is necessary to determine whether a sediment problem remains in this stream.

5.5.1. Margin of Safety

The margin of safety regarding TSS and TP targets is implicit in the chosen endpoints. The 0.075 mg/L target concentration is below EPA's (1986) recommendation that TP concentration not exceed 0.1 mg/L in stream reaches where the receiving water is another stream. Hence, the 0.075 target in Bear River Basin is a 25% reduction in the EPA recommended target. The sediment endpoints (35, 60, 80 mg TSS/L) fall within the range of concentrations (25-80 mg/L) necessary to maintain a good to moderate fishery (EIFAC 1964). The 80 mg/L target only applies during runoff, when higher suspended solids concentrations would be expected. Most of the year, maximum concentrations will range from 35 to 60 mg/L; in the middle or lower end of the EIFAC recommendations. Thus, the chosen targets implicitly include a margin of safety for support of beneficial uses. For point sources, recommended targets followed those for nonpoint sources or were based on the facility's technology based NPDES permit limits.

The margin of safety (MOS) factored into streambank sediment load allocations is implicit. The MOS includes the conservative assumptions used to develop existing sediment loads. Conservative assumptions made as part of the sediment loading analysis include the following: Desired bank erosion rates are representative of assumed natural background conditions. Water quality targets for percent depth fines are consistent with values measured and are set by local land management agencies based on established literature values, incorporating an adequate level of fry survival to provide for stable salmonid production.

5.5.2. Seasonal Variation

Seasonal variability was built-in to streambank erosion TMDLs by developing sediment 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. Streambank erosion inventories take into account that most bank recession occurs during peak flow events, when the banks are saturated. The estimated annual average sediment delivery is a function of bankfull discharge. It is assumed that the accumulation of sediment within dry channels is continuous until flow resumes and the accumulated sediment is transported and deposited.

Where TP and TSS were concerned, seasonality is considered only for TSS. Sediment endpoints vary to account for higher sediment loads naturally carried by streams during runoff periods. Due to the affinity of phosphorus for adsorbing to sediment and thus the potential for "release" back into the stream during periods of vegetative growth, no change in total phosphorus endpoints are recommended based on season.

With suspended sediment two targets are specified for each site, one or the other of which applies at all times; which one applies depends on the runoff season. Knowing that naturally higher sediment loads are observed during times of runoff, it makes sense to have a seasonal adjustment to the recommended targets. Thus, the higher target concentration of 60 or 80 mg/L during the historic spring runoff period allows for normal seasonal increases in suspended sediment while still within concentrations needed to maintain good to moderate fisheries. During periods of lower flows, the target concentration is lowered to 35 and 60 mg/L to further enhance and protect fisheries.

These targets are assumed to represent average values over the sampling period (e.g., hydrologic period). Targets can be adjusted as additional information is collected.

The critical period for nutrients in terms of affecting beneficial uses in Bear River Basin is the warmer months of summer and early fall. Nutrients promote growth of aquatic vegetation, which usually is at highest density in late summer - a time of high demand by river recreationists. Summer also means warmer water temperatures, and because saturation levels of gases decline as temperature increases, decreased concentrations of dissolved oxygen result. These conditions stress aquatic biota when oxygen levels are low and respiration of dense aquatic vegetation pushes dissolved oxygen concentrations lower.

The tendency for the uptake of phosphorus as phosphates by sediment allows phosphorus availability throughout the growing season regardless of time of input. If Bear River was the only concern, seasonal variation in nutrient concentrations would be considered. However, Bear River flows into Bear Lake, Alexander Reservoir, and Oneida Reservoir. Lentic waters (e.g., lakes and reservoirs) act as sinks for phosphorus, increasing the available time for uptake by aquatic vegetation. Thus, phosphorus, which entered the stream in the winter when vegetative growth is low or nil, could be available to aquatic vegetation in the reservoir in late summer and early fall when conditions are conducive to algal or macrophytic growth. Due to concern about the lake and reservoirs, no allowance for seasonal variation in nutrient loading is made.

5.5.3. Reasonable Assurance

The U. S. Environmental Protection Agency (EPA) requires that Total Maximum Daily Loads (TMDL) with a combination of point and nonpoint sources and with wasteload allocations dependent on nonpoint source controls, provide reasonable assurance that the nonpoint source controls will be implemented and effective in achieving the load allocation (EPA 1991). If reasonable assurance that nonpoint source reductions will be achieved is not provided, the entire pollutant load will be assigned to point sources.

Nonpoint source reductions listed in the Bear River TMDL will be achieved through state authority within the Idaho Nonpoint Source Management Program. Section 319 of the Federal Clean Water Act requires each state to submit to EPA a management plan for controlling pollution from nonpoint sources to waters of the state. The plan must: identify programs to achieve implementation of best management practices (BMPs); furnish a schedule containing annual milestones for utilization of program implementation methods; provide certification by the attorney general of the state that adequate authorities exist to execute the plan for implementation of best management practices; and, include a listing of available funding sources for these programs. The current Idaho Nonpoint Source Management Plan has been approved by EPA (December 1999) as meeting the intent of section 319 of the Clean Water Act. As described in the Idaho Nonpoint Source Management Plan, Idaho Water Quality Standards require that if monitoring indicates water quality standards are not met due to nonpoint source impacts, even with the use of current best management practices, the practices will be evaluated and modified as necessary by the appropriate agencies in accordance with provisions of the Administrative Procedure Act (IDAPA). If necessary, injunctive or other judicial relief may be initiated against the operator of a nonpoint source activity in accordance

with authority of the Director of Environmental Quality provided in Section 39-108, Idaho Code (IDAPA 58.01.02.350). Idaho Water Quality Standards list designated agencies responsible for reviewing and revising nonpoint source BMPs based on water quality monitoring data generated through the state's water quality monitoring program. Designated agencies are: Department of Lands for timber harvest activities, oil and gas exploration and development, and mining activities; Soil and Water Conservation Commission for grazing and agricultural activities; Transportation Department for public road construction; Department of Agriculture for aquaculture; and the Department of Environmental Quality for all other activities (Idaho Code 39-3602). Existing authorities and programs for assuring implementation of BMPs to control nonpoint sources of pollution in Idaho are as follows:

- Nonpoint Source 319 Grant Program/ State Agricultural Water Quality Program
- Wetlands Reserve Program
- Resource Conservation and Development/ Agricultural Pollution Abatement Plan
- Conservation Reserve Program
- Idaho Forest Practices Act
- Environmental Quality Improvement Program
- Stream Channel Protection Act Water Quality Certification for Dredge and Fill

The Idaho Water Quality Standards direct appointed advisory groups to recommend specific actions needed to control point and nonpoint sources affecting water quality limited water bodies. Upon approval of this TMDL by EPA Region 10, the existing Bear River Basin Advisory Group, with the assistance of appropriate local, state, tribal, and federal agencies, will continue to work on water quality improvements and specific pollution control actions for achieving water quality targets listed in the Bear River Total Maximum Daily Load and this addendum. These plans can be found at the following internet address: www.deq.idaho.gov/bear-river-basin-malad-river-subbasin. These implementation plans will continue to guide water quality improvement in the Bear/Malad River. See Section 5.8 on Implementation Strategies and Table 23 for a list of Implementation Plans and non-point source projects that have either been completed to date or that are currently being planned and implemented. Recent data (2006-2009) indicate reductions in total phosphorus compared to historical data (1990-2005).

Additionally, the Settlement Agreement (28 August 2002) for the relicensing of PacifiCorp's Bear River Hydroelectric Projects created the Environmental Coordination Committee which administers funding to selected projects aimed at enhancing habitat for Bonneville Cutthroat Trout. Since its inception, the ECC has funded numerous projects that have improved water quality in the Bear River and many tributaries. The Habitat Fund allocates up to \$167,000/year for habitat enhancement and restoration projects, while the Land and Water Acquisition Fund allocates up to \$300,000/year for purchase of land, easements, and water rights to further habitat for Bonneville Cutthroat Trout. These funding mechanisms extend through the end of the FERC License in 2031.

Table 21 and Table 22 summarize Environmental Coordination Committee projects completed through 2010. While these projects focus on Bonneville Cutthroat Trout restoration, many are directly related to improving water quality. To date, nineteen projects relating directly to water quality improvements (e.g., bank stabilization, removal

of confined animal feeding sites and barns from streamside areas and riparian fencing) have been completed. Many more such projects will be completed during the remaining license period. WLAs are based on recent water quality data indicating phosphorus targets are generally being met. Continued reductions in both total phosphorus (via activities reducing sediment inputs into the Bear River and its tributaries) and dissolved phosphorus (via reduction of animal waste by removal or improvements to confined animal feeding operations) will assure water quality sufficient to accommodate proposed WLAs will be maintained or improved in the future.

Finally, DEQ will continue to collect water quality data, on a quarterly basis at a minimum, and will analyze this information in conjunction with Bear River TMDL Five Year Reviews. These reviews are required by Idaho Statute 39-3611(7) and will include a review of all available data, assessments, instream targets, pollutant allocations, assumptions and analyses upon which the TMDL and subbasin assessment were based. If it is found that implementation plan(s) are inappropriate (i.e., not providing adequate water quality improvement to progress towards timely attainment of water quality targets), implementation plans, load allocations and wasteload allocations will be reviewed and adjusted if necessary to further water quality improvement. As directed by Idaho Statute, this review and subsequent actions will be coordinated with the appropriate DEQ water quality advisory group.

Table 21. PacifiCorp Environmental Coordination Committee Projects, 2005-2010.

Project Name	ECC Sponsor	Project Description	ECC Funding Amount
2005			
Cub River	Colyer, Trout Unlimited	Retrofit irrigation diversion for fish passage	\$55,000.00
Cottonwood Creek	Davies, PacifiCorp	Retrofit irrigation diversion for fish passage and screening	\$45,000.00
Williams Creek	Van Every, Idaho Dept. of Environmental Quality Stenberg, PacifiCorp	Irrigation ditch piping and screening	\$25,000.00
McGregor Fencing	Davies, PacifiCorp	Install riparian fencing on Bear River	\$4,000.00
Skinner Creek	Capurso, Forest Service	Move feedlot off creek and stream reclamation	\$46,000.00
2006			
Kackley Springs Restoration Feasibility Evaluation and Site Plan	Stenberg, PacifiCorp	Develop a plan for reclamation of spring	\$10,000.00
Ovid Irrigation Diversion	Colyer, Trout Unlimited	Retrofit irrigation diversion for fish passage and screening	\$11,000.00
Alleman Lower Diversions Screening and Bypass	Capurso, Forest Service	Retrofit irrigation diversion for fish passage and screening	\$30,000.00
Cub River Phase II - Screening	Colyer, Trout Unlimited	Retrofit irrigation diversion for fish screening	\$47,000.00
Nounan Road Crossing of Skinner Creek	Capurso, Forest Service	Culvert replacement and stream reclamation	\$25,000.00
Liberty Creek Diversions Screen and Weir		Retrofit irrigation diversion for fish passage and screening	\$16,000.00
Cove Bypass Reach Fencing	Stenberg, PacifiCorp	Install riparian fencing on several parcels along Bear River	\$5,000.00
2007			
Laurie Harris Spring	Davies, PacifiCorp	Winter feedlot relocation; alternate water source, stream reclamation, grazing removal on spring system	\$20,000.00
Trout Creek Restoration (Vegetation Planning)	Stenberg/ Davies, PacifiCorp	Plan for Trout Creek reclamation	\$3,500.00
Whiskey Creek/Trout Creek Reclamation	Stenberg, PacifiCorp	Stream reclamation includes re-route to historic channel, planting, fisheries habitat enhancement, etc.	\$40,000.00
Bunderson	Colyer, Trout Unlimited	Relocate calving barn; fence stream to exclude grazing.	\$25,000.00
Mathews Bear River Restoration (two phases)	Stenberg, PacifiCorp	Bear River bank stabilization and riparian fencing with grazing exclusion	\$80,000.00
Georgetown Creek Enhancement	Capurso, Forest Service	Develop plan to retrofit diversion for fish passage and screening	\$24,000.00
Eightmile Road and Trail Closure	Capurso, Forest Service	Close/obliterate trails and roads (4.05 miles), realign trails (0.25 miles), reconstruct trails and define four dispersed recreation sites out of the riparian areas within Eightmile Creek watershed	\$14,500.00
Midland Trail Renovation	Capurso, Forest Service	Realign several sections of trail, improve drainage structures and improve the stream crossing (i.e. construct bridges) on the Midland Trail (#309)	\$5,000.00
North Canyon Riparian	Capurso, Forest Service	Improve watershed by restricting motorized access on 1 acre of riparian habitat	\$1,500.00

Project Name	ECC Sponsor	Project Description	ECC Funding Amount
Protection		in three locations	
2008			
Bailey Creek Culvert	Stenberg, PacifiCorp	Culvert replacement to remove aquatic barrier.	\$25,000.00
Cub River Irrigation Upper Diversion	Colyer, Trout Unlimited	Retrofit irrigation diversion for fish passage and screening	\$45,000.00
Screen Tender	Colyer, Teuscher, Capurso Trout Unlimited, Idaho Dept. of Fish and Game and Forest Service	Hire seasonal screen tender	\$14,000.00
Stauffer Creek	Teuscher, Idaho Dept. of Fish and Game	Install riparian fencing and bottomless culverts and harden stream crossing	\$40,000.00
Black Canyon Turner Bridge Cleanup	Van Every, Idaho Dept. of Environmental Quality	Remove debris from Bear River below Turner Bridge	\$5,740.00
Harris Completion	Davies, PacifiCorp	See previous Harris description- new request based on NRCS scope bid estimate.	\$15,500.00
2009			
Kackley Springs Reroute	Stenberg, PacifiCorp	Redirect current spring flow to a longer route through Kackley property. Rebuild and remove dikes and other water control structures and create new stream channel on PacifiCorp lands.	\$9,000
Cub River Upper Fish Screen	Colyer, Trout Unlimited	Install a fish screen at the uppermost irrigation diversion on the Cub River.	\$40,000
Aquatic Nuisance Species Signage	Berglund, Bureau of Land Management	Install interpretive signage at high use boating and fishing areas along the Bear River that are infected with aquatic invasive species, including New Zealand mudsnail and whirling disease.	\$3,000
Keetch Fish Screen	Colyer, Trout Unlimited	Convert 198 acres of cropland from flood irrigation to sprinkler. Includes 3400-ft conveyance pipe, sprinkler system, pumping plant, and water control structure.	\$7,500
Bailey Creek/Midnight Mountain Fencing	Teuscher, Idaho Dept. of Fish and Game	Scout troop(s) to build riparian fencing along sensitive streams.	\$5,000
Battle and Mink Creek	Colyer, Trout Unlimited	Relocate six corrals from the Battle and Mink Creek watersheds.	\$46,000
Anderson Eight-Mile	Colyer, Trout Unlimited	Replace an irrigation diversion with one better suited for fish passage and that will prevent fish from swimming down the irrigation ditch. Install conveyance and gated pipe.	\$27,804
Ovid and Cub Fish Screen Repair	Colyer, Trout Unlimited	Provide funding for repair to fish screens on projects previously funded by the ECC at an irrigation diversion at Ovid and on the Cub River.	\$10,675
Oneida Fish Passage Design (Phase One)	Capurso, Forest Service; Stenberg, PacifiCorp and others	Design an upstream fish passage facility for Oneida Narrows Dam to reconnect Bonneville cutthroat trout (BCT) stronghold populations upstream and downstream of the reservoir.	\$73,000
2010			
Alleman Dam Removal	Capurso, Forest Service	Remove an irrigation diversion dam on Alleman property on Georgetown Creek, establish a single point of diversion, restore riparian area, and exclude cattle.	\$45,000
Bunderson, Roy Irrigation	Colyer, Trout Unlimited	Install a fish ladder on irrigation structure on Paris Creek to allow passage of BCT.	\$25,000

Project Name	ECC Sponsor	Project Description	ECC Funding Amount
Structure			
Bunderson, Max Irrigation Structure Fish Bypass	Colyer, Trout Unlimited	Replace wooden irrigation diversion on Paris Creek with rock drop structures to allow fish passage and install fish screen on irrigation ditch.	\$30,000
Whiskey Creek Habitat Restoration	Teuscher, Idaho Dept. of Fish and Game	Improve habitat for BCT in Whiskey Creek by narrowing stream channel and planting riparian vegetation.	\$30,000
Georgetown Fish Ladder	Capurso, Forest Service	Allocate additional funding for recently constructed Georgetown Hydro fish ladder to address cost over-runs.	\$10,000
Screen Tender	Teuscher, Idaho Department of Fish and Game	Allocate funding for an Idaho Department of Fish and Game employee to monitor and maintain fish screens.	\$12,000
Oneida Narrows Riparian Protection	Berglund, Bureau of Land Management	Exclude cattle from the Oneida Narrows boater take-out on the Bear River by installing a fence and cattleguard and providing an alternative water source for cattle.	\$15,000
Alexander Shrub Planting	Stenberg, PacifiCorp	Continue native shrub planting in Alexander Reservoir shoreline buffer.	\$7,000
Cub River Fish Tracking	Colyer, Trout Unlimited	Install radiotelemetry tags in 40 BCT to identify migration extent and spawning locations within the Cub River and to determine whether Cub River BCT use the Bear River for overwintering habitat.	\$5,000
Kackley Springs Fish Trap	Stenberg, PacifiCorp	Design, build and install a structure to exclude nonnative fish from Kackley Spring.	\$20,000
Kackley Springs Consultation	Stenberg, PacifiCorp	Engage an aquatic ecosystem restoration specialist to review progress at Kackley Springs and provide recommendations.	\$1,020.00

Table 22. PacifiCorp Environmental Coordination Committee Conservation Land and Easement Purchases, 2005-2010.

Conservation Land and Easement purchases 100% funded by the Bear River Hydroelectric Project Land and Water Conservation Fund and held by Sagebrush Steppe Regional Land Trust:

<u>Conservation Easements</u>	<u>Acreage</u>	<u>Waterbody</u>	<u>Date</u>	<u>LF Protection*</u>	
				<u>RB</u>	<u>LB</u>
Cove Easement 1/Olsen	0.25	Bear River	2006	342	
Cove Easement 2/Hansen	0.04	Bear River	2006	29	
Cove Easement 3/McCurdy	0.68	Bear River	2006	758	
Cove Easement 4/Olsen	0.24	Bear River	2006	343	
Cove Easement 5/Harris	1.0	Bear River	2006	740	
Henderson Preserve	210	Bear River	2008	4,406	4,114
Harris Preserve	116	Bear River 2009	2,899		
<u>Fee Title</u>	<u>Acreage</u>	<u>Watershed</u>	<u>Date</u>	<u>LF Protection*</u>	
				<u>RB</u>	<u>LB</u>
Kackley Preserve	157	Bear River	2006	1,964	3,402
		Kackley Crk	2006	2,661	2,790
Cove Preserve	2.3	Bear River	2006		772
Deep Creek Preserve	435	Bear River 2010	1,767	1,812	

Conservation Land purchase partial funded by the Bear River Hydroelectric Project Land and Water Conservation Fund and held by the Idaho Department of Fish and Game.

<u>Fee Title</u>	<u>Acreage</u>	<u>Watershed</u>	<u>Date</u>	<u>LF Protection*</u>	
				<u>RB</u>	<u>LB</u>
McCammon Parcel	77.5	Bear River	2006		4696

Total Lands Protected through Fee Purchase and Conservation Easements is 1000.01 Acres.

***Linear feet of riparian protection provided. RB = Right Bank, LB = Left Bank looking downstream.**

5.5.4. Background

Natural background loading rates for sediment from streambank erosion are assumed to be the natural sediment loading capacity of 80% or greater streambank stability and 28% or less subsurface fine sediment. Therefore natural background is accounted for in the load capacity.

Natural background in the Bear River Basin is unknown: data were not available to make such estimates. To account for the lack of information on natural background levels, load capacities were calculated such that their attainment would result in support of beneficial uses, thus including natural background.

5.5.5. Reserve

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

In some situations, a certain load capacity is held in reserve for future growth. This reserve capacity reduces overall load capacity so none was recommended for Bear River in the original Bear River SBA/TMDL. It is anticipated that any new pollutant source would have to meet load or wasteload allocations in line with current sediment and nutrient targets. Should future monitoring indicate water quality goals are being met and/or beneficial uses are being supported in certain river or tributary reaches, DEQ will look at load capacity for new sources on an individual basis.

No reserve for future growth is included in the wasteload allocations. Municipal point source dischargers will have to adjust for additional population growth through additional reductions in concentrations or discharge or both.

5.5.6. Construction Storm Water and TMDL Wasteload Allocations

5.5.6.1. Construction Storm Water

The Clean Water Act requires operators of construction sites to obtain permit coverage to discharge storm water to a water body or to a municipal storm sewer. In Idaho, EPA has issued a general permit for storm water discharges from construction sites. In the past storm water was treated as a non-point source of pollutants. However, because storm water can be managed on site through management practices or when discharged through a discrete conveyance such as a storm sewer, it now requires a National Pollution Discharge Elimination System (NPDES) Permit.

5.5.6.2. The Construction General Permit (CGP)

If a construction project disturbs more than one acre of land (or is part of larger common development) that will disturb more than one acre), the operator is required to apply for permit coverage from EPA after developing a site-specific Storm Water Pollution Prevention Plan.

5.5.6.3. Storm Water Pollution Prevention Plan (SWPPP)

In order to obtain the Construction General Permit operators must develop a site-specific Storm Water Pollution Prevention Plan (SWPPP). The operator must document the erosion, sediment, and pollution controls they intend to use, inspect the controls periodically and maintain the best management practices (BMPs) through the life of the project

5.5.6.4. Construction Storm Water Requirements

When a stream is on Idaho's § 303(d) list and has a TMDL developed DEQ may incorporate a gross WLA for anticipated construction storm water activities. TMDLs developed in the past that did not have a WLA for construction storm water activities will also be considered in compliance with provisions of the TMDL if they obtain a Construction General Permit (CGP) under the NPDES program and implement the appropriate Best Management Practices.

Typically, there are specific requirements you must follow to be consistent with any local pollutant allocations. Many communities throughout Idaho are currently developing rules for post-construction storm water management. Sediment is usually the main pollutant of concern in storm water from construction sites. The application of specific best management practices from *Idaho's Catalog of Storm Water Best Management Practices for Idaho Cities and Counties* is generally sufficient to meet the standards and requirements of the General Construction Permit, unless local ordinances have more stringent and site specific standards that are applicable.

5.5.7. Remaining Available Load/Reserve for Growth

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

In some situations, a certain load capacity is held in reserve for future growth. This reserve capacity reduces overall load capacity so none was recommended for Bear River in the original Bear River SBA/TMDL. It is anticipated that any new pollutant source would have to meet load or wasteload allocations in line with current sediment and nutrient targets. Should future monitoring indicate water quality goals are being met and/or beneficial uses are being supported in certain river or tributary reaches, DEQ will look at load capacity for new sources on an individual basis.

No reserve for future growth is included in the wasteload allocations. Municipal point source dischargers will have to adjust for additional population growth through additional reductions in concentrations and/or discharge.

5.6. Pollution Trading

Pollutant trading (also known as *water quality trading*) is a contractual agreement to exchange pollution reductions between two parties. Pollutant trading is a business-like way of helping to solve water quality problems by focusing on cost effective local solutions to problems caused by pollutant discharges to surface waters.

The appeal of trading emerges when pollutant sources face substantially different pollutant reduction costs. Typically, a party facing relatively high pollutant reduction costs compensates another party to achieve an equivalent, though less costly, pollutant reduction.

Pollutant trading is voluntary. Parties trade only if both are better off because of the trade, and trading allows parties to decide how to best reduce pollutant loadings within the limits of certain requirements.

Pollutant trading is recognized in Idaho's Water Quality Standards at IDAPA 58.01.02.054.06. Currently, DEQ's policy is to allow for pollutant trading as a means to meet total maximum daily loads (TMDLs), thus restoring water quality limited water bodies to compliance with water quality standards. The *Pollutant Trading Guidance* document sets forth the procedures to be followed for pollutant trading:

www.deq.idaho.gov/pollutant-trading

5.6.1. Trading Components

The major components of pollutant trading are *trading parties* (buyers and sellers) and *credits* (the commodity being bought and sold). Additionally, *ratios* are used to ensure environmental equivalency of trades on water bodies covered by a TMDL. All trading activity must be recorded in the trading database through the Idaho Clean Water Cooperative, Inc.

Both point and nonpoint sources may create marketable credits, which are a reduction of a pollutant beyond a level set by a TMDL:

- Point sources create credits by reducing pollutant discharges below NPDES effluent limits set initially by the wasteload allocation.
- Nonpoint sources create credits by implementing approved best management practices (BMPs) that reduce the amount of pollutant run-off. Nonpoint sources must follow specific design, maintenance, and monitoring requirements for that BMP, apply discounts to credits generated if required, and provide a water quality contribution to ensure a net environmental benefit. The water quality contribution also ensures the reduction (the marketable credit), is surplus to the reductions the TMDL assumes the nonpoint source is achieving to meet the water quality goals of the TMDL.

5.6.2. Watershed-Specific Environmental Protection

Trades must be implemented so that the overall water quality of the waterbodies covered by the TMDL are protected. To do this, hydrologically-based ratios are developed to ensure trades between sources distributed throughout TMDL water bodies result in environmentally equivalent or better outcomes at the point of environmental concern. Moreover, localized adverse impacts to water quality are not allowed.

5.6.3. Trading Framework

For pollutant trading to be authorized, it must be specifically mentioned within a TMDL document. After adoption of an EPA approved TMDL, DEQ, in concert with the Watershed Advisory Group (WAG), must develop a pollutant trading framework document as part of an implementation plan for the watershed that is the subject of the TMDL.

The elements of a trading document are described in the aforementioned DEQ Pollutant Trading Guidance.

5.7. Public Participation

House Bill 145 (HB145) has brought about changes in how WAGs are involved in TMDL development and review. The basic process for developing TMDLs and implementation plans is as follows:

1. BAG members are appointed by DEQ's director for each of Idaho's basins.
2. An "Integrated Report" is developed by DEQ every two years that highlights which water bodies in Idaho appear to be degraded.
3. DEQ prepares to begin the SBA and TMDL process for individual degraded watersheds.
4. A WAG is formed by DEQ (with help from the BAG) for a specific watershed/TMDL.
5. With the assistance of the WAG, DEQ develops an SBA and any necessary TMDLs for the watershed.

6. The WAG comments on the SBA/TMDL.
 7. WAG comments are considered and incorporated, as appropriate, by DEQ into the SBA/TMDL.
 8. The public comments on the SBA/TMDL.
 9. Public comments are considered and incorporated, as appropriate, by DEQ into the SBA/TMDL.
 10. DEQ sends the document to the U.S. Environmental Protection Agency (EPA) for approval.
 11. DEQ and the WAG develop, then implement, a plan to reach the goals of the TMDL.
- DEQ will provide the WAG with all available information pertinent to the SBA/TMDL, when requested, such as monitoring data, water quality assessments, and relevant reports. The WAG will also have the opportunity to actively participate in preparing the SBA/TMDL documents.

Once a draft SBA/TMDL is complete, it is reviewed first by the WAG, then by the public. If, after WAG comments have been considered and incorporated, a WAG is not in agreement with an SBA/TMDL, the WAG's position and the basis for it will be documented in the public notice of public availability of the SBA/TMDL for review. If the WAG still disagrees with the SBA/TMDL after public comments have been considered and incorporated, DEQ must incorporate the WAG's dissenting opinion.

5.8. Implementation Strategies

DEQ recognizes that implementation strategies for TMDLs may need to be modified if monitoring shows that the TMDL goals are not being met or significant progress is not being made toward achieving the goals.

Since approval of the original Bear River Basin SBA/TMDL several TMDL Implementation Plans have been written by the United States Forest Service (USFS) and the Idaho Soil and Water Conservation Commission (ISWCC) (www.deq.idaho.gov/bear-river-basin-malad-river-subbasin).

A brief outline for each of the eight Implementation Plans follows:

Lower Bear/Malad Subbasin (ISWCC)

The Lower Bear/Malad Subbasin Implementation Plan (Plan) addresses the Malad River in Idaho and Utah and the Bear River in Utah. The Plan identifies pollutant and transport areas as critical, with 133,713 acres proposed for treatment. Areas adjacent to Deep, Devil, Elkhorn and Samaria creeks and Little Malad and Malad rivers are considered highest priority as they have erosive channels and are adjacent to fields and facilities having a direct and substantial negative influence on these waterbodies. The Plan identifies three Implementation Alternatives to be used – land treatment with structural and non-structural BMPs, riparian and stream channel restoration and animal facility waste management. BMPs should be installed by 2022 and effectiveness evaluated by 2025, with an approximate cost of 10.3 million dollars.

Central Bear (Bear River mainstem - ISWCC)

The Central Bear Subbasin Implementation Plan addresses the mainstem Bear River (Wyoming border to Wardboro). The Plan identifies pollutant and transport areas as critical, with an area of 50,313 acres of riparian, cropland and rangeland proposed for various treatments. The Plan identifies three Implementation Alternatives to be used – land treatment with structural and non-structural BMPs, riparian and stream channel restoration and animal facility waste management. BMPs include a broad range of practices, including but not limited to, fencing, water projects, conservation crop rotation and sediment basins. BMPs should be installed by 2022 and effectiveness evaluated by 2025, with an approximate cost of 1.7 million dollars.

Northern Middle Bear River (ISWCC)

The Northern Middle Bear Subbasin Implementation Plan addresses the mainstem Bear River (Alexander Dam to Oneida Reservoir), Cottonwood, Densmore, Whiskey and Williams creeks. The Plan identifies dry cropland as comprising the majority of critical area within the basin, with an overall area of 119,278 acres proposed for various treatments (also includes some rangeland and riparian). Implementation projects will prioritize riparian and stream restoration, animal facilities/waste management and land treatment with structural and non-structural improvements on crop and rangelands. BMPs will include a broad range of practices, including but not limited to, fencing, water projects, conservation crop rotation and sediment basins. The use of sediment basins has been, and will continue to be used as an effective BMP on highly erodible croplands. BMPs should be installed by 2018 and effectiveness evaluated by 2025, with an approximate cost of 7.3 million dollars.

Southern Middle Bear River (ISWCC)

The Southern Middle Bear Subbasin Implementation Plan addresses the mainstem Bear River (Oneida Reservoir to ID-UT border), Weston, Fivemile, Strawberry, Deep and Battle creeks. The Plan identifies critical areas of mass wasting and eroding banks on Battle, Deep, Fivemile and Weson creeks. The Plan also notes severe erosion of Bear River banks downstream of Riverdale Bridge. Implementation projects will prioritize land treatment with structural and non-structural improvements on crop and rangelands, riparian and stream restoration and animal facilities/waste management. BMPs will be applied to 95,733 acres and include a broad range of practices, including but not limited to, fencing, water projects, conservation crop rotation and sediment basins. BMPs should be installed by 2022 and effectiveness evaluated by 2025, with an approximate cost of 7.7 million dollars.

Bear Lake Subbasin (ISWCC)

The Bear Lake Subbasin Implementation Plan addresses the mainstem Bear River (Wardboro to Alexander Reservoir), Co-op, Ovid, North, Pearl, Eightmile, Skinner,

Georgetown, Mill and St. Charles creeks. The Plan focuses on rangeland improvements in Bear Lake County while Caribou County's first priority is riparian and stream channel restoration. Implementation projects will prioritize land treatment with structural and non-structural improvements on crop and rangelands, riparian and stream restoration and animal facilities/waste management. BMPs will be applied to 344,698 acres and include a broad range of practices, including but not limited to, fencing, water projects, conservation crop rotation and sediment basins. BMPs should be installed by 2018 and effectiveness evaluated by 2025, with an approximate cost of 5.9 million dollars.

Bear River and Malad River (USFS)

This Implementation Plan addresses all streams on U.S. Forest Service land in all subbasins included in the TMDL. High priority streams that require load reductions are Dry, Preuss, Georgetown and Skinner creeks. Implementation of BMPs will focus mainly on improving grazing practices and trail and road management/improvements on the Forest. Adaptive management will be applied in an ongoing manner to meet beneficial use goals and TMDL targets. No specific acreage or cost estimates are given.

Daniels Subbasin (Malad River - ISWCC)

The Daniels Subbasin Implementation Plan addresses Daniels Reservoir and tributary streams including Wrights, Dairy, Indian Mill creeks and Little Malad River/Spring. Wright and Dairy creeks are critical focal points in terms of their sediment contributions to Daniels Reservoir. BMPs will be applied to 23,742 acres and include a broad range of practices, including but not limited to, channel vegetation, fencing, planting and sediment basins. BMPs should be installed by 2018 and effectiveness evaluated by 2025, with an approximate cost of 4.5 million dollars.

Cub River Subbasin (Bear River - ISWCC)

The Cub River Subbasin Implementation Plan addresses the mainstem Cub River and Worm and Maple creeks. The Plan identifies critical areas as unstable and erosive stream channels and adjacent areas on Cub River, Worm and Maple creeks. BMPs will be applied to 46,439 acres and include a broad range of practices, prioritizing stream channel stabilization, nutrient management and waste management systems. BMPs should be installed by 2019 and effectiveness evaluated by 2025, with an approximate cost of 5.1 million dollars.

A number of water quality improvement projects have been conducted in the basin by the Soil and Water Conservation Districts and other stakeholders on agricultural lands in the Basin. The Bear Lake Regional Commission (BLRC) has conducted an improvement project on St. Charles Creek and they continue to expand their streambank restoration work on the Thomas Fork and in the mainstem Bear River near the Idaho-Wyoming Border. The ability to adequately monitor these activities and quantitatively assess their effectiveness is significantly limited by the short time-frame between the approval of the original document and this addendum. Despite this limitation, these past and ongoing

efforts are most certainly having a positive impact on overall water quality in the Bear River Basin. Table 23 summarizes the most recent water quality improvement projects in the Bear River Basin.

A detailed description of completed projects by SWCDs and BLRC are available on the Bear River BAG webpage at: <http://www.deq.idaho.gov/regional-offices-issues/pocatello/basin-watershed-advisory-groups/bear-river-basin-advisory-group.aspx> or www.deq.idaho.gov/idaho-nps-management-program

Additionally, numerous habitat and water quality improvement projects have been completed through efforts of the Environmental Coordination Committee (ECC) which is responsible for implementing PacifiCorp Energy's "Settlement Agreement Resolving the Relicensing of the Bear River Hydroelectric Projects – August 28, 2002". See PacifiCorp's website at:

<http://www.pacificorp.com/es/hydro/hl/br.html>

Table 23. Some recent water quality improvement projects in the Bear River Basin.

Stream	General Project Overview	Agency	Year Completed
Jenkins Hollow	Water developments	Franklin SWCD	2007
Mink Creek	AFO relocation	Franklin SWCD	2009
Paris Creek	CAFO relocation	Bear Lake SWCD	2008
Old Bear River Channel	Fencing, water development	Bear Lake SWCD	2008
Mainstem Bear River (Dingle)	Steambank restoration	Bear Lake SWCD	2007
Wright Creek	Fencing	Oneida SWCD	2006
Weston Creek	Fencing, water developments	Franklin SWCD	2007
Main Canyon	Spring developments	Franklin SWCD	2007
Densmore Creek	Water developments	Caribou SWCD	2007
Battle Creek	AFO relocation	Franklin SWCD	2009
St. Charles Creek	Habitat restoration, water control structures, fencing, fish ladders	BLRC	2009
Thomas Fork	Streambank restoration	BLRC	2006
Mainstem Bear River near ID-WY border	Streambank Restoration	BLRC	2006

Recent water quality data indicate TP levels in the mainstem Bear River and some tributaries are at or less than TMDL targets. At least a portion of this improvement in water quality is attributable to the variety of projects that have occurred along the mainstem Bear River and its tributaries. Additional projects aimed at reducing nonpoint pollution sources will continue into the foreseeable future.

Currently, the municipalities of Georgetown, Soda Springs, Grace, Preston, and Franklin are in the facility planning phases of upgrades to their wastewater treatment facilities. This TMDL will help guide these communities' efforts to build the appropriate infrastructure to meet water quality goals and maintain and/or restore beneficial uses in the Bear River Basin.

5.8.1. Time Frame

The expected time frame for attaining water quality standards and restoring beneficial uses is a function of management intensity, climate, ecological potential, and natural variability of environmental conditions. If implementation of best management practices is embraced enthusiastically some improvements may be seen in as little as several years (<10 years). Even with aggressive implementation, however, some natural processes required for satisfying the requirements of this TMDL may not be seen for many years (20-30). The deleterious effects of historic land management practices have accrued over many years and recovery of natural systems may take longer than administrative needs allow for.

5.8.2. Approach

It is anticipated that by improving riparian management practices, overall riparian zone recovery will precipitate streambank stabilization, reduce sedimentation, increase canopy cover, and lower stream temperatures; all of which will precipitate overall stream habitat improvements. Such improvements will contribute to an overall improvement in stream morphology and habitat, shifting stream health towards beneficial use attainment.

Implementation of BMPs on animal feeding operations (AFO) and confined animal feeding operations (CAFO) has already begun so show improvements in water quality. Ongoing efforts to restore streambanks and habitat along with improving AFO and CAFO BMPs, will continue in the Bear River Basin.

5.8.3. Responsible Parties

As stated in the Bear River Basin TMDL/SBA, the responsibility for implementing water quality improvement in the Bear River Basin will include the participation of many various agencies and individuals which include but are not limited to:

- Federal Government – Natural Resources Conservation Service, U. S. Forest Service, Bureau of Land Management, U. S. Fish and Wildlife Service, Bureau of Reclamation
- State Government – Departments of Environmental Quality, Lands, Transportation, Fish and Game, and Agriculture, Soil Conservation Commission; Bear Lake, Caribou, Franklin, and Oneida Soil Conservation districts
- County Government – Bear Lake, Caribou, Franklin, Oneida counties
- Local Government – Cities of Montpelier, Soda Springs, Grace, Preston, Franklin, Georgetown
- Quasi-Government – Bear Lake Regional Commission, Bear River Commission, Bear River Resource Conservation and Development, Bear River Tri-State Water Quality Committee
- Companies – PacifiCorp, Agrium, Monsanto

- Irrigation Companies – West Cache Irrigation Company, Bear River Canal Company, Cub River Canal Company, Last Chance Canal Company
- Fish Hatcheries – Clear Springs Food (Clear Springs Foods), Grace Fish Hatchery (Idaho Department of Fish and Game), Bear River Trout Farm and Black Canyon Trout Farms (George Kimball), Smith Creek Hatchery (John Lambregts, Edwin Smith), Ben Forsgren, and Wright’s Rainbows (Sherman Wright).
- Grazing Associations – Samaria Grazing Association, Pleasantview Livestock and Grazing Association, Cottonwood Grazing Association, Cub River Stockmen's Association, Fish Haven Stockmen's Association, Gem Valley Stockmen's Association, Main Canyon Stockmen's Association, Paris-Liberty Cattle Association, Bloomington Cattle Association, Cherryville Cattle Association, Maple Canyon Cattle Association, Caribou Cattlemen’s Association, Bear Lake Cattlemen’s Association, Mink Creek Cattlemen’s Association

5.8.4. Monitoring Strategy

DEQ will monitor BMP implementation through annual reports submitted as part of any implementation program. Due to constraints of money, time, and personnel, DEQ does not expect to directly monitor BMP effectiveness. The hope would be that the funding agency include monitoring as part of the project funding request. Tributary monitoring at the point the stream enters the mainstem would allow some determination of watershed BMP effectiveness.

DEQ is responsible for monitoring both mainstem and tributaries as to compliance with TMDL allocations and as to progress toward supporting beneficial uses. The Beneficial Use Reconnaissance Program monitoring will help determine support of beneficial uses for coldwater aquatic life, salmonid spawning, and contact recreation. Ambient water quality monitoring will be dependent on money, time, and personnel available to DEQ. Point sources will be monitored through their Discharge Monitoring Reports submitted to DEQ monthly.

As stated throughout this report, the Idaho DEQ, in collaboration with Utah and Wyoming are currently monitoring the mainstem Bear River as part of the Tri-State Water Quality monitoring effort. DEQ will continue monitoring water quality at key sites on the mainstem Bear River through 2020.

5.9. Conclusions

As shown in Table 24, the primary water quality concerns in the Bear River Basin are nutrients and sediment. To address these pollutants, the DEQ in collaboration with IASCD collected water quality data in the form of streambank erosion inventories, water column data, and depth fine measurements in the streams that were deferred from TMDL development in the original Bear River Basin SBA/TMDL. As a result of this analysis five sediment TMDLs were completed for five streams (Table 24 and Table 25). Load reductions are recommended in four of the five streams; Dry, Preuss, Snowslide, and Strawberry Creeks. Three total phosphorus TMDLs were completed (Table 24 and Table 25) with load reductions recommended on Dry, Strawberry, and Dairy Creeks. Table 25 provides a summary of the non-point source load allocations for Bear River Basin in daily, monthly, and annual configurations.

Table 24. Summary of assessment outcomes in the Bear River Basin.

Water Body	Assessment Units	Listed Pollutant	TMDL(s) Completed	TMDL Type	Recommended Changes to the Next Integrated Report	Justification
Bear River – Ovid Cr confluence to Alexander Reservoir	ID16010201BR002_06	Total suspended solids, Total phosphorus	Total phosphorus, Total suspended solids (TSS)	Revised	Retain in 4a	Revised TMDL, WLAs for Montpelier, Georgetown, Soda
Bear River – Alexander Reservoir Dam to Densmore Creek	ID16010202BR009_06	Total suspended solids, Total phosphorus	Total phosphorus	Revised	Retain in 4a	Revised TMDL, WLA for Grace
Cub River – Maple Cr to Border	ID16010202BR002_04	Total suspended solids, Total phosphorus	Total phosphorus	Revised	Retain in 4a	Revised TMDL, WLA for Franklin
Worm Cr – Glendale Reservoir to Border	ID16010202BR005_02b	Sedimentation/siltation, Total phosphorus	Total phosphorus	Revised	Retain in 4a	Revised TMDL, WLA for Preston
Dry Creek – Dip Creek to Thomas Fk.	ID16010102BR005_02,	Sedimentation/siltation, Cause unknown	Bank stability (sediment), Total Phosphorus	New	Move to 4a of Integrated Report, Delist Cause Unknown and replace with TP	TMDLs Completed, Cause unknown determined to be TP
Dry Creek (including Dip Creek) to USFS boundary	ID16010102BR005_02a	Sedimentation/siltation	Bank stability (sediment), Total Phosphorus	New	Move to 4a of Integrated Report	TMDLs Completed, though unlisted for TP, TP determined to be impairment
Preuss Creek USFS boundary to Geneva ditch	ID16010102BR006_02	Sedimentation/siltation	Bank stability (sediment)	New	Move to 4a of Integrated Report	TMDL Completed
Beaver Creek – headwaters to Preuss Creek	ID16010102BR006_02a	Combined biota/habitat bioassessments	Bank stability (sediment)	New	Move to 4a of Integrated Report, Delist Combined Biota/Habitat Bioassessments and replace with Sediment	TMDL Completed
Preuss Creek (includes Fish Creek) headwaters to USFS boundary	ID16010102BR006_02b	Sedimentation/siltation	Bank stability (sediment)	New	Move to 4a of Integrated Report	TMDL Completed
Co-Op Creek – source to mouth	ID16010201BR008_02	Sedimentation/siltation, Total phosphorus	None	N/A	Delist for sediment and TP and move to 4c of Integrated Report for low flow alterations	Flaws in original listing. BURP data shows Full support, lower reach dewatered due to irrigation withdrawals.

Water Body	Assessment Units	Listed Pollutant	TMDL(s) Completed	TMDL Type	Recommended Changes to the Next Integrated Report	Justification
Upper Co-Op Creek	ID16010201BR008_02a	Sedimentation/siltation, Total phosphorus	None	N/A	Delist for sediment and TP and move to 2 of Integrated Report	Flaws in original listing. BURP data shows support, lower reach de-watered due to irrigation withdrawals.
Snowslide Creek -lower	ID16010201BR020_02f	Combined biota/habitat bioassessments	Bank stability (sediment)	New	Delist Combined biota/Habitat bioassessments and replace with Sediment. Move to 4a of Integrated Report	TMDL Completed, though unlisted for sedimentation/siltation, sediment determined to be impairment
Snowslide Creek – source to mouth	ID16010201BR021_02	Sedimentation/siltation	Bank stability (sediment)	New	Move to 4a of Integrated Report	TMDL Completed
Strawberry Creek	ID16010202BR007_02a	Fishes Bioassessments, Habitat Assessment, Sedimentation/siltation	Bank stability (sediment), Total Phosphorus	New	Move to 4a of Integrated Report, Delist Fishes Bioassessments and Habitat Assessment	TMDLs Completed, though unlisted for TP, TP determined to be impairment
Dairy Creek	ID16010204BR011_02	Combined biota/habitat bioassessments	None	N/A	Delist Combined bioata/habitat bioassessments. Move to 3 of Integrated Report	Unassessed -2005, 2008 BURP sites dry
Dairy Creek	ID16010204BR011_03	Sedimentation/siltation	Total Phosphorus	New	Retain in 5 for further assessment of aediment. Move to 4a for TP	TSS not found to be impairing AU, TMDL Completed, though unlisted for TP, TP determined to be impairment

Table 25. Nonpoint source load allocations for Bear River Basin.

Source	Pollutant	Allocation			Time Frame for Meeting Allocations
		Daily	Monthly	Annually	
Strawberry Creek	Sediment	0.712 t/day	21.65 t/month	259.76 t/yr	Dependent on implementation activities
	Total Phosphorus – Runoff	2.76 lb/day	82.8 lb/month	1007.4 lb/yr	Dependent on implementation activities
	Total Phosphorus – Base Flow	0.24 lb/day	7.2 lb/month	87.6 lb/yr	Dependent on implementation activities
Snowslide Creek	Sediment	0.158 t/day	4.80 t/month	57.55 t/yr	Dependent on implementation activities
Dry Creek	Sediment	2.494 t/day	75.86 t/month	910.28 t/yr	Dependent on implementation activities
	Total Phosphorus – Runoff	1.92 lb/day	57.6 lb/month	700.8 lb/yr	Dependent on implementation activities
	Total Phosphorus – Base Flow	0.35 lb/day	10.5 lb/month	127.75 lb/yr	Dependent on implementation activities
Preuss Creek	Sediment	1.296 t/day	39.43 t/month	473.04 t/yr	Dependent on implementation activities
Dairy Creek	Total Phosphorus – Runoff	2.3 lb/day	69 lb/month	839.5 lb/yr	Dependent on implementation activities
	Total Phosphorus – Base Flow	0.15 lb/day	4.5 lb/month	54.75 lb/yr	Dependent on implementation activities

An examination of the most current available data (2006-2012 Tri-state monitoring and data provided by the City of Soda Springs) indicates the Bear River in Idaho generally meets total phosphorus (TP) TMDL targets along its length. Median TP concentration of Alexander Reservoir inflows are meeting the TMDL target (0.05 mg/L) during low flow conditions; however, sediment-derived phosphorus contributes towards exceedances in this reach (and some other reaches) during some high flow periods. Therefore, analyses focused on recent (2006-2009) TP concentrations and loads in Bear River. Where the river is meeting TP TMDL targets during the growing season, WWTP TP loads are set equal to existing mean daily loads. This also will not exacerbate problems associated with excess TP during high flow periods. Bear River TSS (and associated TP) loads continue to exceed TMDL targets at high flows due to non-point sources, and need to be reduced. Table 26 provides a summary of wasteload allocations in daily, monthly, and annual configurations.

Table 26. Point source wasteload allocations for Bear River Basin Basin.

Source	Pollutant	Allocation (pounds)			Time Frame for Meeting Allocation
		Daily	Monthly	Annually	
Montpelier	Total Phosphorus	1.65	49.5	602	Presently Met
Georgetown discharge to adjacent stream	Total Phosphorus	0.014	0.4	5	5 years
Georgetown discharge to Bear River	Total Phosphorus	0.67	20.1	245	Presently Met
Georgetown discharge to Bear River or adj. stream	TSS	5.50	165.0	2008	Presently Met
Soda Springs	Total Phosphorus	5.82	174.6	2124	Presently Met
Clear Springs Foods ¹	Total Phosphorus	2.05, 4.6	61.5, 138	1197	Presently Met
Grace	Total Phosphorus	2.36	70.8	861	Presently Met
Bear River Trout Farm ²	Total Phosphorus	3.6, 5.4, 8	108, 162, 240	1854	Presently Met
Grace Fish Hatchery ³	Total Phosphorus	0.46, 0.51, 0.99, 1.32	13.8, 15.3, 29.7, 39.6	295	Presently Met
Preston	Total Phosphorus	0.48	14.4	175	5 years
Franklin (May - February)	Total Phosphorus	0.05	1.4	14	Presently Met
Franklin (March-April)	Total Phosphorus	3.56	106.8	214	Presently Met
¹ Clear Springs Foods allocation is 2.05 lbs/day for Ap. - Sep. and 4.6 lbs/day for Oct. - Mr.					
² Bear River Trout Farm WLA is 3.6 lbs/day Jl-Dec, 5.4 lbs/day Jan-Mr and 8 lbs/day Ap-Je					
³ Grace Fish Hatchery WLA is 0.46 lbs/day Oct-Dec, 0.51lbs/day Jl-Sep, 0.99 lbs/day Ap-Je and 1.32 lbs/day Jan-Mr					

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GIS Coverages

Restriction of liability: Neither the state of Idaho nor the Department of Environmental Quality, nor any of their employees make any warranty, express or implied, or assume any legal liability or responsibility for the accuracy, completeness or usefulness of any information or data provided. Metadata is provided for all data sets, and no data should be used without first reading and understanding its limitations. The data could include technical inaccuracies or typographical errors. The Department of Environmental Quality may update, modify, or revise the data used at any time, without notice.

Glossary

305(b)

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

§303(d)

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

Ambient

General conditions in the environment (Armantrout 1998). In the context of water quality, ambient waters are those representative of general conditions, not associated with episodic perturbations or specific disturbances such as a wastewater outfall (EPA 1996).

Anadromous

Fish, such as salmon and sea-run trout, that live part or the majority of their lives in the saltwater but return to fresh water to spawn.

Anaerobic

Describes the processes that occur in the absence of molecular oxygen and describes the condition of water that is devoid of molecular oxygen.

Anoxia

The condition of oxygen absence or deficiency.

Anthropogenic

Relating to, or resulting from, the influence of human beings on nature.

Anti-Degradation

Refers to the U.S. Environmental Protection Agency’s interpretation of the Clean Water Act goal that states and tribes maintain, as well as restore, water quality. This applies to waters that meet or are of higher water quality than required by state standards. State rules provide that the quality of those high quality waters may be lowered only to allow important social or economic development and only after adequate public participation (IDAPA 58.01.02.051). In all cases, the existing beneficial uses must be maintained. State rules further define lowered water quality to be 1) a measurable change, 2) a change adverse to a use, and 3) a change in a pollutant relevant to the water’s uses (IDAPA 58.01.02.003.61).

Aquatic

Occurring, growing, or living in water.

Assemblage (aquatic)

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

Assessment Database (ADB)	The ADB is a relational database application designed for the U.S. Environmental Protection Agency for tracking water quality assessment data, such as use attainment and causes and sources of impairment. States need to track this information and many other types of assessment data for thousands of water bodies and integrate it into meaningful reports. The ADB is designed to make this process accurate, straightforward, and user-friendly for participating states, territories, tribes, and basin commissions.
Assessment Unit (AU)	A segment of a water body that is treated as a homogenous unit, meaning that any designated uses, the rating of these uses, and any associated causes and sources must be applied to the entirety of the unit.
Assimilative Capacity	The ability to process or dissipate pollutants without ill effect to beneficial uses.
Batholith	A large body of intrusive igneous rock that has more than 40 square miles of surface exposure and no known floor. A batholith usually consists of coarse-grained rocks such as granite.
Bedload	Material (generally sand-sized or larger sediment) that is carried along the streambed by rolling or bouncing.
Beneficial Use	Any of the various uses of water, including, but not limited to, aquatic life, recreation, water supply, wildlife habitat, and aesthetics, which are recognized in water quality standards.
Beneficial Use Reconnaissance Program (BURP)	A program for conducting systematic biological and physical habitat surveys of water bodies in Idaho. BURP protocols address lakes, reservoirs, and wadeable streams and rivers
Benthic	Pertaining to or living on or in the bottom sediments of a water body
Benthos	Organisms living in and on the bottom sediments of lakes and streams. Originally, the term meant the lake bottom, but it is now applied almost uniformly to the animals associated with the lake and stream bottoms.
Best Management Practices (BMPs)	Structural, nonstructural, and managerial techniques that are effective and practical means to control nonpoint source pollutants.
Best Professional Judgment	A conclusion and/or interpretation derived by a trained and/or technically competent individual by applying interpretation and synthesizing information.
Biological Integrity	1) The condition of an aquatic community inhabiting unimpaired water bodies of a specified habitat as measured by an evaluation of multiple attributes of the aquatic biota (EPA 1996). 2) The ability of an aquatic ecosystem to support and maintain a balanced, integrated, adaptive community of organisms having a species composition, diversity, and

functional organization comparable to the natural habitats of a region (Karr 1991).

Biomass	The weight of biological matter. Standing crop is the amount of biomass (e.g., fish or algae) in a body of water at a given time. Often expressed as grams per square meter.
Biota	The animal and plant life of a given region.
Biotic	A term applied to the living components of an area.
Clean Water Act (CWA)	The Federal Water Pollution Control Act (commonly known as the Clean Water Act), as last reauthorized by the Water Quality Act of 1987, establishes a process for states to use to develop information on, and control the quality of, the nation's water resources.
Coliform Bacteria	A group of bacteria predominantly inhabiting the intestines of humans and animals but also found in soil. Coliform bacteria are commonly used as indicators of the possible presence of pathogenic organisms (also see Fecal Coliform Bacteria, <i>E. Coli</i> , and Pathogens).
Community	A group of interacting organisms living together in a given place.
Conductivity	The ability of an aqueous solution to carry electric current, expressed in micro (μ) mhos/centimeter at 25 °C. Conductivity is affected by dissolved solids and is used as an indirect measure of total dissolved solids in a water sample.
Criteria	In the context of water quality, numeric or descriptive factors taken into account in setting standards for various pollutants. These factors are used to determine limits on allowable concentration levels, and to limit the number of violations per year. The U.S. Environmental Protection Agency develops criteria guidance; states establish criteria.
Cubic Feet per Second	A unit of measure for the rate of flow or discharge of water. One cubic foot per second is the rate of flow of a stream with a cross-section of one square foot flowing at a mean velocity of one foot per second. At a steady rate, once cubic foot per second is equal to 448.8 gallons per minute and 10,984 acre-feet per day.
Cultural Eutrophication	The process of eutrophication that has been accelerated by human-caused influences. Usually seen as an increase in nutrient loading (also see Eutrophication).
Depth Fines	Percent by weight of particles of small size within a vertical core of volume of a streambed or lake bottom sediment. The upper size threshold for fine sediment for fisheries purposes varies from 0.8 to 6.5 millimeters depending on the observer and methodology used. The depth sampled varies but is typically about one foot (30 centimeters).

Designated Uses	Those water uses identified in state water quality standards that must be achieved and maintained as required under the Clean Water Act.
Discharge	The amount of water flowing in the stream channel at the time of measurement. Usually expressed as cubic feet per second (cfs).
Disturbance	Any event or series of events that disrupts ecosystem, community, or population structure and alters the physical environment.
<i>E. coli</i>	Short for <i>Escherichia coli</i> , <i>E. coli</i> are a group of bacteria that are a subspecies of coliform bacteria. Most <i>E. coli</i> are essential to the healthy life of all warm-blooded animals, including humans, but their presence in water is often indicative of fecal contamination. <i>E. coli</i> are used by the state of Idaho as the indicator for the presence of pathogenic microorganisms.
Effluent	A discharge of untreated, partially treated, or treated wastewater into a receiving water body.
Environment	The complete range of external conditions, physical and biological, that affect a particular organism or community.
Ephemeral Stream	A stream or portion of a stream that flows only in direct response to precipitation. It receives little or no water from springs and no long continued supply from melting snow or other sources. Its channel is at all times above the water table (American Geological Institute 1962).
Erosion	The wearing away of areas of the earth's surface by water, wind, ice, and other forces.
Eutrophic	From Greek for "well nourished," this describes a highly productive body of water in which nutrients do not limit algal growth. It is typified by high algal densities and low clarity.
Eutrophication	1) Natural process of maturing (aging) in a body of water. 2) The natural and human-influenced process of enrichment with nutrients, especially nitrogen and phosphorus, leading to an increased production of organic matter.
Exceedance	A violation (according to DEQ policy) of the pollutant levels permitted by water quality criteria.
Existing Beneficial Use or Existing Use	A beneficial use actually attained in waters on or after November 28, 1975, whether or not the use is designated for the waters in Idaho's <i>Water Quality Standards and Wastewater Treatment Requirements</i> (IDAPA 58.01.02).
Extrapolation	Estimation of unknown values by extending or projecting from known values.

Fecal Coliform Bacteria	Bacteria found in the intestinal tracts of all warm-blooded animals or mammals. Their presence in water is an indicator of pollution and possible contamination by pathogens (also see Coliform Bacteria, <i>E. coli</i> , and Pathogens).
Feedback Loop	In the context of watershed management planning, a feedback loop is a process that provides for tracking progress toward goals and revising actions according to that progress.
Fixed-Location Monitoring	Sampling or measuring environmental conditions continuously or repeatedly at the same location.
Flow	See <i>Discharge</i> .
Fluvial	In fisheries, this describes fish whose life history takes place entirely in streams but migrate to smaller streams for spawning.
Fully Supporting	In compliance with water quality standards and within the range of biological reference conditions for all designated and existing beneficial uses as determined through the <i>Water Body Assessment Guidance</i> (Grafe et al. 2002).
Geographical Information Systems (GIS)	A georeferenced database.
Geometric Mean	A back-transformed mean of the logarithmically transformed numbers often used to describe highly variable, right-skewed data (a few large values), such as bacterial data.
Grab Sample	A single sample collected at a particular time and place. It may represent the composition of the water in that water column.
Gradient	The slope of the land, water, or streambed surface.
Ground Water	Water found beneath the soil surface saturating the layer in which it is located. Most ground water originates as rainfall, is free to move under the influence of gravity, and usually emerges again as stream flow.
Habitat	The living place of an organism or community.
Headwater	The origin or beginning of a stream.
Hydrologic Basin	The area of land drained by a river system, a reach of a river and its tributaries in that reach, a closed basin, or a group of streams forming a drainage area (also see Watershed).

Hydrologic Unit	One of a nested series of numbered and named watersheds arising from a national standardization of watershed delineation. The initial 1974 effort (USGS 1987) described four levels (region, subregion, accounting unit, cataloging unit) of watersheds throughout the United States. The fourth level is uniquely identified by an eight-digit code built of two-digit fields for each level in the classification. Originally termed a cataloging unit, fourth field hydrologic units have been more commonly called subbasins. Fifth and sixth field hydrologic units have since been delineated for much of the country and are known as watershed and subwatersheds, respectively.
Hydrologic Unit Code (HUC)	The number assigned to a hydrologic unit. Often used to refer to fourth field hydrologic units.
Hydrology	The science dealing with the properties, distribution, and circulation of water.
Influent	A tributary stream.
Inorganic	Materials not derived from biological sources.
Instantaneous	A condition or measurement at a moment (instant) in time.
Intergravel Dissolved Oxygen	The concentration of dissolved oxygen within spawning gravel. Consideration for determining spawning gravel includes species, water depth, velocity, and substrate.
Intermittent Stream	1) A stream that flows only part of the year, such as when the ground water table is high or when the stream receives water from springs or from surface sources such as melting snow in mountainous areas. The stream ceases to flow above the streambed when losses from evaporation or seepage exceed the available stream flow. 2) A stream that has a period of zero flow for at least one week during most years.
Interstate Waters	Waters that flow across or form part of state or international boundaries, including boundaries with Native American nations.
Irrigation Return Flow	Surface (and subsurface) water that leaves a field following the application of irrigation water and eventually flows into streams.
Land Application	A process or activity involving application of wastewater, surface water, or semi-liquid material to the land surface for the purpose of treatment, pollutant removal, or ground water recharge.
Load Allocation (LA)	A portion of a water body's load capacity for a given pollutant that is given to a particular nonpoint source (by class, type, or geographic area).

Load(ing)	The quantity of a substance entering a receiving stream, usually expressed in pounds or kilograms per day or tons per year. Loading is the product of flow (discharge) and concentration.
Load(ing) Capacity (LC)	A determination of how much pollutant a water body can receive over a given period without causing violations of state water quality standards. Upon allocation to various sources, and a margin of safety, it becomes a total maximum daily load.
Loam	Refers to a soil with a texture resulting from a relative balance of sand, silt, and clay. This balance imparts many desirable characteristics for agricultural use.
Lotic	An aquatic system with flowing water such as a brook, stream, or river where the net flow of water is from the headwaters to the mouth.
Macroinvertebrate	An invertebrate animal (without a backbone) large enough to be seen without magnification and retained by a 500µm mesh (U.S. #30) screen.
Macrophytes	Rooted and floating vascular aquatic plants, commonly referred to as water weeds. These plants usually flower and bear seeds. Some forms, such as duckweed and coontail (<i>Ceratophyllum sp.</i>), are free-floating forms not rooted in sediment.
Margin of Safety (MOS)	An implicit or explicit portion of a water body's loading capacity set aside to allow the uncertainty about the relationship between the pollutant loads and the quality of the receiving water body. This is a required component of a total maximum daily load (TMDL) and is often incorporated into conservative assumptions used to develop the TMDL (generally within the calculations and/or models). The MOS is not allocated to any sources of pollution.
Mass Wasting	A general term for the down slope movement of soil and rock material under the direct influence of gravity.
Mean	Describes the central tendency of a set of numbers. The arithmetic mean (calculated by adding all items in a list, then dividing by the number of items) is the statistic most familiar to most people.
Median	The middle number in a sequence of numbers. If there are an even number of numbers, the median is the average of the two middle numbers. For example, 4 is the median of 1, 2, 4, 14, 16; 6 is the median of 1, 2, 5, 7, 9, 11.
Metric	1) A discrete measure of something, such as an ecological indicator (e.g., number of distinct taxa). 2) The metric system of measurement.

Milligrams per Liter (mg/L)	A unit of measure for concentration. In water, it is essentially equivalent to parts per million (ppm).
Monitoring	A periodic or continuous measurement of the properties or conditions of some medium of interest, such as monitoring a water body.
Mouth	The location where flowing water enters into a larger water body.
National Pollution Discharge Elimination System (NPDES)	A national program established by the Clean Water Act for permitting point sources of pollution. Discharge of pollution from point sources is not allowed without a permit.
Natural Condition	The condition that exists with little or no anthropogenic influence.
Nitrogen	An element essential to plant growth, and thus is considered a nutrient.
Nonpoint Source	A dispersed source of pollutants, generated from a geographical area when pollutants are dissolved or suspended in runoff and then delivered into waters of the state. Nonpoint sources are without a discernable point or origin. They include, but are not limited to, irrigated and non-irrigated lands used for grazing, crop production, and silviculture; rural roads; construction and mining sites; log storage or rafting; and recreation sites.
Not Assessed (NA)	A concept and an assessment category describing water bodies that have been studied, but are missing critical information needed to complete an assessment.
Not Fully Supporting	Not in compliance with water quality standards or not within the range of biological reference conditions for any beneficial use as determined through the <i>Water Body Assessment Guidance</i> (Grafe et al. 2002).
Not Fully Supporting Cold Water	At least one biological assemblage has been significantly modified beyond the natural range of its reference condition.
Nuisance	Anything that is injurious to the public health or an obstruction to the free use, in the customary manner, of any waters of the state.
Nutrient	Any substance required by living things to grow. An element or its chemical forms essential to life, such as carbon, oxygen, nitrogen, and phosphorus. Commonly refers to those elements in short supply, such as nitrogen and phosphorus, which usually limit growth.
Oligotrophic	The Greek term for “poorly nourished.” This describes a body of water in which productivity is low and nutrients are limiting to algal growth, as typified by low algal density and high clarity.

Organic Matter	Compounds manufactured by plants and animals that contain principally carbon.
Orthophosphate	A form of soluble inorganic phosphorus most readily used for algal growth.
Oxygen-Demanding Materials	Those materials, mainly organic matter, in a water body that consume oxygen during decomposition.
Parameter	A variable, measurable property whose value is a determinant of the characteristics of a system, such as temperature, dissolved oxygen, and fish populations are parameters of a stream or lake.
Pathogens	A small subset of microorganisms (e.g., certain bacteria, viruses, and protozoa) that can cause sickness or death. Direct measurement of pathogen levels in surface water is difficult. Consequently, indicator bacteria that are often associated with pathogens are assessed. <i>E. coli</i> , a type of fecal coliform bacteria, are used by the state of Idaho as the indicator for the presence of pathogenic microorganisms.
Perennial Stream	A stream that flows year-around in most years.
pH	The negative $\log_{10}$ of the concentration of hydrogen ions, a measure which in water ranges from very acid (pH=1) to very alkaline (pH=14). A pH of 7 is neutral. Surface waters usually measure between pH 6 and 9.
Phosphorus	An element essential to plant growth, often in limited supply, and thus considered a nutrient.
Physiochemical	In the context of bioassessment, the term is commonly used to mean the physical and chemical factors of the water column that relate to aquatic biota. Examples in bioassessment usage include saturation of dissolved gases, temperature, pH, conductivity, dissolved or suspended solids, forms of nitrogen, and phosphorus. This term is used interchangeable with the term “physical/chemical.”
Point Source	A source of pollutants characterized by having a discrete conveyance, such as a pipe, ditch, or other identifiable “point” of discharge into a receiving water. Common point sources of pollution are industrial and municipal wastewater.
Pollutant	Generally, any substance introduced into the environment that adversely affects the usefulness of a resource or the health of humans, animals, or ecosystems.
Pollution	A very broad concept that encompasses human-caused changes in the environment which alter the functioning of natural processes and produce undesirable environmental and health effects. This includes human-induced

alteration of the physical, biological, chemical, and radiological integrity of water and other media.

Population	A group of interbreeding organisms occupying a particular space; the number of humans or other living creatures in a designated area.
Pretreatment	The reduction in the amount of pollutants, elimination of certain pollutants, or alteration of the nature of pollutant properties in wastewater prior to, or in lieu of, discharging or otherwise introducing such wastewater into a publicly owned wastewater treatment plant.
Protocol	A series of formal steps for conducting a test or survey.
Qualitative	Descriptive of kind, type, or direction.
Quantitative	Descriptive of size, magnitude, or degree.
Reach	A stream section with fairly homogenous physical characteristics.
Reconnaissance	An exploratory or preliminary survey of an area.
Reference	A physical or chemical quantity whose value is known and thus is used to calibrate or standardize instruments.
Reference Condition	1) A condition that fully supports applicable beneficial uses with little affect from human activity and represents the highest level of support attainable. 2) A benchmark for populations of aquatic ecosystems used to describe desired conditions in a biological assessment and acceptable or unacceptable departures from them. The reference condition can be determined through examining regional reference sites, historical conditions, quantitative models, and expert judgment (Hughes 1995).
Reference Site	A specific locality on a water body that is minimally impaired and is representative of reference conditions for similar water bodies.
Representative Sample	A portion of material or water that is as similar in content and consistency as possible to that in the larger body of material or water being sampled.
Riffle	A relatively shallow, gravelly area of a streambed with a locally fast current, recognized by surface choppiness. Also an area of higher streambed gradient and roughness.
Riparian	Associated with aquatic (stream, river, lake) habitats. Living or located on the bank of a water body.
River	A large, natural, or human-modified stream that flows in a defined course or channel or in a series of diverging and converging channels.

Runoff	The portion of rainfall, melted snow, or irrigation water that flows across the surface, through shallow underground zones (interflow), and through ground water to creates streams.
Sediments	Deposits of fragmented materials from weathered rocks and organic material that were suspended in, transported by, and eventually deposited by water or air.
Species	1) A reproductively isolated aggregate of interbreeding organisms having common attributes and usually designated by a common name. 2) An organism belonging to such a category.
Spring	Ground water seeping out of the earth where the water table intersects the ground surface.
Stagnation	The absence of mixing in a water body.
Stream	A natural water course containing flowing water, at least part of the year. Together with dissolved and suspended materials, a stream normally supports communities of plants and animals within the channel and the riparian vegetation zone.
Stream Order	Hierarchical ordering of streams based on the degree of branching. A first-order stream is an unforked or unbranched stream. Under Strahler's (1957) system, higher order streams result from the joining of two streams of the same order.
Storm Water Runoff	Rainfall that quickly runs off the land after a storm. In developed watersheds the water flows off roofs and pavement into storm drains that may feed quickly and directly into the stream. The water often carries pollutants picked up from these surfaces.
Stressors	Physical, chemical, or biological entities that can induce adverse effects on ecosystems or human health.
Subbasin	A large watershed of several hundred thousand acres. This is the name commonly given to 4 th field hydrologic units (also see Hydrologic Unit).
Subbasin Assessment (SBA)	A watershed-based problem assessment that is the first step in developing a total maximum daily load in Idaho.
Subwatershed	A smaller watershed area delineated within a larger watershed, often for purposes of describing and managing localized conditions. Also proposed for adoption as the formal name for 6 th field hydrologic units.
Surface Fines	Sediments of small size deposited on the surface of a streambed or lake bottom. The upper size threshold for fine sediment for fisheries purposes

varies from 0.8 to 605 millimeters depending on the observer and methodology used. Results are typically expressed as a percentage of observation points with fine sediment.

Surface Runoff

Precipitation, snow melt, or irrigation water in excess of what can infiltrate the soil surface and be stored in small surface depressions; a major transporter of nonpoint source pollutants in rivers, streams, and lakes. Surface runoff is also called overland flow.

Surface Water

All water naturally open to the atmosphere (rivers, lakes, reservoirs, streams, impoundments, seas, estuaries, etc.) and all springs, wells, or other collectors that are directly influenced by surface water.

Suspended Sediments

Fine material (usually sand size or smaller) that remains suspended by turbulence in the water column until deposited in areas of weaker current. These sediments cause turbidity and, when deposited, reduce living space within streambed gravels and can cover fish eggs or alevins.

Total Maximum Daily Load (TMDL)

A TMDL is a water body's load capacity after it has been allocated among pollutant sources. It can be expressed on a time basis other than daily if appropriate. Sediment loads, for example, are often calculated on an annual basis. A TMDL is equal to the load capacity, such that $\text{load capacity} = \text{margin of safety} + \text{natural background} + \text{load allocation} + \text{wasteload allocation} = \text{TMDL}$. In common usage, a TMDL also refers to the written document that contains the statement of loads and supporting analyses, often incorporating TMDLs for several water bodies and/or pollutants within a given watershed.

Total Dissolved Solids

Dry weight of all material in solution in a water sample as determined by evaporating and drying filtrate.

Total Suspended Solids (TSS)

The dry weight of material retained on a filter after filtration. Filter pore size and drying temperature can vary. American Public Health Association Standard Methods (Franson et al. 1998) call for using a filter of 2.0 microns or smaller; a 0.45 micron filter is also often used. This method calls for drying at a temperature of 103-105 °C.

Tributary

A stream feeding into a larger stream or lake.

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A stream feeding into a larger stream or lake.

Turbidity	A measure of the extent to which light passing through water is scattered by fine suspended materials. The effect of turbidity depends on the size of the particles (the finer the particles, the greater the effect per unit weight) and the color of the particles.
Wasteload Allocation (WLA)	The portion of receiving water's loading capacity that is allocated to one of its existing or future point sources of pollution. Wasteload allocations specify how much pollutant each point source may release to a water body.
Water Body	A stream, river, lake, estuary, coastline, or other water feature, or portion thereof.
Water Column	Water between the interface with the air at the surface and the interface with the sediment layer at the bottom. The idea derives from a vertical series of measurements (oxygen, temperature, phosphorus) used to characterize water.
Water Pollution	Any alteration of the physical, thermal, chemical, biological, or radioactive properties of any waters of the state, or the discharge of any pollutant into the waters of the state, which will or is likely to create a nuisance or to render such waters harmful, detrimental, or injurious to public health, safety, or welfare; to fish and wildlife; or to domestic, commercial, industrial, recreational, aesthetic, or other beneficial uses.
Water Quality	A term used to describe the biological, chemical, and physical characteristics of water with respect to its suitability for a beneficial use.
Water Quality Criteria	Levels of water quality expected to render a body of water suitable for its designated uses. Criteria are based on specific levels of pollutants that would make the water harmful if used for drinking, swimming, farming, or industrial processes.
Water Quality Limited	A label that describes water bodies for which one or more water quality criterion is not met or beneficial uses are not fully supported. Water quality limited segments may or may not be on a §303(d) list.
Water Quality Standards	State-adopted and U.S. Environmental Protection Agency-approved ambient standards for water bodies. The standards prescribe the use of the water body and establish the water quality criteria that must be met to protect designated uses.
Watershed	1) All the land which contributes runoff to a common point in a drainage network, or to a lake outlet. Watersheds are infinitely nested, and any large watershed is composed of smaller "subwatersheds." 2) The whole geographic region which contributes water to a point of interest in a water body.

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Appendix A. Unit Conversion Chart

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Appendix A. Metric - English unit conversions.

	English Units	Metric Units	To Convert	Example
Distance	Miles (mi)	Kilometers (km)	1 mi = 1.61 km 1 km = 0.62 mi	3 mi = 4.83 km 3 km = 1.86 mi
Length	Inches (in) Feet (ft)	Centimeters (cm) Meters (m)	1 in = 2.54 cm 1 cm = 0.39 in 1 ft = 0.30 m 1 m = 3.28 ft	3 in = 7.62 cm 3 cm = 1.18 in 3 ft = 0.91 m 3 m = 9.84 ft
Area	Acres (ac) Square Feet (ft ²) Square Miles (mi ²)	Hectares (ha) Square Meters (m ²) Square Kilometers (km ²)	1 ac = 0.40 ha 1 ha = 2.47 ac 1 ft ² = 0.09 m ² 1 m ² = 10.76 ft ² 1 mi ² = 2.59 km ² 1 km ² = 0.39 mi ²	3 ac = 1.20 ha 3 ha = 7.41 ac 3 ft ² = 0.28 m ² 3 m ² = 32.29 ft ² 3 mi ² = 7.77 km ² 3 km ² = 1.16 mi ²
Volume	Gallons (gal) Cubic Feet (ft ³)	Liters (L) Cubic Meters (m ³)	1 gal = 3.78 L 1 L = 0.26 gal 1 ft ³ = 0.03 m ³ 1 m ³ = 35.32 ft ³	3 gal = 11.35 L 3 L = 0.79 gal 3 ft ³ = 0.09 m ³ 3 m ³ = 105.94 ft ³
Flow Rate	Cubic Feet per Second (cfs) ^a	Cubic Meters per Second (m ³ /sec)	1 cfs = 0.03 m ³ /sec 1 m ³ /sec = 35.31 cfs	3 ft ³ /sec = 0.09 m ³ /sec 3 m ³ /sec = 105.94 ft ³ /sec
Concentration	Parts per Million (ppm)	Milligrams per Liter (mg/L)	1 ppm = 1 mg/L ^b	3 ppm = 3 mg/L
Weight	Pounds (lbs)	Kilograms (kg)	1 lb = 0.45 kg 1 kg = 2.20 lbs	3 lb = 1.36 kg 3 kg = 6.61 lb
Temperature	Fahrenheit (°F)	Celsius (°C)	°C = 0.55 (F - 32) °F = (C x 1.8) + 32	3 °F = -15.95 °C 3 °C = 37.4 °F

^a 1 cfs = 0.65 million gallons per day; 1 million gallons per day is equal to 1.55 cfs.

^b The ratio of 1 ppm = 1 mg/L is approximate and is only accurate for water.

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Appendix B. Mainstem Bear River Water Quality Data

Description	Site #	Collection Date	Month-Year	Time	TSS	TDS	Alkalinity, total as CaCO ₃	Chloride	Sulfate	NH ₃	NO ₂ +NO ₃	TKN	Ortho-P	TP
ID/WY Border	BR-06	7/18/2006	Jul-06	1750	30	405	253	34	53	ND	ND	1.3	0.004	0.072
ID/WY Border	BR-06	11/15/2006	Nov-06	1445	13	359	213	26	57	ND	0.06	0.4	ND	0.031
ID/WY Border	BR-06	4/24/2007	Apr-07	1425	69	325	207	29	60	ND	ND	1	0.013	0.132
ID/WY Border	BR-06	6/20/2007	Jun-07	1430	21	442	276	44	70	ND	ND	1.1	0.008	0.057
ID/WY Border	BR-06	8/20/2007	Aug-07	1740	ND	307	178	30	64	ND	ND	0.8	0.034	0.04
ID/WY Border	BR-06	4/16/2008	Apr-08	1445	58	383	212	35	79	0.09	0.07	0.4	0.037	0.1
ID/WY Border	BR-06	5/14/2008	May-08	1330	187	320	192	23	50	ND	ND	1	0.025	0.263
ID/WY Border	BR-06	6/10/2008	Jun-08	1600	76	351	229	29	48	ND	ND	0.7	0.01	0.115
ID/WY Border	BR-06	9/11/2008	Sep-08	1055	ND	328	197	21	63	ND	ND	0.1	0.02	0.017
ID/WY Border	BR-06	12/2/2008	Dec-08	1150	ND	343	211	26	70	ND	0.07	ND	0.012	0.023
ID/WY Border	BR-06	4/27/2009	Apr-09	1515	117	350	208	41	56	ND	ND	0.6	0.007	0.196
ID/WY Border	BR-06	6/1/2009	Jun-09	1530	138	268	189	18	31	ND	ND	0.5	0.016	0.218
ID/WY Border	BR-06	8/5/2009	Aug-09	1500	12	298	201	23	53	ND	ND	0.2	ND	0.025
Rainbow Canal above Stewart Dam	BR-07	7/19/2006	Jul-06	900	59	430	248	43	59	ND	ND	1	ND	0.12
Rainbow Canal above Stewart Dam	BR-07	11/15/2006	Nov-06	1520	ND	417	220	49	60	ND	0.16	0.4	ND	0.019
Rainbow Canal above Stewart Dam	BR-07	4/25/2007	Apr-07	1010	31	362	214	48	61	ND	ND	1	ND	0.084
Rainbow Canal above Stewart Dam	BR-07	6/20/2007	Jun-07	1530	32	442	265	47	74	ND	ND	1	0.012	0.083
Rainbow Canal above Stewart Dam	BR-07	4/16/2008	Apr-08	1405	50	376	213	42	69	ND	ND	0.4	0.014	0.066
Rainbow Canal above Stewart Dam	BR-07	5/14/2008	May-08	1400	56	339	199	33	55	ND	ND	0.5	0.025	0.079
Rainbow Canal above Stewart Dam	BR-07	6/11/2008	Jun-08	1045	87	365	232	34	52	ND	ND	0.7	0.016	0.116
Rainbow Canal above Stewart Dam	BR-07	9/11/2008	Sep-08	1435	15	352	199	36	70	ND	ND	0.2	ND	0.03
Rainbow Canal above Stewart Dam	BR-07	12/2/2008	Dec-08	1220	ND	370	215	41	70	ND	0.16	0.4	0.012	0.02
Rainbow Canal above Stewart Dam	BR-07	4/27/2009	Apr-09	1545	91	365	206	36	61	ND	0.11	0.6	0.006	0.161
Rainbow Canal above Stewart Dam	BR-07	6/3/2009	Jun-09	1030	143	308	195	26	32	ND	0.07	2	0.014	0.222
Rainbow Canal above Stewart Dam	BR-07	8/5/2009	Aug-09	1530	16	344	213	46	58	ND	ND	0.2	ND	0.038
Rainbow Canal above Stewart Dam	BR-07(A)	8/22/2007	Aug-07	1300	14	396	224	42	77	ND	ND	0.4	0.014	0.041
Bear Lake Inlet	BR-08	7/19/2006	Jul-06	1005	ND	396	203	47	60	0.05	ND	1.6	0.007	0.044
Bear Lake Inlet	BR-08	11/16/2006	Nov-06	925	ND	388	220	38	61	ND	ND	0.5	ND	0.02
Bear Lake Inlet	BR-08	4/25/2007	Apr-07	1120	89	364	214	45	65	ND	ND	1.4	0.004	0.168
Bear Lake Inlet	BR-08	6/20/2007	Jun-07	1600	ND	399	227	53	88	ND	ND	0.9	0.006	0.031
Bear Lake Inlet	BR-08	4/16/2008	Apr-08	1330	ND	374	227	38	66	ND	ND	0.3	0.017	0.024
Bear Lake Inlet	BR-08	5/14/2008	May-08	1545	23	320	180	33	63	ND	ND	0.4	0.025	0.03
Bear Lake Inlet	BR-08	6/11/2008	Jun-08	1120	13	369	224	34	55	ND	ND	1	0.015	0.039
Bear Lake Inlet	BR-08	12/2/2008	Dec-08	1300	ND	390	224	46	83	ND	ND	0.3	0.011	0.01
Bear Lake Inlet	BR-08	4/27/2009	Apr-09	1745	26	372	206	43	69	ND	ND	0.5	0.007	0.051
Bear Lake Inlet	BR-08	6/3/2009	Jun-09	1055	64	311	190	27	33	ND	ND	0.3	0.005	0.081
Bear Lake Inlet	BR-08	8/5/2009	Aug-09	1600	ND	370	232	49	53	ND	ND	0.5	ND	0.024
Bear Lake Outlet at Lifton Pump Station	BR-09	7/19/2006	Jul-06	1000	12	391	237	43	66	ND	ND	0.5	0.005	0.014
Bear Lake Outlet at Lifton Pump Station	BR-09	11/16/2006	Nov-06	940	ND	385	223	41	68	ND	ND	0.6	ND	0.015
Bear Lake Outlet at Lifton Pump Station	BR-09	4/25/2007	Apr-07	1106	ND	343	208	43	54	ND	ND	0.9	0.005	0.028
Bear Lake Outlet at Lifton Pump Station	BR-09	6/20/2007	Jun-07	1620	ND	380	240	47	72	ND	ND	1.7	0.006	0.016
Bear Lake Outlet at Lifton Pump Station	BR-09	8/22/2007	Aug-07	1330	15	399	239	50	73	ND	ND	0.4	0.015	0.02
Bear Lake Outlet at Lifton Pump Station	BR-09	4/16/2008	Apr-08	1320	10	327	211	34	65	ND	ND	0.4	0.021	0.02
Bear Lake Outlet at Lifton Pump Station	BR-09	5/14/2008	May-08	1530	ND	352	207	39	68	ND	ND	0.3	0.015	0.016
Bear Lake Outlet at Lifton Pump Station	BR-09	6/11/2008	Jun-08	1140	ND	345	219	31	51	ND	ND	0.9	0.008	0.024
Bear Lake Outlet at Lifton Pump Station	BR-09	9/11/2008	Sep-08	1330	21	383	222	44	74	ND	ND	0.4	0.007	0.012
Bear Lake Outlet at Lifton Pump Station	BR-09	12/2/2008	Dec-08	1315	ND	371	220	39	70	ND	ND	ND	0.011	0.01
Bear Lake Outlet at Lifton Pump Station	BR-09	4/27/2009	Apr-09	1730	ND	364	199	43	69	ND	ND	0.6	0.007	0.018
Bear Lake Outlet at Lifton Pump Station	BR-09	6/3/2009	Jun-09	1115	ND	296	194	26	33	ND	ND	0.3	ND	0.027
Bear Lake Outlet at Lifton Pump Station	BR-09	8/5/2009	Aug-09	1610	ND	368	236	51	69	ND	ND	0.3	ND	0.019
Paris Dike	BR-10	7/19/2006	Jul-06	930	85	409	244	40	59	ND	ND	1	0.005	0.142
Paris Dike	BR-10	11/16/2006	Nov-06	1015	ND	364	236	32	55	ND	ND	0.7	ND	0.022
Paris Dike	BR-10	4/25/2007	Apr-07	1025	19	698	358	95	165	ND	ND	1.2	0.006	0.064
Paris Dike	BR-10	6/20/2007	Jun-07	1655	67	399	245	48	73	ND	ND	0.8	0.006	0.099
Paris Dike	BR-10	8/22/2007	Aug-07	1400	35	395	244	50	75	ND	ND	0.6	0.013	0.058
Paris Dike	BR-10	9/11/2008	Sep-08	1410	15	377	217	42	73	ND	ND	0.2	0.013	0.034
Paris Dike	BR-10	8/4/2009	Aug-09	1815	25	376	233	47	69	ND	ND	0.3	ND	0.05
Old River Channel at HWY Crossing	BR-10(A)	4/16/2008	Apr-08	1250	27	488	251	51	106	0.07	0.07	0.9	0.041	0.125

Description	Site #	Collection Date	Month-Year	Time	TSS	TDS	Alkalinity, total as CaCO3	Chloride	Sulfate	NH3	NO2+NO3	TKN	Ortho-P	TP
Pescadero	BR-11	7/19/2006	Jul-06	1115	62	425	253	43	59	ND	ND	1.1	0.006	0.114
Pescadero	BR-11	11/16/2006	Nov-06	1122	ND	386	226	34	69	ND	0.23	0.6	ND	0.024
Pescadero	BR-11	4/25/2007	Apr-07	1210	24	346	209	36	63	ND	0.11	1.1	ND	0.073
Pescadero	BR-11	6/21/2007	Jun-07	920	70	402	246	48	74	ND	ND	0.8	0.007	0.252
Pescadero	BR-11	8/22/2007	Aug-07	1520	47	396	245	50	75	ND	ND	0.7	0.013	0.078
Pescadero	BR-11	4/16/2008	Apr-08	1150	ND	363	200	37	68	ND	0.12	0.9	0.024	0.063
Pescadero	BR-11	5/14/2008	May-08	1425	37	306	185	25	43	ND	0.08	0.7	0.013	0.069
Pescadero	BR-11	6/10/2008	Jun-08	1645	29	345	208	31	49	ND	ND	1	0.009	0.054
Pescadero	BR-11	9/11/2008	Sep-08	945	17	381	223	42	73	ND	ND	0.4	0.015	0.027
Pescadero	BR-11	12/2/2008	Dec-08	1405	ND	346	211	32	68	ND	0.25	ND	0.01	0.017
Pescadero	BR-11	4/27/2009	Apr-09	1625	21	304	176	22	47	ND	0.09	0.5	0.008	0.055
Pescadero	BR-11	6/3/2009	Jun-09	1200	52	313	192	23	29	ND	0.06	0.5	0.007	0.083
Pescadero	BR-11	8/4/2009	Aug-09	1745	35	391	236	47	70	ND	ND	0.4	ND	0.044
Above Alexander	BR-12	7/19/2006	Jul-06	1210	50	400	255	36	47	ND	ND	1.2	ND	0.082
Above Alexander	BR-12	11/16/2006	Nov-06	1206	ND	372	234	23	56	0.07	0.76	0.5	0.009	0.02
Above Alexander	BR-12	4/25/2007	Apr-07	1256	18	321	212	25	50	0.09	0.46	1.2	0.007	0.081
Above Alexander	BR-12	6/21/2007	Jun-07	1013	98	383	251	48	74	ND	ND	1	0.007	0.155
Above Alexander	BR-12	8/22/2007	Aug-07	1610	66	404	248	50	74	ND	0.07	0.8	0.025	0.107
Above Alexander	BR-12	4/16/2008	Apr-08	1110	18	340	209	26	60	ND	0.11	0.6	0.007	0.042
Above Alexander	BR-12	5/13/2008	May-08	1510	24	263	172	18	37	ND	0.1	0.6	0.028	0.042
Above Alexander	BR-12	6/11/2008	Jun-08	930	28	305	197	22	41	ND	0.15	0.9	0.012	0.043
Above Alexander	BR-12	9/11/2008	Sep-08	1525	12	371	233	39	71	0.05	0.17	0.3	0.039	0.032
Above Alexander	BR-12	12/2/2008	Dec-08	1455	ND	331	228	25	58	0.1	0.75	0.3	0.018	0.018
Above Alexander	BR-12	4/28/2009	Apr-09	1235	46	279	190	17	45	ND	0.31	0.7	0.007	0.082
Above Alexander	BR-12	6/3/2009	Jun-09	1245	38	229	168	14	20	ND	0.11	0.4	0.006	0.066
Above Alexander	BR-12	8/4/2009	Aug-09	1700	14	350	214	42	68	ND	0.06	0.3	ND	0.027
Grace	BR-13	7/19/2006	Jul-06	1235	ND	402	250	36	49	ND	0.12	1	0.014	0.04
Grace	BR-13	11/16/2006	Nov-06	1240	11	439	275	28	65	ND	0.52	0.7	0.004	0.035
Grace	BR-13	4/25/2007	Apr-07	1323	13	406	284	26	58	ND	0.39	0.9	0.007	0.053
Grace	BR-13	6/21/2007	Jun-07	1040	ND	431	263	47	75	ND	0.09	0.9	0.01	0.05
Grace	BR-13	8/22/2007	Aug-07	1645	15	419	260	50	77	ND	0.09	0.7	0.009	0.067
Grace	BR-13	4/16/2008	Apr-08	1045	10	447	323	27	65	0.1	0.69	0.5	0.004	0.036
Grace	BR-13	5/13/2008	May-08	1545						0.09	0.3	0.8	0.026	0.048
Grace	BR-13	6/9/2008	Jun-08	1550	19	321	215	22	44	ND	0.1	0.9	0.008	0.042
Grace	BR-13	9/10/2008	Sep-08	1525	ND	397	235	43	75	ND	0.05	0.4	0.012	0.034
Grace	BR-13	12/2/2008	Dec-08	1515	ND	426	301	29	67	ND	0.5	0.5	0.019	0.023
Grace	BR-13	4/28/2009	Apr-09	1215	23	356	235	24	60	ND	0.22	0.7	0.007	0.082
Grace	BR-13	6/3/2009	Jun-09	1315	10	294	201	17	30	ND	0.07	0.3	0.007	0.037
Grace	BR-13	8/4/2009	Aug-09	1630	12	393	210	44	67	ND	0.13	0.4	0.017	0.05
Below Black Canyon	BR-14	7/19/2006	Jul-06	1255	11	437	277	39	54	ND	0.25	0.9	0.009	0.041
Below Black Canyon	BR-14	11/16/2006	Nov-06	1310	11	471	293	34	68	ND	0.78	0.6	0.008	0.034
Below Black Canyon	BR-14	4/25/2007	Apr-07	1350	19	413	262	33	62	ND	0.75	1.2	0.012	0.061
Below Black Canyon	BR-14	6/21/2007	Jun-07	1114	12	440	266	47	75	ND	0.13	0.9	0.007	0.057
Below Black Canyon	BR-14	8/22/2007	Aug-07	1710	27	427	265	50	77	ND	0.14	0.7	0.014	0.076
Below Black Canyon	BR-14	4/16/2008	Apr-08	1010	19	458	324	30	66	0.07	0.9	0.4	0.015	0.051
Below Black Canyon	BR-14	5/13/2008	May-08	1615	17	419	281	35	66	ND	0.33	0.8	0.013	0.042
Below Black Canyon	BR-14	6/9/2008	Jun-08	1520	17	333	221	24	46	ND	0.16	0.9	0.013	0.043
Below Black Canyon	BR-14	9/10/2008	Sep-08	1445	ND	488	310	47	76	ND	0.29	0.4	0.021	0.033
Below Black Canyon	BR-14	12/2/2008	Dec-08	1540	ND	455	321	36	69	ND	0.68	0.2	0.016	0.031
Below Black Canyon	BR-14	4/28/2009	Apr-09	1155	36	353	239	24	61	ND	0.3	0.6	0.007	0.101
Below Black Canyon	BR-14	6/3/2009	Jun-09	1330	30	310	209	19	33	ND	0.22	0.3	0.014	0.063
Below Black Canyon	BR-14	8/4/2009	Aug-09	1600	14	398	251	44	67	ND	0.19	0.4	0.018	0.046
Above Oneida Reservoir	BR-15	7/19/2006	Jul-06	1200	17	421	269	38	53	ND	0.41	1	0.04	0.067
Above Oneida Reservoir	BR-15	11/16/2006	Nov-06	1335	ND	443	293	36	63	ND	1.03	0.8	0.009	0.029
Above Oneida Reservoir	BR-15	4/25/2007	Apr-07	1337	25	407	281	35	54	ND	0.74	1	0.015	0.083
Above Oneida Reservoir	BR-15	6/21/2007	Jun-07	1145	38	451	277	47	74	ND	0.13	0.9	0.009	0.094
Above Oneida Reservoir	BR-15	8/22/2007	Aug-07	1800	36	441	276	50	75	ND	0.24	0.8	0.027	0.089
Above Oneida Reservoir	BR-15	4/16/2008	Apr-08	935	13	451	323	31	62	0.08	0.89	0.5	0.039	0.047
Above Oneida Reservoir	BR-15	5/13/2008	May-08	1650	21	393	262	33	55	ND	0.42	0.6	0.027	0.052
Above Oneida Reservoir	BR-15	6/9/2008	Jun-08	1450	45	344	236	24	43	ND	0.24	0.8	0.014	0.072
Above Oneida Reservoir	BR-15	9/10/2008	Sep-08	1405	ND	433	273	45	74	ND	0.27	0.4	0.016	0.029
Above Oneida Reservoir	BR-15	12/3/2008	Dec-08	1015	ND	428	294	35	61	ND	0.84	0.5	0.014	0.028
Above Oneida Reservoir	BR-15	4/28/2009	Apr-09	1110	84	361	237	25	57	ND	0.36	0.7	0.006	0.169
Above Oneida Reservoir	BR-15	6/3/2009	Jun-09	1230	295	330	214	21	31	ND	0.34	0.2	0.034	0.333
Above Oneida Reservoir	BR-15	8/4/2009	Aug-09	1530	25	412	270	43	64	ND	0.31	0.3	0.023	0.07
Below Oneida Reservoir	BR-16	7/19/2006	Jul-06	1115	ND	450	274	45	56	0.06	0.23	1	0.015	0.048
Below Oneida Reservoir	BR-16	11/16/2006	Nov-06	1341	ND	479	294	49	71	0.07	0.85	0.9	ND	0.024
Below Oneida Reservoir	BR-16	4/25/2007	Apr-07	1300	12	400	264	39	54	0.09	0.49	1	0.009	0.045
Below Oneida Reservoir	BR-16	6/20/2007	Jun-07	1803	ND	457	282	51	74	0.11	0.12	0.8	0.019	0.046
Below Oneida Reservoir	BR-16	8/23/2007	Aug-07	1220	ND	450	281	55	79	ND	0.14	0.7	0.033	0.054
Below Oneida Reservoir	BR-16	4/16/2008	Apr-08	905	ND	508	329	49	74	0.09	0.86	0.5	0.018	0.03
Below Oneida Reservoir	BR-16	5/13/2008	May-08	1730	11	394	238	37	58	ND	0.33	0.7	0.024	0.025
Below Oneida Reservoir	BR-16	6/9/2008	Jun-08	1420	ND	353	231	29	48	0.08	0.19	0.5	0.015	0.024
Below Oneida Reservoir	BR-16	9/10/2008	Sep-08	1320	ND	442	261	49	79	0.07	0.11	0.3	0.013	0.014
Below Oneida Reservoir	BR-16	12/3/2008	Dec-08	1050	ND	464	287	52	75	0.05	0.6	0.5	0.012	0.056
Below Oneida Reservoir	BR-16	4/28/2009	Apr-09	1015	10	332	216	28	50	ND	0.38	0.5	0.006	0.061
Below Oneida Reservoir	BR-16	6/2/2009	Jun-09	1515	ND	355	226	31	39	0.011	0.27	0.2	0.03	0.045
Below Oneida Reservoir	BR-16	8/4/2009	Aug-09	1500	ND	418	263	47	62	0.07	0.24	0.5	0.025	0.047
ID/UT Border - 3900 S. road crossing	BR-17	7/19/2006	Jul-06	1015	10	522	244	113	53	ND	0.07	0.9	0.015	0.042
ID/UT Border - 3900 S. road crossing	BR-17	11/16/2006	Nov-06	1246	ND	557	288	99	69	ND	0.79	0.8	0.005	0.021
ID/UT Border - 3900 S. road crossing	BR-17	4/25/2007	Apr-07	1150	15	430	234	92	49	ND	0.26	0.8	0.011	0.055
ID/UT Border - 3900 S. road crossing	BR-17	6/21/2007	Jun-07	1303	37	494	283	73	73	ND	0.18	1	0.01	0.11
ID/UT Border - 3900 S. road crossing	BR-17	8/23/2007	Aug-07	1130	15	507	284	82	78	ND	0.14	0.7	0.014	0.064
ID/UT Border - 3900 S. road crossing	BR-17	4/16/2008	Apr-08	810	92	528	320	72	72	0.1	0.84	1.1	0.015	0.131
ID/UT Border - 3900 S. road crossing	BR-17	5/13/2008	May-08	1815	23	474	243	92	55	ND	0.31	0.6	0.019	0.044
ID/UT Border - 3900 S. road crossing	BR-17	6/9/2008	Jun-08	1330	19	393	227	61	40	0.05	0.19	0.7	0.009	0.036
ID/UT Border - 3900 S. road crossing	BR-17	9/10/2008	Sep-08	1225	ND	508	259	107	75	ND	ND	0.3	0.02	0.014
ID/UT Border - 3900 S. road crossing	BR-17	12/3/2008	Dec-08	1130	ND	572	291	109	73	0.1	0.64	0.5	0.014	0.02
ID/UT Border - 3900 S. road crossing	BR-17	4/28/2009	Apr-09	925	49	345	216	45	44	ND	0.44	0.7	0.015	0.125
ID/UT Border - 3900 S. road crossing	BR-17	6/2/2009	Jun-09	1445	454	382	216	56	30	0.09	0.26	0.5	0.02	0.5
ID/UT Border - 3900 S. road crossing	BR-17	8/4/2009	Aug-09	1400	23	463	264	89	59	ND	0.18	0.4	0.015	0.047

Appendix C. McNeil Depth Fine Computation Sheets

McNeil Sediment Core Sampling Form						
Stream	Dry Creek					
Date	8/28/2008					
Location:	Lower end of erosion inventory reach					
Lat/Lon:	N:	42.42328				
	W:	111.06949				
Site Desc:						
Personnel:	DWZ					
Target Species		Bonneville cutthroat trout				
Sample Number		1	2	3		
Occular Est% Surf Fns						
Seive Size (inches)		ML	ML	ML		
2.5	63 mm	366	380	290		
1	25 mm	810	1155	910		
0.5	12.5 mm	380	660	765		
0.25	6.35 mm	555	465	500		
1.0 - 0.25" Subtotal		1745	2280	2175		
#4	4.75 mm	142	200	152		
#8	2.36 mm	485	425	320		
#20	850 um	415	430	390		
#70	212 um	1170	710	690		
#140	106 um	80	71	80		
#200	75 um	52	42	42		
<0.25" Subtotal		2344	1878	1674		
Sample Total						
W/O 2.5"		4089	4158	3849	Mean	Std. Dev.
% Fines W/O 2.5"		0.573245292	0.451659452	0.43491816	48.66%	0.075495897
Sample Total						
W 2.5"		4455	4538	4139	Mean	Std. Dev.
% Fines W 2.5"		0.526150393	0.413838695	0.40444552	44.81%	0.067717828

McNiel Sediment Core Sampling Form						
Stream	Snowslide Creek					
Date	8/12/2009					
Location:	Lower (Near Mouth)					
Lat/Lon:	N:	42.39291				
	W:	-111.1702				
Site Desc:	Lower (Near Mouth)					
Personnel:	MCT/DWZ					
Target Species	Bonneville Cutthroat Trout					
Sample Number		1	2	3		
Occular Est% Surf Fns						
Seive Size (inches)		ML	ML	ML		
2.5	63 mm	0	0	0		
1	25 mm	1340	1675	990		
0.5	12.5 mm	575	760	595		
0.25	6.35 mm	825	1038	980		
1.0 - 0.25" Subtotal		2740	3473	2565		
#4	4.75 mm	420	490	460		
#8	2.36 mm	740	870	795		
#20	850 um	880	1086	105		
#70	212 um	830	575	715		
#140	106 um	106	95	78		
#200	75 um	52	45	94		
#270	53 um	86	22	28		
<0.25" Subtotal		3114	3183	2275		
Sample Total						
W/O 2.5"		5854	6656	4840	Mean	Std. Dev.
% Fines W/O 2.5"		0.53194397	0.4782151	0.470041	49.34%	0.033629193
Sample Total						
W 2.5"		5854	6656	4840	Mean	Std. Dev.
% Fines W 2.5"		0.53194397	0.4782151	0.470041	49.34%	0.033629193

McNiel Sediment Core Sampling Form							
Stream	Strawberry Creek						
Date	8/26/2009						
Location:	Upper						
Lat/Lon:	N:	42.30883					
	W:	111.64156					
Site Desc:	Upper strawberry on USFS Property						
Personnel:	MCT/DWZ						
Target Species	Bonneville Cutthroat Trout						
Sample Number			1	2	3		
Occular Est% Surf Fns							
Seive Size (inches)			ML	ML	ML		
2.5	63 mm		0	0	0		
1	25 mm		520	610	620		
0.5	12.5 mm		645	705	272		
0.25	6.35 mm		485	560	560		
1.0 - 0.25" Subtotal			1650	1875	1452		
#4	4.75 mm		195	220	136		
#8	2.36 mm		940	390	530		
#20	850 um		1200	500	1880		
#70	212 um		530	870	525		
#140	106 um		54	120	97		
<0.25" Subtotal			2919	2100	3168		
Sample Total							
W/O 2.5"			4569	3975	4620	Mean	Std. Dev.
% Fines W/O 2.5"			0.63887065	0.52830189	0.685714	0.61762894	0.08082743
Sample Total							
W 2.5"			4569	3975	4620	Mean	Std. Dev.
% Fines W 2.5"			0.63887065	0.52830189	0.685714	0.61762894	0.08082743

McNiel Sediment Core Sampling Form						
Stream	Strawberry Creek					
Date	8/11/2009					
Location:	Middle					
Lat/Lon:	N:	42.27943				
	W:	-111.70051				
Site Desc:	Middle Strawberry Creek on rd easment off of Hwy 36					
Personnel:	MCT/DWZ/JES					
Target Species	Bonneville Cutthroat Trout					
Sample Number		1	2	3		
Occular Est% Surf Fns						
Seive Size (inches)		ML	ML	ML		
2.5	63 mm	367	170	165		
1	25 mm	1992	1321	1810		
0.5	12.5 mm	1198	1840	1460		
0.25	6.35 mm	790	910	760		
1.0 - 0.25" Subtotal		3980	4071	4030		
#4	4.75 mm	320	435	350		
#8	2.36 mm	990	910	730		
#20	850 um	1318	880	1220		
#70	212 um	780	470	675		
#140	106 um	118	52	60		
#200	75 um	42	18	20		
#270	53 um	25	10	3		
<0.25" Subtotal		3593	2775	3058		
Sample Total						
W/O 2.5"		7573	6846	7088	Mean	Std. Dev.
% Fines W/O 2.5"		0.474448699	0.405346188	0.431433409	43.71%	0.03489512
Sample Total						
W 2.5"		7940	7016	7253	Mean	Std. Dev.
% Fines W 2.5"		0.452518892	0.395524515	0.421618641	42.32%	0.02853094

McNiel Sediment Core Sampling Form					
Stream	Strawberry Creek				
Date	9/8/2009				
Location:	Lower				
Lat/Lon:	N:	42.25715			
	W:	-111.7154			
Site Desc:	Lower Strawberry Creek on Richard Free's Property				
Personnel:	MCT/DWZ				
Target Species	Bonneville Cutthroat Trout				
Sample Number		1	2	3	
Occular Est% Surf Fns					
Seive Size (inches)		ML	ML	ML	
2.5	63 mm	0	0	0	
1	25 mm	23	154	710	
0.5	12.5 mm	250	400	620	
0.25	6.35 mm	425	525	590	
1.0 - 0.25" Subtotal		698	1079	1920	
#4	4.75 mm	168	235	270	
#8	2.36 mm	500	720	1092	
#20	850 um	1725	2025	1320	
#70	212 um	1260	1510	1470	
#140	106 um	122	190	74	
<0.25" Subtotal		3775	4680	4226	
Sample Total					
W/O 2.5"		4473	5759	6146	Mean
% Fines W/O 2.5"		0.843952605	0.812641084	0.6876017	78.14%
Sample Total					
W 2.5"		4473	5759	6146	Mean
% Fines W 2.5"		0.843952605	0.812641084	0.6876017	78.14%
					Std. Dev.
					0.0827253

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Appendix D. Streambank Erosion Inventory Method

Streambank Erosion Inventory

The streambank erosion inventory used to estimate background and existing streambank erosion followed methods outlined in the proceedings from the Natural Resource Conservation Service (NRCS) Channel Evaluation Workshop (NRCS, 1983). Using the direct volume method, sub-sections of 1996 §303(d) watersheds were surveyed to determine the extent of chronic bank erosion and estimate the needed reductions.

The NRCS Stream Bank Erosion Inventory is a field based methodology, which measures streambank/channel stability, length of active eroding banks, and bank geometry (Stevenson, 1994). The streambank/channel stability inventories were used to estimate the long-term lateral recession rate. The recession rate is determined from field evaluation of streambank characteristics that are assigned a categorical rating ranging from 0 to 3. The categories of rating the factors and rating scores are:

Bank Stability:

- Do not appear to be eroding - 0
- Erosion evident - 1
- Erosion and cracking present - 2
- Slumps and clumps sloughing off - 3

Bank Condition:

- Some bare bank, few rills, no vegetative overhang - 0
- Predominantly bare, some rills, moderate vegetative overhang - 1
- Bare, rills, severe vegetative overhang, exposed roots - 2
- Bare, rills and gullies, severe vegetative overhang, falling trees - 3

Vegetation / Cover On Banks:

- Predominantly perennials or rock-covered - 0
- Annuals / perennials mixed or about 40% bare - 1
- Annuals or about 70% bare - 2
- Predominantly bare - 3

Bank / Channel Shape:

- V - Shaped channel, sloped banks - 0
- Steep V - Shaped channel, near vertical banks - 1
- Vertical Banks, U - Shaped channel - 2
- U - Shaped channel, undercut banks, meandering channel - 3

Channel Bottom:

- Channel in bedrock / noneroding - 0
- Soil bottom, gravels or cobbles, minor erosion - 1
- Silt bottom, evidence of active downcutting - 2

Deposition:

- No evidence of recent deposition - 1
- Evidence of recent deposits, silt bars - 0

Cumulative Rating

Slight (0-4) Moderate (5-8) Severe (9+)

From the Cumulative Rating, the lateral recession rate is assigned.

0.01 - 0.05 feet per year	Slight
0.06 - 0.15 feet per year	Moderate
0.16 - 0.3 feet per year	Severe
0.5+ feet per year	Very Severe

Streambank stability can also be characterized through the following definition and the corresponding streambank erosion condition rating from Bank Stability or Bank Condition above are included in italics.

Streambanks are considered stable if they do not show indications of any of the following features:

- **Breakdown** - Obvious blocks of bank broken away and lying adjacent to the bank breakage. *Bank Stability Rating 3*
- **Slumping or False Bank** - Bank has obviously slipped down, cracks may or may not be obvious, but the slump feature is obvious. *Bank Stability Rating 2*
- **Fracture** - A crack is visibly obvious on the bank indicating that the block of bank is about to slump or move into the stream. *Bank Stability Rating 2*
- **Vertical and Eroding** - The bank is mostly uncovered and the bank angle is steeper than 80 degrees from the horizontal. *Bank Stability Rating 1*

Streambanks are considered covered if they show any of the following features:

- Perennial vegetation ground cover is greater than 50%. *Vegetation/Cover Rating 0*
- Roots of vegetation cover more than 50% of the bank (deep rooted plants such as willows and sedges provide such root cover). *Vegetation/Cover Rating 1*
- At least 50% of the bank surfaces are protected by rocks of cobble size or larger. *Vegetation/Cover Rating 0*
- At least 50% of the bank surfaces are protected by logs of 4 inch diameter or larger. *Vegetation/Cover Rating 1*

Streambank stability is estimated using a simplified modification of Platts, Megahan, and Minshall (1983, p. 13) as stated in *Monitoring Protocols to Evaluate Water Quality Effects of Grazing Management on Western Rangeland Streams* (Bauer and Burton, 1993). The modification allows for measuring streambank stability in a more objective fashion. The lengths of banks on both sides of the stream throughout the entire linear distance of the representative reach are measured and proportioned into four stability classes as follows:

- **Mostly covered and stable (non-erosional).** Streambanks are Over 50% Covered as defined above. Streambanks are Stable as defined above. Banks associated with gravel bars having perennial vegetation above the scourline are in this category. *Cumulative Rating 0 - 4 (slight erosion) with a corresponding lateral recession rate of 0.01 - 0.05 feet per year.*

- **Mostly covered and unstable (vulnerable).** Streambanks are Over 50% Covered as defined above. Streambanks are Unstable as defined above. Such banks are typical of “false banks” observed in meadows where breakdown, slumping, and/or fracture show instability yet vegetative cover is abundant. *Cumulative Rating 5 - 8 (moderate erosion) with a corresponding lateral recession rate of 0.06 - 0.2 feet per year.*
- **Mostly uncovered and stable (vulnerable).** Streambanks are less than 50% Covered as defined above. Streambanks are Stable as defined above. Uncovered, stable banks are typical of streambanks trampled by concentrations of cattle. Such trampling flattens the bank so that slumping and breakdown do not occur even though vegetative cover is significantly reduced or eliminated. *Cumulative Rating 5 - 8 (moderate erosion) with a corresponding lateral recession rate of 0.06 - 0.2 feet per year.*
- **Mostly uncovered and unstable (erosional).** Streambanks are less than 50% Covered as defined above. They are also Unstable as defined above. These are bare eroding streambanks and include ALL banks mostly uncovered, which are at a steep angle to the water surface. *Cumulative Rating 9+ (severe erosion) with a corresponding lateral recession rate of over 0.5 feet per year.*

Streambanks were inventoried to quantify bank erosion rate and annual average erosion. These data were used to develop a quantitative sediment budget to be used for TMDL development.

Site Selection

The first step in the bank erosion inventory is to identify key problem areas. Streambank erosion tends to increase as a function of watershed area (NRCS, 1983). As a result, the lower stream segment of larger watersheds tend to be problem areas. These stream segments tend to be alluvial streams commonly classified as response reaches (Rosgen B and C channel types) (Rosgen, 1996).

Because it is often unrealistic to survey every stream segment, sampled reaches were used and bank erosion rates are extrapolated over a larger stream segment. The length of the sampled reach is a function of stream type variability where streams segments with highly variable channel types need a large sample, whereas segments with uniform gradient and consistent geometry need less. Typically between 10 and 30 percent of streambank needs to be inventoried. Often, the location of some stream inventory reaches is more dependent on land ownership than watershed characteristics. For example, private land owners are sometimes unwilling to allow access to stream segments within their property.

Stream reaches are subdivided into *sites* with similar channel and bank characteristics. Breaks between sites are made where channel type and/or dominate bank characteristics change substantially. In a stream with uniform channel geometry there may be only one site per stream reach, whereas in an area with variable conditions there may be several sites. Subdivision of stream reaches is at the discretion of the field crew leader.

Field Methods

Streambank erosion or channel stability inventory field methods were originally developed by the USDA USFS (Pfankuch, 1975). Further development of channel stability inventory methods are outlined in Lohrey (1989) and NRCS (1983). As stated above, the NRCS (1983) document outlines field methods used in this inventory. However, slight modifications to the field methods were made and are documented.

Field crews typically consist of two to four people and are trained as a group to ensure quality control or consistent data collection. Field crews survey selected stream reaches measuring bank length, slope height, bankfull width and depth, and bank content. In most cases, a Global Positioning System (GPS) is used to locate the upper and lower boundaries of inventoried stream reaches. Additionally, while surveying field crews photograph key problem areas.

Bank Erosion Calculations

The direct volume method is used to calculate average annual erosion rates for a given stream segment based on bank recession rate determined in the survey (NRCS, 1983). The erosion rate (tons/mile/year) is used to estimate the total bank erosion of the selected stream corridor.

The direct volume method is summarized in the following equations:

$$E = [A_E * R_{LR} * \rho_B] / 2000 \text{ (lbs/ton)}$$

where:

E = bank erosion over sampled stream reach (tons/yr/sample reach)

A_E = eroding area (ft²)

R_{LR} = lateral recession rate (ft/yr)

ρ_B = bulk density of bank material (lbs/ft³)

The bank erosion rate (E_R) is calculated by dividing the sampled bank erosion (E) by the total stream length sampled:

$$E_R = E / L_{BB}$$

where:

E_R = bank erosion rate (tons/mile/year)

E = bank erosion over sampled stream reach (tons/yr/sample reach)

L_{BB} = bank to bank stream length over sampled reach

Total bank erosion is expressed as an annual average. However, the frequency and magnitude of bank erosion events are greatly a function of soil moisture and stream discharge (Leopold et al, 1964). Because channel erosion events typically result from above average flow events, the annual average bank erosion value should be considered a long term average. For example, a 50 year flood event might cause five feet of bank erosion in one year and over a ten year period this events accounts for the majority of bank erosion. These factors have less of an influence where bank trampling is the major cause of channel instability.

The *eroding area* (A_E) is the product of linear horizontal bank distance and average bank slope height. Bank length and slope heights are measured while walking along the stream channel. Pacing is used to measure horizontal distance, and bank slope heights are continually measured and averaged over a given reach or site. The horizontal length is the length of the right or left bank, not both. Typically, one bank along the stream channel is actively eroding. For example, the bank on the outside of a meander. However, both banks of channels with severe headcuts or gullies will be eroding and are to be measured separately and eventually summed.

Determining the *lateral recession rate* (R_{LR}) is one of the most critical factors in this methodology (NRCS, 1983). Several techniques are available to quantify bank erosion rates: for example, aerial photo interpretation, anecdotal data, bank pins, and channel cross sections.

To facilitate consistent data collection, the NRCS developed rating factors used to estimate lateral recession rate. Similar to methods developed by Pfankuch (1975), the NRCS method measures bank and channel stability, and then uses the ratings as surrogates for bank erosion rates.

The *bulk density* (ρ_B) of bank material is measured ocularly in the field. Soil bulk density is the weight of material divided by its volume, including the volume of its pore spaces. A table of typical soil bulk densities can be used, or soil samples can be collected and soil bulk density measured in the laboratory.

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Appendix E. Data Sources

Data sources for Bear River Basin Subbasin Assessment.

Water Body	Data Source	Type of Data	When Collected
Bear River	DEQ Pocatello Regional Office	DMR and other data for municipal WWTPs	2004-2009
Bear River	DEQ Pocatello Regional Office	Tri-State water quality monitoring	July 2006-Aug 2009
Co-Op, Dry, Strawberry Creeks	DEQ Pocatello Regional Office	Water quality monitoring	June 2006 and October 2006
Co-Op Creek	IASCD	Water quality monitoring	June – December 2008
Dairy Creek	IASCD	Water quality monitoring	March 2005 – November 2006
Strawberry Creek	DEQ Pocatello Regional Office	Depth fine data, streambank erosion inventory	Summer 2009
Dry Creek	DEQ Pocatello Regional Office	Depth fine data, streambank erosion inventory	Summer 2008
Preuss Creek	DEQ Pocatello Regional Office	Streambank erosion inventory	Summer 2008
Snowslide Creek	DEQ Pocatello Regional Office	Depth fine data, streambank erosion inventory	Summer 2009

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Appendix F. Distribution List

Dallan Nalder Bear River BAG, Chairman, Agricultural Rep. Holbrook, ID	Steven Smith Soil Conservation Commission 98 E 800 N #3 Preston, ID 83263
Eulalie Langford Bear River BAG, Environmental Rep. Montpelier, ID	William Stewart Idaho Operations Office Environmental Protection Agency 1435 N. Orchard St. Boise, ID 83706
Bob Jensen Bear River BAG, Forestry Representative Ovid, ID	Justin Krajewski, Riparian Specialist Idaho Association of Soil Conservation Districts 1551 Baldy Ave., Ste. #2 Pocatello, ID 83201 Justin.krajewski@agri.idaho.gov
Gale Moser Bear River BAG, Livestock Representative Preston, ID	Leigh Woodruff, Watershed Unit US Environmental Protection Agency 1435 N Orchard Boise, Idaho 83716 Woodruff.leigh@epa.gov
Mitch Hart Mining Representative, Bear River BAG Mining Projects and Remediation Manger Agrium 3010 Conda Rd. Soda Springs, ID 83276 mhart@agrium.com	Brad Higginson USFS, Hydrologist 1405 Hollipark Dr. Idaho Falls, ID 83401 bhigginson@fs.fed.us
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Jim Mende Idaho Fish and Game, Environmental Coordinator 1345 Barton Rd. Pocatello, ID 83201 jmende@idfg.idaho.gov	Larry Mickelson Natural Resource Conservation Service, District Conservationist 785 N 4 th St., Ste B Montpelier, ID 83254 Larry.mickelson@id.usda.gov

US Fish and Wildlife Service Bear Lake National Wildlife Refuge 370 Webster Montpelier, ID 83254	Dan Kotanski Bureau of Land Management, Environmental Protection Specialist 1405 Holipark Dr. Idaho Falls, ID 83401 Daniel_kotansky@blm.gov
City of Georgetown Albert Johnson, Mayor PO Box 99 Georgetown, ID 83239	City of Montpelier T.D. Bird, Mayor 534 Washington Montpelier, ID 83254
City of Soda Springs Kirk Hansen, Mayor 9 West 2 nd South Soda Springs, ID 83276	City of Preston F. Lee Hendrickson, Mayor 70 West Oneida Preston, ID 83263
City of Grace Charles Titcomb, Mayor PO Box 288 Grace, ID 83241	City of Franklin Wayne Priestly, Mayor PO Box 69 Franklin, ID 83237

Appendix G. Public Comments/Public Participation

IDEQ Responses to Comments on 2010 Bear River TMDL Addendum

Comments from the U.S. Environmental Protection Agency

Total phosphorus target. It is clear from the original TMDL that the TP target applies year around, but it is not so clear how the targets are to be interpreted. Several graphs in the original TMDL show month-by-month monitoring results, suggesting they should be viewed as a monthly targets. However, 2006 – 2009 mean and median concentration values are presented on p. 4 of the Addendum. We think it would be much more appropriate for this nutrient TMDL to focus on and evaluate monthly concentration data, at least during the growing season (e.g. April – September), in addition to annual average and median concentrations.

DEQ Response:

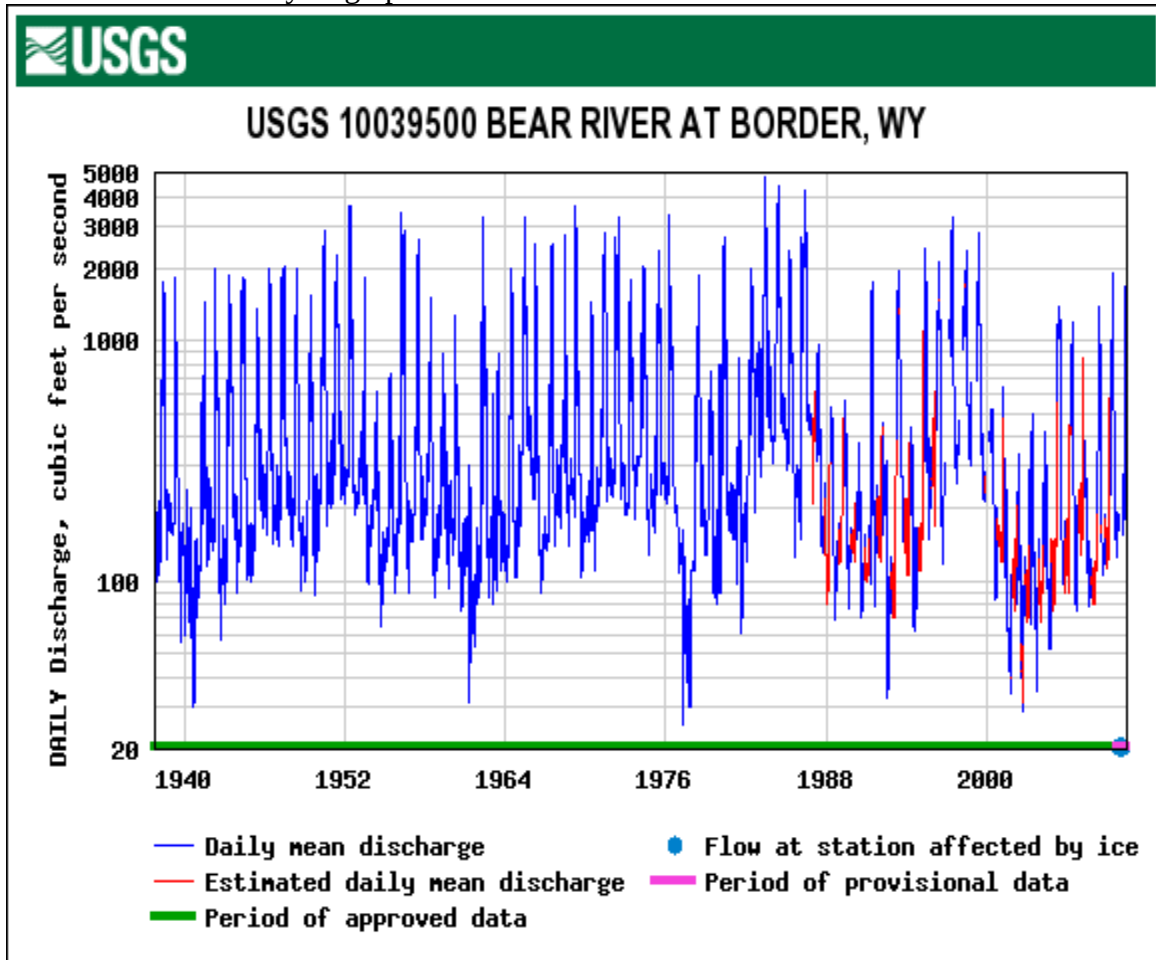
In the absence of site-specific monthly monitoring datasets, DEQ has re-evaluated 2006-2009 data based on the biologically-active period (growing season). After analyzing dissolved oxygen percent-saturation levels from representative sites (Bear and Blackfoot rivers), we used May – September as the time period for the growing season evaluation. Based on data DEQ has collected in the Bear and other rivers in southeast Idaho, significant biological activity seldom occurs prior to May. Median TP concentrations measured during the May-September period of biological activity indicate mainstem Bear River and Cub River sites are meeting TMDL targets. The target Above Alexander Reservoir is 0.05 mg/L, while the median TP at that site = 0.055 mg/L. Worm Creek (0.73 mg/L) exceeds the TMDL TP target of 0.075 mg/L by an order of magnitude.

Load Capacity. The LCs for critical flow conditions for locations relevant to each of the revised WWTP WLAs must be identified in this section.

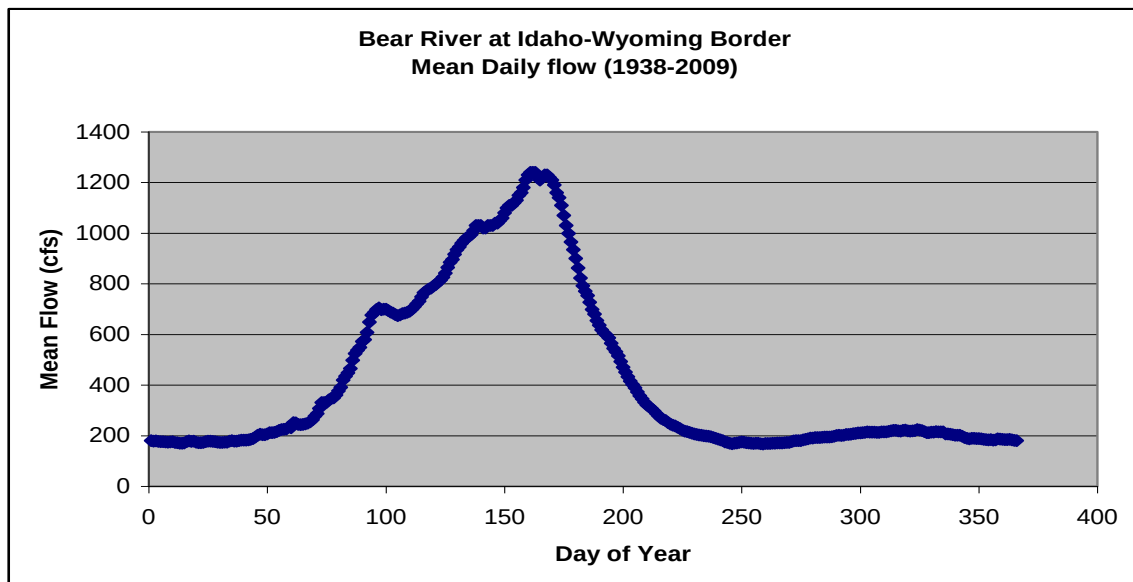
DEQ Response:

The Bear River hydrograph is heavily influenced by water deliveries during the summer growing season, especially at Pescadero. The following graphs illustrate general hydrographs and daily mean flow at several mainstem Bear River sites.

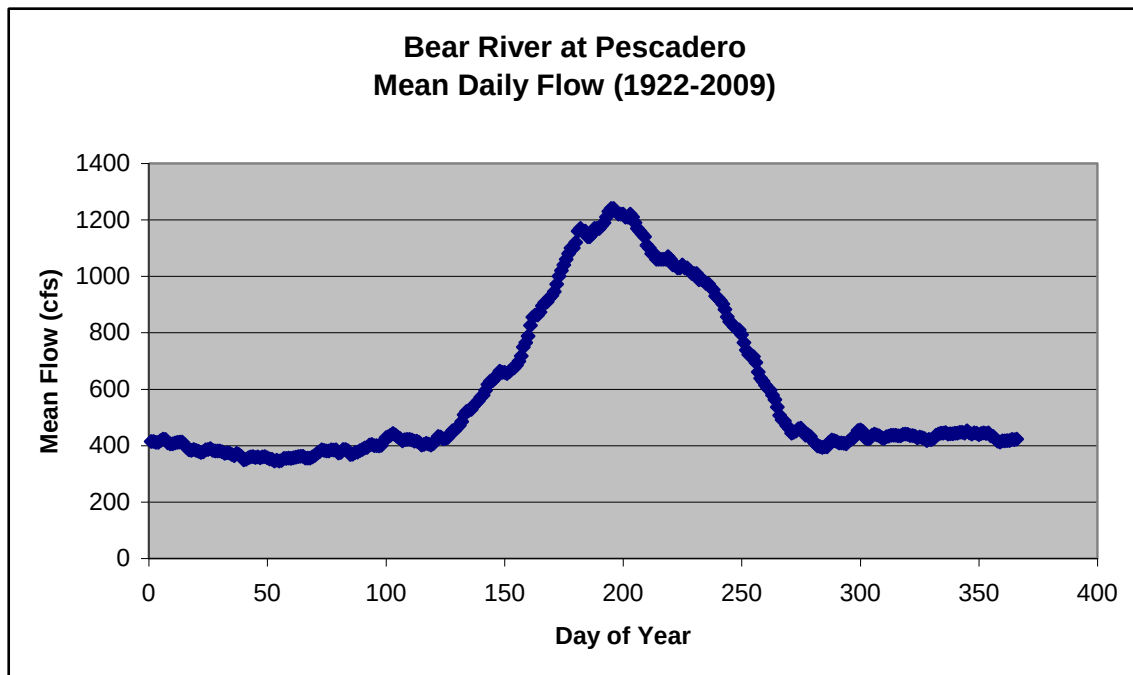
Selected Bear River hydrographs:



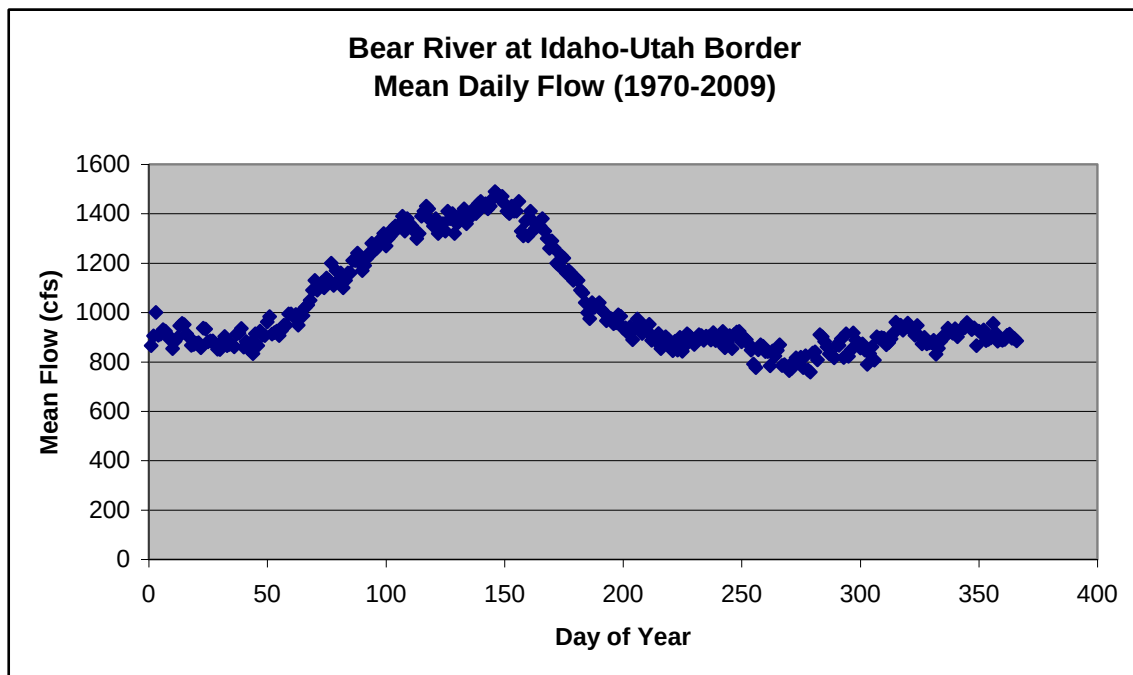
Long-term mean daily discharge for Bear River at the Idaho-Wyoming border.



USGS 10039500 – Bear River at ID-WY border



USGS 10068500 – Bear River at Pescadero



USGS 10092700 – Bear River at ID-UT border

DEQ calculated LCs for locations with sufficient data on the Bear and Cub rivers. Loading capacities calculated for average monthly flows have been placed in the appropriate section. Tables 10 and 11 summarize calculations for the Pescadero and ID/UT Border gages.

Further discussion with EPA ensued regarding applicability of WLAs under various flow conditions. It has been clarified that LAs and WLAs set in the tables apply during all

conditions. As explained in the text, under lowest flow conditions, sediment concentrations would be lowest, leading to lower LAs that would result in meeting LCs.

Table 10. Loading capacity for Bear River at Pescadero USGS gage 10068500 (1922-2009).

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean daily Q (cfs)	397	358	373	415	543	912	1180	998	630	423	433	435
Daily TP load capacity (lb/day)	161	145	151	168	220	369	478	404	255	171	175	176
Daily TP existing load * (lb/day)	118	106	111	123	217	364	472	399	252	126	129	129
Montpelier WLA (lb/day)	1.65	1.65	1.65	1.65	1.65	1.65	1.65	1.65	1.65	1.65	1.65	1.65
Georgetown WLA (lb/day)	1.83	1.83	1.83	1.83	1.83	1.83	1.83	1.83	1.83	1.83	1.83	1.83
Soda Springs WLA (lb/day)	5.82	5.82	5.82	5.82	5.82	5.82	5.82	5.82	5.82	5.82	5.82	5.82
Clear Springs Foods WLA (lb/day)	4.6	4.6	4.6	2.05	2.05	2.05	2.05	2.05	2.05	4.6	4.6	4.6
Nonpoint LA (lb/day)	147	131	137	157	209	358	467	393	244	157	161	162
10th percentile Q (cfs)	55	60	87	119	228	409	772	644	220	53	66	63
10th percentile LC (lb/day)	22	24	35	48	92	165	313	261	89	21	27	26
10th percentile Existing Load* (lb/day)	16	18	26	35	91	163	308	257	88	16	20	19
Total WLAs (lb/day)	13.9	13.9	13.9	11.35	11.35	11.35	11.35	11.35	11.35	13.9	13.9	13.9
Nonpoint 10th percentile LA (lb/day)	8	10	21	37	81	154	301	249	78	8	13	12
WLA / 10th percentile LC X 100%	62	57	39	23	12	7	4	4	13	65	52	54
30Q10 Flow (cfs-all months)	38											
30Q10 LC (lb/day)	15											
30Q10 Existing Load (lb/day)	15											
Nonpoint 30Q10 LA (lb/day)	1											
Green highlight indicates months during biologically-active period												
* existing loads use median concentrations calculated for growing and non-growing season X mean daily Q. 30Q10 load uses growing season median												

Table 11. Loading capacity for Bear River at Idaho-Utah border USGS gage 10092700 (1970-2009).

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean daily Q (cfs)	899	906	1110	1330	1410	1280	969	886	840	846	901	914
Daily TP load capacity (lb/day)	243	245	300	359	381	346	262	239	227	228	243	247
Daily TP existing load * (lb/day)	267	269	330	395	350	318	241	220	209	251	268	271
Grace WLA (lb/day)	2.36	2.36	2.36	2.36	2.36	2.36	2.36	2.36	2.36	2.36	2.36	2.36
Bear River Trout Farm WLA (lb/day)	5.4	5.4	5.4	8	8	8	3.6	3.6	3.6	3.6	3.6	3.6
Grace Fish Hatchery WLA (lb/day)	1.32	1.32	1.32	0.99	0.99	0.99	0.51	0.51	0.51	0.46	0.46	0.46
Nonpoint LA (lb/day)	234	236	291	348	369	334	255	233	220	222	237	240
10th percentile Q (cfs)	345	369	511	479	377	456	489	499	317	278	322	333
10th percentile LC (lb/day)	93	100	138	129	102	123	132	135	86	75	87	90
10th percentile Existing Load* (lb/day)	102	110	152	142	94	113	122	124	79	83	96	99
Total WLAs (lb/day)	9.08	9.08	9.08	11.35	11.35	11.35	6.47	6.47	6.47	6.42	6.42	6.42
Nonpoint 10th percentile LA (lb/day)	84	91	129	118	90	112	126	128	79	69	80	83
WLA / 10th percentile LC X 100%	10	9	7	9	11	9	5	5	8	9	7	7
30Q10 Flow (cfs-all months)	197											
30Q10 LC (lb/day)	53											
30Q10 Existing Load (lb/day)	49											
Nonpoint 30Q10 LA (lb/day)	44											
Green highlight indicates months during biologically-active period												
* existing loads use median concentrations calculated for growing and non-growing season X mean daily Q. 30Q10 load uses growing season median												

The above table (Table 11) has been revised to reflect the 0.05 mg/L TP target at the ID-UT border.

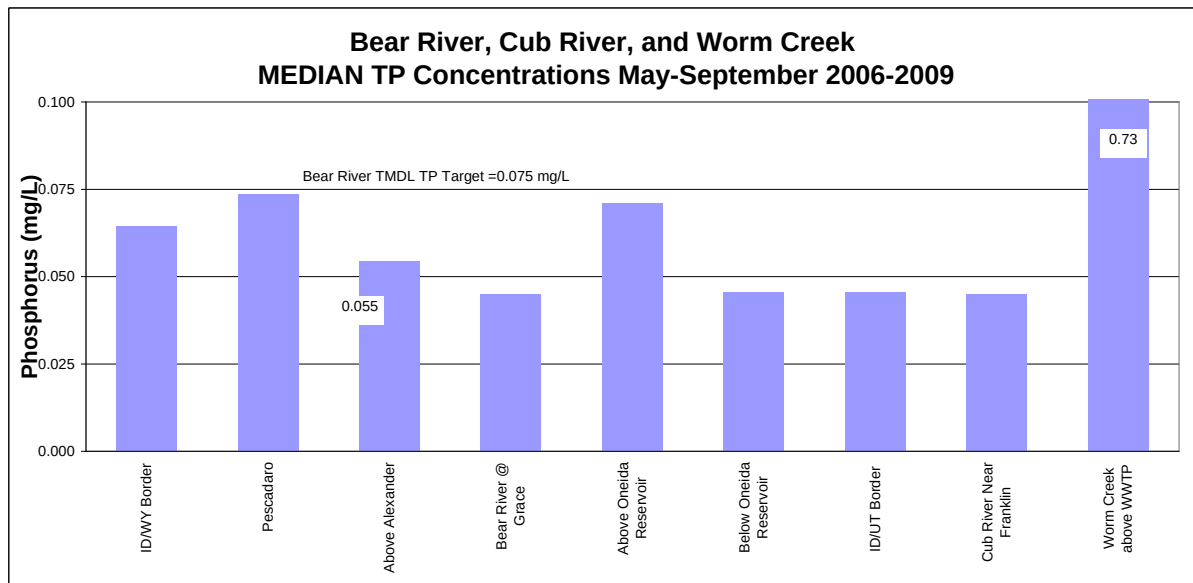
To evaluate critical conditions on a monthly basis, we calculated 10th percentile flows for each month over the entire period of record. The proportion of the 10th percentile load capacity allocated to point sources ranges from approximately 4-13% during the growing season at Pescadero and from 9-16% at the ID/UT border. A large percentage of the Cub River LC (16-60% of 10 percentile flow LCs) is allocated to the Franklin WWTP for two months outside the growing season (March and April). The Franklin WWTP has historically discharged this load during these months. During other months, the WLA is based on 0.05 mg/L TP concentration.

We agree with comments that low flows are relatively more affected by WWTP than higher flows, which is one reason why there is a requirement to address critical flow conditions in all TMDLs. We are concerned by the statement that low flows are defined as "... flows that are less than long term median flow at the nearest USGS gaging station..." In our view, these flows would not be considered critical low flow conditions. For NPDES permitting purposes, 7Q10 flows are typically used to establish limits. Other low flow values such as a 30Q10 might be appropriate in a nutrient TMDL context. A flow duration curve approach or

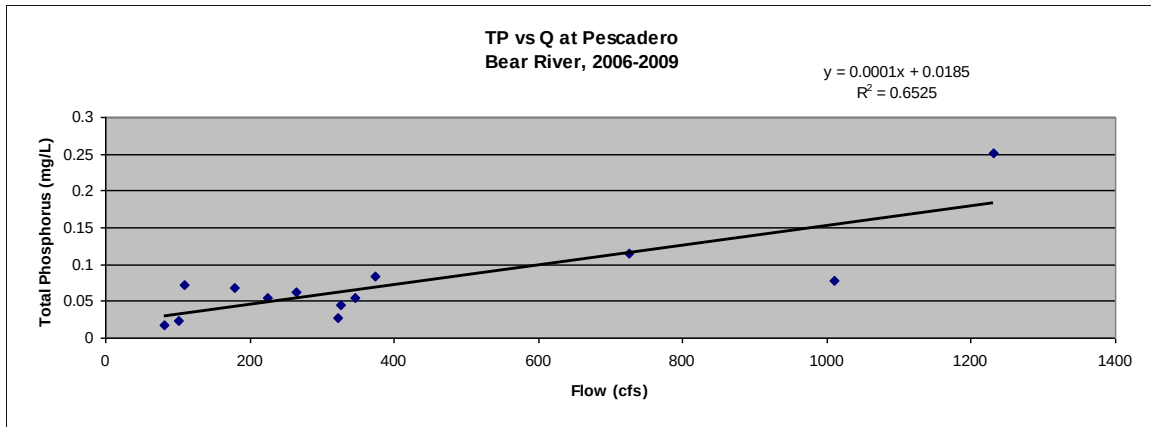
non-growing season flow tiers might also be appropriate. In the original TMDL, WLAs were set as the phosphorus target concentration at end-of-pipe, making receiving water flow assumptions less critical. With proposed increases in WLAs, a more careful evaluation of protectiveness under low flows is appropriate. We would be glad to discuss alternative receiving water flow assumptions to ensure these WLAs are protective under low flow conditions.

DEQ Response:

In our initial analysis, we focused on flows that were not unduly influenced by sediment (i.e., runoff situations). Based on your comment regarding the growing season, we focused on data collected during the biologically-active period. A few flows during that period related to runoff (upper basin runoff can occur through July, as defined in the 2006 Bear TMDL). By using a median TP value, we avoided unduly influencing TP concentration statistics due to sediment-derived phosphorus. As per your suggestion, we calculated (using DFLOW) the 30Q10 from the USGS gage at Pescadero flow record at 38 cfs and Cub River near Preston at 1.3 cfs. At the ID/UT Border, 30Q10 = 197 cfs. The following regression of flow versus TP concentration at Pescadero indicated TP was positively correlated with flow ($R^2 = 0.65$).

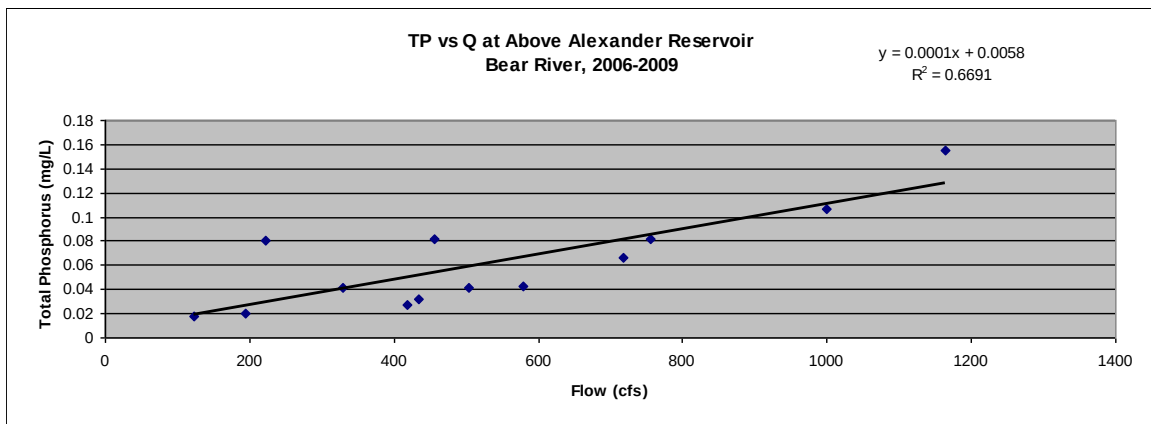


Median TP at Bear River sites.



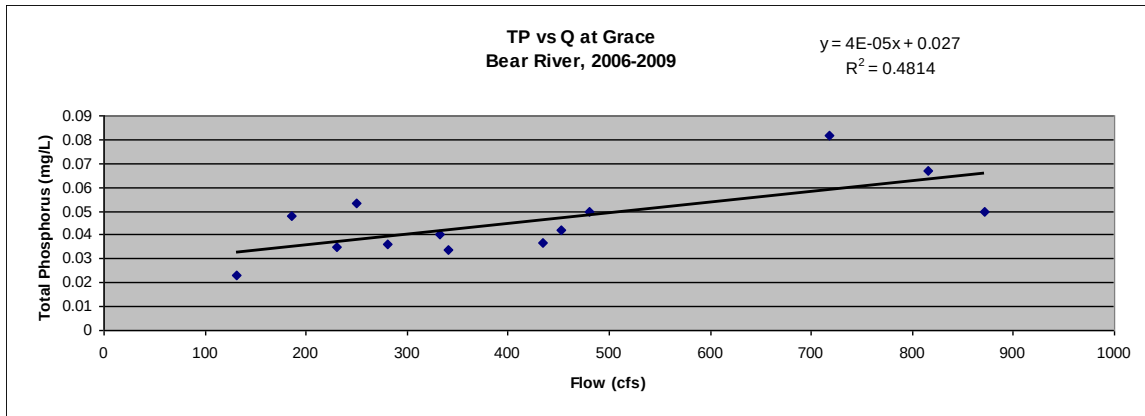
TP versus Q for Bear River at Pescadero.

TP also positively correlates with flow at the Above Alexander sample location (see figure below). Most TP concentrations were less than 0.05 mg/L at this site. The two samples that slightly exceeded the target at lower flows occurred in April 2007 and April 2009.



TP versus Q for Bear River above Alexander Reservoir.

Flows at Grace are significantly reduced by irrigation withdrawals at the Last Chance diversion; therefore the relationship is weaker than at Pescadero or Above Alexander Reservoir. Except for a single measurement 28 April 2009, TP concentrations at this location were less than the target throughout the sampling period.



TP versus Q for Bear River at Grace.

These analyses seem to indicate that existing (= proposed) WLAs do not contribute to exceedences of TP targets at low flows. TP concentrations tend to be sediment-driven and highest with higher flows. During growing season periods of concern, TP concentrations tend to be lowest. Table 15 was added to the TMDL to clarify low flow scenarios in the Cub River near Franklin.

Table 15. Loading capacity for Cub River at Franklin (Above Maple Creek) USGS Gage 10096000, 1939-1952.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean daily Q (cfs)	26	29	43	153	281	153	8.3	3.7	4.8	9.6	8.5	19
Daily TP load capacity (lb/day)	7.0	7.8	11.6	41.3	75.9	41.3	2.2	1.0	1.3	2.6	2.3	5.1
Daily TP existing load * (lb/day)	6.3	7.0	10.4	37.2	68.3	37.2	2.0	0.9	1.2	2.3	2.1	4.6
Franklin WLA (lb/day)	0.05	0.05	3.56	3.56	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Nonpoint LA (lb/day)	6	7	7	34	68	37	2	1	1	2	2	5
10th percentile Q (cfs)	16	19	22	83	216	26	2	2	2	3	4	10
10th percentile LC (lb/day)	4.4	5.2	5.9	22.5	58.2	7.0	0.6	0.5	0.6	0.9	1.0	2.6
10th percentile Existing Load* (lb/day)	4.0	4.7	5.3	20.3	52.4	6.3	0.6	0.4	0.5	0.8	0.9	2.3
Total WLAs (lb/day)	0.05	0.05	3.56	3.56	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Nonpoint 10th percentile LA (lb/day)	4.4	5.2	2.4	18.9	58.1	7.0	0.6	0.4	0.5	0.9	1.0	2.5
WLA / 10th percentile LC X 100%	1	1	60	16	0	1	8	10	8	5	5	2
30Q10 Flow (cfs-all months)	1.3											
30Q10 LC (lb/day)	0.35											
30Q10 Existing Load (lb/day)	0.30											
Nonpoint 30Q10 LA (lb/day)	0.30											
Green highlight indicates months during biologically-active period												
* existing loads use median concentrations calculated for growing and non-growing season X mean daily Q. 30Q10 load uses growing season median												

Proposed TP wasteload allocations. On p. 31 the TMDL states:

Currently the municipalities of Georgetown, Soda Springs, Grace, Preston, and Franklin are in the facility planning phases of upgrades to their wastewater treatment facilities. This TMDL will help guide these communities' efforts to build the appropriate infrastructure to meet water quality goals and maintain and/or restore beneficial uses in the Bear River Basin.

We agree, which is why we are surprised that the proposed revised WLAs call for no improvement in the amount of phosphorus discharged from these facilities, except for Preston. Current discharge concentrations range from 0.8 – 3.6 mg/l from these facilities (Table 8, 9), whereas the instream targets are 0.05 and 0.075 mg/l. While we understand it may not be necessary in all cases to achieve “end-of-pipe” limits using advanced nutrient treatment, various cost-effective treatment options are available to greatly improve on the current phosphorus discharge levels. According to the Municipal Nutrient Removal Technologies Reference Document (EPA 2008), “Technologies are available to reliably attain an annual average of 0.1 milligram per liter (mg/L) or less for TP,” and “biological phosphorus removal (without filters or chemical addition) achieved an annual average effluent concentration of 0.26 mg/L.” I think this is especially important because the current phosphorus concentrations in Bear River have not improved much compared to long term data in the original Bear River TMDL, and in some cases, phosphorus levels have increased.

Given the upgrades being planned, the timing seems ideal to increase the effectiveness of nutrient removal at these facilities. These circumstances are not unique. Many other communities large and small across the State and elsewhere in the Northwest are being required to reduce their nutrient loading.

We also recommend that wasteload allocations be expressed as a concentration limit, in addition to a load limit. For example, for Preston, 0.075 mg/l TP, in addition to the load limit. It is also helpful to be clear for concentration based limits, the time period in which they apply. We recommend adding language stating that the WLAs should be included in the permits as monthly average limits.

DEQ Response:

We have based our loading capacity analyses on meeting TMDL targets for TP (0.075, 0.05 mg/L). In the case of Preston, upstream water quality data clearly indicate the TMDL TP target is not being met. Therefore, Preston will need to meet the TMDL TP concentration target at the WWTP discharge point. Our analyses of median TP concentrations of data collected from 2006-2009 indicate Bear River reaches MR 2 and MR 3 are meeting the TMDL TP target.

DEQ also received comments from several WWTPs in the basin (Franklin and Preston) requesting that their targets be based on average (not median) flow and TP concentrations. Since NPDES limits will likely be based on averages, we have revised WLAs to reflect monthly average targets. Table 12 of the TMDL has been revised and summarizes this information.

Table 12. Current daily Total Phosphorus (TP) and Total Suspended Solid wasteloads and revised wasteload allocations for wastewater treatment plants on the Bear River at various locations (expressed as pounds/day). Total phosphorus wasteloads are based on recent data (2004-2009) from DMR reports, additional data provided by municipalities, and DEQ sampling.

WWTPs, receiving waters, critical flow, current TP load, current and revised TP WLAs, TP reach load capacity. This table has been revised to reflect mean TP and Q from WWTPs and uses an average 45 day discharge period for Montpelier rather than 60-d discharge period used in past calculations.											
	receiving water/ management reach	critical flow (30Q10 in cfs)	WWTP effluent mean Q (cfs)	current mean TP waste load (lb/day)	current TP WLA ¹ (lb/day)	revised TP concentration (mg/L)	revised TP WLA (lb/day)	revised TP WLA (lb/month)	Reach 30Q10 Daily LC for TP	WLA % of 30Q10 LC	Waste load reduction required
Montpelier ²	Bear River/ MR 2	38	2.00	1.65	0.26	1.24	1.65	49.5	15	11%	0%
Georgetown ³	Bear River/ MR 2	38	0.034	0.67	NA	3.64	0.67	20.1	15	4%	0%
Soda Springs	Bear River/ MR2	38	1.53	5.82	0.21	0.70	5.82	174.6	10	57%	0%
Grace	Bear River/ MR3	38	0.237	2.36	0.09	1.85	2.36	70.8	15	15%	0%
Preston ⁴	Worm Creek	0.85	1.29	12.3	0.45	0.075	0.52	15.6	0.34	151%	94%
Franklin ⁵ May - February	Cub River/ u.s. of UT border	1.3	0.176	0	0.02	0.05	0.048	1.43	0.4	14%	0%
Franklin ⁵ March-April	Cub River/ u.s. of UT border	22 - 83	0.176	3.56	0.02	3.74	3.56	106.8	5.9-22.4	60-16%	0%
¹ Current WLA from Table 3-15 Bear River TMDL 2006 - WLAs for 20 years hence. Current instream TP concentration target = 0.075 mg/L for Montpelier, Grace, and Preston; instream target for Soda Springs and Franklin = 0.05 mg/L.											
² Montpelier flow given as flow when discharging (approximately 45 days/year during 2006-2009).											
³ Georgetown target load and 0% reduction contingent on direct discharge to mainstem Bear River. If discharge continues to enter the small steam adjacent to the WWTP, the daily TP load shall be 0.034 cfs x 0.075 TP x 5.4 = 0.014 #/day or 0.413 #/month. Average monthly concentration shall be 0.075 mg/L.											
⁴ Preston target load calculated based on Worm Creek target concentration of 0.075 mg/L TP. Since flow data are limited, critical flow is the minimum Q given in DMR.											
⁵ Franklin discharges to the Cub River only during November - April when lagoon capacity is exceeded. Critical flows for March - April are calculated as 10th percentile for those months. Effluent is land-applied during the growing season.											

The above table (Table 12) also was clarified as per EPA recommendations. WLAs are termed “revised”, Georgetown’s receiving water associated with the TMDL is clarified, and the following Table (Table 14) was inserted into the Addendum for Georgetown’s TP and TSS WLAs.

WWTP	Total Phosphorus						Total suspended solids			
	Mean Flow (cfs)	Mean concentration (mg/L)	Current wasteload (lbs/ day)	Revised WLA (lbs/day)*	Revised WLA (monthly average)	Waste load reduction required	Mean concentration (mg/L)	Current wasteload (pounds/ day)	Current WLA (lbs/day)	Waste load reduction required
Georgetown	0.034	3.64	0.67	0.67	20.10	0% ¹	20.5	3.6	5.5	0% ¹
¹ Georgetown target load and 0% reduction contingent on direct discharge to mainstem Bear River. If discharge continues to the small steam adjacent to the WWTP, the daily TP load shall be 0.034 cfs x 0.075 TP x 5.4 = 0.014 #/day or 0.413 #/month. Average monthly concentration shall be 0.075 mg/L.										

DEQ’s analyses indicate that TP concentrations have declined in the Bear River. A comparison of DEQ data collected from 2006-2009 with USGS data collected between 1998 and 2001 indicates both TP and TSS concentrations show dramatic decreases in the most

recent data set. At Pescadero, median TP = 0.102 and median TSSC = 86 during the growing season from 1998-2001 versus 0.07 and 42 mg/L for TP and TSSC, respectively during 2006-2009. Comparing 1986-2001 data collected at the ID/UT border with the most recent data set indicates a decline in growing season median TSS of 188 to 19 mg/L. An analysis of total phosphorus data collected at the ID/UT border by the USGS from 1989 – 2002 (SIR 2005-5033) indicates a TP median of 0.05 (n=27). Greater than 75% of those samples had P that was mostly associated with suspended and organic forms.

Montpelier WWTP. Average phosphorus concentration at Pescadero during 2006 – 2009 summer months (from Appendix B) is 0.085 mg/l. Since the target in this reach is 0.075 mg/l, it appears that the target is not consistently being achieved during the critical growing season.

DEQ Response:

Sediment-derived phosphorus contributed to higher TP in a few events (TSS = 62 and 70 mg/L) during the biologically-active period. These events were associated with the two highest flows (725, 1230 cfs – during the upper basin runoff period) on sample days during this period. To avoid confounding values relating to runoff events, DEQ used median values to assess TP concentrations during the biologically-active season. The median value for TP at Pescadero during this period is 0.073 mg/L (mean = 0.09 mg/L). Both mean and median calculations result in 0.06 mg/L if these two high flow event results are removed from the data set. It is DEQ's opinion that these data do not support reducing Montpelier WWTP's WLA; however, we have revised the proposed WLA from 2.29 to 1.65 pounds/day based on Montpelier discharging an average of 45 days/year (versus 60 days/year used in the original TMDL) during the assessment period of 2006-2009. Table 12 of the TMDL Addendum has been modified to reflect proposed WWTP load changes.

Franklin WWTP. Please provide data and calculations mentioned in this section.

DEQ Response:

Critical flow analysis indicates the potential for target exceedences to the Cub River during growing season; therefore, Franklin's load allocation only applies during the non-growing season (October – April). It is now explicit in the table that Franklin's load is based on end of pipe 0.05 mg/L limits for all months except March and April, when the load is 2.05 pounds/day.

Table 15. Loading capacity for Cub River at Franklin (Above Maple Creek) USGS Gage 10096000, 1939-1952.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean daily Q (cfs)	26	29	43	153	281	153	8.3	3.7	4.8	9.6	8.5	19
Daily TP load capacity (lb/day)	7.0	7.8	11.6	41.3	75.9	41.3	2.2	1.0	1.3	2.6	2.3	5.1
Daily TP existing load * (lb/day)	6.3	7.0	10.4	37.2	68.3	37.2	2.0	0.9	1.2	2.3	2.1	4.6
Franklin WLA (lb/day)	0.05	0.05	3.56	3.56	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Nonpoint LA (lb/day)	6	7	7	34	68	37	2	1	1	2	2	5
10th percentile Q (cfs)	16	19	22	83	216	26	2	2	2	3	4	10
10th percentile LC (lb/day)	4.4	5.2	5.9	22.5	58.2	7.0	0.6	0.5	0.6	0.9	1.0	2.6
10th percentile Existing Load* (lb/day)	4.0	4.7	5.3	20.3	52.4	6.3	0.6	0.4	0.5	0.8	0.9	2.3
Total WLAs (lb/day)	0.05	0.05	3.56	3.56	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Nonpoint 10th percentile LA (lb/day)	4.4	5.2	2.4	18.9	58.1	7.0	0.6	0.4	0.5	0.9	1.0	2.5
WLA / 10th percentile LC X 100%	1	1	60	16	0	1	8	10	8	5	5	2
30Q10 Flow (cfs-all months)	1.3											
30Q10 LC (lb/day)	0.35											
30Q10 Existing Load (lb/day)	0.30											
Nonpoint 30Q10 LA (lb/day)	0.30											
Green highlight indicates months during biologically-active period												
* existing loads use median concentrations calculated for growing and non-growing season X mean daily Q. 30Q10 load uses growing season median												

The above table (Table 15 in the Addendum) has been updated to reflect the 0.05 mg/L TP target at the border of Utah.

Load Allocation; 5.5. Reduced load allocations to accommodate increases in WWTP WLAs are not discussed. To be complete, the Addendum should include all elements of the phosphorus TMDLs, including revised LA's.

DEQ Response:

WWTP WLAs are set at existing levels, except for the City of Preston which will be based on meeting the TMDL target of 0.075 mg/L. LAs have been revised in conjunction with proposed WLAs and are included in Tables 10 and 11, Section 5.4.

Reasonable assurance; 5.5.3. Increasing WLAs above end-of-pipe limits means that there is a clear need to ensure reasonable assurance of NPS reductions. Is there increased assurance beyond what was in the original Bear River TMDL that NPS controls will be implemented in order to meet TP targets? Have there been water quality improvements as a result of implementation of the NPS measures in Table 13? What is the assurance that these efforts and reductions will continue? My review of phosphorus concentration data in Appendix B

suggests that there have been modest improvements TP levels at Above Alexander and Grace sampling locations, but a decline in water quality at the ID/UT border where the Bear River leaves Idaho, where the summer average TP levels are now 0.102 mg/l, or twice the TMDL target of 0.050 mg/l.

DEQ Response:

Data collected since July 2006 indicate improvements in water quality compared to other, older data sets collected at similar locations. DEQ would ascertain some of these improvements result from implementation measures listed in Table 13 of the Draft TMDL Addendum. Data collected downstream of the Grace WWTP clearly indicates TMDL targets are being met at that location. Failure to always meet TMDL TP targets at the Utah border are not due to inputs by WWTPs, rather, they result from sediment-derived phosphorus. Dissolved ortho-phosphorus concentrations were very low throughout the Tri-State Monitoring sampling period (mean = 0.014, median = 0.015 mg/L). Non-point source reductions are needed, as several events having very high TSS contributed to exceedences of both TSS and TP targets. Specifically, exceedances in April 2008 and June 2009 were associated with TSS concentrations of 92 and 454, respectively. Refocusing on contributions by WWTPs - removing the single 0.5 mg/L TP concentration datum (6-2-2009) from the growing season data set results in both mean and median TP concentrations of < 0.05 mg/L at the ID/UT border. Table 4 summarizes recent data collected at the ID/UT border.

Table 4. Summary of DEQ data from Bear River at ID/UT border.

Date	TSS	TP	OP	Flow
7/19/2006	10	0.042	0.015	163
11/16/2006	5	0.021	0.005	523
4/25/2007	15	0.055	0.011	479
6/21/2007	37	0.11	0.01	880
8/23/2007	15	0.064	0.014	711
4/16/2008	92	0.131	0.015	809
5/13/2008	23	0.044	0.019	470
6/9/2008	19	0.036	0.009	653
9/10/2008	5	0.014	0.02	434
12/3/2008	5	0.02	0.014	398
4/28/2009	49	0.125	0.015	1190
6/2/2009	454	0.5	0.02	1020
8/4/2009	23	0.047	0.015	526

The median concentration for samples collected by the USGS at the ID/UT border from 1985-2001 is 188 mg/L during the May – September period compared to a median TSS of 19 mg/L for samples collected during the same period in 2006-2009. Of 24 total phosphorus samples taken by the USGS between 1989 and 2002 the median was 0.05 mg/L and > 75% of those samples had > ½ of the phosphorus was associated with suspended and organic forms (USGS Scientific Investigations Report 2005-5033).

The section on Reasonable Assurance has been modified to include specific examples of actions to be taken to reduce sediment (and sediment-derived phosphorus) in the watershed.

**Comments on tributary sediment TMDLs.
(Dry, Preuss, Snowslide, Strawberry, Dairy Creeks)**

Target selection; 5.1.2. Bank erosion and depth fines targets are discussed, but TSS targets are a basis for load allocations for some streams. If TSS is also a target, please explain in this section, and clarify how the values of 35, 60 and 80 mg/l are to be interpreted (maximum values, two week average, etc.) and when they apply. Constructing a simple table to show this might be helpful.

DEQ Response:

TSS targets were defined in the original Bear River SBA/TMDL (March 2006). TSS targets are applicable to all streams in the subbasin whether or not they are listed for sediment, as they contribute to other listed streams or rivers in the subbasin. Measured concentrations should be representative of low or high flow conditions and of sufficient quantity to calculate a statistically-valid median.

Load capacity; 5.2. A load capacity for each of these streams is not provided in this section. The LC's must be identified for the TMDLs to be complete. Later in the document both bank stability and TSS based allocations are discussed, making it confusing. More clearly stating what the LC and allocations are based on for each stream would be helpful.

DEQ Response:

A table has been added describing what targets apply to each stream. LCs have been calculated and placed in Section 5.2.

Wasteload allocation; 5.4. Please clarify if there are any point sources on these streams, and their wasteload allocations. If there are no point sources, please indicate the WLA is zero, unless you plan to provide a reserve for future point sources.

DEQ Response:

NPDES point discharges are explicitly listed in Section 5.4. There are no other NPDES point sources for sediment or phosphorus in the watershed; therefore WLAs = 0. There is no reserve for future point sources.

Dairy Creek. Discussion of Dairy Cr is puzzling. Only TSS data has been collected, and apparently neither streambank erosion nor McNeil core data is available. The text indicates the TSS levels do not exceed the TSS target, yet load allocations are set in Table 12, and Table 2 indicates that a sediment TMDL has been completed. The TSS data would appear to suggest a TMDL is not warranted, but with the lack of streambank erosion data and McNeil core data, it is unknown whether a bedload sediment problem exists. At a minimum, it appears that sediment information is incomplete for Dairy Creek.

DEQ Response:

Dairy Creek (ID16010204BR011_02, ID16010204BR011_03) was listed for sedimentation/siltation with beneficial uses of cold water aquatic life and salmonid spawning. This does include bedload. DEQ needs to conduct further assessment of this stream in order to ascertain whether sedimentation of the bed is a problem. The TSS load allocation will remain as is to protect Wright Creek (ID16010204BR010_04), which Dairy Creek is tributary to and is listed for Total Suspended Solids. These changes have been included in Tables 1, 2, Key Findings, and Section 5.5.

**Comments on tributary total phosphorus TMDLs.
(Dry, Strawberry, Dairy Creeks)**

Target selection; 5.1.2. Please identify the total phosphorus target and averaging period for Dry, Strawberry and Dairy Creeks.

DEQ Response:

The target of 0.075 mg/L has been included in Section 5.1.2. Data has been included under new Appendix C – Tributary Stream Data.

Load capacity; 5.2. There is no discussion of the LC for TP for these streams. What is the LC for the critical flow period, e.g. April – September?

DEQ Response:

The LC is calculated using available data under Base Flow conditions.

Wasteload allocation; 5.4. Please clarify if there are any point sources on these streams, and their wasteload allocations. If there are no point sources, please indicate the WLA is zero, unless you plan to provide a reserve for future point sources.

DEQ Response:

There are no point sources on these streams; therefore the WLA = 0. This is indicated in the Section 5.5 text and in associated table(s).

Load allocation; 5.5. The LA is based on July-March flows, to represent baseline low flows. Please explain whether this also represents critical low flow conditions which would occur during the summer/early fall months, when nutrient impacts are greatest, e.g. April – September.

DEQ Response:

Runoff in these streams typically occurs during spring months (April – June). Critical low flow conditions would occur during the July – March period.

Comments from the City of Preston

City of Preston

70 West Oneida • Preston, Idaho 83263

Office 208-852-1817 Fax 208-852-1820

F. Lee Hendrickson, Mayor

Saundra Hubbard, Council President

Neal P. Larson, Councilmember

Travis M. Kunz, Councilmember

Todd D. Thomas, Councilmember

Jerry C. Larsen, City Clerk

Melissa Thompson
DEQ Pocatello Regional Office
444 Hospital Way #300
Pocatello, ID 83201

RECEIVED
MAY 20 2010
IDAHO DEPARTMENT OF
ENVIRONMENTAL QUALITY

Dear Ms. Thompson,

This letter is in response to the proposed phosphorous TMDL for the City of Preston as outlined in the Bear River Basin TMDL Plan, April 2010. Our comments are outlined as follows.

The City of Preston has several concerns regarding the proposed wasteload allocation for the Preston Wastewater Treatment Plant (WWTP). The first concern is with regards to the stringent 95% reduction in phosphorus waste load that is now required in the latest wasteload allocation. During the November 12, 2009 Watershed Advisory Group (WAG) meeting, IDEQ indicated that the water quality data and analyses showed that a 38% reduction would be included in the wasteload allocation sent to EPA for review. The City requests documentation supporting why the initially proposed reduction value of 38% has now been increased to 95%.

A second concern is that after the November 12, 2009 WAG meeting, the City noted the high cost of improvements that would be required to comply with a 38% reduction, but compliance with a 95% reduction will create that much greater financial burden. The life cycle costs associated with these improvements will require a dramatic increase in user fees resulting in long-term financial hardship for citizens.

A third concern is that available technologies for phosphorus removal generally result in significantly higher volumes of biosolids produced by the WWTP. The City currently disposes of biosolids at the County landfill. This landfill is filling quickly, and increased biosolids volume will significantly decrease the remaining capacity and life of the landfill creating additional financial burden for the area residents.

A fourth concern is with respect to how the City's next NPDES permit will be written to comply with the TMDL. The phosphorus allocation in the TMDL is based on the current median value for the wasteload discharged from the WWTP and is given in terms of lb/day. The TMDL should be revised to specifically state that the median value represents a longer term seasonal average because phosphorus does not present an immediate (acute) impact to the water body and that permit limits should reflect this seasonal average basis to allow continued compliance during excursions that will regularly occur above the median value. If the permit is written based only on the daily median value, then the WWTP discharge will be out of compliance, statistically speaking, 50% of the time. Also, the permit limits should be based on a longer period of time such as lb/month or lb/year to allow for the implementation of seasonal alternatives in the future if necessary. For example, since the critical period for the discharge of phosphorus to the river is during the summer, it may be beneficial in the future for both river water quality and the City to land apply wastewater in the summer and discharge the City's entire annual allocation of phosphorus during the non-growing season (i.e., late fall through early spring) months. A stringent lb/day limit will not allow the City this flexibility.

Finally, the City recognizes that water quality in Worm Creek is important. However, efforts and costs by the City to improve water quality in Worm Creek should be matched by other efforts to reduce non-point sources in proportion to the phosphorus wasteloads discharged to the creek. Also, the City's wasteload allocation should be adjusted to allow phasing of gradual improvements over a long term period of at least 10 to 15 years to achieve water quality goals. If the City's next permit is written around the currently proposed allocation, compliance will likely be required within this 5 year permit cycle making immediate implementation of high-cost improvement necessary.

We look forward to your response to our concerns, and to working with you toward a solution that is beneficial to all.

Respectfully,



F. Lee Hendrickson
Mayor, City of Preston

DEQ Response:

DEQ provided a courtesy Draft of the TMDL Addendum to local communities prior to finalizing the document. Upon further review it became evident that setting the WLA with in-stream conditions already exceeding the TMDL target was untenable. Therefore, Preston's WLA has been revised accordingly. Future goals include reducing non-point source inputs to Worm Creek to attain TMDL targets for phosphorus and sediment. If TMDL targets are met in the future, the City of Preston could petition DEQ to increase the WLA for the Wastewater Treatment Plant.

DEQ has changed WLA from median to average daily values. Limits set in the NPDES Permit should be based on average daily loads. Limits are typically set for 7-day and monthly averages. This allows for occasional excursions from daily WLAs.

Comments from the City of Franklin

Franklin City

Council:

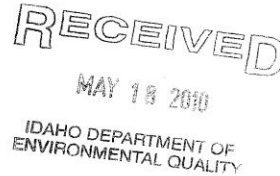
J. TODD HAWKES
JEREMY KIMPTON
ROY WADDUPS
EMILY CHATTERTON

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Mayor:

WAYNE PRIESTLEY
Clerk:
LAEL PARKINSON

Melissa Thompson
DEQ Pocatello Regional Office
444 Hospital Way #300
Pocatello, ID 83201



Dear Ms. Thompson:

The City of Franklin appreciates the opportunity to comment on the Bear River Basin TMDL Plan, April 2010. We have been following this process, reviewed the draft proposals, studied the document and have the following comments.

The City of Franklin has two concerns regarding the proposed wasteload allocation for the Franklin Waste Water Treatment Plant (WWTP). The first concern is with respect to how the City's next NPDES permit will be written to comply with the TMDL. The phosphorus allocation in the TMDL is based on the current median value for the wasteload discharged from the WWTP and is given in terms of lb/day. The TMDL should be revised to specifically state that the median value represents a longer term seasonal average because phosphorus does not present an immediate (acute) impact to the water body and that permit limits should reflect this seasonal average basis to allow continued compliance during excursions that will regularly occur above the median value. If the permit is written based only on the daily median value, then the WWTP discharge will be out of compliance, statistically speaking, 50% of the time. Also, the permit limits should be based on a longer period of time such as lb/month or lb/year to allow for the implementation of seasonal alternatives in the future if necessary.

For example, since the critical period for the discharge of phosphorus to the river is during the summer, it may be beneficial in the future for both river water quality and the City to land apply wastewater in the summer and discharge the City's entire annual allocation of phosphorus during the non-growing season (i.e., late fall through early spring) months. A stringent lb/day limit will not allow the City this flexibility.

Franklin currently follows the practice of summer land application. The City stores as much wastewater as possible in the winter, and then land applies it in the summer. Typically, toward the latter part of the winter, or early spring, the City must discharge because the lagoons reach their storage capacity. For this reason, the City is also pursuing

additional storage lagoons for the sewer effluent. A monthly or seasonal type mass loading would allow the City the flexibility discussed earlier.

The second concern is that setting the allocation to equal the current wasteload level for phosphorus may not provide any capacity for reasonable growth. The TMDL identifies the current WWTP effluent flow as 0.111 cfs (0.07 mgd) and uses this flow with the median effluent phosphorus concentration to calculate an allocation of 2.05 lb/day for the City. However, the City is currently making upgrades to their lagoon system and adding aeration in order to treat a design average daily flow of 0.24 mgd and a maximum daily flow of 0.4 mgd. Therefore, the wasteload allocation should be set based on the larger design capacity of the WWTP that the City has been counting on and permitted for to serve its citizens rather than the much lower current effluent flow. If the permit is written to only allow compliance at current levels, then any growth in the City, however small, will require additional improvements above and beyond those currently under construction at the WWTP to maintain compliance.

It appears that the setting of the allocation to current levels was not based on actual modeling results that could potentially indicate that the Cub River at Franklin has capacity to assimilate more phosphorus from Franklin's discharge than is currently proposed. The second paragraph on page 20 gives the impression that the river has additional capacity. Additionally, Figure 18 in the TMDL shows that the existing load (~38 lb/day) in the river at Franklin is less than the target load (~45 lb/day). While the existing load is not much less than the target load, the TMDL should use the WWTP's design capacity, and Franklin's baseline allocation should be increased from 2.05 lb/day to 6.0 lb/day (based on the design average flow for a long-term seasonal average limit) or 12 lb/day (based on the design maximum daily flow for a short-term limit). At a minimum the additional capacity of the river (7 lb/day) should be allocated to the City to accommodate future growth. This would maintain water quality goals without costly improvements to the WWTP while allowing for reasonable future growth.

We look forward to hearing from you, and your response to our concerns.

Respectfully,

A handwritten signature in dark ink, appearing to read "Wayne Priestley", written in a cursive style.

Wayne Priestley
Mayor, City of Franklin

DEQ Response:

DEQ has changed WLAs from median to average daily values. Limits set in the NPDES Permit should be based on average daily loads. Limits are typically set for 7-day and monthly averages. Non-growing season WLAs are set on a monthly load basis, allowing for excursions from daily WLAs during the non-growing season in March and April.

DEQ has based the revised WLA presented in the TMDL Addendum on attainment of TMDL targets for total phosphorus concentrations in the Cub River downstream of Franklin. For the purposes of this TMDL Addendum, DEQ examined limited data that indicated total phosphorus concentrations at this location on the Cub River are meeting the TMDL; therefore, maintaining the present discharge scenario is acceptable. The City of Franklin has requested an increased WLA to allow for future growth. DEQ respects this request; however, DEQ cannot allow increased loads that will increase the present load in a waterbody that has higher water quality than necessary to support beneficial uses without following procedures outlined in IDAPA 58.01.02.051.02; High Quality Waters. DEQ will consider future proposals to increase the wasteload allocation for the City of Franklin, following appropriate Idaho Administrative Code requirements. While DEQ cannot accommodate your request for an increased load at this time, we have revised the WLAs to allow greater flexibility in discharge during non-growing season months of March and April. DEQ appreciates the City of Franklin's efforts in improving the waste water treatment facility and operations.

Comments from the City of Grace

Page 1 of 2

Lynn Vanevery

From: Melissa Thompson
Sent: Monday, May 17, 2010 5:14 PM
To: Lynn Vanevery
Subject: FW: TMDL Comment

Melissa Thompson
Idaho Department of Environmental Quality
444 Hospital Way, #300
Pocatello, ID 83201
Phone: (208) 236-6160
melissa.thompson@deq.idaho.gov

From: citygrace [mailto:citygrace@icsofidaho.net]
Sent: Friday, May 07, 2010 11:06 AM
To: Melissa Thompson
Subject: TMDL Comment

Sorry Melissa, I was given the wrong version of our comments on the TMDL limits to submit to you. Could you disregard the one I sent yesterday and file this one instead?

The City of Grace has two concerns regarding the proposed waste load allocation for the Grace WWTP. The first concern is with respect to how the City's next NPDES permit will be written to comply with the TMDL. The phosphorus allocation in the TMDL is based on the current median value for the waste load discharged from the WWTP and is given in terms of lb/day. The TMDL should be revised to specifically state that the median value represents a longer term seasonal average because phosphorus does not present an immediate (acute) impact to the water body and that permit limits should reflect this seasonal average basis to allow continued compliance during excursions that will regularly occur above the median value. If the permit is written based only on the daily median value, then the WWTP discharge will be out of compliance, statistically speaking, 50% of the time. Also, the permit limits should be based on a longer period of time such as lb/month or lb/year to allow for the implementation of seasonal alternatives in the future if necessary. For example, since the critical period for the discharge of phosphorus to the river is during the summer, it may be beneficial in the future for both river water quality and the City to land apply wastewater in the summer and discharge the City's entire annual allocation of phosphorus during the non-growing season (i.e., late fall through early spring) months. A stringent lb/day limit will not allow the City this flexibility.

The second concern is that setting the allocation to equal the current waste load level for phosphorus does not provide any capacity for reasonable growth. The TMDL identifies the current WWTP effluent flow as 0.236 cfs (0.153 mgd) and uses this flow with the median effluent phosphorus concentration to calculate an allocation of 2.5 lb/day for the City. However, the design average daily flow is 0.290 mgd and the maximum daily flow is 0.435 mgd as documented by the WWTP's operation and maintenance manual. Therefore, the waste load allocation should be set based on the larger design capacity of the WWTP that the City has been counting on and permitted for to serve its citizens rather than the much lower current effluent flow. If the permit is written to only allow compliance at current levels, then any growth in the City, however small, will require improvements to the WWTP to maintain compliance.

5/18/2010

It appears that the setting of the allocation to current levels was not based on actual modeling results that could potentially indicate that the Bear River at Grace has capacity to assimilate more phosphorus from Grace's discharge than is currently proposed. Figure 18 in the TMDL shows that the existing load (80 lb/day) to the river at Grace is approximately half of the target load (155 lb/day). The TMDL should use the WWTP's design capacity, and Grace's baseline allocation should be increased from 2.5 lb/day to 4.7 lb/day (based on the design average flow for a long-term seasonal average limit) or 7.1 lb/day (based on the design maximum daily flow for a short-term limit). This would result in relatively negligible actual impact to the existing load in the river and would maintain water quality goals without costly improvements to the WWTP while allowing for reasonable future growth.

Thanks,
Wendy Anderson
City Clerk/Treasurer
City of Grace
PO Box 288
Grace, ID 83241
(208) 425-3533

_____ Information from ESET NOD32 Antivirus, version of virus signature database 5095 (20100507)

_____ The message was checked by ESET NOD32 Antivirus.

<http://www.eset.com>

5/18/2010

DEQ Response

DEQ has changed WLAs from median to average daily values. Limits set in the NPDES Permit should be based on average daily loads. Limits are typically set for 7-day and monthly averages. This allows for occasional excursions from daily WLAs.

DEQ has revised WLAs presented in the TMDL Addendum on attainment of TMDL targets for total phosphorus concentrations in the Bear River at Grace. Current discharge for the Grace WWTP is into Hack's Hole, a PacifiCorp impoundment on Bear River. For the purposes of this TMDL Addendum, DEQ determined that total phosphorus concentrations at this location on the Bear River are meeting the TMDL; therefore, maintaining this level of discharge is acceptable. The City of Grace requests an increased WLA to allow for future growth. DEQ cannot allow increased loads that will increase the present load in a waterbody that has higher water quality than necessary to support beneficial uses without following procedures outlined in IDAPA 58.01.02.051.02; High Quality Waters. DEQ will consider future proposals to increase the wasteload allocation for the City of Grace, following appropriate Idaho Administrative Code requirements.