Lower Boise River Subbasin Assessment and Total Maximum Daily Load

2013 Total Phosphorus Addendum

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2013 Total Phosphorus Addendum

November 2013

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In Cooperation with the

Lower Boise Watershed Council

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Abbreviations, Acronyms, and Symbols

§303(d) refers to section 303 subsection (d) of the Clean Water Act, or a list of impaired water bodies required by this section

µ micro, one-one thousandth

§ section (usually a section of federal or state rules or statutes)

ADB assessment database

AU assessment unit

AWS agricultural water supply

BAG basin advisory group

BLM United States Bureau of Land Management

BMP best management practice

BOD biochemical oxygen demand

BOR United States Bureau of Reclamation

Btu British thermal unit

BURP Beneficial Use Reconnaissance Program

C Celsius

CFR Code of Federal Regulations (refers to citations in the federal administrative rules)

cfs cubic feet per second

cm centimeters

CWAL cold water aquatic life

CWE cumulative watershed effects

DEQ Idaho Department of Environmental Quality

DMA Designated Management Agency

DO dissolved oxygen

DOI United States Department of the Interior

DWS domestic water supply

EMAP Environmental Monitoring and Assessment Program

EPA United States Environmental Protection Agency

ESA Endangered Species Act

F Fahrenheit

FPA Idaho Forest Practices Act

FWS United States Fish and Wildlife Service

GIS geographic information system

HUC hydrologic unit code

IDAPA Refers to citations of Idaho administrative rules

IDFG Idaho Department of Fish and Game

IDL Idaho Department of Lands

IDWR Idaho Department of Water Resources

km kilometer

LA load allocation

LC load capacity

m	meter
mi	mile
MBI	Macroinvertebrate Biotic Index
MDAT	maximum daily average temperature
MDMT	maximum daily maximum temperature
mgd	million gallons per day
mg/L	milligrams per liter
mL	milliliter
mm	millimeter
MOS	margin of safety
MWMT	maximum weekly maximum temperature
n/a	not applicable
NA	not assessed
NB	natural background
NFS	not fully supporting
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NTU	nephelometric turbidity unit
ORV	off-road vehicle
ORW	outstanding resource water
PCR	primary contact recreation
PFC	proper functioning condition
ppm	part(s) per million
QA	quality assurance
QC	quality control
RBP	rapid bioassessment protocol
RDI	DEQ's River Diatom Index
RFI	DEQ's River Fish Index
RHCA	riparian habitat conservation area
RMI	DEQ's River Macroinvertebrate Index
RPI	DEQ's River Physiochemical Index
SBA	subbasin assessment
SCR	secondary contact recreation
SFI	DEQ's Stream Fish Index
SHI	DEQ's Stream Habitat Index
SMI	DEQ's Stream Macroinvertebrate Index
SS	salmonid spawning
STATSGO	State Soil Geographic Database
TDG	total dissolved gas
TDS	total dissolved solids
T&E	threatened and/or endangered species
TIN	total inorganic nitrogen
TKN	total Kjeldahl nitrogen
TMDL	total maximum daily load
TP	total phosphorus
TS	total solids
TSS	total suspended solids
US	United States

USC	United States Code
USDA	United States Department of Agriculture
USDI	United States Department of the Interior
USFS	United States Forest Service
USGS	United States Geological Survey
WAG	watershed advisory group
WBAG	*Water Body Assessment Guidance*
WBID	water body identification number
WLA	wasteload allocation

Executive Summary

The federal Clean Water Act 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 Clean Water Act, 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 Clean Water Act 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 is published every 2 years as the list of Category 5 water bodies in Idaho’s Integrated Report. For waters identified on this list, states and tribes must develop a total maximum daily load (TMDL) for the pollutants, set at a level to achieve water quality standards. This document addresses 3 water bodies (5 assessment units) in the lower Boise River subbasin that have been placed in Category 5 of Idaho’s most recent federally approved Integrated Report (DEQ 2010).

This addendum describes the key physical and biological characteristics of the subbasin; water quality concerns and status; pollutant sources; and recent pollution control actions in the lower Boise River subbasin, located in southeast Idaho. For more detailed information about the subbasin and previous TMDLs, see the Lower Boise River Subbasin Assessment, TMDLs, Addendums, and Five-Year Review (DEQ 1999, 2008, 2009, 2010b).

The TMDL analysis establishes water quality targets and load capacities, estimates existing pollutant loads, and allocates responsibility for load reductions needed to return listed waters to a condition meeting water quality standards. It also identifies implementation strategies—including reasonable time frames, approach, responsible parties, and monitoring strategies—necessary to achieve load reductions and meet water quality standards.

This addendum addresses Total Phosphorus (TP) in the lower Boise River and Mason Creek between Diversion Dam and Parma, along with and Sand Hollow Creek which is a tributary to the Snake River. Elevated levels of TP in the lower Boise River can negatively affect cold water aquatic life and contact recreation by manifesting itself through elevated nuisance algae growth and negatively affecting other water quality parameters, including dissolved oxygen, and pH. Within the physically-complex network of the lower Boise River watershed, tributaries, irrigation conveyances, ground water, unmeasured flows, and other non-point sources, along with Waste Water Treatment Facilities (WWTFs), Municipal Separate Storm Sewer Systems (MS4s), industrial dischargers, and other point-sources can all affect TP levels in the watershed.

This Total Maximum Daily Load (TMDL) addendum quantifies TP pollutant sources and allocates responsibility for load and wasteload allocations needed for the lower Boise River, Mason Creek, and Sand Hollow, to meet water quality objectives. For more detailed information about the subbasin and previous TMDLs and Implementation Plans, see:

- Sediment and Bacteria Allocations Addendum to the Lower Boise River (DEQ 2012 - DRAFT)
- Lower Boise River TMDL Five-Year Review (DEQ 2009)

- Lower Boise River Implementation Plan Total Phosphorus (DEQ 2008)
- Snake River – Hells Canyon Total Maximum Daily Load (TMDL; DEQ and ODEQ 2004).
- Implementation Plan for the Lower Boise River Total Maximum Daily Load (DEQ 2003)
- Lower Boise River TMDL Subbasin Assessment Total Maximum Daily Loads (DEQ 1999),
- Lower Boise River Nutrient and Tributary Subbasin Assessments (DEQ 2001a)
- Lake Lowell TMDL: Addendum to the Lower Boise River Subbasin Assessment and Total Maximum Daily Loads (DEQ 2010b)
- Mason Creek Subbasin Assessment (2001c)
- Sand Hollow Creek Subbasin Assessment (2001d)

Subbasin at a Glance

The Lower Boise River Subbasin is identified in the Idaho water quality standards as water body ID17050114, with 36 AUs and several site-specific standards described under Section 150.12 (IDAPA 58.01.02). As described in the Lower Boise River TMDL (DEQ, 1999), the subbasin drains approximately 1,290 square miles of rangeland, forests, agricultural lands and urban areas into the Snake River at the confluence between the cities of Adrian and Nyssa, Oregon. The lower Boise River is a 64-mile long 7th-order stream, which flows through Ada and Canyon counties. The subbasin also drains portions of Elmore, Gem, Payette, and Boise counties. The river aspect is northwest from Lucky Peak Dam outfall to the confluence with the Snake River near Parma, Idaho. There are at least seven 3rd order, one 4th order and one 6th order tributaries to the Lower Boise River (Figure 1). One other 6th order stream, Sand Hollow Creek, is included in the subbasin but drains to the Snake River approximately 1 mile north of the Lower Boise River confluence (Figure A).

This addendum specifically addresses the following five impaired AUs:

- Boise River–Middleton to Indian Creek (ID17050114SW005_06b)
- Boise River–Indian Creek to Mouth (ID17050114SW001_06)
- Mason Creek–Entire Watershed (ID17050114SW006_02)
- Sand Hollow Creek–C Line Canal to I-84 (ID17050114SW016_03)
- Sand Hollow Creek–Sharp Road to Snake River (ID17050114SW017_06)

Tributary and upstream AUs that are not listed as impaired are addressed as pollutant sources to the downstream impaired AUs, listed above.

The impaired beneficial uses in the subbasin are cold water aquatic life, primary and secondary contact recreation, and salmonid spawning. Total phosphorus pollutant sources include natural background contributions, WWTFs, stormwater, industrial discharges, agricultural and irrigation returns, ground water and unmeasured sources (e.g. small drains, septics, etc.).

Additionally, because the lower Boise River is a tributary of significance to the Snake River, it received a May 1 – September 30 total phosphorus (TP) load allocation of $\leq$ 0.07 mg/L in the Snake River-Hells Canyon (SR-HC) TMDL (IDEQ and ODEQ 2004).

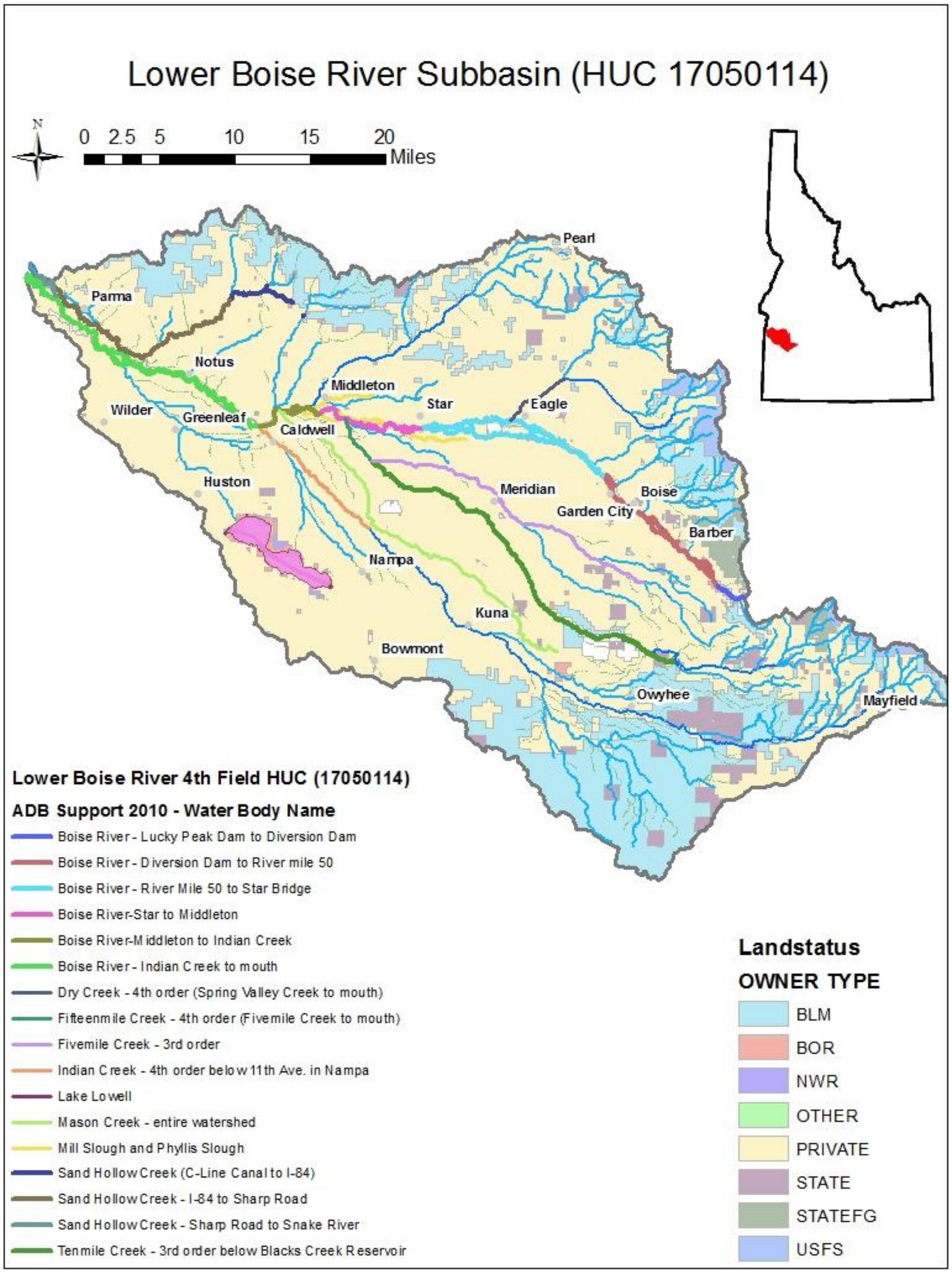

Figure A. The lower Boise River subbasin. The impaired AUs that are specifically addressed in this TMDL addendum are identified by their AU number on the map (all of the impaired AUs in this TMDL addendum begin with 17050114).

Key Findings

Data analysis for a 5-year review of the Lower Boise River TP TMDL was completed in 2009 (DEQ 2009). This document is available at: *http://www.deq.idaho.gov/water-quality/surface-water/tmdls/table-of-sbas-tmdls/boise-river-lower-subbasin.aspx*.

The lower Boise River from Middleton to the confluence with the Snake River, along with Mason Creek/Drain, and two segments of Sand Hollow Creek (a tributary to the Snake River) are listed as impaired by TP or nutrients in the 2010 Integrated Report (Category 5, Table A). Additionally, upstream and tributary AUs that are not listed as impaired on the 2010 Integrated Report are addressed as nutrient sources for the impaired AUs. However, this TMDL analysis does not address potential impairment in the unlisted AUs of the lower Boise River subbasin. The lower Boise River has designated beneficial uses of cold water aquatic life, salmonid spawning, and primary contact recreation, while the aforementioned tributaries have designated beneficial uses of secondary contact recreation and presumed uses of cold water aquatic life.

Each of these beneficial uses is suspected to be impaired by total phosphorus from both point and non-point sources. Increasing concentrations of TP in the river can result in elevated benthic (attached) and sestonic (suspended) algae biomass, and negatively impact ecological and recreational conditions such as dissolved oxygen, pH, macroinvertebrate and fish abundances and species assemblages, and aesthetics.

Table A.Summary of 303(d)-listed assessment units and outcomes in this TMDL.

Water Body	Assessment Unit	Pollutant	TMDL Completed	Recommended Changes to the Next Integrated Report	Justification
Boise River–Middleton to Indian Creek	ID17050114SW005_06b	Total Phosphorus	Yes	Move to Category 4a	TP TMDL Completed
Boise River–Indian Creek to Mouth	ID17050114SW001_06	Total Phosphorus	Yes	Move to Category 4a	TP TMDL Completed
Mason Creek–Entire Watershed	ID17050114SW006_02	Cause Unknown - Nutrients Suspected	Yes	Move to Category 4a	TP TMDL Completed
Sand Hollow Creek–C Line Canal to I-84	ID17050114SW016_03	Nutrients Suspected	Yes	Move to Category 4a	TP TMDL Completed
Sand Hollow Creek–Sharp Road to Snake River	ID17050114SW017_06	Nutrients Suspected	Yes	Move to Category 4a	TP TMDL Completed

TP – Total Phosphorus

The final Snake River-Hells Canyon (SR-HC) TMDL was approved by EPA in September 2004 (DEQ and ODEQ 2004). The TMDL addressed point and non-point sources within the 2,500 square miles that discharge or drain directly to this reach of the Snake River. Five major tributaries received gross phosphorus allocations at their mouths, including the lower Boise River. The SR-HC TMDL anticipated that the three major Idaho and two major Oregon tributaries would either develop individual nutrient TMDLs or plans for implementation of the SR-HC nutrient TMDL that contained load and WLAs that satisfy final SR-HC nutrient TMDL requirements. Load allocations were developed to ensure target TP concentrations of $\leq$ 0.07

mg/L in the Snake River and Brownlee Reservoir are met, particularly during periods when dissolved oxygen levels are low. Compliance with the SR-HC TMDL was identified as a $\leq$ 0.07 mg/L TP target applied at the mouth of the lower Boise River (at Parma) from May 1 through September 30.

While other Idaho water quality standards may be utilized to help determine ongoing and support or impairment of beneficial uses in the watershed, this TMDL addendum focuses on two primary targets:

1. TP concentrations (or mass equivalent) $\leq$ 0.07 mg/l from May 1 through September 30 in the lower Boise River near Parma in order to meet the 2004 Snake River-Hells Canyon TMDL requirements; and

2. TP concentrations (or mass equivalent) correlated with a mean benthic chlorophyll-a (periphyton) biomass target of $\leq$ 150 mg/m^2 in the mainstem AUs of the lower Boise River:

    a. Estimated within individual impaired AUs on the mainstem LBR,
    b. Estimated as an average (monthly or seasonal, depending on modeling results, continued discussions, etc. ??),
    c. From XXX to XXX (depending on modeling results, continued discussions, etc.).

The lower Boise River TP TMDL addendum relies on a staged implementation strategy as referenced in EPA's Phased TMDL Clarification memo (EPA 2006). The staged implementation strategy for the lower Boise River acknowledges that NPDES-permitted point sources will strive to meet the TMDL target as soon as possible, but will be given 2 permit cycles (10 years from the approval of the TMDL) to achieve their wasteload allocations.

The lower Boise River TP TMDL addendum, however, does not define an implementation time frame for non-point sources; rather, implementation would begin as soon as possible and continue until the load allocation targets are met. This acknowledges that successfully achieving the TMDL target and allocations will depend on voluntary measures, including but not limited to available funding, cost-sharing, willing partners, and opportunities for water quality trading.

Further, although DEQ and the lower Boise River TP TMDL addendum encourage water quality trading to the extent possible and practicable, the TMDL addendum does not address specific water quality trading implementation (potential exception as an appendix to the TMDL). Those details will be subsequently developed in a water quality trading framework upon completion of the TMDL addendum (see Pollutant Trading, section 5.5.5).

Idaho state law requires that TMDL allocations be reviewed every 5 years. Accordingly, the lower Boise River TP TMDL addendum should include compliance monitoring to assess the 5-year benchmarks, and new data obtained during implementation will help measure the success of reaching water quality goals for both the SR-HC target attainment and beneficial use attainment in the lower Boise River. During the post-TMDL implementation, all monitoring and analysis should be conducted under DEQ, USGS, or other scientifically-defensible and approved protocols.

Recognizing that there are many uncertainties toward successfully achieving the non-point source load allocations over the long-term, critical uncertainties will need to be evaluated through an adaptive management-type, including:

- Rate of land use conversion,
- Effects of land use conversion on runoff and infiltration,
- Effectiveness of agricultural BMPs,
- Available funding, cost-sharing, willing partners to help manage non-point source TP contributions
- Ability of ground water phosphorus levels to recover in land conversion and nutrient reduction areas, and
- Future drainage and water management policies

Allocations – May 1 to September 30

Based on flow, concentration, load duration curves developed for the LBR, and the USGS mass balance model and report for the lower Boise River (Etheridge 2013 - DRAFT) the TMDL utilizes a tiered approach toward load reductions needed to meet the May – September $\leq$ 0.07 mg/L TP target identified in the SR-HC TMDL (DEQ and ODEQ 2004)…

Allocations – Non Irrigation Season

Similarly, based on flow, concentration, load duration curves developed for the LBR, and the AQUATOX modeling effort for the lower Boise River the TMDL utilizes a tiered approach toward TP load reductions needed to meet the nuisance periphyton algae biomass target of $\leq$ 150 mg/m^2 in the lower Boise River…

Public Participation

DEQ consulted and coordinated with the Lower Boise Watershed Council, other agencies, nongovernment organizations, and the public throughout the current and previous TMDL development processes. The LBWC and other stakeholders were involved in developing the allocation processes, and their continued participation will be critical during and after the public comment period in XXX 2013, and in implementing the TMDL. A distribution list and detailed identification of LBWC and public participation through the TMDL development are available in Appendix C.

Introduction

This document addresses 5 assessment units in the lower Boise River subbasin that have been placed in Category 5 of Idaho's most recent federally approved Integrated Report (DEQ 2010). The purpose of this total maximum daily load (TMDL) addendum is to characterize and document pollutant loads within the lower Boise River subbasin. The first portion of this document presents key characteristics or updated information for the subbasin assessment, which is divided into four major sections: subbasin characterization (section 1), water quality concerns and status (section 2), pollutant source inventory (section 3), and a summary of past and present pollution control efforts (section 4). While the subbasin assessment is not a requirement of the TMDL, DEQ performs the assessment to ensure impairment listings are up-to-date and accurate.

The subbasin assessment is used to develop a TMDL for each pollutant of concern for the lower Boise River subbasin. The TMDL (section 5) is a plan to improve water quality by limiting pollutant loads. Specifically, a TMDL is an estimation of the maximum pollutant amount that can be present in a water body and still allow that water body to meet water quality standards (40 CFR Part 130). Consequently, a TMDL is water body- and pollutant-specific. The TMDL also allocates allowable discharges of individual pollutants among the various sources discharging the pollutant.

Regulatory Requirements

This document was prepared in compliance with both federal and state regulatory requirements. The federal government, through the United States Environmental Protection Agency (EPA), assumed the dominant role in defining and directing water pollution control programs across the country. The Idaho Department of Environmental Quality (DEQ) implements the Clean Water Act in Idaho, while EPA oversees Idaho and certifies the fulfillment of Clean Water Act requirements and responsibilities.

Congress passed the Federal Water Pollution Control Act, more commonly called the Clean Water Act, in 1972. The goal of this act was to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters" (33 USC §1251). The act and the programs it has generated have changed over the years as experience and perceptions of water quality have changed. The Clean Water Act has been amended 15 times, most significantly in 1977, 1981, and 1987. One of the goals of the 1977 amendment was protecting and managing waters to ensure "swimmable and fishable" conditions. These goals relate water quality to more than just chemistry.

The Clean Water Act 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 Clean Water Act, 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. DEQ must review those standards every 3 years, and EPA must approve Idaho's water quality standards. Idaho adopts water quality standards to protect public health and welfare, enhance water quality, and protect biological integrity. A water quality standard defines the goals of a water body by designating the use or uses for the water, setting criteria necessary to protect those uses, and preventing degradation of water quality through antidegradation provisions.

Section 303(d) of the Clean Water Act 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 is published every 2 years as the list of Category 5 waters in Idaho's Integrated Report. For waters identified on this list, states and tribes must develop a TMDL for the pollutants, set at a level to achieve water quality standards.

DEQ monitors waters, and for those not meeting water quality standards, DEQ must establish a TMDL for each pollutant impairing the waters. However, some conditions that impair water quality do not require TMDLs. EPA considers certain unnatural conditions—such as flow alteration, human-caused lack of flow, or habitat alteration—that are not the result of discharging a specific pollutant as "pollution." TMDLs are not required for water bodies impaired by pollution, rather than a specific pollutant. A TMDL is only required when a pollutant can be identified and in some way quantified.

1 Subbasin Assessment—Subbasin Characterization

This document presents an addendum to a number of lower Boise River Subbasin Assessment and Total Maximum Daily Loads (TMDL) and Addendums (DEQ 1999, 2003, 2008, 2009, 2010b, 2012) and addresses water bodies in the subbasin that are on Idaho's current §303(d) list for Total Phosphorus (TP) and Cause Unknown – Nutrients Suspected.

1.1 Physical, Biological, and Cultural Characteristics

A thorough discussion of the physical, biological, and cultural characteristics of the lower Boise River subbasin are provided in the Lower Boise River TMDL Subbasin Assessment TMDL (DEQ 1999), the Lower Boise River Implementation Plan Total Phosphorus (DEQ 2008), and the Lower Boise River Total Phosphorus Five-Year Review (2009).

1.2 Subwatershed Characteristics

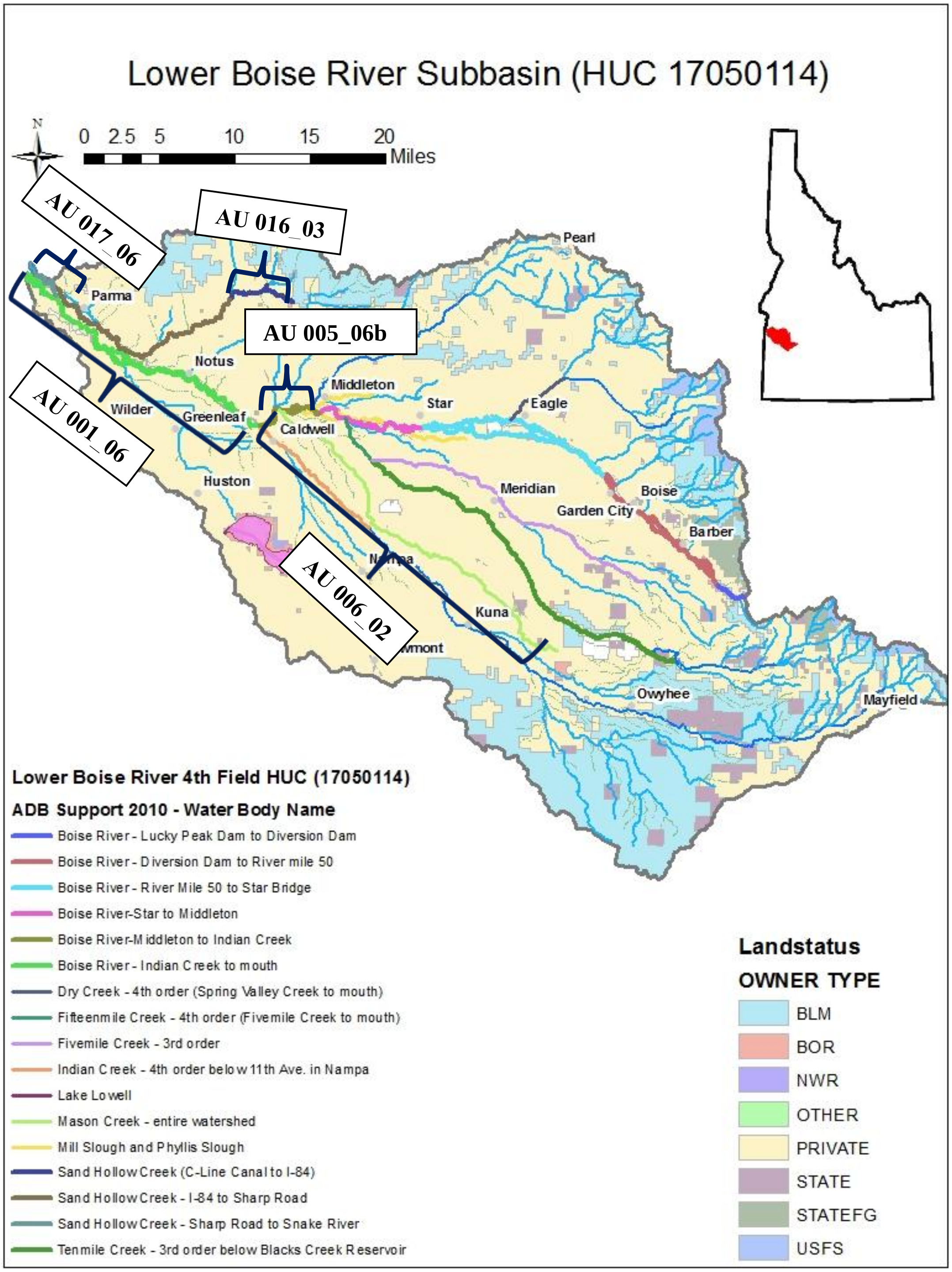

Figure A. The lower Boise River subbasin. The impaired AUs specifically addressed in this TMDL addendum are identified by their AU number on the map (all of the impaired AUs in this TMDL addendum begin with 17050114).

Lower Boise River

The addendum addresses two mainstem AUs identified as impaired on the 2010 §303(d) list:

- Boise River–Middleton to Indian Creek (ID17050114SW005_06b)
- Boise River–Indian Creek to Mouth (ID17050114SW001_06)

Tributary and upstream AUs that are not listed as impaired are addressed as pollutant sources to the downstream impaired AUs, listed above.

The lower Boise River is a 64-mile stretch of river that flows through Ada County, Canyon County, and the city of Boise, Idaho. The river flows in a northwesterly direction from Lucky Peak Dam to its confluence with the Snake River near Parma, Idaho. Major tributaries include Fifteenmile Creek, Mill Slough, Mason Creek, Indian Creek, Conway Gulch, and Dixie Drain.

Detailed discussions of the lower Boise River subwatershed were provided in the Lower Boise River Subbasin Assessment (DEQ 1999) and Lower Boise River TMDL Five-Year Review (DEQ 2009), which are available at: *http://www.deq.idaho.gov/regional-offices-issues/boise/basin-watershed-advisory-groups/lower-boise-river-wag.aspx*

Mason Creek

- Mason Creek–Entire Watershed (ID17050114SW006_02)

The Mason Creek subwatershed drains 62 square miles of rangeland, agricultural land and urban areas. Mason Creek is located in the southern portion of the lower Boise River watershed. Mason Creek largely flows through Canyon County, but the headwaters are located in Ada County. The stream flows in a northwesterly direction from its origin at the New York Canal to its confluence with the lower Boise River in the city of Caldwell.

Detailed discussions of the Mason Creek subwatershed were provided in the Mason Creek Subbasin Assessment (DEQ 2001c) and is available at: *http://www.deq.idaho.gov/water-quality/surface-water/tmdls/table-of-sbas-tmdls/boise-river-lower-nutrient-tributary-subbasin.aspx*

Sand Hollow

- Sand Hollow Creek–C Line Canal to I-84 (ID17050114SW016_03)
- Sand Hollow Creek–Sharp Road to Snake River (ID17050114SW017_06)

The Sand Hollow Creek subwatershed drains 93 square miles of rangeland, agricultural land and mixed rural farmstead. Sand Hollow Creek is located in the northwest portion of the lower Boise River watershed, although it ultimately drains to the Snake River. Sand Hollow Creek largely flows through Canyon County, but the headwaters are located in Gem and Payette Counties. The stream flows in a southwesterly direction from its origin to Interstate 84, then in a northwesterly direction from the interstate to its confluence with the Snake River below Parma.

Detailed discussions of the Sand Hollow Creek subwatershed were provided in the Sand Hollow Creek Subbasin Assessment (DEQ 2001c) and is available at: *http://www.deq.idaho.gov/water-*

quality/surface-water/tmdls/table-of-sbas-tmdls/boise-river-lower-nutrient-tributary-subbasin.aspx

2 Subbasin Assessment—Water Quality Concerns and Status

2.1 Water Quality Limited Assessment Units Occurring in the Subbasin

Section 303(d) of the Clean Water Act states that waters that are unable to support their beneficial uses and do not meet water quality standards must be listed as water quality limited. Subsequently, these waters are required to have TMDLs developed to bring them into compliance with water quality standards.

2.1.1 Assessment Units

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

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

2.1.2 Listed Waters

Table 1 shows the pollutants listed and the basis for listing for each §303(d)-listed AU and pollutant combination in the lower Boise River subbasin that is addressed in this TMDL. It also shows three AUs that are not on the §303(d) list but are intimately tied to the water quality of the listed AUs.

Table 1. Lower Boise River subbasin §303(d)-listed assessment unit and pollutant combinations that are addressed in this TMDL.

Assessment Unit Name	Assessment Unit Number	Listed Pollutants	Listing Basis
Boise River–Middleton to Indian Creek	ID17050114SW005_06b	Total Phosphorus	1996 §303(d) list - Nutrients
Boise River–Indian Creek to Mouth	ID17050114SW001_06	Total Phosphorus	1996 §303(d) list - Nutrients
Mason Creek–Entire Watershed	ID17050114SW006_02	Cause Unknown - Nutrients Suspected Impairment	1996 §303(d) list - Nutrients
Sand Hollow Creek – C-Line Canal to I-84	ID17050114SW016_03	Cause Unknown - Nutrients Suspected Impairment	1996 §303(d) list - Nutrients
Sand Hollow Creek – Sharp Road to Snake River	ID17050114SW017_06	Cause Unknown - Nutrients Suspected Impairment	1996 §303(d) list - Nutrients

2.2 Applicable Water Quality Standards and Beneficial Uses

Idaho water quality standards (IDAPA 58.01.02) list beneficial uses and set water quality goals for waters of the state. Idaho water quality standards require that surface waters of the state be protected for beneficial uses, wherever attainable (IDAPA 58.01.02.050.02). These beneficial uses are interpreted as existing uses, designated uses, and presumed uses as described briefly in the following paragraphs. The *Water Body Assessment Guidance* (Grafe et al. 2002) provides a more detailed description of beneficial use identification for use assessment purposes.

Beneficial uses include the following:

- Aquatic life support—cold water, seasonal cold water, warm water, salmonid spawning, and modified
- Contact recreation—primary (swimming) or secondary (boating)
- Water supply—domestic, agricultural, and industrial
- Wildlife habitats
- Aesthetics

2.2.1 Existing Uses

Existing uses under the Clean Water Act are "those uses actually attained in the water body on or after November 28, 1975, whether or not they are included in the water quality standards" (40 CFR 131.3). The existing instream water uses and the level of water quality necessary to protect the uses shall be maintained and protected (IDAPA 58.01.02.051.01). Existing uses need to be protected, whether or not the level of water quality to fully support the uses currently exists. A practical application of this concept would be to apply the existing use of salmonid spawning to a water that supported salmonid spawning since November 28, 1975, but does not now due to other factors, such as blockage of migration, channelization, sedimentation, or excess heat.

2.2.2 Designated Uses

Designated uses under the Clean Water Act are “those uses specified in water quality standards for each water body or segment, whether or not they are being attained” (40 CFR 131.3). Designated uses are simply uses officially recognized by the state. In Idaho, these include uses such as aquatic life support, recreation in and on the water, domestic water supply, and agricultural uses. Multiple uses often apply to the same water; in this case, water quality must be sufficiently maintained to meet the most sensitive use (designated or existing). Designated uses may be added or removed using specific procedures provided for in state law, but the effect must not be to preclude protection of an existing higher quality use such as cold water aquatic life or salmonid spawning. Designated uses are described in the Idaho water quality standards (IDAPA 58.01.02.100) and specifically listed by water body in sections 110–160.

2.2.3 Presumed Uses

In Idaho, due to a change in scale of cataloging waters in 2000, most water bodies listed in the tables of designated uses in the water quality standards do not yet have specific use designations. These undesignated waters ultimately need to be designated for appropriate uses. In the interim, and absent information on existing uses, DEQ presumes that most waters in the state will support cold water aquatic life and either primary or secondary contact recreation (IDAPA 58.01.02.101.01). To protect these so-called *presumed uses*, DEQ applies the numeric cold water criteria and primary or secondary contact recreation criteria to undesignated waters. If in addition to these presumed uses, an additional existing use (e.g., salmonid spawning) exists, then the additional numeric criteria for salmonid spawning would also apply (e.g., intergravel dissolved oxygen, temperature) because of the requirement to protect water quality for existing uses. However, if for example, cold water aquatic life is not found to be an existing use, a use designation (rulemaking) to that effect is needed before some other aquatic life criteria (such as seasonal cold) can be applied in lieu of cold water criteria (IDAPA 58.01.02.101.01).

2.2.4 Beneficial Uses in the Subbasin

Beneficial uses of the impaired AUs addressed in this TMDL are presented in Table 2.

Table 2. Lower Boise River subbasin beneficial uses of §303(d)-listed streams.

Assessment Unit Name	Assessment Unit Number	Beneficial Uses[a]	Type of Use
Boise River– Middleton to Indian Creek	ID17050114SW005_06b	COLD, SS, PCR	Designated
Boise River– Indian Creek to Mouth	ID17050114SW001_06	COLD, PCR	Designated
Mason Creek– Entire Watershed	ID17050114SW006_02	COLD SCR	Presumed Designated
Sand Hollow Creek– C-Line Canal to I-84	ID17050114SW016_03	COLD SCR	Presumed Designated
Sand Hollow Creek– Sharp Road to Snake River	ID17050114SW017_06	COLD SCR	Presumed Designated

[a] Cold water aquatic life (COLD), salmonid spawning (SS), primary contact recreation (PCR), secondary contact recreation (SCR),

2.2.5 Criteria to Support Beneficial Uses

Beneficial uses are protected by a set of water quality criteria, which include *numeric* criteria for pollutants such as bacteria, dissolved oxygen, pH, ammonia, temperature, and turbidity, and *narrative* criteria for pollutants such as sediment and nutrients (IDAPA 58.01.02.250–251) (Table 3).

Table 3. Selected numeric criteria supportive of designated beneficial uses in Idaho water quality standards.

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

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

Narrative criteria for excess nutrients are described in the water quality standards:

> Surface waters of the state shall be free from excess nutrients that can cause visible slime growths or other nuisance aquatic growths impairing designated beneficial uses. (IDAPA 58.01.02.200.06)

Additionally, in consultation with the LBWC, DEQ has identified a numeric nuisance aquatic growth target for the impaired AUs of the LBR: benthic (periphyton) chlorophyll a biomass $\leq$ 150 mg/m^2. This target is then translated into a numeric target to help derive TP load and wasteload allocations for this TMDL.

DEQ's procedure to determine whether a water body fully supports designated and existing beneficial uses is outlined in IDAPA 58.01.02.050.02. The procedure relies heavily upon biological parameters and is presented in detail in the *Water Body Assessment Guidance* (Grafe et al. 2002). This guidance requires DEQ to use the most complete data available to make beneficial use support status determinations (Figure 1).

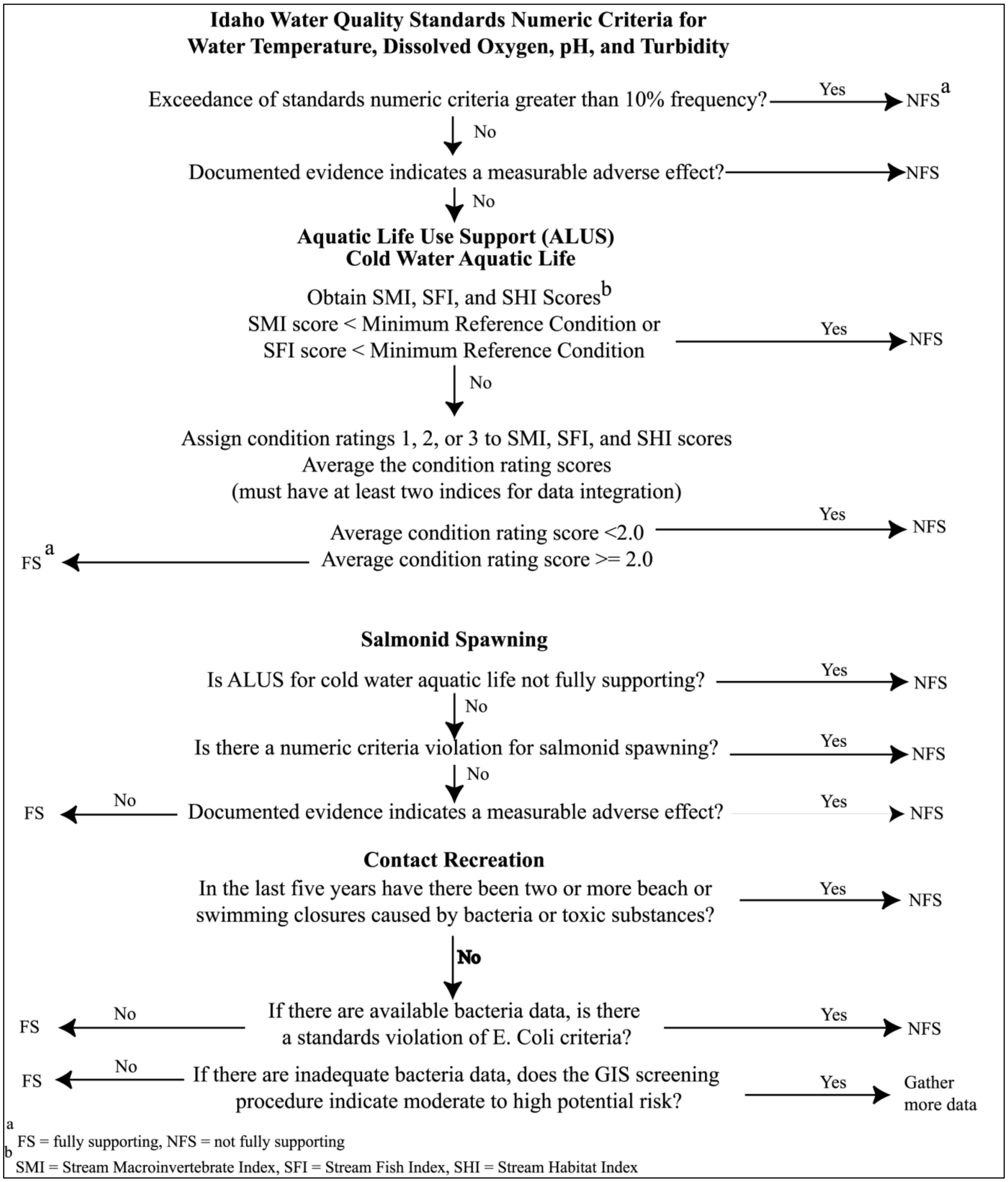

Figure 1. Determination steps and criteria for determining support status of beneficial uses in wadeable streams (Grafe et al. 2002).

2.3 Summary and Analysis of Existing Water Quality Data

This section addresses water quality data in the lower Boise River subbasin, focusing on the nutrient-impaired assessment units of the lower Boise River, Mason Creek, and Sand Hollow Creek.

Since the Lower Boise River TMDL Subbasin Assessment TMDL (DEQ 1999) was approved, DEQ has collected data, requested data from other agencies and organizations, searched external databases, and reviewed university publications and municipal or regional resource management plans for additional and recent water quality data. The results of that effort were compiled in the Lower Boise River Total Phosphorus Five-Year Review (DEQ 2009), available at *http://www.deq.idaho.gov/water-quality/surface-water/tmdls/table-of-sbas-tmdls/boise-river-lower-subbasin.aspx*.

Similarly, DEQ completed the Mason Creek Subbasin Assessment (2001c) and the Sand Hollow Creek Subbasin Assessment (2001d), which identify data collected in the respective subwatersheds. Both of these reports are available at *http://www.deq.idaho.gov/water-quality/surface-water/tmdls/table-of-sbas-tmdls/boise-river-lower-nutrient-tributary-subbasin.aspx,*

and

http://www.deq.idaho.gov/water-quality/surface-water/tmdls/table-of-sbas-tmdls/boise-river-lower-nutrient-tributary-subbasin.aspx.

Since then, much water quality and quantity data collected have been collected in the lower Boise River subbasin by DEQ, USGS, ISDA, municipalities, and other agencies and organizations (see Appendix B – Data Sources).

Several DEQ Beneficial Use Reconnaissance Program (BURP) sites have been monitored on the lower Boise River and within the subbasin. However, due to higher flows in the river than are typically feasible for completing BURP activities, BURP protocol could not be completed at these mainstem sties, yielding limited data collection and analyses (specifically stated in the 1995SBOIC029 site data, and presumed for the remaining two sites).

BURP data was also collected on Mason Creek and Sand Hollow Creek. All of the BURP data and summary reports can be obtained through DEQ's Final 2010 305(b) Integrated Report webpage at *http://mapcase.deq.idaho.gov/wq2010/*.

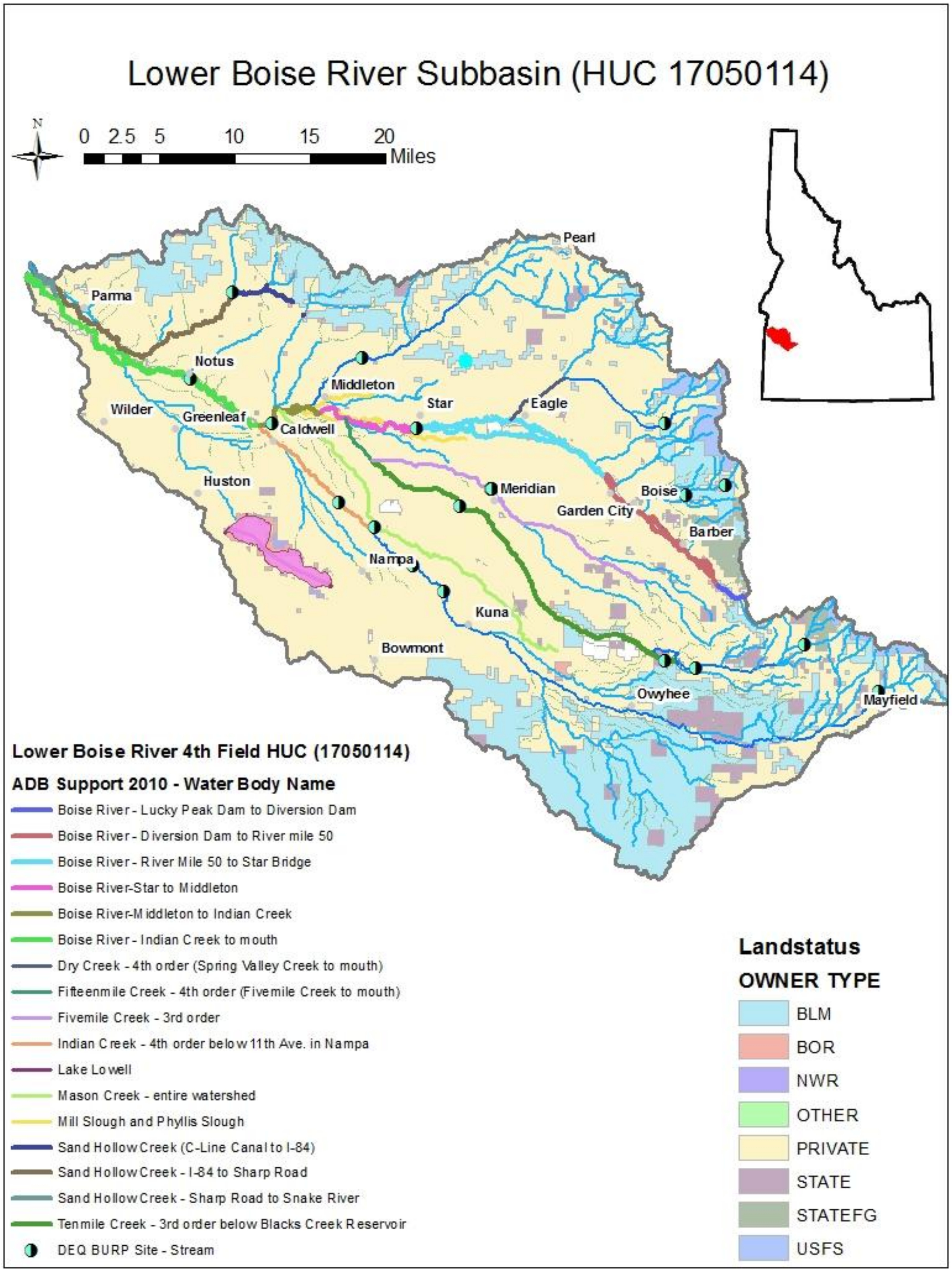

Figure ?. DEQ BURP sites in the lower Boise River Subbasin.

Lower Boise River

The two AUs on the mainstem LBR are listed as impaired for TP, in part, due to EPA's Partial Approval/Partial Disapproval of Idaho's Final 2008 303(d) list letter dated February 4, 2009, in which EPA disapproved delisting of the Lower Boise River for nutrients (total phosphorus) because DEQ did not demonstrate good cause to delist, and that DEQ provided insufficient rationale to justify the exclusion of all existing and readily available data. EPA subsequently took public comment on this reversal that ended May 15, 2009. EPA concluded in their final decision letter dated October 13, 2009 that the lower Boise River is water quality-limited and mandated that DEQ add the lower Boise River back to the 303(d) list. EPA's final determination on the lower Boise River is available at *http://www.deq.idaho.gov/media/773615-2008-ir-epa-response-lower-boise-river-hemcreek-101309.pdf*

Over the past several decades, a considerable amount of data has been collected in the lower Boise River subbasin and the lower Boise River, specifically. Much of this data indicates that the upper end of the river, from Diversion Dam to Veterans Parkway, typically has TP levels ≤ 0.02 mg/L; meanwhile, the remaining segments experience increasing TP concentrations and loads downstream, with Parma often experiencing TP levels ≥ 0.25 mg/L.

Some of the most recent and comprehensive data was collected by the USGS in 2012 and 2013, specifically to aid in the development of this TMDL addendum (Etheridge 2013 - DRAFT). The USGS, in cooperation with DEQ, collected total phosphorus and other water quality data during three synoptic sampling events in the lower Boise River watershed during August and October 2012, and March 2013. The resulting mass balance model and report spanned 46.4 river miles along the Boise River from Veteran's Parkway in Boise, ID (RM 50.2) to Parma, ID (RM 3.8). The USGS measured streamflow at 14 mainstem Boise River sites, 2 Boise River north channel sites, 2 sites on the Snake River upstream of and downstream of its confluence with the Boise River, and 17 tributary and return flow sites. Additional samples were collected from treated effluent at six wastewater treatment facilities and two fish hatcheries. Idaho Department of Water Resources diversion flow measurements were utilized within the sampled reaches (Etheridge 2013 - DRAFT).

A TP mass-balance model was developed to evaluate sources of phosphorus to the Boise River during the sampling timeframe (Etheridge 2013 - DRAFT). The timing of synoptic sampling allowed the USGS to evaluate phosphorus inputs and outputs to the lower Boise River during irrigation season (August 2012), shortly after irrigation ended (October 2012), and shortly before irrigation resumed (March 2013).

The USGS mass balance modeling indicate that both point and nonpoint sources (including ground water and unmeasured) contributed phosphorus loads in the Boise River during irrigation season (Etheridge 2013 - DRAFT). During the non-irrigation seasons, however, point sources appear to contribute a higher proportion of the TP in the river.

The report, consistent with other data collected in the lower Boise River (see Appendix B – Data Sources) indicates that at the upstream sampling location near Veteran's Parkway (RM 50.2), TP concentrations were between 0.01 and 0.02 mg/L. Conversely, at the downstream sampling location near Parma, TP concentrations were ≥ 0.29 mg/L during each of the synoptic events (Table ?).

Table ?. Results of USGS synoptic sampling on the lower Boise River in 2012 and 2013[1].

Week of…	Location	Flow (cfs)	TP Concentration (mg/L)	TP Load (lbs/day)
August 20, 2012	Veteran's Parkway (RM 50.2)	759	0.015 (0.02)[2]	61.4
	Parma (RM 3.8)	624	0.30	1,010
October 29, 2012	Veteran's Parkway (RM 50.2)	234	<0.01	5.10
	Parma (RM 3.8)	924	0.29	1,450
March 4, 2013	Veteran's Parkway (RM 50.2)	243	0.01	13.1
	Parma (RM 3.8)	846	0.34	1,550

[1] Information in this table can be found in Table 7 of the USGS mass balance report (Etheridge 2013 - DRAFT).
[2] the USGS mass balance report text identifies the value as 0.015 and Table 7 of the report identifies the value as 0.02 (Etheridge).

Mason Creek

The USGS sampled Mason Creek as part of the lower Boise River synoptic sampling efforts in 2012 and 2013 and found that TP concentrations ranged from 0.14 in March to 0.31 mg/L in August (Table ?).

Table ?. Results of USGS synoptic sampling on Mason Creek in 2012 and 2013[1].

Week of…	Flow (cfs)	TP Concentration (mg/L)	TP Load (lbs/day)
August 20, 2012	155	0.31	259
October 29, 2012	66.1	0.18	64.2
March 4, 2013	44.7	0.14	33.8

[1] Information in this table can be found in Table 7 of the USGS mass balance report (Etheridge 2013 - DRAFT).

Sand Hollow

The USGS also sampled Sand Hollow as part of the lower Boise River synoptic sampling efforts in 2012 and 2013 and found that TP concentrations ranged from 0.09 in March to 0.35 mg/L in August (Table XX).

Table ?. Results of USGS synoptic sampling on Sand Hollow Creek in 2012 and 2013[1].

Week of…	Flow (cfs)	TP Concentration (mg/L)	TP Load (lbs/day)
August 20, 2012	169	0.35	319
October 29, 2012	62.0	0.20	66.9
March 4, 2013	38.7	0.09	18.8

[1] Information in this table can be found in Table 7 of the USGS mass balance report (Etheridge 2013 - DRAFT).

2.3.1 Status of Beneficial Uses

Based on a thorough analysis of: 1) the available water quality data collected by DEQ, USGS, ISDA, Idaho Power, municipalities and others, 2) the SR-HC TMDL analysis (DEQ and ODEQ 2004), and 3) written correspondence from EPA (EPA 2009), cold water aquatic life and contact recreation beneficial uses are likely impaired by excess nutrients, in the form of TP, within the lower Boise River, Mason Creek, and Sand Hollow Creek. This likely impairment from excess TP is can be expressed as visible slime and other nuisance aquatic growths in these waterbodies, impacts to other water quality and aesthetic parameters, and elevated nutrient contributions to the downstream Snake River. It is also evident that a combination of point sources (e.g. WWTFs, stormwater, industrial discharge, etc.) and nonpoint sources (e.g. agricultural return water, ground water, septic, unmeasured, etc.) are the most likely contributors to these impairments.

3 Subbasin Assessment—Pollutant Source Inventory

The pollutant of concern for this addendum is limited to excess nutrients in the form of TP for which narrative criteria are established in the Idaho water quality standards. TP has been identified as a current or potential limiting factor for attaining designated, existing, or presumed beneficial uses in the lower Boise River subbasin. TP load and wasteload allocations have not previously been established for the lower Boise River subbasin; however, detailed discussions of nonpoint and point sources in the subbasin have been addressed in:

- Sediment and Bacteria Allocations Addendum to the Lower Boise River (DEQ 2013 - DRAFT)
- Lower Boise River TMDL Five-Year Review (DEQ 2009)
- Lower Boise River Implementation Plan Total Phosphorus (DEQ 2008)
- Snake River – Hells Canyon Total Maximum Daily Load (TMDL; DEQ and ODEQ 2004).
- Implementation Plan for the Lower Boise River Total Maximum Daily Load (DEQ 2003)
- Lower Boise River TMDL Subbasin Assessment Total Maximum Daily Loads (DEQ 1999),
- Lower Boise River Nutrient and Tributary Subbasin Assessments (DEQ 2001a)
- Lake Lowell TMDL: Addendum to the Lower Boise River Subbasin Assessment and Total Maximum Daily Loads (DEQ 2010b)
- Mason Creek Subbasin Assessment (2001c)

- Sand Hollow Creek Subbasin Assessment (2001d)

Because little has changed in this subbasin since the 2008 TP Implementation Plan and the 2009 5-year review, the information provided in these documents remains largely applicable.

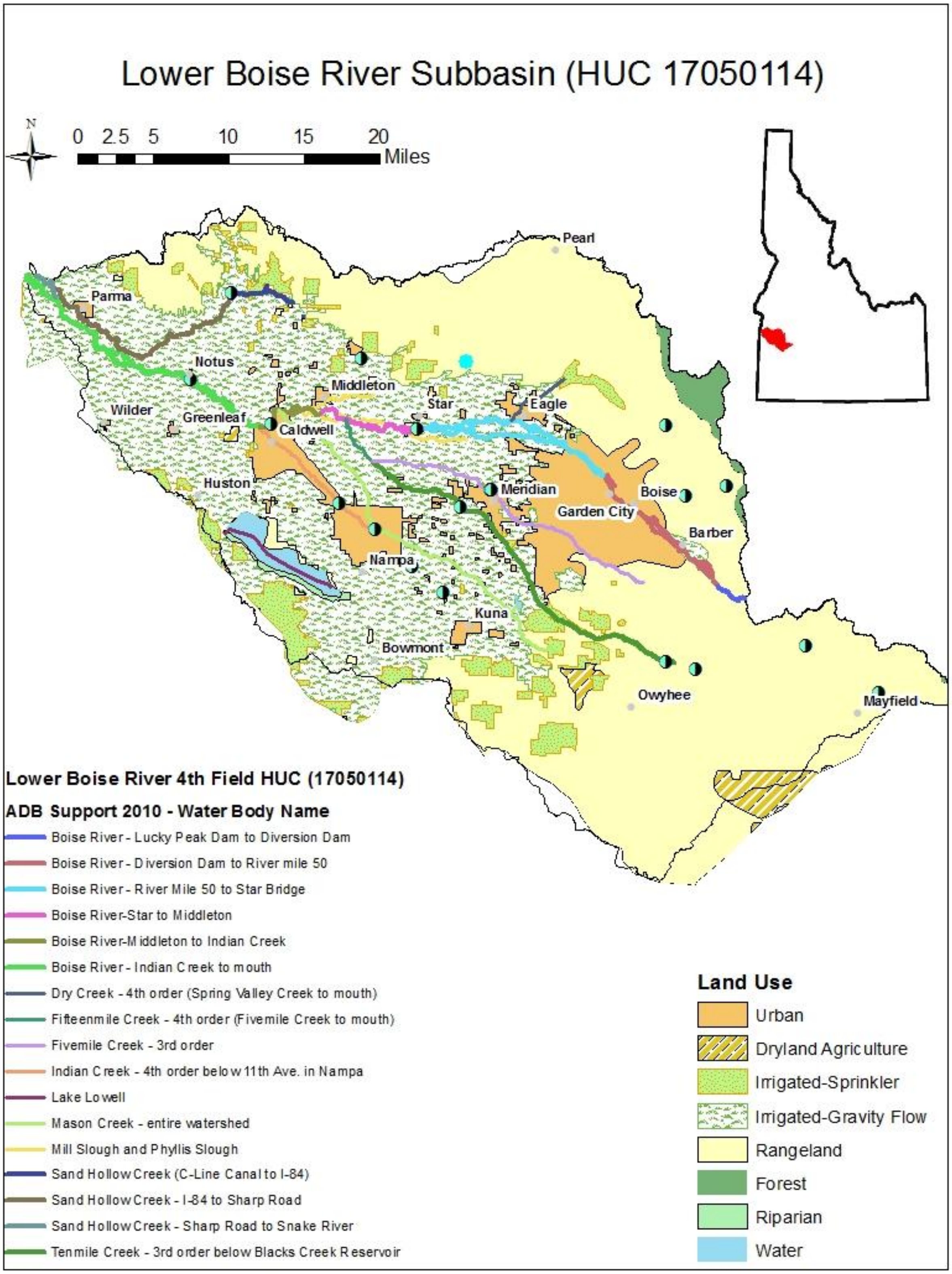

Figure ?. Land use in the lower Boise River Subbasin.

3.1 Point Sources

There are a number of EPA-permitted point source facilities that discharge phosphorus into the lower Boise River, directly or indirectly, through drains, tributaries, and other hydrological connections, as well as into Sand Hollow Creek (a tributary to the Snake River). The pollutant loads from these facilities are calculated based discharge monitoring data flows and effluent concentrations (Table ?).

Table ?. Estimated current annual point-source discharge to the lower Boise River and the Snake River (directly and indirectly).

Source	NPDES Permit No.	Mainstem RM[1] or Receiving Water	Mean Discharge (MGD)[2]	Mean TP Concention (mg/L)[2]	Mean TP Load (lbs/day)[2]
Boise River - Mainstem					
Lander WWTF	ID-002044-3	RM 50.0	12.39	2.05	211.9
West Boise WWTF	ID-002398-1	RM 44.2	15.11	4.75	598.8
IDFG-Eagle	NPDES permit currently not required	RM 41.8 (estimated)	2.38	0.06	1.3
Middleton WWTF	ID-002183-1	RM 27.1	0.46	4.02	15.5
Caldwell WWTF	ID-002150-4	RM 22.6	6.45	1.12	60.3
Darigold	ID-002495-3	RM 22.6 (estimated)	0.25	0.23	0.5
Boise River - Tributaries					
Avimor WWTF	In Application	Dry Creek	Not Yet Active	Not Yet Active	Not Yet Active
Star WWTF	ID-002359-1	Lawrence Kennedy Canal (Mill Slough/Boise River)	0.53	1.50	6.7
Meridian WWTF	ID-002019-2	Fivemile Creek (Fifteenmile Creek)	5.40	1.07	48.2
Sorrento Lactalis	ID-002803-7	Mason Creek	0.63	0.22	1.2
Nampa WWTF	ID-002206-3	Indian Creek	10.10	5.08	428.1
Kuna WWTF	ID-002835-5	Indian Creek	0.49	2.45	9.9
IDFG-Nampa	IDG-130042 (not subject to WLA)	Wilson Drain and Pond (Indian Creek)	20.43	0.06	10.1
Notus WWTF[3]	ID-002101-6	Conway Gulch	0.06	4.6	2.2
Wilder WWTF	ID-0020265	Wilder Ditch Drain	0.16	2.33	3.1
Greenleaf WWTF[3]	ID-002830-4	West End Drain	??	??	??
ConAgra (XL 4 Star)	ID-000078-7	Indian Creek	Not Active	Not Active	Not Active

Source	NPDES Permit No.	Mainstem RM[1] or Receiving Water	Mean Discharge (MGD)[2]	Mean TP Concention (mg/L)[2]	Mean TP Load (lbs/day)[2]
Snake River					
Parma WWTF	ID-002177-6	Sand Hollow Drain	0.11	0.15	0.1

[1] River Miles as identified by USGS in lower Boise River mass balance report (Etheridge 2013 - DRAFT); IDFG-Eagle and Darigold RMs are estimated. IDFG-Eagle discharges to lakes on Eagle Island and Darigold discharges to a storm drain which are then believed to discharge into the lower Boise River.
[2] Estimated from January 1, 2012 through April 30, 2013 using data provided by facilities and/or DMR data.
[3] Values for the Notus and Greenleaf facilities are only for periods between October –April; the facilities did not discharge between May – September. However, the newly-completed 2013 NPDES permits allow May – September discharge.

There are several EPA stormwater permits that discharge phosphorus into the lower Boise River, directly or indirectly, through drains, tributaries, and other hydrological connections. Several agencies and organizations share responsibilities for the NPDES MS4 permits and information, including a five-year report which is available from the partnership internet site at *http://www.partnersforcleanwater.org/default.asp*.

An annual report is published and made available through ACHD's web site at *http://www.achd.ada.id.us/Departments/TechServices/Drainage.aspx*.

Other agencies and stakeholders in the subbasin are in the process of applying for stormwater NPDES permits and have yet to develop or implement the voluntary stormwater activities addressed in the plan. A multi-agency effort produced the BMP Handbook of Best Management Practices for Idaho Rural Road Maintenance (University of Idaho, 2005) and highway district personnel were trained in the methods through a program supported by public funds through various agencies.

Table ?. Estimated current annual MS4 (stormwater) discharge to the lower Boise River (directly and indirectly).

Source	NPDES Permit No.	Service Area (mi^2)	Area Ratio[1]	Estimated Annual Stormwater Load to LBR (lbs/day)[2]	Mean TP Load (lbs/day)
Boise/Ada County MS4	IDS-028185 IDS-027561	120	0.64	174.2	112.2
Canyon Hwy District #4 MS4	IDS-028134	8	0.04		7.5
Middleton MS4	IDS-028100	5	0.03		4.7
Nampa MS4	IDS-028126	30.3	0.16		28.3
Nampa Hwy District MS4	IDS-128142	8.5	0.05		7.9
Caldwell MS4	IDS-028118	12.5	0.07		11.7

Notus-Parma MS4	IDS-028151	2	0.01		1.9
Total		**186.3**	**1.0**	**174.2**	**174.2**

[1] Area ratio = the area contribution of each individual MS4 relative to the total service area for all MS4s.
[2] Based on estimated stormwater loads identified in the *2008 Lower Boise River Implementation Plan Total Phosphorus* (DEQ 2008).

Although there are numerous active facilities in the lower Boise River subbasin, DEQ is unable to quantify wasteload allocations for Multi-Sector General Permits (MSGPs). Further, DEQ expects permittees to conduct any required monitoring under the permit and ensure BMPs appropriate to the site are applied and maintained to prevent water quality impairment.

3.2 Nonpoint Sources

Although the locations of agricultural diversions, dams, and drains can sometimes be indified as specific points on the landscape, the Clean Water Act designates these as nonpoint sources due to the impact that widespread land use activities have on the water channeled through agricultural irrigation systems. Septic systems, paved and unpaved road surfaces, and other unquantified sources are likely to contribute TP, directly and indirectly, to surface water in the lower Boise River, Mason Creek, and Sand Hollow Creek. Contributions from these orphan sources are acknowledged data gaps, and implementation plans could include details regarding future data collection from these sources.

3.2.1 Tributary Discharges

Of the approximately 475,000 acres that drain to the lower Boise River, approximately 162,000 of those acres are irrigated cropland (as defined by ISDA as encompassing agricultural parcels greater than 20 acres). These acres are located along the water conveyance system and contribute non-point loading of phosphorus. Within the watershed, TP is delivered from irrigated cropland and animal-related phosphorus sources (for example, grazing and dairies/feedlots).

Table ?. Estimated annual tributary discharge to the Lower Boise River and Snake River (directly and indirectly).

Source Name	Lower Boise River Receiving River Mile (RM)[1]	Mean Discharge (cfs)[2]	Mean TP Concentration (mg/L)[2]	Mean TP Load (lbs/day)[2]
Boise River				
Eagle Drain	42.7	24.0	0.13	17
Dry Creek	42.5	3.6	0.09	2
Thurman Drain	41.9	12.0	0.12	8
Fifteenmile Creek	30.3	98.7	0.33	176
Mill Slough	27.2	107.6	0.2	116

Source Name	Lower Boise River Receiving River Mile (RM)[1]	Mean Discharge (cfs)[2]	Mean TP Concentration (mg/L)[2]	Mean TP Load (lbs/day)[2]
Willow Creek	27.0	32.6	0.21	37
Mason Slough	25.6	8.2	0.31	14
Mason Creek	25.0	137.4	0.34	252
Hartley Gulch (E. and W.)	24.4	15.8	0.32	27
Indian Creek	22.4	126.2	0.49	333
Conway Gulch	14.2	32.9	0.3	53
Dixie Drain	10.5	185.8	0.35	350
Total		784.7	0.33	1384
Snake River				
Sand Hollow Creek	Snake River	115	0.37	229

[1] As identified by USGS in lower Boise River mass balance report (Etheridge 2013 - DRAFT).
[2] Values estimated from USGS for data available data from 1983 – 2013. Sand Hollow was estimated from available ISDA and USGS data from 1998 – 2013.

3.2.2 Background

Inflows at the upstream boundary of the lower Boise River originate from Lucky Peak Dam releases (operated by the U.S. Army Corps of Engineers). Lucky Peak Reservoir inflows are controlled by two other upstream storage projects: Arrowrock Reservoir and Anderson Ranch Dam (operated by Reclamation). During the 2013 and 2014 synoptic sampling efforts, USGS identified natural background concentrations near diversion dam as ≤ 0.02 mg/L in August 2012, October 2012, and March 2013. This is consistent with historical data collected near Diversion Dam, and is comparable to background values of 0.02 mg/L used in the SR-HC TMDL (IDEQ/ODEQ 2004).

Table ?. Estimated natural background concentrations for the lower Boise River between Diversion Dam and Parma.

Sampling Date	Parma Flow (cfs)[1]	Background Concentration at Diversion (mg/L)[1]	Potential TP Background Load at Parma (lbs/day)[2]	TP Load at Parma (lbs/day)[1]	Max Potential Background TP Contribution at Parma (%)[3]
August 2012	624	0.01	34	1,010	3.3%
October 2012	924	0.01	50	1,450	3.4%
March 2013	846	0.01	46	1,550	2.9%

[1] As identified by USGS in lower Boise River mass balance model (Etheridge 2013 - DRAFT).
[2] Estimated as Parma Flow (cfs) x Concentration (mg/L) x 5.39.

[3] Estimated as Potential TP Background Load at Parma (lbs/day) / TP Load at Parma (lbs/day)

The resulting estimated load from natural background ranges from approximately 34 to 50 lbs/day at Parma, which represents approximately 2.9 to 3.4%.of the load at Parma (assuming 100% of natural background reaches Parma).

3.2.3 Ground Water and Unmeasured Sources

The gaining and losing reaches of the mainstem lower Boise River vary both spatially and temporally. In addition to work that has been conducted previously, the USGS synoptic sampling efforts and revised mass balance model have provided additional information to help better understand ground water and other unmeasured sources of water and TP in the lower Boise River.

The issue of ground water and other unmeasured flows as contributing to loads observed in the return tributaries is complex given the uses and plumbing of the water conveyance in this system. Given this complexity, it is important to note that ground water and unmeasured sources are estimated in the mass balance model as sources that are not directly attributed to point-source, or non-point source tributary and drain additions. As a result, it is understood and explicitly assumed that the shallow subsurface ground water and unmeasured flows may come from a variety of known and unknown sources that were not measured as surface water, including but not limited to: agricultural irrigation, ground seepage, unidentified small drains, urban, suburban, and rural diffuse returns, septic systems, bank recharge, etc.

During the August USGS synoptic sampling effort, ground water and unmeasured flows (485 cfs at 0.22 mg/L TP) accounted for approximately 78 % of the 624 cfs discharge measured at the Boise River near Parma, and accounted for an estimated 576 lbs/day of TP (Etheridge 2013 - DRAFT). Conversely, in October, the Boise River ground water gains of 91.4 cfs accounted for approximately 9.9 % of the 924 cfs flow measured at Parma, estimated at 0.16 mg/L, resulting in an estimated 79 lbs/day of TP. Finally, the March discharge balance resulted in a 174 cfs gain from ground water, or 21 percent of the 846 cfs discharge observed at the Boise River near Parma, corresponding with TP concentrations of approximately 0.12 mg/L and loads of 113 lbs/day (Etheridge 2013 - DRAFT).

3.3 Pollutant Transport

Nutrients are discharged into the river from both point and nonpoint sources. It is difficult to determine pollutant delivery potential in a watershed with such a complex modified surface hydrology system. In the lower Boise River watershed, wastewater and agricultural return flow is often subsequently diverted and utilized again for irrigation, industrial, or municipal purposes. In the lower Boise River, even though complex modeling efforts, the accuracy in determining exactly where particular pollutants originate is greatly compromised as distance from original diversion/return increases.

Additional discussions of pollutant transport in the subbasin are provided in the Lower Boise River Nutrient Subbasin Assessment (DEQ 2001b) and Lower Boise River Implementation Plan: Total Phosphorus (DEQ 2008).

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

Information concerning pollution control efforts for WWTFs, urban and suburban storm drainage, agricultural and other nonpoint sources (including rural roads, septic systems, leaky sewer lines, etc.) can be found in the Implementation Plan for the Lower Boise River TMDL (DEQ 2003). While this plan was developed for the sediment and bacteria TMDLs, many of the practices used by nonpoint sources are similar. Additional information pertaining to point sources is also available in the Lower Boise River Implementation Plan Total Phosphorus (DEQ 2008).

319 Grants and Projects

In 1987, Congress established the Nonpoint Source Management Program under section 319 of the Clean Water Act, to help states address nonpoint source pollution by identifying waters affected by such pollution and adopting and implementing management programs to control it. These programs recommend where and how to use BMPs to prevent runoff from becoming polluted, and where it is polluted, to reduce the amount that reaches surface waters.

Since 1997, DEQ has allocated approximately 1.4 million dollars toward 319 grants in the lower Boise River subbasin for the implementation of BMPs to reduce and prevent pollutant runoff (e.g. sediment, nutrients, etc.) from reaching surface waters. Currently, contract S443 is being implemented by the Lower Boise Watershed Council, which includes the implementation of projects using sprinkler and drip irrigations systems to reduce water use and pollutant delivery relative to traditional surface irrigation practices.

Table ?. 319 project grants in the lower Boise River subbasin.

Subgrant	Grant Year	Project	Sponsor	Budget[1]
QC037900	1997	LBRWQP TandE		$32,000.00
QC051900	1999	LBRWQP DNA Finger Printing	Lower Boise River WQ Plan	$46,839.00
QC061100	2000	Dixie Surge System	Canyon SWCD	$18,000.00
S104/S232	2004	Boise River Side Channel Reconstruction	Trout Unlimited	$159,525.00
S120	2000	Jerrell Glenn Wetland Restoration	Jerrell Glenn	$22,250.00
S130/Ph1	2002, 2004	Indian Creek LID Demonstration Caldwell	City of Caldwell	$28,668.00
S130/Ph2	2002	Indian Creek LID Demonstration Caldwell	City of Caldwell	$73,332.00
S131	2001	Downtown Boise Graywater Recycling	The Christensen group	$50,000.00
S131	2004	Downtown Boise Graywater Recycling	The Christensen Group	$50,000.00
S132	2002	Barber Park Living Roof Demonstration	Ada County	$150,703.00

S132	2004	Barber Park Living Roof Demonstration	Ada County	$150,703.00
S195	2002	Indian Creek Stormwater Runoff Phase 2	City of Caldwell	$79,383.00
S231	2006	Dry Creek Streambed Protection Patterson Property	Ada SWCD	$58,365.67
S232	2004	Boise River Side Channel Formerly S104	Trout Unlimited	$34,525.00
S323	2009	Canyon Co. BMPs for WQ Improvement	Lower Boise Watershed Council	$250,000.00
S356[2]	2009[2]	Ada County BMPs Four Corners[2]	Ada SWCD[2]	$48,000.00[2]
S443	2011	Canyon County BMPs	Lower Boise Watershed Council	$250,000.00

[1] Total subgrant amount allocated for each project, but not necessarily the amount spent.
[b] Ada SWCD revised the application to purchase a John Deere 1590 No-Till Drill - 15 ft., (model year 2013) that would be made available, at a reasonable cost, for use by producers within the lower Boise River watershed. The drill has been purchased and estimated sediment and phosphorus losses are expected to be reduced by up to 95%.

Simplot Caldwell Potato Processing Plant

The Caldwell potato processing plant and land application site is adjacent to the lower Boise River. This plant has been applying industrial wastewater on this site since the late 1960's and early 1970's. Since first obtaining a land application permit at the site in the 1980's, the site has been operating under a zero surface water discharge requirement. In 1998, upgrades at the Simplot site included (H. Haminishi, pers. comm., 2013):

- All flood irrigation fields were converted to sprinkler irrigation, including an extensive pumping system and piping infrastructure, in 2012, this system was upgraded to include more pivot irrigation and to irrigate corners that were previously not farmed.
- The land application system was doubled in land size to its current acreage (approximately 2000 acres).
- The cattle feedlot on site was shut down
- An anaerobic digester was installed for further digestion of organics and conversion of nutrients to a more "plant available" form.
- A holding pond was built (28 MG) that allowed periods during the winter to hold water (during very severe weather) and to hold water during summer harvest of crops.
- A silt recovery system was installed to remove significantly more silt during the washing of the potato, thus reducing silt discharges to the land application system.
- A centrifuge building and system was installed for dewatering primary clarifier underflow.
- In 2008, the ethanol plant was permanently shut down, thus eliminating a source of flow and nutrients.

Even though Simplot upgraded the site over the years, there was still concern that the canals and drains going through the site, along with the high ground water, were possibly impacting surface water quality, even without direct discharge. As a result, DEQ required a study that was completed in 2008, specifically looking at many source impacts of phosphorus for the site that resulted in several recommendations: 1) reducing phosphorus loadings to the site, 2) evaluating a couple of unnamed drains at the site for reduction or elimination of phosphorus impacts, and 3) eliminating the Simplot domestic drainfield on site as a source of phosphorus. Associated implementation measures have included:

- Since 1995 the wastewater flow has been reduced from 1,474 MGY to our current (2012) 637 MGY.
- In 2009, a double cropping system was installed for the land that has up to double the nutrient uptake (both nitrogen and phosphorus) as well as significantly increase ash (TDS) uptake.
- In 2009, zero discharge evaporation ponds were installed to replace the domestic drainfield, thus eliminating domestic wastewater as a source of phosphorus.

In addition, Simplot is currently completing construction and startup of a new treatment system that will support the new potato processing plant at this site. This treatment system will:

- Reduce overall hydraulic flow to the land application site
- Reduce nitrogen loading to less than half of the current loading rates and reduce phosphorus loading rates by 90-95%
- Return more than half of the treated process water to the new process plant for reuse in the industrial process
- Use mechanical evaporators to evaporation the reverse osmosis concentrate from the treatment plant

Additional Water Quality Information

Additional information regarding past, present, and future management actions affecting water quality in the lower Boise River were previously identified are available in the 2008 Lower Boise River Implementation Plan Total Phosphorus (DEQ 2008), including submissions by:

- City of Boise
- City of Caldwell
- City of Meridian
- City of Nampa
- Darigold
- City of Wilder

4.1 Water Quality Monitoring

A vast combination of one time, ongoing, regularly-scheduled, and event-specific water quality monitoring occurs in the lower Boise River (see Appendix B – Data Sources). These monitoring efforts include, but are not limited to DEQ BURP sampling, synoptic sampling events of 2012 and 2013 (Etheridge 2013 - DRAFT) other USGS data collection, ongoing City of Boise data collection throughout the river (unpublished data), Discharge Monitoring Reports (DMRs) and data collected other by municipal, stormwater, and industrial dischargers, 319 grant and other non-point source monitoring efforts, etc. The vast breadth and depth of water quality monitoring efforts in the subbasin helps provide a clearer picture of water quality.

5 Total Maximum Daily Load(s)

A TMDL prescribes an upper limit (i.e., load capacity) on discharge of a pollutant from all sources to ensure water quality standards are met. It further allocates this load capacity among the various sources of the pollutant. Pollutant sources fall into two broad classes: point sources, each of which receives a wasteload allocation, and nonpoint sources, each of which receives a load allocation. Natural background contributions, when present, are considered part of the load allocation but are often treated separately because they represent a part of the load not subject to control. Because of uncertainties about quantifying loads and the relation of specific loads to attaining water quality standards, the rules regarding TMDLs (40 CFR Part 130) require a margin of safety be included in the TMDL. Practically, the margin of safety and natural background are both reductions in the load capacity available for allocation to pollutant sources.

Load capacity can be summarized by the following equation:

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

Where:

LC = load capacity
MOS = margin of safety
NB = natural background
LA = load allocation
WLA = wasteload allocation

The equation is written in this order because it represents the logical order in which a load analysis is conducted. First, the load capacity is determined. Then the load capacity is broken down into its components. After the necessary margin of safety and natural background, if relevant, are quantified, the remainder is allocated among pollutant sources (i.e., the load allocation and wasteload allocation). When the breakdown and allocation are complete, the result is a TMDL, which must equal the load capacity.

The load capacity must be based on critical conditions—the conditions when water quality standards are most likely to be violated. If protective under critical conditions, a TMDL will be more than protective under other conditions. Because both load capacity and pollutant source loads vary, and not necessarily in concert, determining critical conditions can be more complicated than it may initially appear.

Another step in a load analysis is quantifying current pollutant loads by source. This step allows for the specification of load reductions as percentages from current conditions, considers equities in load reduction responsibility, and is necessary for pollutant trading to occur. A load is fundamentally a quantity of pollutant discharged over some period of time and is the product of concentration and flow. Due to the diverse nature of various pollutants, and the difficulty of strictly dealing with loads, the federal rules allow for “other appropriate measures” to be used when necessary (40 CFR 130.2). 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 Instream Water Quality Targets

Instream water quality targets are selected for the purpose of restoring "full support of designated beneficial uses" (Idaho Code 39-3611, 39-3615). The load capacity for a TMDL designed to address a nutrient-caused limitation to use support is complicated by the fact that the state's water quality standard is narrative rather than numerical. Because the Idaho Water Quality Standards definition of excess nutrients is narrative and because the lower Boise River was assigned a load allocation for TP in the SR-HC TMDL, two targets were established for the lower Boise River in this TMDL addendum: 1) a target to specifically meet the SR-HC TMDL allocation target for the lower Boise River and 2) a nuisance aquatic growth target specific to the lower Boise River.

The Mason Creek TP allocations were developed to help meet the lower Boise River target, which should also result in full beneficial use support in the creek, itself, due to the large reductions in TP concentrations and loads.

The Sand Hollow Creek TP allocations were developed to help meet the SR-HC target, which should also result in full beneficial support in the creek, itself due to the large reductions in the TP concentrations and loads.

5.1.1 Design Conditions

Design conditions are those methods used to determine load capacity, existing pollutant loads, wasteload allocations, and load allocations. Because these elements are variable for each pollutant and AU combination, design conditions are discussed separately for the ≤ 0.07 mg/L target allocation to comply with the SR-HC TMDL and nuisance aquatic growth in the lower Boise River. Load capacity is the calculated lower Boise River TP load at Parma that complies with the SR-HC TMDL and fully supports beneficial uses.

Consistent quantitative measurements of the effects of excess nutrients (and aquatic growth) on recreation and cold water aquatic life uses in the subbasin have not been fully developed. Given this limitation, a TP load capacity has been developed to: 1) comply with the SR-HC May – September target allocation of ≤ 0.07 mg/L TP in the lower Boise River at the mouth (Parma), and 2) using literature-based values from effects-based studies (empirical), ecological modeling, and LBWC and stakeholder input to define nuisance aquatic growth in the lower Boise River. The TP load capacity values for these lower Boise River, Mason Creek, and Sand Hollow AUs are based on the following assumptions:

1. The lower Boise River, Mason Creek, and Sand Hollow Creek have some finite ability to process and transport TP at concentrations greater than background values without impairing beneficial uses and the beneficial uses will respond positively to these TP concentrations.

2. TP concentrations that support beneficial uses in similar watersheds and values identified in scientific literature are also fully supportive of the cold water aquatic life and recreation beneficial use in the lower Boise River.

5.1.2 Target Selection (Lower Boise River)

1. TP concentrations (or mass equivalent) ≤ 0.07 mg/L from May 1 through September 30 in the lower Boise River near Parma in order to meet the 2004 Snake River-Hells Canyon TMDL requirements.

The final SR-HC TMDL was approved by EPA in September 2004 (DEQ 2004). The TMDL addressed point and non-point sources that discharge or drain directly to that reach of the Snake River. Five major tributaries received gross phosphorus allocations at their mouths, including the lower Boise River. Load allocations in the SR-HC TMDL were developed to ensure that TP concentrations of ≤ 0.07 mg/L in the Snake River and Brownlee Reservoir are maintained from May 1 through September 30. Therefore, compliance with the SR-HC TMDL will be determined based on meeting this seasonal target at the mouth of the lower Boise River near Parma.

This May 1 through September 30, seasonal TP target ≤ 0.07 mg/L is believed to be protective of both cold water aquatic life and primary contact recreation by reducing and maintaining phytoplankton biomass in the Snake River and reservoirs < 15 µg/L. Achieving this seasonal ≤ 0.07 mg/L target in the lower Boise River will help reduce the frequency, magnitude, and duration of algal blooms and other aesthetic, ecological, and physical nuisance on primary and secondary recreators, as ecological impacts for cold water aquatic life, in both the Snake River and the lower Boise River.

2. TP concentrations (or mass equivalent) correlated with a mean benthic chlorophyll-a (periphyton) biomass target of ≤ 150 mg/m² in the mainstem AUs of the lower Boise River:

a. Estimated within individual AUs on the mainstem LBR,

b. Estimated as an average (monthly or seasonal, depending on modeling results, continued discussions, etc ??),

c. From XXX to XXX (depending on modeling results, continued discussions, etc.).

The narrative standard for excess nutrients poses a challenge to the development of a pollutant target for preventing nuisance aquatic growth in the lower Boise River. However, through the TMDL process, DEQ, in consultation with the LBWC, identified and developed this set of metrics that relate nuisance algae growth with the impairment of beneficial uses in the lower Boise River.

These targets are believed to be protective of primary/secondary contact recreation and cold water aquatic life. These targets correspond well with values established in the academic literature and are similar to targets developed and implemented for waters in Montana (MDEQ 2008), Minnesota (MPCA 2013) and Colorado (CDPHE 2012).

5.1.3 Target Selection (Mason Creek)

The target selection for Mason Creek is developed in the same manner as load allocations for the other major tributaries to the lower Boise River. These load allocations will help the lower Boise River meet the May – September SR-HC TMDL TP target, and will be adjusted during the non-irrigation season to help meet the lower Boise River nuisance aquatic growth target (translated in to a TP target). These allocations should also result in full beneficial use support in Mason Creek through TP load reductions and related nuisance aquatic growth. In addition, subsequent monitoring of Mason Creek, along with DEQ's ongoing statewide effort to identify nutrient and nuisance aquatic growth relationships in wadeable streams, should provide further insight into achieving full beneficial use in Mason Creek and other lower Boise River tributaries. Any potential subsequent changes in the load allocations that may be needed to reach full support of beneficial uses in Mason Creek will adaptively reassessed as part of the 5-year review.

5.1.4 Target Selection (Sand Hollow Creek)

The target selection for Sand Hollow Creek is developed to help achieve the May – September target in the Snake River as identified in the SR-HC TMDL (DEQ and ODEQ 2004). These allocations should also result in full beneficial use support in Sand Hollow Creek, itself through TP load reductions and related nuisance aquatic growth. In addition, subsequent monitoring of Sand Hollow Creek, along with DEQ's ongoing statewide effort to identify nutrient and nuisance aquatic growth relationships in wadeable streams, should provide further insight into achieving full beneficial use in Sand Hollow Creek and other lower Boise River tributaries. Any potential subsequent changes in the load allocations that may be needed to reach full support of beneficial uses in Sand Hollow Creek will be adaptively reassessed as part of the 5-year review.

5.1.5 Water Quality Monitoring Points

Since 1994 the USGS has monitored water quality and biological communities in the Boise River in cooperation with DEQ and the LBWC. Early efforts were designed to assess ongoing status and trends in river quality, including the monitoring of water quality and biological communities on the Boise River and synoptic studies to identify the tributaries contributing the most significant loads of selected constituents to the river. The program evolved over the years to accommodate data needs to formulate TMDLs in the lower Boise River subbasin. Included were several short-term studies to evaluate continuous water temperatures; nutrient loads contributed by ground water, nutrient and sediment loads discharged to the Snake River, resident fish communities, cost-effective methods to monitor nutrients and sediment more frequently, and potential applications of isotopic tracers for understanding nutrient sources and cycling (USGS 2012, 2013a, 2013b).

Efforts are now underway to track trends in stream quality that might result from management of water resources. These efforts require an emphasis on gathering information within tributary basins in addition to continued monitoring on the Boise River for ongoing trend detection. This includes maintaining and evaluating the long-term water-quality dataset on the lower Boise River near Parma. Monitoring results from the lower Boise River near Parma incorporate contributions and impacts from nearly all basin activities and represent the quality of Boise River water discharging to the Snake River. The USGS measures continuous streamflow near Parma as funded by the USGS National Streamflow Information Program (NSIP).

Additionally, monitoring activities beginning in fiscal year 2014 will include sample collection and continuous monitoring of water-quality parameters at the gage near Parma. In addition to collecting at least 8 water quality samples during the fiscal year, a continuous water-quality monitor will be installed and operated at the Parma stream gage. The continuous monitor will collect temperature, specific conductance, dissolved oxygen, and turbidity every 15 minutes and will be updated in real time on the stream gage web page (USGS 2013b).

A previously-published statistical regression model provides the ability to estimate TP and suspended sediment in real time at Parma given continuously monitored turbidity and specific conductance (Wood and Etheridge 2011). Event-based sample collection efforts will be used to verify and/or calibrate model estimates of the TP and suspended sediment. Real-time estimates of TP and suspended sediment will be provided on line and can be used to evaluate TP and suspended sediment loading and concentrations on time scales consistent with storm events, diurnal variation, and anomalous fluctuations in stream pollutants (USGS 2013b).

Additionally, the USGS, in cooperation with the DEQ and the LBWC, has collected and published other biological data throughout the lower Boise River subbasin, including aquatic growth (periphyton and phytoplankton). Some of their published monitoring results are available in the subsequent documents:

- Evaluation of Total Phosphorus Mass Balance in the Lower Boise River, Southwestern Idaho (Etheridge 2013 - DRAFT)
- Water-quality Conditions near the Confluence of the Snake and Boise Rivers, Canyon County, Idaho (Wood and Etheridge 2011)
- Water-Quality and Biological Conditions in the Lower Boise River, Ada and Canyon Counties, Idaho, 1994–2002 (MacCoy 2004)
- Water-quality Conditions of the Lower Boise River, Ada and Canyon Counties, Idaho, May 1994 through February 1997 (Mullins 1998)
- Biological Assessment of the Lower Boise River, October 1995 through January 1998, Ada and Canyon Counties, Idaho (Mullins 1999)

5.2 Load Capacity

The load capacity is the amount of pollutant a water body can receive and still meet the water quality standard for load capacity. This must be a level to meet "...water quality standards with seasonal variations and a margin of safety which takes into account any lack of knowledge..." (Clean Water Act § 303(d)(C)). Seasonal variations and a margin of safety to account for any uncertainty are calculated within the load capacity. The margin of safety accounts for uncertainty about assimilative capacity, the precise relationship between the selected target and beneficial uses, and variability in target measurement.

The load capacity is based on existing uses within the watershed. The load capacity for each water body and specific pollutant are tailored to both the nature of the pollutant and the specific use impairment.

5.2.1 TP ≤ 0.07 mg/l May 1 – September 30

The load capacities for TP in the lower Boise River are based on the instream loads that would be present when a seasonal TP concentration of ≤ 0.07 mg/L is maintained at the mouth of the lower Boise River near Parma throughout the critical season (May 1–September 30). These load capacities comply with the target TP concentration for the lower Boise River as identified in the SR-HC TMDL.

Insert load/flow duration curves and tables following completion of modeling efforts…

5.2.2 TP Loads to Meet Mean Benthic Chlorophyll-a Biomass Target of ≤ 150 mg/m^2

Insert load/flow duration curves and tables following completion of modeling efforts and target refinement…

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" (40 CFR 130.2(g)). An estimate must be made for each point source. Nonpoint sources are typically estimated based on the type of source or land area. To the extent possible, background loads should be distinguished from human-caused increases in nonpoint loads.

5.3.1 Boise River May – September Pollutant Load Estimates

Pollutant loads were estimated based from existing data for the lower Boise River from May – September. Point source contributions (primarily WWTFs) were estimated based on DMR and/or facility-supplied data from May 1 – September 30, 2012, as available. This time period was chosen in order to utilize the most recent data available and to accurately capture the current conditions.

Stormwater contributions were estimated based on information provided in the 2008 Lower Boise River Implementation Plan Total Phosphorus (DEQ 2008). These values were used due to a paucity of data for much of the stormwater MS4 permitted area.

Nonpoint source tributary contributions were estimated based on available USGS and ISDA data for May 1 – September 30 from 1983 through 2013, as available. This longer time period was selected due to paucity of data for some tributaries and in order to moderate the intra- and inter-annual variation that can result from varying precipitation, runoff, temperature, and water use regimes.

Nonpoint source ground water, unmeasured, and background contributions were estimated using data from the 2012 August synoptic sampling effort in the lower Boise River subbasin (Etheridge 2013 – DRAFT). This data represents the best and most current ground water and unmeasured data for the lower Boise River to date. Further, this data largely confirms existing data regarding the existing background contributions that are largely unaffected by anthropogenic activities.

Table ?. Estimated and permitted point source TP discharge from May - September in the lower Boise River (directly and indirectly).

Source	NPDES Permit No.	Mainstem RM[1] or Receiving Water	Mean Discharge May – Sept (MGD)[2]	Design Flow (MGD)	Mean TP Conc. May – Sept (mg/L)[2]	Permitted TP Conc. May – Sept (mg/L)	Mean TP Load May – Sept (lbs/day)[2]	Permitted TP Load May – Sept (lbs/day)
Boise River - Mainstem								
Lander WWTF	ID-002044-3	RM 50.0	12.7	15	2.1	0.07/monthly avg 0.931/weekly avg	22.5	8.7/monthly avg 11.6/weekly avg
West Boise WWTF	ID-002398-1	RM 44.2	16.1	24	4.47	0.07/monthly avg 0.084/weekly avg	600.5	14/monthly avg 16.8/weekly avg
Middleton WWTF	ID-002183-1	RM 27.1	0.57	1.83	3.23	No Limit	15.4	No Limit
Caldwell WWTF	ID-002150-4	RM 22.6	7.9	8.5	2.18	No Limit	143.7	No Limit
IDFG-Eagle[3]	NPDES permit currently not required	RM 41.8	2.95	4.25	0.02	No Limit	0.5	No Limit
Darigold	ID-002495-3	RM 22.6	0.22	1.7	0.31	No Limit	0.6	No Limit
Boise River -Tributaries								
Avimor WWTF	In Application	Dry Creek	Draft NPDES permit prohibits discharge April - September					
Star WWTF	ID-002359-1	Lawrence Kennedy Canal (Mill Slough/Boise River)	0.63	0.33	1.85	No Limit	9.7	No Limit
Meridian WWTF[4]	ID-002019-2	Fivemile Creek	5.87	7	1.25	No Limit	61.2	No Limit

Source	NPDES Permit No.	Mainstem RM[1] or Receiving Water	Mean Discharge May – Sept (MGD)[2]	Design Flow (MGD)	Mean TP Conc. May – Sept (mg/L)[2]	Permitted TP Conc. May – Sept (mg/L)	Mean TP Load May – Sept (lbs/day)[2]	Permitted TP Load May – Sept (lbs/day)
		(Fifteenmile Creek)						
Sorrento Lactalis	ID-002803-7	Mason Creek	0.7	1.8	0.03	0.07/monthly avg 0.14/weekly avg	0.2	0.29/monthly avg 0.58/weekly avg
Nampa WWTF	ID-002206-3	Indian Creek	10.51	11.8	4.97	No Limit	435.8	No Limit
Kuna WWTF	ID-002835-5	Indian Creek	0.47	3.5	0.04	0.07/monthly avg 105/weekly avg	0.2	1.1/monthly avg 1.65/weekly avg
IDFG-Nampa[3]	IDG-130042 (current permit not subject to WLA)	Wilson Drain and Pond (Indian Creek)	20.43	??	0.06	No Limit	10.1	No Limit
Notus WWTF[5]	ID-002101-6	Conway Gulch	No May-Sep Discharge	0.11	No May-Sep Discharge Currently	0.07/monthly avg 0.14/weekly avg	No May-Sep Discharge Currently	0.064/monthly avg 0.128/weekly avg
Wilder WWTF	ID-0020265	Wilder Ditch Drain	0.07	0.25	9.22	No Limit	5.1	No Limit
Greenleaf WWTF[5]	ID-002830-4	West End Drain		0.24	No May-Sep Discharge Currently	0.07/monthly avg 0.105/weekly avg	No May-Sep Discharge Currently	0.14/monthly avg 0.21/weekly avg
ConAgra (XL 4 Star)	ID-000078-7	Indian Creek	Not Active	0.475	No May-Sep Discharge Currently	No Limit	No May-Sep Discharge Currently	No Limit
Total			**79.1**	**80.8**			**1505.4**	

[1] River Miles as identified by USGS in lower Boise River Mass Balance Report (Etheridge 2013 – DRAFT). Darigold discharges to a storm drain which is then believed to discharge into the lower Boise River at or near RM 22.6.
[2] Estimated from January 1, 2012 through April 30, 2013 using data provided by facilities and/or DMR data.
[3] Nampa and Eagle IDFG facility outputs were calculated using 2011 and 2012 data due a single concentration/load data point in 2012.
[4]Meridian – current design flow is higher than 7, but permitted design flow was 7 when issued in 1999.
[5]The Notus and Greenleaf facilities did not discharge during the months of May – September. However, the newly-completed 2013 NPDES permits allow May – September discharge.

Table ?. Estimated stormwater (MS4) TP discharge May - September discharge to the lower Boise River (directly and indirectly).

Source	NPDES Permit No.	Service Area[1] (mi^2)	Area Ratio[2]	Estimated Total Annual TP Load May - Sept (lbs/day)[3]	Estimated Annual TP Load (lbs/day)	Estimated TP Load May - Sept (lbs/day)[c]
Boise/Ada County MS4	IDS-028185 IDS-027561	120	0.64		112.2	28.1
Canyon Hwy District #4 MS4	IDS-028134	8	0.04		7.5	1.9
Middleton MS4	IDS-028100	5	0.03		4.7	1.2
Nampa MS4	IDS-028126	30.3	0.16	174.2	28.3	7.1
Nampa Hwy District MS4	IDS-128142	8.5	0.05		7.9	2.0
Caldwell MS4	IDS-028118	12.5	0.07		11.7	2.9
Notus-Parma MS4	IDS-028151	2	0.01		1.9	0.5
				Total	**174.2**	**43.6**

[1] Service areas were obtained via the NPDES permits and/or fact sheets.
[2] Area ratio = the area contribution of each individual MS4 relative to the total service area for all MS4s.
[3] Based on estimated stormwater loads identified in the *2008 Lower Boise River Implementation Plan Total Phosphorus* (DEQ 2008).
[4] Based on estimated ~25% of annual precipitation occurring during the May – September months from 1981 through 2010 (WRCC 2010).

Table ?. Estimated May - September nonpoint-source discharge to the Lower Boise River (directly and indirectly).

Source Name	Lower Boise River Receiving River Mile (RM)[1]	Mean Discharge May – Sept (cfs)[2]	Mean TP Concentration May – Sept (mg/L)[2]	Mean TP Load May – Sept (lbs/day)[2]
Boise River				
Eagle Drain	42.7	36.2	0.12	22
Dry Creek	42.5	5.25	0.08	2
Thurman Drain	41.9	13.92	0.11	8
Fifteenmile Creek	30.3	130.43	0.31	219
Mill Slough	27.2	126.5	0.21	141
Willow Creek	27.0	37.36	0.18	36
Mason Slough	25.6	13	0.22	15
Mason Creek	25.0	139.42	0.43	323
Hartley Gulch (E. and W.)	24.4	35	0.24	45
Indian Creek	22.4	90.5	0.46	224
Conway Gulch	14.2	42.32	0.38	86
Dixie Drain	10.5	228.04	0.39	477
Total		**897.9**	**Mean = 0.33**	**1601**
Ground water and Unmeasured	NA	485	0.22	576

Source Name	Lower Boise River Receiving River Mile (RM)[1]	Mean Discharge May – Sept (cfs)[2]	Mean TP Concentration May – Sept (mg/L)[2]	Mean TP Load May – Sept (lbs/day)[2]
Background	NA	NA	0.01	47[3]

[1] River Miles as identified by USGS in lower Boise River Mass Balance Report (Etheridge 2013 - DRAFT).
[2] Mason Creek values estimated from USGS for data available data from 1983 – 2013.
Sand Hollow values were estimated from available ISDA and USGS data from 1998 – 2013.
Ground water and unmeasured values were estimated in the USGS lower Boise River Mass Balance Report for August 2012 (Etheridge 2013 - DRAFT).

5.3.2 Sand Hollow (Snake River) May – September Pollutant Load Estimates

Table XX. Estimated and permitted point source TP discharge from May - September in Sand Hollow Creek (a tributary to the Snake River).

Source	NPDES Permit No.	Receiving Water	Mean Discharge May - Sept (MGD)[3]	Design Flow (MGD)	Mean TP Conc. May – Sept (mg/L)[3]	Permitted TP Conc. May – Sept (mg/L)	Mean TP Load May – Sept (lbs/day)[3]	Permitted TP Load May – Sept (lbs/day)[3]
Snake River								
Parma WWTF	ID-002177-6	Sand Hollow Drain	0.09	0.68	0.21	No Limit	0.2	No Limit

[3]Estimated from May 1 through September 30, 2012 using data provided by facilities and/or DMR data.

Table XX. Estimated May - September nonpoint-source discharge to the Snake River (via Sand Hollow Creek).

Source Name	Receiving Water	Mean Discharge May – Sept (cfs)[2]	Mean TP Conc. May – Sept (mg/L)[2]	Mean TP Load May – Sept (lbs/day)[2]
Sand Hollow Creek				
Non-point, ground water, background, and other unmeasured[3]	Snake River	141	0..4	304

[3] From ISDA and USGS for data available data from 1998 – 2013.

5.3.3 Non - May – September Pollutant Load Estimates

Depending on modeling results and refinement of periphyton target…

5.4 Load and Wasteload Allocation

5.4.1 Boise River Load and Wasteload Allocations

5.4.2 Sand Hollow Creek Load and Wasteload Allocations

5.4.3 Margin of Safety

5.4.4 Seasonal Variation

5.4.5 Reasonable Assurance

5.4.6 Natural Background

Synoptic sampling efforts (Etheridge 2013 - DRAFT) identified natural background concentrations near Diversion Dam as < 0.01 mg/L in August 2012, October 2012, and March 2013. This is consistent with previous data collected near Diversion Dam, previously and is comparable to background values of 0.02 mg/L used in the SR-HC TMDL (IDEQ/ODEQ 2004).

The natural background level of TP must be subtracted from all anthropogenic sources, and therefore represents a reduction in the available load capacity. That is, even perfectly pure water in the lower Boise River would naturally be expected contain $\leq$ 0.01 mg/L of TP as it travelled down the stream.

5.4.7 Construction Stormwater and TMDL Wasteload Allocations

Stormwater runoff is water from rain or snowmelt that does not immediately infiltrate into the ground and flows over or through natural or man-made storage or conveyance systems. When undeveloped areas are converted to land uses with impervious surfaces—such as buildings, parking lots, and roads—the natural hydrology of the land is altered and can result in increased surface runoff rates, volumes, and pollutant loads. Certain types of stormwater runoff are considered point source discharges for Clean Water Act purposes, including stormwater that is associated with municipal separate storm sewer systems (MS4s), industrial stormwater covered under the Multi-Sector General Permit (MSGP), and construction stormwater covered under the Construction General Permit (CGP).

5.4.7.1 Municipal Separate Storm Sewer Systems

Polluted stormwater runoff is commonly transported through MS4s, from which it is often discharged untreated into local water bodies. An MS4, according to (40 CFR 122.26(b)(8)), is a conveyance or system of conveyances that meets the following criteria:

- Owned by a state, city, town, village, or other public entity that discharges to waters of the U.S.

- Designed or used to collect or convey stormwater (including storm drains, pipes, ditches, etc.)
- Not a combined sewer
- Not part of a publicly owned treatment works (sewage treatment plant)

To prevent harmful pollutants from being washed or dumped into an MS4, operators must obtain an NPDES permit from EPA, implement a comprehensive municipal stormwater management program (SWMP), and use best management practices (BMPs) to control pollutants in stormwater discharges to the maximum extent practicable.

5.4.7.2 Industrial Stormwater Requirements

Stormwater runoff picks up industrial pollutants and typically discharges them into nearby water bodies directly or indirectly via storm sewer systems. When facility practices allow exposure of industrial materials to stormwater, runoff from industrial areas can contain toxic pollutants (e.g., heavy metals and organic chemicals) and other pollutants such as trash, debris, and oil and grease. This increased flow and pollutant load can impair water bodies, degrade biological habitats, pollute drinking water sources, and cause flooding and hydrologic changes, such as channel erosion, to the receiving water body.

Multi-Sector General Permit and Stormwater Pollution Prevention Plans

In Idaho, if an industrial facility discharges industrial stormwater into waters of the U.S., the facility must be permitted under EPA's most recent MSGP. To obtain an MSGP, the facility must prepare a stormwater pollution prevention plan (SWPPP) before submitting a notice of intent for permit coverage. The SWPPP must document the site description, design, and installation of control measures; describe monitoring procedures; and summarize potential pollutant sources. A copy of the SWPPP must be kept on site in a format that is accessible to workers and inspectors and be updated to reflect changes in site conditions, personnel, and stormwater infrastructure.

Industrial Facilities Discharging to Impaired Water Bodies

Any facility that discharges to an impaired water body must monitor all pollutants for which the water body is impaired and for which a standard analytical method exists (see 40 CFR Part 136).

Also, because different industrial activities have sector-specific types of material that may be exposed to stormwater, EPA grouped the different regulated industries into 29 sectors, based on their typical activities. Part 8 of EPA's MSGP details the stormwater management practices and monitoring that are required for the different industrial sectors. EPA anticipates issuing a new MSGP in December 2013. DEQ anticipates including specific requirements for impaired waters as a condition of the 401 certification. The new MSGP will detail the specific monitoring requirements.

TMDL Industrial Stormwater Requirements

When a stream is on Idaho's §303(d) list and has a TMDL developed, DEQ may incorporate a wasteload allocation for industrial stormwater activities under the MSGP. However, most load analyses developed in the past have not identified sector-specific numeric wasteload allocations for industrial stormwater activities. Industrial stormwater activities are considered in compliance with provisions of the TMDL if operators obtain an MSGP under the NPDES program and implement the appropriate BMPs. Typically, operators must also follow specific requirements to be consistent with any local pollutant allocations. The next MSGP will have specific monitoring requirements that must be followed.

5.4.7.3 Construction Stormwater

The CWA requires operators of construction sites to obtain permit coverage to discharge stormwater to a water body or municipal storm sewer. In Idaho, EPA has issued a general permit for stormwater discharges from construction sites.

Construction General Permit and Stormwater Pollution Prevention Plans

If a construction project disturbs more than 1 acre of land (or is part of a larger common development that will disturb more than 1 acre), the operator is required to apply for a CGP from EPA after developing a site-specific SWPPP. The SWPPP must provide for the erosion, sediment, and pollution controls they intend to use; inspection of the controls periodically; and maintenance of BMPs throughout the life of the project. Operators are required to keep a current copy of their SWPPP on site or at an easily accessible location.

TMDL Construction Stormwater Requirements

When a stream is on Idaho's §303(d) list and has a TMDL developed, DEQ may incorporate a gross wasteload allocation for anticipated construction stormwater activities. Most loads developed in the past did not have a numeric wasteload allocation for construction stormwater activities. Construction stormwater activities are considered in compliance with provisions of the TMDL if operators obtain a CGP under the NPDES program and implement the appropriate BMPs. Typically, operators must also follow specific requirements to be consistent with any local pollutant allocations. The CGP has monitoring requirements that must be followed.

Postconstruction Stormwater Management

Many communities throughout Idaho are currently developing rules for postconstruction stormwater management. Sediment is usually the main pollutant of concern in construction site stormwater. DEQ's *Catalog of Stormwater Best Management Practices for Idaho Cities and Counties* (DEQ 2005) should be used to select the proper suite of BMPs for the specific site, soils, climate, and project phasing in order to sufficiently meet the standards and requirements of the CGP to protect water quality. Where local ordinances have more stringent and site-specific standards, those are applicable.

5.4.8 Reserve for Growth

5.5 Implementation Strategies

The purpose of the implementation strategy is to outline the pathway by which the SWCC and Idaho Association of Soil Conservation Districts (IASCD) can develop a comprehensive implementation plan within 18 months after TMDL approval. The implementation plan will provide details of the actions needed to achieve load reductions (set forth in this TMDL), a schedule of those actions, and the monitoring needed to document actions and progress toward meeting state water quality standards.

DEQ recognizes that implementation strategies for TMDLs may need to be modified if monitoring shows that TMDL goals are not being met or significant progress is not being made toward achieving the goals. Reasonable assurance (addressed in section 5.4.5) for the TMDL to meet water quality standards is based on the implementation strategy.

A TP Implementation Plan for the lower Boise River was previously created by DEQ and the LBWC (DEQ 2008). This plan presented strategies designed to meet the May 1 – September 30 SR-HC TP allocation target on the lower Boise River Activities within a 70-year timeframe, including assessing the effects:

- TP reductions from point source facilities
  - Effluent concentration targets as stipulated in the staged implementation approach
  - Projected design flows
  - Projected loads on a seasonal basis
- TP reductions from stormwater dischargers through BMPs, increased attention to on-site stormwater inspection, and public education
- Voluntary BMP implementation on agricultural lands, contingent on available funding levels and previously-developed implementation plans
- Conversion of agricultural land to other land uses
- Pollutant trading framework
- Monitoring strategy
- Reevaluation of the SR-HC TMDL target

Some of these original implementation measures could be appropriate to the current TMDL addendum, understanding the need to expand and revise the focus to appropriately address the specific needs of the AUs in this document given current conditions and knowledge.

5.5.1 Time Frame

The lower Boise River TP TMDL addendum relies on a staged implementation strategy as referenced in EPA's Phased TMDL Clarification memo (EPA 2006). The staged implementation strategy for the lower Boise River acknowledges that NPDES-permitted point sources will strive to meet the TMDL target as soon as possible, but will be given 2 permit cycles (10 years from the approval of the TMDL) to achieve their wasteload allocations.

The lower Boise River TP TMDL addendum, however, does not define an implementation time frame for non-point sources; rather, implementation would begin as soon as possible and continue until the load allocation targets are met. This acknowledges that successfully achieving the TMDL target and allocations will depend on voluntary measures, including but not limited to available funding, cost-sharing, willing partners, and opportunities for water quality trading.

5.5.2 Approach

Point source contributions will be determined and regulated by EPA and NPDES permitting, whereas, funding provided under section 319, and other funds, will be used to encourage voluntary projects to reduce nonpoint source pollution. Additionally, upon the development of the TMDL, it is expected that a lower Boise River pollutant trading framework will be updated/developed and that pollutant trading may be utilized to meet the pollutant targets in the subbasin (also see 5.5.5 Pollutant Trading).

5.5.3 Responsible Parties

The final implementation plan for this TMDL addendum will be developed under the existing practice established for the state of Idaho. The plan will be cooperatively developed by DEQ, the LBWC, affected private landowners, and designated management agencies with input through the established public process. Other individuals may also be identified to assist in developing site-specific implementation plans as their areas of expertise are identified as beneficial to the process.

All stakeholders in the lower Boise River subbasin have a responsibility for implementing the TMDL addendum. DEQ and the designated management agencies in Idaho have primary responsibility for overseeing implementation in cooperation with landowners and managers.

Designated state agencies are responsible for assisting with preparation of specific implementation plans, particularly for those resources for which they have regulatory authority or programmatic responsibilities:

- **Idaho Department of Lands (IDL)** for timber harvest, oil and gas exploration and development, and mining—IDL will maintain and update approved BMPs for forest practices and mining. IDL is responsible for ensuring use of appropriate BMPs on state and private lands.
- **Idaho Soil and Water Conservation Commission (SWCC)** for grazing and agriculture—working in cooperation with local soil and water conservation districts, the Idaho State Department of Agriculture (ISDA), and the NRCS, the SWCC will provide technical assistance to agricultural landowners. These agencies will help landowners design BMPs appropriate for their property and identify and seek appropriate cost-share funds. They also will provide periodic project reviews to ensure BMPs are working effectively.
- **Idaho Transportation Department** for public roads—The Idaho Transportation Department will ensure appropriate BMPs are used for construction and maintenance of public roads.
- **Idaho State Department of Agriculture (ISDA)** for aquaculture, animal feeding operations, and concentrated animal feeding operations—ISDA will work with aquaculture facilities to install appropriate pollutant control measures. Under a memorandum of understanding with EPA and DEQ, ISDA also inspects animal feeding operations, concentrated animal feeding operations, and dairies to ensure compliance with NPDES requirements.

- **DEQ** for all other activities—DEQ will oversee and track overall progress on the specific implementation plan and monitor the watershed response. DEQ will also work with local governments on urban/suburban issues.

In Idaho, these agencies, and their federal and state partners, are charged by the Clean Water Act to lend available technical assistance and other appropriate support to local efforts for water quality improvements.

The designated management agencies, LBWC, and other appropriate public process participants are expected to:

- Develop BMPs to achieve load allocations.
- Provide reasonable assurance that management measures will meet load allocations through both quantitative and qualitative analysis of management measures.
- Adhere to measurable milestones for progress.
- Develop a timeline for implementation, with reference to costs and funding.
- Develop a monitoring plan to determine if BMPs are being implemented, individual BMPs are effective, load allocations and wasteload allocations are being met, and water quality standards are being met.

In addition to the designated management agencies, the public, through the LBWC and other processes, will be provided with opportunities to be involved in developing the implementation plan to the maximum extent practical. Public participation will significantly affect public acceptance of the document and the proposed control actions. Stakeholders (i.e., landowners, local governing authorities, taxpayers, industries, and land managers) are the most educated regarding the pollutant sources and will be called upon to help identify the most appropriate control actions for each area. Experience has shown that the best and most effective implementation plans are those developed with substantial public cooperation and involvement.

5.5.4 Implementation Monitoring Strategy

5.5.5 Pollutant 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. Pollutant trading is one of the tools available to meet reductions called for in a TMDL where point and nonpoint sources both exist in a watershed.

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 58.01.02.055.06. DEQ allows for pollutant trading as a means to meet TMDLs, thus restoring water quality limited water bodies to compliance with water quality standards. DEQ's *Water Quality Pollutant Trading Guidance* sets forth the procedures to be followed for pollutant trading (DEQ 2010).

5.5.5.1 Trading Components

The major components of pollutant trading are trading parties (buyers and sellers) and credits (the commodity being bought and sold). 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 by DEQ or its designated party.

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 BMPs that reduce the amount of pollutant runoff. 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.

5.5.5.2 Watershed-Specific Environmental Protection

Trades must be implemented so that the overall water quality of the water bodies 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.

5.5.5.3 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 WAG, must develop a pollutant trading framework document. The framework would mesh with the implementation plan for the watershed that is the subject of the TMDL. The elements of a trading document are described in DEQ's pollutant trading guidance (DEQ 2010).

6 Conclusions

Data analysis for a 5-year review of the lower Boise River subbasin was completed in 2009 (DEQ 2009), and a TP implementation plan for the lower Boise River subbasin was completed in 2008 (DEQ 2008). These documents are available at: *http://www.deq.idaho.gov/water-quality/surface-water/tmdls/table-of-sbas-tmdls/boise-river-lower-subbasin.aspx*. The identified pollutant sources in this TMDL are both point and nonpoint in nature. Point sources include WWTFs, other industrial discharges, and stormwater contributions. Nonpoint sources include tributaries and drains that are generally agriculturally-fed or supplemented streams, ground water and other unmeasured sources, and natural background. Allocations in the TMDL addendum are designed to meet two targets: 1) the May 1 – September 30 SR-HC allocation target of $\leq$ 0.07 mg/L TP in the Snake River (e.g. in the lower Boise River near Parma and at the mouth of Sand Hollow Creek near the Snake River), and 2) the lower Boise River-specific TP target that corresponds with mean benthic chlorophyll a (periphyton) biomass of $\leq$ 150 mg/m^2 from XXX - XXX as a measure of nuisance aquatic growth. Meeting these targets is expected to result in full support cold water aquatic life and contact recreation beneficial uses in the lower Boise River, Mason Creek, and Sand Hollow Creek. Table Z provides a summary of assessment outcomes and recommended changes to the next Integrated Report.

This document was prepared with input from the public, as described in Appendix C, including comments and DEQ responses. A distribution list is included in Appendix D.

Table Z. Summary of assessment outcomes.

Assessment Unit Name	Assessment Unit Number	Pollutant	TMDL(s) Completed	Recommended Changes to Next Integrated Report	Justification
Boise River – Middleton to Indian Creek	ID17050114SW005_06b	Total Phosphorus	Yes	List in Category 4a for Total Phosphorus	EPA-approved Total Phosphorus TMDL completed
Boise River – Indian Creek to Mouth	ID17050114SW001_06	Total Phosphorus	Yes	List in Category 4a for Total Phosphorus	EPA-approved Total Phosphorus TMDL completed
Mason Creek – Entire Watershed	ID17050114SW006_02	Cause Uknown - Nutrients Suspected Impairment	Yes	List in Category 4a for Total Phosphorus	EPA-approved Total Phosphorus TMDL completed
Sand Hollow Creek – C-Line Canal to I-84	ID17050114SW016_03	Nutrients Suspected Impairment	Yes	List in Category 4a for Total Phosphorus	EPA-approved Total Phosphorus TMDL completed
Sand Hollow Creek – Sharp Road to Snake River	ID17050114SW017_06	Nutrients Suspected Impairment	Yes	List in Category 4a for Total Phosphorus	EPA-approved Total Phosphorus TMDL completed

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GIS Coverages

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Glossary

§303(d)

Refers to section 303 subsection "d" of the Clean Water Act. Section 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 United States Environmental Protection Agency approval.

Assessment Unit (AU)

A group of similar streams that have similar land use practices, ownership, or land management. However, stream order is the main basis for determining AUs. All the waters of the state are defined using AUs, and because AUs are a subset of water body identification numbers, they tie directly to the water quality standards so that beneficial uses defined in the water quality standards are clearly tied to streams on the landscape.

Beneficial Use

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

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.

Exceedance

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

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 *Water Body Assessment Guidance* (Grafe et al. 2002).

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 Capacity (LC)

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, a margin of safety, and natural background contributions, it becomes a total maximum daily load.

Margin of Safety (MOS)

An implicit or explicit portion of a water body's load capacity set aside to allow for uncertainly about the relationship between the pollutant loads and the quality of the receiving water body. The margin of safety 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 margin of safety is not allocated to any sources of pollution.

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 nonirrigated 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 *Water Body Assessment Guidance* (Grafe et al. 2002).

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 plants.

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 that alter the functioning of natural processes and produce undesirable environmental and health effects. Pollution includes human-induced alteration of the physical, biological, chemical, and radiological integrity of water and other media.

Stream Order

Hierarchical ordering of streams based on the degree of branching. A 1st-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.

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 load capacity = margin of safety + natural background + load allocation + wasteload allocation = 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.

Wasteload Allocation (WLA)

The portion of receiving water's load 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 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, aquatic habitat, or industrial processes.

Water Quality Standards

State-adopted and United States 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.

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Appendix A. Site-Specific Water Quality Standards and Criteria

Idaho Water Quality Standards IDAPA 58.01.02.140.12 for the lower Boise River subbasin.

12. **Lower Boise Subbasin**. The Lower Boise Subbasin, HUC 17050114, is comprised of seventeen (17) water body units

Unit	Waters	Aquatic Life	Recreation	Other
SW-1	Boise River- Indian Creek to mouth	COLD	PCR	
SW-2	Indian Creek - Sugar Ave. (T03N, R02W, Sec. 15) to mouth	COLD	SCR	
SW-3a	Split between New York Canal and historic creek bed to Sugar Ave. (T03N, R02W, Sec. 15)	COLD SS	SCR	
SW-3b	Indian Creek Reservoir to split between New York Canal and historic creek bed	COLD	SCR	
SW-3c	Indian Creek Reservoir	COLD	PCR	
SW-3d	Indian Creek - source to Indian Creek Reservoir	COLD	SCR	

Unit	Waters	Aquatic Life	Recreation	Other
SW-4	Lake Lowell	WARM	PCR	
SW-5	Boise River - river mile 50 (T04N, R02W, Sec. 32) to Indian Creek	COLD SS	PCR	
SW-6	Mason Creek - New York Canal to mouth		SCR	
SW-7	Fifteenmile Creek - Miller Canal to mouth		SCR	
SW-8	Tenmile Creek - Blacks Creek Reservoir Dam to Miller Canal	COLD	SCR	
SW-9	Blacks Creek - source to and including Blacks Creek Reservoir			
SW-10	Fivemile Creek - source to Miller Canal	COLD	SCR	
SW-11a	Boise River - Diversion Dam to river mile 50 (T04N, R02W, Sec. 32)	COLD SS	PCR	DWS
SW-11b	Boise River - Lucky Peak Dam to Diversion Dam	COLD	PCR	DWS
SW-12	Stewart Gulch, Cottonwood and Crane Creeks -source to mouth			
SW-13	Dry Creek - source to mouth			
SW-14	Big/Little Gulch Creek complex			
SW-15	Willow Creek - source to mouth			
SW-16	Langley/Graveyard Gulch complex			
SW-17	Sand Hollow Creek - source to mouth		SCR	

Idaho Water Quality Standards IDAPA 58.01.02.278.01-05 for the lower Boise River subbasin.

278. LOWER BOISE RIVER SUBBASIN, HUC 17050114 SUBSECTION 140.12.

01. Boise River, SW-1 and SW-5 -- Salmonid Spawning and Dissolved Oxygen. The waters of the Boise River from Veterans State Park to its mouth will have dissolved oxygen concentrations of six (6) mg/l or seventy-five percent (75%) of saturation, whichever is greater, during the spawning period of salmonid fishes inhabiting those waters. (3-15-02)

02. Boise River, SW-5 and SW-11a -- Copper and Lead Aquatic Life Criteria. The water-effect ratio (WER) values used in the equations in Subsection 210.02 for calculating copper and lead CMC and CCC values shall be two and five hundred seventy-eight thousandths (2.578) for dissolved copper and two and forty-nine thousandths (2.049) for lead. These site-specific criteria shall apply to the Boise River from the Lander St. wastewater outfall to where the channels of the Boise River become fully mixed downstream of Eagle Island.

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Department of Environmental Quality ***Water Quality Standards***

(5-3-03)

03. Indian Creek, SW-3a -- Site-Specific Criteria for Water Temperature. A maximum weekly maximum temperature of thirteen degrees C (13°C) to protect brown trout and rainbow trout spawning and incubation applies from October 15 through June 30. (3-29-12)

04. Boise River, SW-5 and SW-11a -- Site-Specific Criteria for Water Temperature. A maximum weekly maximum temperature of thirteen degrees C (13°C) to protect brown trout, mountain whitefish, and rainbow trout spawning and incubation applies from November 1 through May 30. (3-29-12)

05. Point Source Thermal Treatment Requirement. With regard to the limitations set forth in Section 401 relating to point source wastewater discharges, only the limitations of Subsections 401.01.a. and 401.01.b. and the temperature limitation relating to natural background conditions shall apply to discharges to any water body within the Lower Boise River Subbasin. (3-29-12)

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Appendix B. Data Sources

Table B1. Data sources for lower Boise River subbasin assessment.

Water Body	Data Source	Type of Data	Collection Date
Lander Street WWTF	Kate Harris, City of Boise	Effluent Parameters	2006 – 2013
West Boise WWTF	Kate Harris, City of Boise	Effluent Parameters	2006 – 2013
Middleton WWTF	Brad Green, City of Middleton Michael Moore, Analytical Laboratories	Effluent Parameters	2011 – 2013
Caldwell WWTF	Lee Van DeBogart	Effluent Parameters	2012 – 2013
IDFG Eagle Hatchery	Jeff Heindel, IDFG	Flow	2003 – 2013
IDFG Eagle Hatchery	Kate Harris, City of Boise	Effluent Parameters	2007 – 2013
Darigold, Inc.	Scott Algate, Darigold, Inc.	Effluent Parameters	2012 – 2013
Avimor	??	??	??
Star WWTF	Ken Vose, Star Sewer and Water	Effluent Parameters	2006 – 2013
Meridian WWTF	DMR Data	Effluent Parameters	2012 – 2013
Sorrento Lactalis	DMR Data	Effluent Parameters	2012 – 2013
Nampa WWTF	Matt Gregg, Brown and Caldwell	Effluent Parameters	2012 – 2013
Kuna WWTF	DMR Data	Effluent Parameters	2012 – 2013
IDFG Nampa Hatchery	DMR Data	Effluent Parameters	2012 – 2013
Notus WWTF	Mike Black, City of Notus	Effluent Parameters	2007 – 2013
Wilder WWTF	DMR Data	Effluent Parameters	2012 – 2013
Greanleaf WWTF	??	??	??
ConAgra	??	??	??
Parma WWTF	Ken Steinhaus, City of Parma	Effluent Parameters	2012 – 2013
Lower Boise River, Mason Creek, Sand Hollow Creek, and Lower Boise River Tributaries	Alex Etheridge, USGS	Water Quality, Habitat, and Flow Parameters	1983 – 2013
Lower Boise River Tributaries	Kirk Campbell, ISDA	Water Quality Parameters	1998 - 2008
Lower Boise River	DEQ	BURP	1995
Lower Boise River, Dixie Drain, and Point Sources	Kate Harris, City of Boise	Water Quality, Habitat, and Flow Parameters	1993 – 2013

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Appendix C. Public Participation and Public Comments

DEQ consulted and coordinated with the LBWC on regular and frequent intervals toward developing a nutrient TMDL since the river was listed as impaired by nutrients in the 1998 §303(d) list from Star to the mouth, and again after the final SR-HC TMDL was approved by EPA in September 2004.

Most recently, DEQ has frequently consulted, coordinated, and met with the LBWC, TAC and other subgroups, EPA, USGS, and other interested stakeholders since revitalizing this specific TMDL effort in March 2012. Since that time, DEQ has consulted with these interested stakeholders in more than XX meetings that were open and announced to the public, including but not limited to:

1. April 6, 2012 LBWC TAC Meeting
2. April 12, 2012 LBWC Meeting
3. May 10, 2012 LBWC Meeting
4. June 14, 2012 LBWC Meeting
5. June 19, 2012 LBWC TAC Meeting
6. July 12, 2012 LBWC Meeting
7. July 26, 2012 LBWC TAC Meeting
8. August 23, 2012 LBWC TAC Meeting
9. September 13, 2012 LBWC Meeting
10. September 27, 2012 LBWC TAC Meeting
11. October 11, 2012 LBWC Meeting
12. October 25, 2012 LBWC TAC Meeting
13. November 8, 2012 LBWC Meeting
14. November 28, 2012 Modeling Workgroup Meeting
15. November 29, 2012 LBWC TAC Meeting
16. January 3, 2013 LBWC TAC Meeting
17. January 10, 2013 LBWC Meeting
18. January 17, 2013 Modeling Workgroup Meeting
19. January 24, 2013 LBWC & TAC Combined Meeting
20. February 14, 2013 LBWC Meeting
21. February 21, 2013 Modeling Workgroup Meeting
22. February 28, 2013 LBWC TAC Meeting
23. March 14, 2013 LBWC Meeting
24. March 21, 2013 Modeling Workgroup Meeting
25. April 2, 2013 Modeling Work Session
26. April 4, 2013 LBWC TAC Meeting
27. April 9, 2013 Modeling Work Session
28. April 11, 2013 LBWC Meeting
29. April 16, 2013 Modeling Work Session
30. April 23, 2013 Modeling Work Session
31. April 25, 2013 LBWC TAC Meeting
32. April 30, 2013 Modeling Work Session
33. May 2, 2013 LBWC TAC Meeting
34. May 9, 2013 LBWC Meeting

35. May 14, 2013 Modeling Work Session
36. May 23, 2013 LBWC TAC Meeting
37. May 28, 2013 Modeling Work Session
38. June 3, 2013 Ada Soil Conservation District Meeting
39. June 11, 2013 Modeling Work Session
40. June 11, 2013 Canyon Soil Conservation District Meeting
41. June 13, 2013 LBWC Meeting
42. June 18, 2013 Model Work Session
43. June 25, 2013 Model Work Session
44. June 27, 2013 LBWC TAC
45. July 2, 2013 Model Work Session
46. July 9, 2013 Model Work Session
47. July 11, 2013 LBWC Meeting
48. July 16, 2013 Model Work Session
49. July 18, 2013 LBWC Monitoring Meeting
50. July 23, 2013 Model Work Session
51. July 25, 2013 LBWC TAC Meeting
52. July 30, 2013 LBWC 319 Tour
53. August 6, 2013 Model Work Session
54. August 8, 2013 319 TAC Meeting
55. August 13, 2013 Model Work Session
56. August 22, 2013 LBWC TAC Meeting
57. August 22, 2013 DEQ WQ Trading Open House
58. August 27, 2013 Model Work Session
59. September 3, 2013 Model Work Session
60. September 10, 2013 Model Work Session
61. September 12, 2013 LBWC Meeting
62. September 24, 2013 Model Work Session
63. September 26, 2013 LBWC TAC Meeting
64. October 10, 2013 LBWC Meeting
65. October 15, 2013 Model Work Session
66. October 22, 2013 Model Work Session
67. October 24, 2013 LBWC TAC Meeting
68. November 5, 2013 Model Work Session
69. November 14, 2013 LBWC Meeting
70. November 26, 2013 Model Work Session
71. December 3, 2013 Model Work Session
72. December 19, 2013 Model Work Session

[Public comments and DEQ responses to be inserted following public comment period.]

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Appendix D. Distribution List

Ben Cope, EPA

Bill Stewart, EPA

BOR Pacific Northwest Region and Snake River Office

Lower Boise Watershed Council and 319 TAC

Lower Boise River Total Phosphorus TMDL TAC and Model Workgroup

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