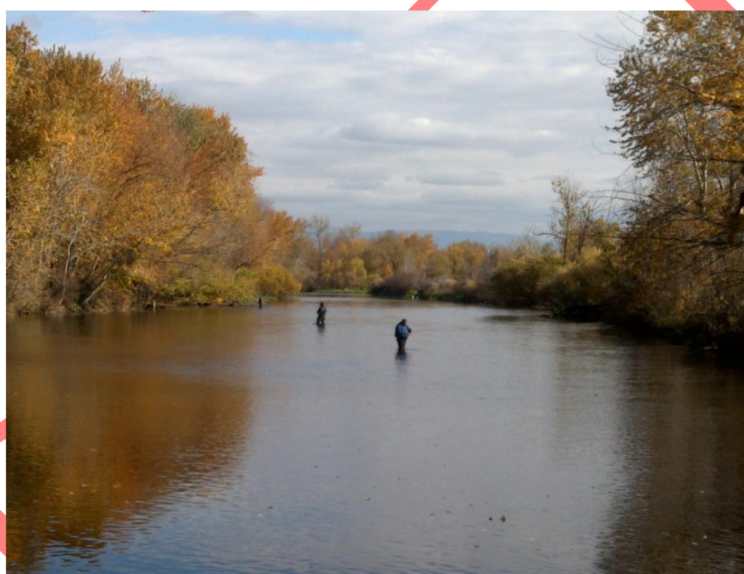
# Lower Boise River Subbasin Assessment and Total Maximum Daily Load

2014 Total Phosphorus Addendum to Lower Boise River, Mason Creek, and Sand Hollow Creek TMDLs

Hydrologic Unit Code 17050114



**Draft**

**State of Idaho**
**Department of Environmental Quality**

**Comment [TS1]:** Text shaded in red is DEQ TMDL template text that should rarely be changed.

**Comment [TS2]:** Text shaded in yellow are items that require additional information to be completed.

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**February 2014**

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**In Consultation 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 Sand Hollow Creek, a tributary to the Snake River. Elevated levels of TP in the lower Boise River (also referred to as the "LBR") 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. Within the physically-complex network of the lower Boise River watershed, tributaries, irrigation conveyances, ground water, unmeasured flows, and other nonpoint sources, along with Waste Water Treatment Facilities (WWTFs), Municipal Separate Storm Sewer Systems (MS4s), industrial wastewater and stormwater sources, and other point sources can 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 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) (tributary to the Snake River)

## 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 northwest from the Lucky Peak Dam outfall, through Diversion Dam (River Mile 64) above Boise, and through Ada and Canyon counties to its mouth on the Snake River near Parma, Idaho. The subbasin also drains portions of Elmore, Gem, Payette, and Boise counties. There are at least seven 3rd order, one 4th order and one 6th order tributaries to the lower Boise River (Figure 1).

Another 6th order stream, Sand Hollow Creek, is included in the subbasin but drains to the Snake River approximately 1 mile north of the mouth of the lower Boise River (Figure 1).

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, contact recreation, and salmonid spawning. Total phosphorus pollutant sources include upstream contributions (background), WWTFs, stormwater, industrial discharges, agricultural and irrigation returns, ground water and unmeasured sources (e.g. drains and septics).

In addition, because the lower Boise River is a tributary of significance to the Snake River, a May 1 – September 30 TP load allocation of ≤ 0.07 mg/L was assigned in the Snake River-Hells Canyon (SR-HC) TMDL (IDEQ and ODEQ 2004).

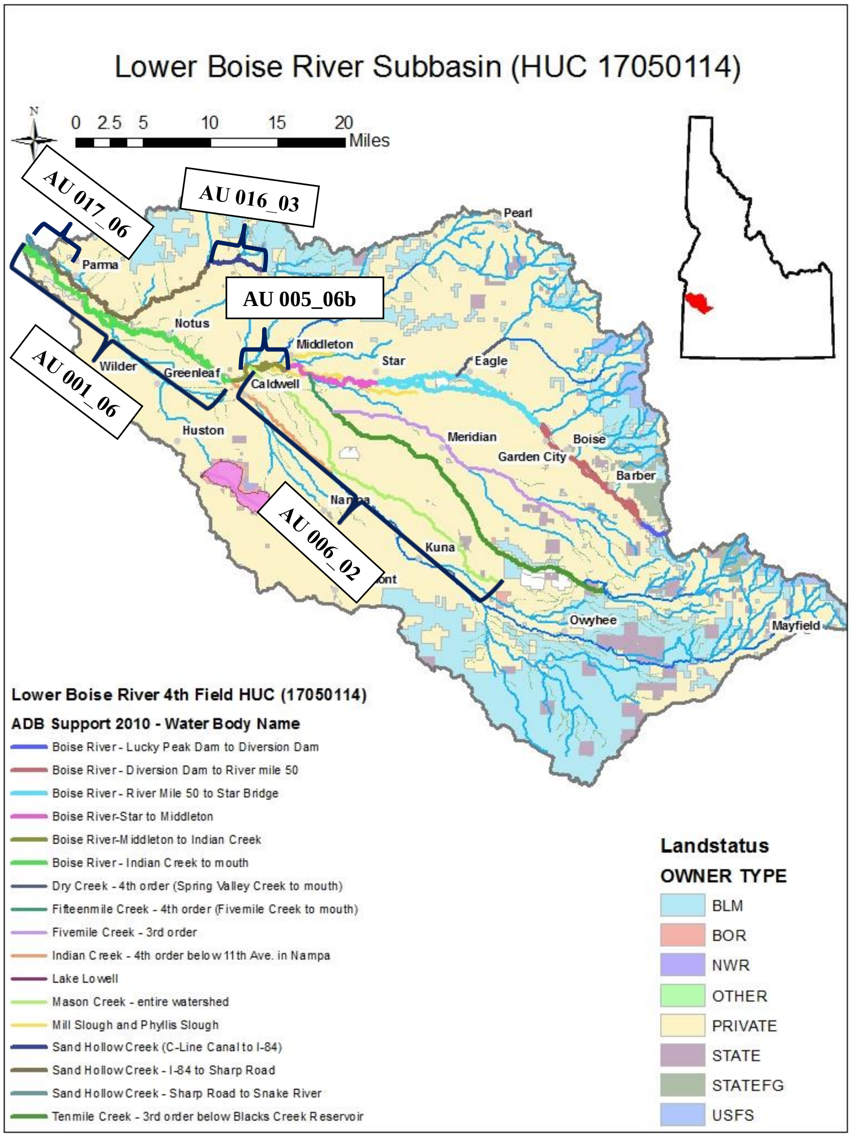



**Figure 1. The lower Boise River subbasin. The impaired AUs that are specifically addressed in this TMDL addendum are identified by their AU number on the map (impaired AUs in this TMDL addendum begin with 17050114).**

## 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 (Category 5) in the 2010 Integrated Report (Table 1). In addition, upstream and tributary AUs that are not listed as impaired on the 2010 Integrated Report are addressed as pollutant 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 contact recreation, while Mason and Sand Hollow Creeks have designated beneficial uses of contact recreation and presumed uses of cold water aquatic life.

Each of these beneficial uses is suspected to be impaired by TP from both point and nonpoint 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 community composition, and aesthetics.

**Table 1.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 |

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 nonpoint sources within the 2,500 square miles that discharge or drain directly to the Snake River from the where it intersects the Oregon/Idaho border near Adrian, Oregon (Snake River Mile 409) to immediately upstream of the inflow of the Salmon River (River Mile 188). Five major tributaries received gross phosphorus allocations at their mouths, including the lower Boise River. The SR-HC TMDL was developed with the assumption that the three major Idaho and two major Oregon tributaries would develop individual nutrient TMDLs or plans for implementation that satisfy final SR-HC nutrient TMDL requirements. Load allocations were developed to achieve target TP concentrations of ≤ 0.07 mg/L in the Snake River and Brownlee Reservoir, particularly during periods when dissolved oxygen levels are low. Compliance with the SR-HC TMDL was determined by applying a TP target of ≤ 0.07 mg/L 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. **May 1 through September 30** – TP concentrations (or mass equivalent) ≤ 0.07 mg/l in the lower Boise River near Parma in order to meet the 2004 Snake River-Hells Canyon TMDL requirements; and

2. **Mean Benthic Chlorophyll a < 150 mg/m$^2$** – TP concentrations (or mass equivalent) correlated with a mean benthic chlorophyll-a (periphyton) biomass target of ≤ 150 mg/m$^2$ in the main stem §303(d)-listed AUs of the lower Boise River:

    a. Estimated within individual impaired AUs on the main stem lower Boise River,
    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 can 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 nonpoint 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 nonpoint source allocations will depend on voluntary measures, including but not limited to, available funding, cost-sharing, willing partners, and opportunities for water quality trading.

DEQ and the lower Boise River TP TMDL addendum encourage water quality trading to the extent possible and practicable. However, this TMDL addendum does not address water quality trading implementation specific to the lower Boise River subbasin (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 subbasin. During the post-TMDL implementation, 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 nonpoint source load allocations over the long-term, critical uncertainties will need to be evaluated through an adaptive management-type approach, including:

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

## Allocations – May 1 to September 30

The TMDL utilizes a flow and water quality curves to develop a tiered load reduction approach needed to meet the May – September ≤ 0.07 mg/L TP target identified in the SR-HC TMDL (DEQ and ODEQ 2004). These calculations are based on the USGS August 2012 mass balance model (Etheridge 2013), along with long-term data from the lower Boise River (Tables 2-5 and Figures 2-4).

**Table 2. Total Phosphorus load allocations for the lower Boise River, Mason Creek and Sand Hollow, May 1 – September 30. The flows, TP concentrations, and TP load allocations are measured/estimated for: 1) the Boise River near Parma; 2) Mason Creek near the confluence with the Boise River, and: 3) Sand Hollow near the confluence with the Snake River.**

| | | | Current Load[3] | | | Load Capacity[3] | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Water Body[1]** | **Flow[2] (cfs)** | **Flow Rank (%)** | **TP Conc. (mg/L)** | **TP Load (lbs/day)** | **Target TP Conc. (mg/L)** | **Target TP Load (lbs/day)** | **Target TP Load Reductions (lbs/day [%])** | **TP Allocations[4] (lbs/day)** | **TP Load Reductions[4] (lbs/day [%])** |
| **Lower Boise River** | | | | | | | | | |
| Boise River near Parma– (AU 001_06) | 3268 | 10th | 0.21 | 3747 | 0.07 | 1233 | -2514 (67%) | 1117 | -2630 (70%) |
| | 912 | 40th | 0.31 | 1531 | 0.07 | 344 | -1187 (78%) | 333 | -1197 (78%) |
| | 705 | 60th | 0.31 | 1190 | 0.07 | 266 | -924 (78%) | 259 | -931 (78%) |
| USGS August Synoptic Sample[5] | 624 | 69th | 0.30 | 1010 | 0.07 | 235 | -775 (77%) | 234 | -776 (77%) |
| | 383 | 90th | 0.36 | 738 | 0.07 | 145 | -594 (80%) | 141 | -597 (81%) |
| | | | | | | | | | |
| Mason Creek– (AU 006_02) | 139 | Mean | 0.43 | 323 | 0.1 to 0.07 | 74 to 52 | -249 to -271 (77 to 81%) | 74 to 52 | -249 to -271 |
| | | | | | | | | | |
| **Snake River** | | | | | | | | | |
| Sand Hollow– (AU 017_06) | 141 | Mean | 0.4 | 304 | 0.07 | 53 | -251 (83%) | 53 | -251 |

[1] All assessment units (AUs) begin with ID17050114.
[2] Lower Boise River – based on flow, concentration, and load duration curve for May 1 – September 30, 1987 through 2012.
Mason Creek – based on USGS mean data from May 1 – September 30, 1995 through 2012.
Sand Hollow – based on ISDA and USGS mean data from May 1 – September 30, 1998 through 2012.
[3] Lower Boise River - current loads and load capacities are estimated using flow, concentration, and load duration curves for the range of flows.
Mason Creek and Sand Hollow Creek – current loads and load capacities are estimated using a portion of the standard pollutant mixing equation with a built-in conversion factor: (conc×flow×5.39) (Hammer 1986).

[4] For NPDES purposes, TP allocations and load reductions in this table are intended as monthly values to correspond with appropriate monthly flows.
[5] Flows, TP concentrations, and loads were measured and identified during the USGS August 2012 synoptic sample (Etheridge 2013).

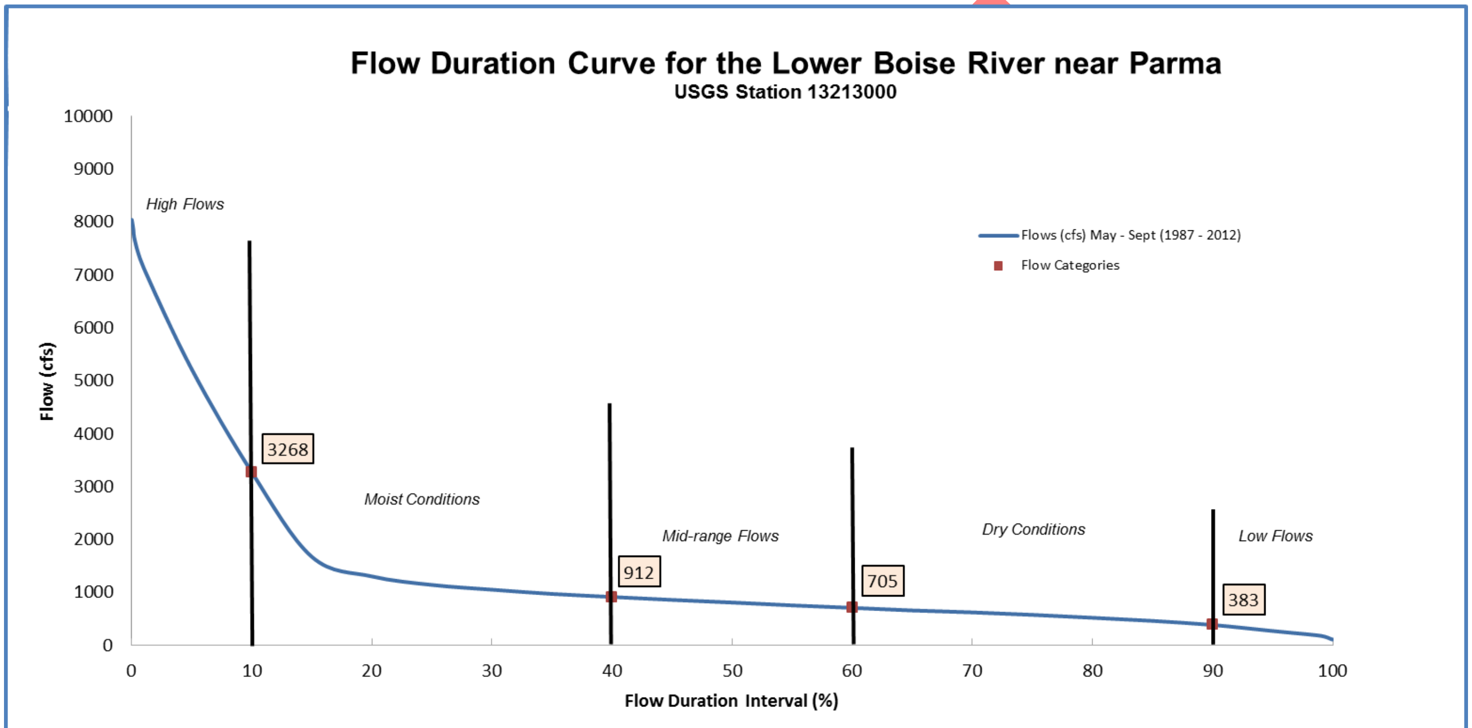



**Figure 2. Flow duration curve for the lower Boise River near Parma from May – September, 1987-2012.**

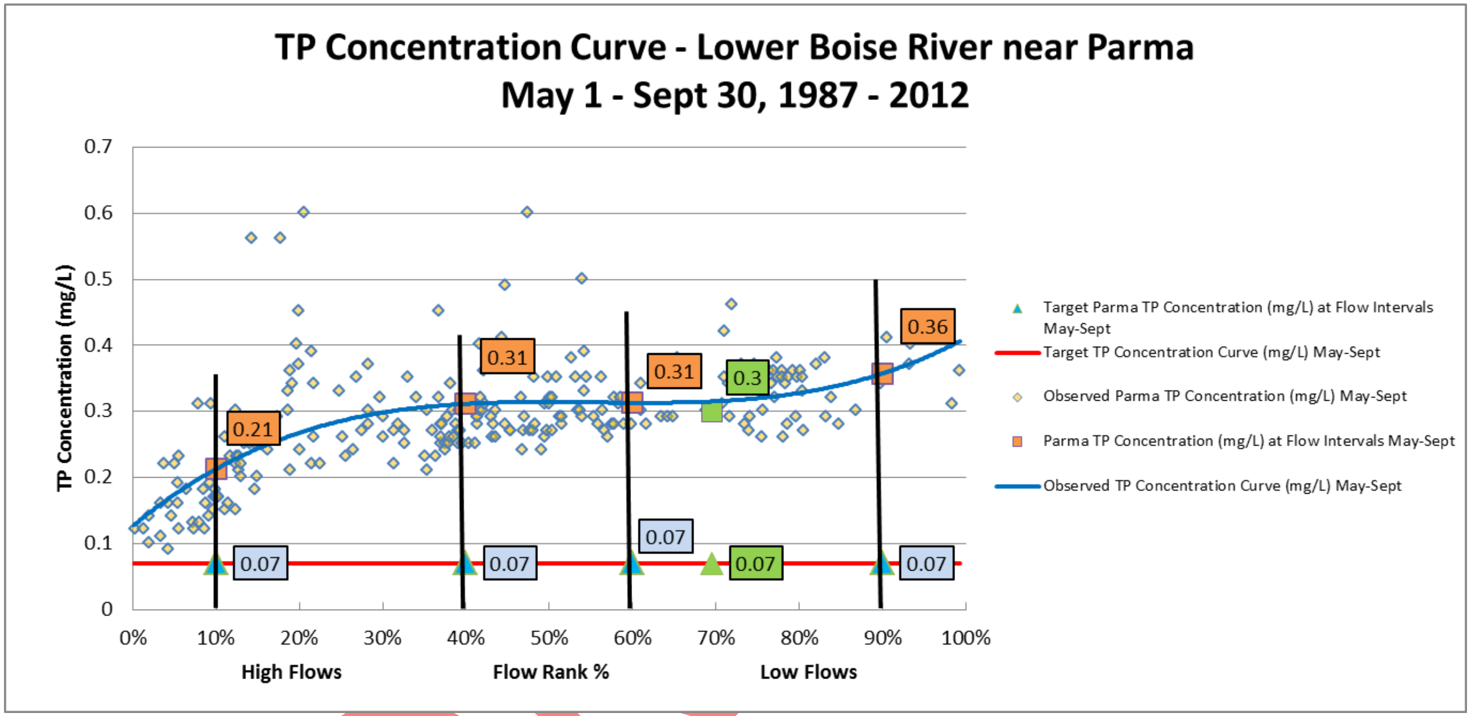



**Figure 3. Existing TP concentration for the lower Boise River in relation to the concentration target of ≤ 0.07 mg/L May - September.**

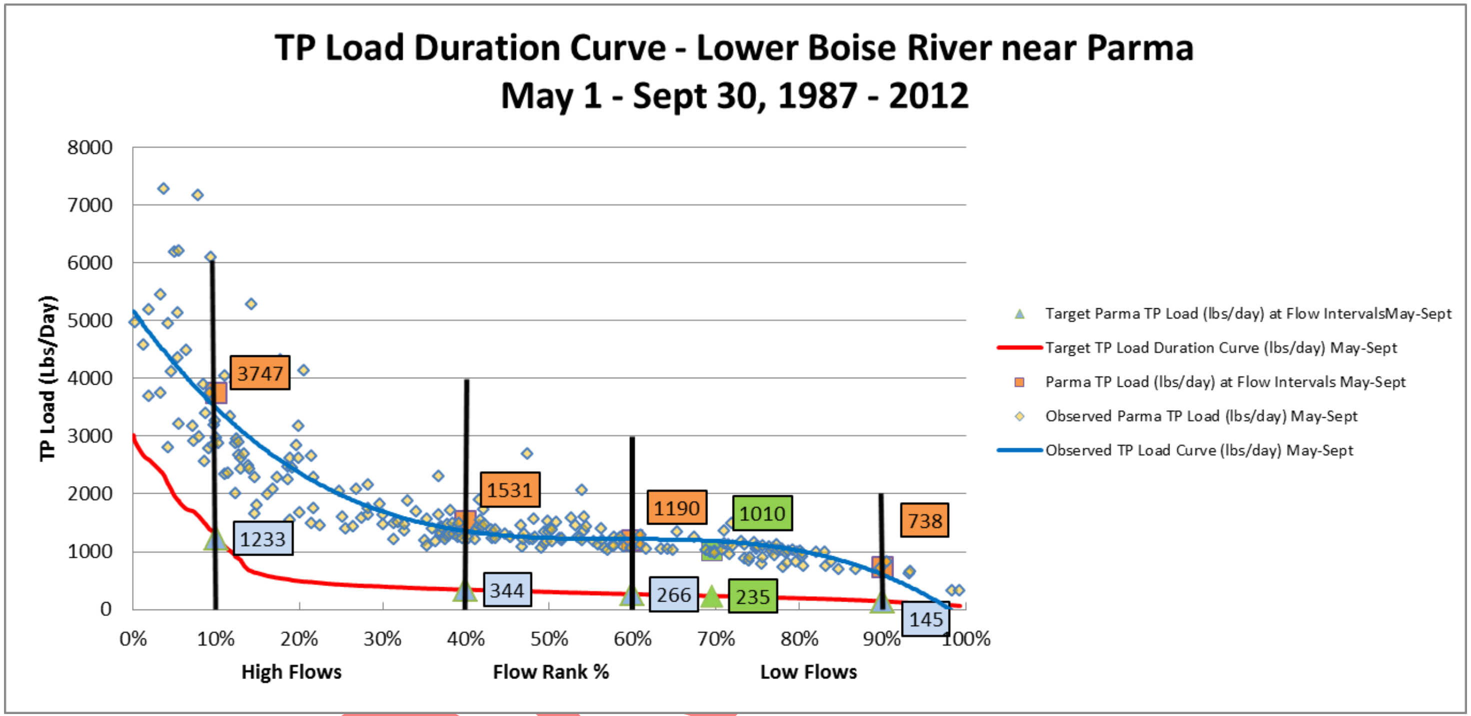



**Figure 4. Existing TP load duration for the lower Boise River in relation to the load duration target mass equivalent of ≤ 0.07 mg/L May – September.**

**Table 3. Gross load and wasteload allocations and TP reductions for the lower Boise River, May 1 – September 30. The green highlight represents data adjusted from the USGS August 2012 mass balance model for the lower Boise River (Etheridge 2013).**

| | TP Inputs into the Boise River | | | | TP Loads in the Boise River near Parma | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Parma Flow | Current TP Inputs | TP Input Allocations | TP Input Reductions | | Current Parma TP Load | Current Parma TP Conc. | Parma TP Target (0.07 mg/L) | Parma TP Load Allocations | Parma TP Conc. Allocations | Parma TP Load Reductions | |
| (cfs) | (lbs/day) | (lbs/day) | (lbs/day) | % | (lbs/day) | mg/L | (lbs/day) | (lbs/day) | mg/L | (lbs/day) | % |
| 3268 | 1490 | 444 | -1046 | 70% | 3747 | 0.21 | 1233 | 1117 | 0.063 | -2630 | 70% |
| 912 | 2995 | 652 | -2342 | 78% | 1531 | 0.31 | 344 | 333 | 0.068 | -1197 | 78% |
| 705 | 2942 | 640 | -2302 | 78% | 1190 | 0.31 | 266 | 259 | 0.068 | -931 | 78% |
| 624 | 2916 | 676 | -2240 | 77% | 1010 | 0.30 | 235 | 234 | 0.070 | -776 | 77% |
| 383 | 3019 | 577 | -2442 | 81% | 738 | 0.36 | 145 | 141 | 0.068 | -597 | 81% |

**Table 4. Current TP loads estimated by sector for the lower Boise River, May 1 – September 30. The green highlight represents data directly attributed to the USGS August 2012 mass balance model for the lower Boise River (Etheridge 2013).**

| Parma Flow | Current Background TP Inputs | | Current WWTF TP Inputs | | | Current Tributary TP Inputs w/o WWTFs | | | Current Ground Water TP Inputs | | | Current Storm Water TP Inputs | Current TP Inputs | Current Parma TP Load | TP Inputs Reaching Parma |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cfs) | (mg/L) | (lbs/day) | (cfs) | (mg/L) | (lbs/day) | (cfs) | (mg/L) | (lbs/day) | (cfs) | (mg/L) | (lbs/day) | (lbs/day) | (lbs/day) | (lbs/day) | (%) |
| 3268 | 0.02 | 352 | 117.9 | 2.37 | 1504 | 850 | 0.25 | 1163 | -1390 | 0.21 | -1573 | 44 | 1490 | 3747 | 252% |
| 912 | 0.02 | 98 | 117.9 | 2.37 | 1504 | 850 | 0.25 | 1163 | 164 | 0.21 | 186 | 44 | 2995 | 1531 | 51% |
| 705 | 0.02 | 76 | 117.9 | 2.37 | 1504 | 834 | 0.22 | 979 | 300 | 0.21 | 340 | 44 | 2942 | 1190 | 40% |
| 624 | 0.01 | 34 | 84.0 | 3.18 | 1440 | 888 | 0.18 | 880 | 485 | 0.21 | 562 | | 2916 | 1010 | 35% |
| 383 | 0.02 | 41 | 117.9 | 2.37 | 1504 | 834 | 0.22 | 979 | 398 | 0.21 | 450 | 44 | 3019 | 738 | 24% |

[1] Background is calculated as the potential TP load at Diversion Dam that could reach Parma (assuming 100% reaches Parma) based on long-term median data. The USGS August 2012 synoptic data identified TP background as 0.1 mg/L (Etheridge 2013), which could result in a potential Parma load of 34 lbs/day.

[2] WWTF data are calculated for May 1 – September 30, 2012, and represent all facilities identified in Table 22Table 1. The USGS August 2012 synoptic sample data represent only WWTF contributions from Lander, West Boise, Meridian, Middleton, Nampa, and Caldwell facilities (Etheridge 2013).

[3] Mean tributary flows of 850 and 834 cfs are estimated to occur when daily mean Boise River flows near Parma are ≤ 912 and > 912 cfs, respectively. Tributary data were calculated by removing all WWTF flows, concentrations, and loads that discharge into tributaries. The USGS August 2012 synoptic sample calculated tributaries by removing the contributions from only the Meridian and Nampa facilities (Etheridge 2013).

[4] Ground water was estimated using the USGS August 2012 mass balance model to adjust likely groundwater contributions, including ground water loss (e.g. -1390 cfs) under various flow scenarios (Alex Etheridge pers. comm. 2014). The USGS August 2012 synoptic identified ground water flows as 485 cfs with 0.21 mg/L concentration (Etheridge 2013).

[5] Stormwater contributions were estimated based on the 2008 Lower Boise River Implementation Plan Total Phosphorus (DEQ 2008). It is assumed that approximately 25% of annual precipitation occurs during the May – September months from 1981 through 2010 (WRCC 2010).

[6] USGS August 2012 mass balance model identified the total diversions as -1,590 cfs at 0.22 mg/L TP, resulting in 1,890 lbs/day of TP.

**Table 5. Gross load and wasteload allocations by sector for the lower Boise River, May 1 – September 30. The green highlight represents data adjusted from the USGS August 2012 mass balance model for the lower Boise River (Etheridge 2013).**

| Parma Flow | Background TP Allocations | | Projected WWTF Flow and TP Allocations | | | Tributary TP Allocations w/o WWTF Projected Flows and Loads | | | Ground Water TP Allocations | | | Storm Water TP Allocations | TP Input Allocations | TP Inputs Reaching Parma | Parma TP Load Allocations |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cfs) | (mg/L) | (lbs/day) | (cfs) | (mg/L) | (lbs/day) | (cfs) | (mg/L) | (lbs/day) | (cfs) | (mg/L) | (lbs/day) | (lbs/day) | (lbs/day) | (%) | (lbs/day) |
| 3268 | 0.02 | 352 | 152.7 | 0.30 | 247 | 783 | 0.1 | 422 | -1390 | 0.08 | -599 | 22 | 444 | 252% | 1117 |
| 912 | 0.02 | 98 | 152.7 | 0.15 | 123 | 783 | 0.08 | 338 | 164 | 0.08 | 71 | 22 | 652 | 51% | 333 |
| 705 | 0.02 | 76 | 152.7 | 0.10 | 82 | 767 | 0.08 | 331 | 300 | 0.08 | 129 | 22 | 640 | 40% | 259 |
| 624 | 0.01 | 34 | 105.5 | 0.09 | 51 | 885 | 0.08 | 382 | 485 | 0.08 | 209 | | 676 | 35% | 234 |
| 383 | 0.02 | 41 | 152.7 | 0.09 | 74 | 767 | 0.07 | 289 | 398 | 0.07 | 150 | 22 | 577 | 24% | 141 |

[1] Background is calculated as the potential TP load at Diversion Dam that could reach Parma (assuming 100% reaches Parma) based on long-term median data. The USGS August 2012 synoptic data identified TP background as 0.1 mg/L (Etheridge 2013), which could result in a potential Parma load of 34 lbs/day.

[2] WWTF data are based on projected facility flows, and represent all facilities identified in Table 22. The USGS August 2012 synoptic sample data represent only WWTF contributions from Lander, West Boise, Meridian, Middleton, Nampa, and Caldwell facilities (Etheridge 2013).

[3] Mean tributary flows of 783 and 767 cfs are projected to occur when daily mean Boise River flows near Parma are ≤ 912 and > 912 cfs, respectively. Tributary data were calculated by removing all projected WWTF flows, concentrations, and loads that discharge into tributaries. The USGS August 2012 synoptic sample calculated tributaries by removing the contributions from only the Meridian and Nampa facilities (Etheridge 2013).

[4] Ground water was estimated using the USGS August 2012 mass balance model to adjust likely groundwater contributions, including ground water loss (e.g. -1390 cfs) under various flow scenarios (Alex Etheridge pers. comm. 2014). The USGS August 2012 synoptic identified ground water flows as 485 cfs with 0.21 mg/L concentration (Etheridge 2013).

[5] Stormwater allocations were reduced by 50% from the current estimate of 44 lbs/day. It is assumed that approximately 25% of annual precipitation occurs during the May – September months from 1981 through 2010 (WRCC 2010).

## Allocations – Mean Benthic Chlorophyll a < 150 mg/$m^2$

TP load reductions needed to help meet the mean benthic chlorophyll a biomass target of ≤ 150 mg/$m^2$ in the lower Boise River.

To Be Determined based on AQUATOX/Mass Balance modeling results and continued WAG/TAC discussions…

**Table 6. Total Phosphorus load allocations for the lower Boise River, for XXX – XXX (based on AQUATOX modeling).**

| Water Body[1] | Flow (cfs) | Current Load[2] | | Load Capacity | | Load Reduction (lbs/day [%]) |
|---|---|---|---|---|---|---|
| | | TP Concentration[3] (mg/L) | TP Load[4] (lbs/day) | TP Concentration (mg/L)[5] | TP Load (lbs/day) | |

## 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 Lower Boise Watershed Council (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 2014, 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 previously completed lower Boise River subbasin assessments, TMDLs and addendums (DEQ 1999, 2003, 2008, 2009, 2010b, 2012). Addendums address waters within a hydrologic unit code (HUC) that did not previously receive a TMDL for a specific pollutant, or they update the TMDL for a specific pollutant with an existing EPA approved TMDL. This TMDL addendum 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

The lower Boise River watershed is one of the more complex watersheds in Idaho (Figure 5; DEQ 2009). Sources of phosphorus are diverse due to the land ownership and management in the watershed (Figure 6) and include: wastewater treatment discharges, stormwater runoff, agricultural runoff, background (from Lucky Peak Reservoir releases), and ground water return flows. Phosphorus from these sources is routed through a physically complex network of river, tributaries, and irrigation conveyances. Figure 7 shows the subwatershed delineations that are operated, in part, based on this conveyance network (DEQ 2009). Figure 8 provides a simplified schematic of the diversions, drains, and tributaries along the lower Boise River (Etheridge 2013), while Figure 9 displays the daily mean flows at the upper end of the lower Boise River at Diversion Dam relative to those near the mouth at Parma.

The following description comes from the 1999 Lower Boise River TMDL Subbasin Assessment (DEQ 1999):

"The presence of upper Boise (Anderson Ranch and Arrowrock) and lower Boise (Lucky Peak, Diversion Dam, and Barber Dam) reservoirs and dams, numerous diversions, and local flood control policies have significantly altered the flow regime and the physical and biological characteristics of the lower Boise River.

Lucky Peak Dam, the structure controlling flow at the upstream end of the watershed, was constructed and began regulating flow in 1957. Water is released from the reservoir to the Boise River just a few miles upstream from Boise. Water releases from the reservoir are managed primarily for flood control and irrigation. Other management considerations include power generation, recreation, maintenance of minimum stream flows during low flow periods and release of water to augment salmon migration flows in the Snake River.

Flow regulation for flood control has replaced natural, short duration (two to three months), flushing peak flows with longer (four to six months), greatly reduced, peak flows. Water management has increased discharge during the summer irrigation season and significantly decreased winter low flows.

The regulated annual hydrograph can be divided into three flow regimes. Low flow conditions generally begin in mid-October when irrigation diversions end. The low flow period extends until flood control releases begin, sometime between the end of January and March. Flood flows generally extend through June, and releases for irrigation control flows from July through mid-October.

The U.S. Bureau of Reclamation (USBR) reserves 102,300 acre-feet of storage to maintain instream flows during the winter low flow period. Storage water provides winter instream flows of 80 cfs from Lucky Peak Dam. The Idaho Fish and Game (IDFG) seeks a minimum target release of 150 cfs for fish protection. IDFG has secured 50,000 acre-feet of storage water in Lucky Peak Reservoir to augment winter low flows. With both of these sources it is frequently possible to maintain winter flows of 240 cfs. Flood season flows for the Boise River below Lucky Peak Dam range from about 2000 to 6500 cfs. Irrigation season flows typically range from 2000 to 4000 cfs."

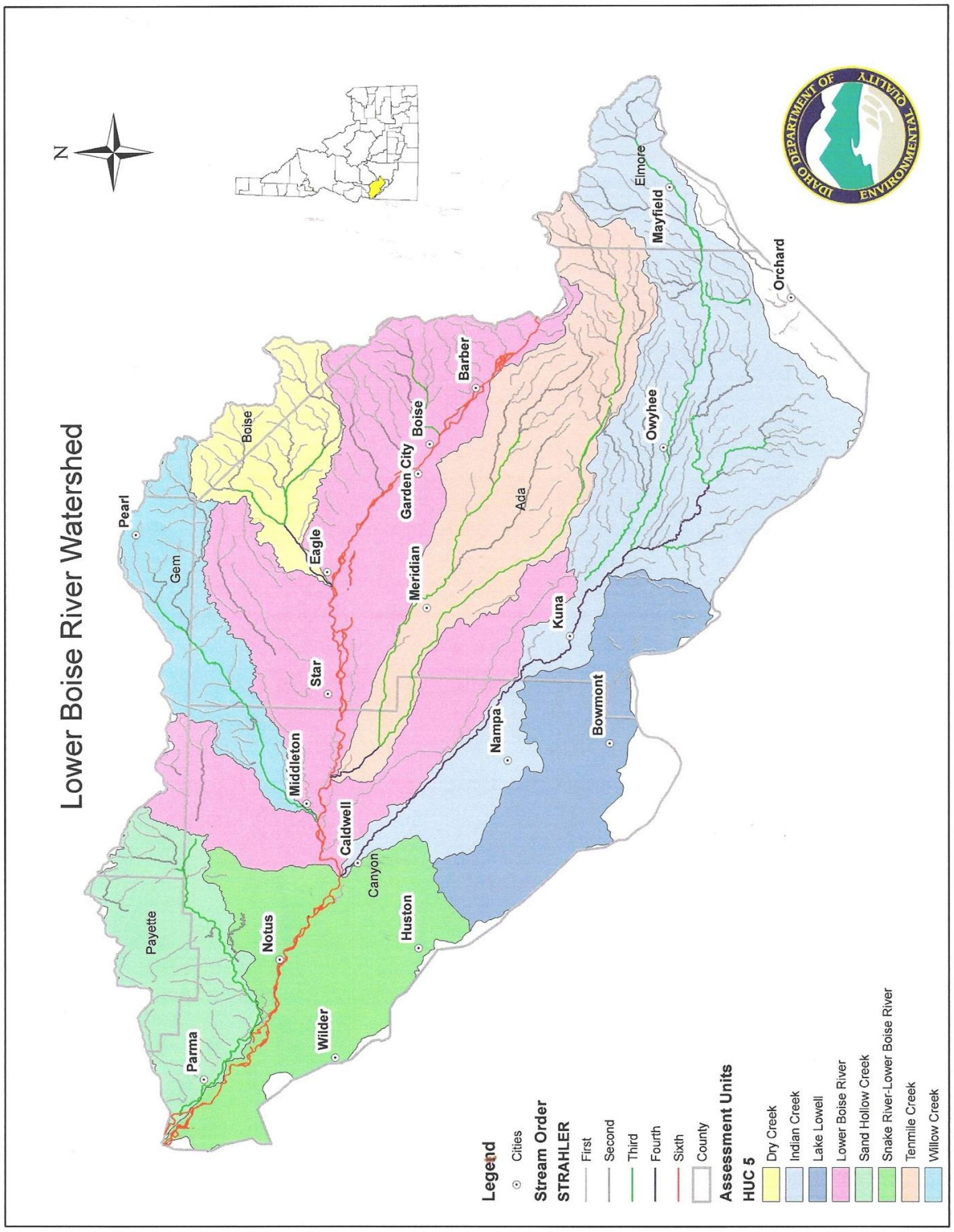



**Figure 5. The lower Boise River subbasin and delineation of subwatersheds (DEQ 2009).**

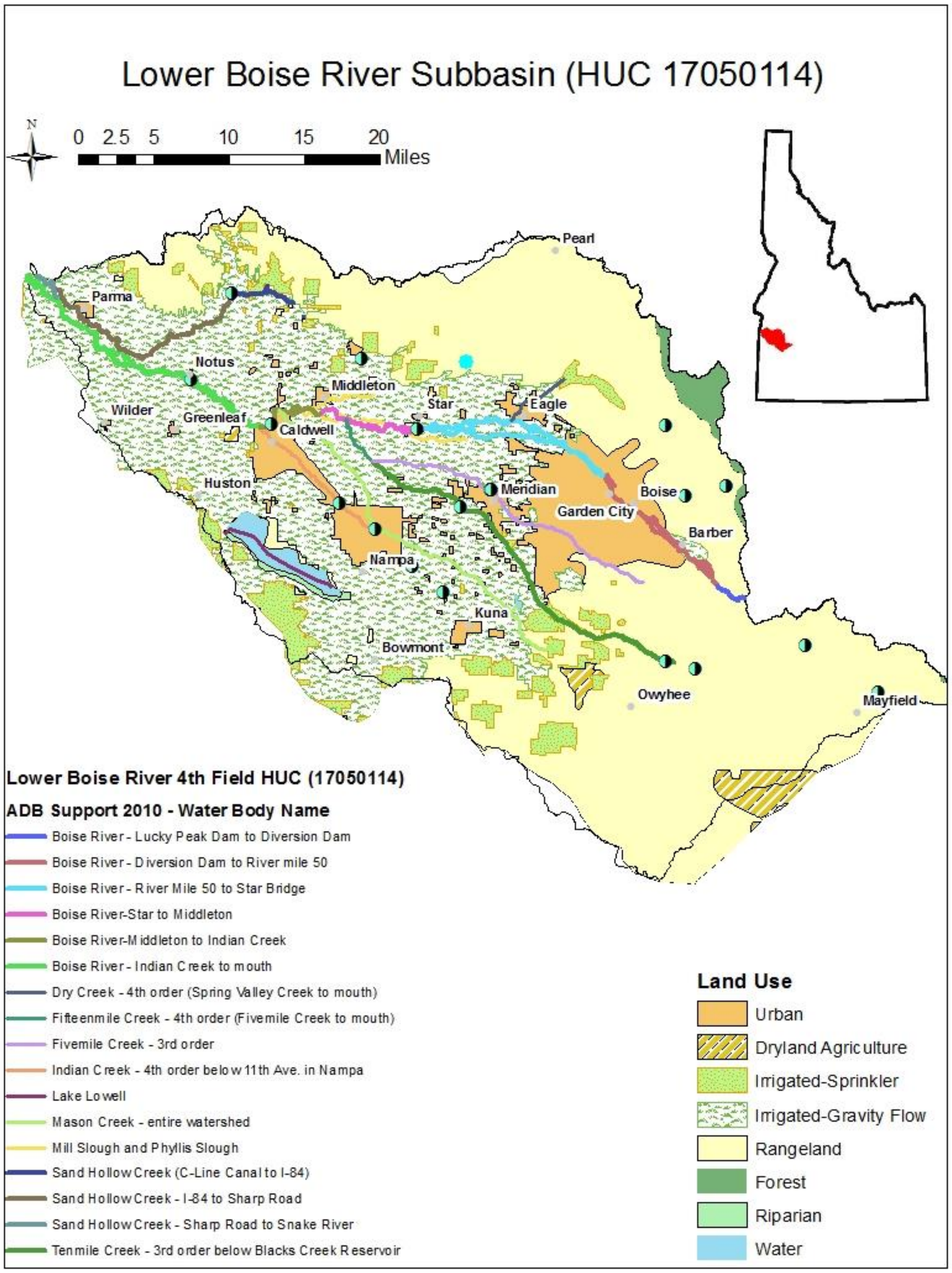



**Figure 6. Land use in the lower Boise River Subbasin.**

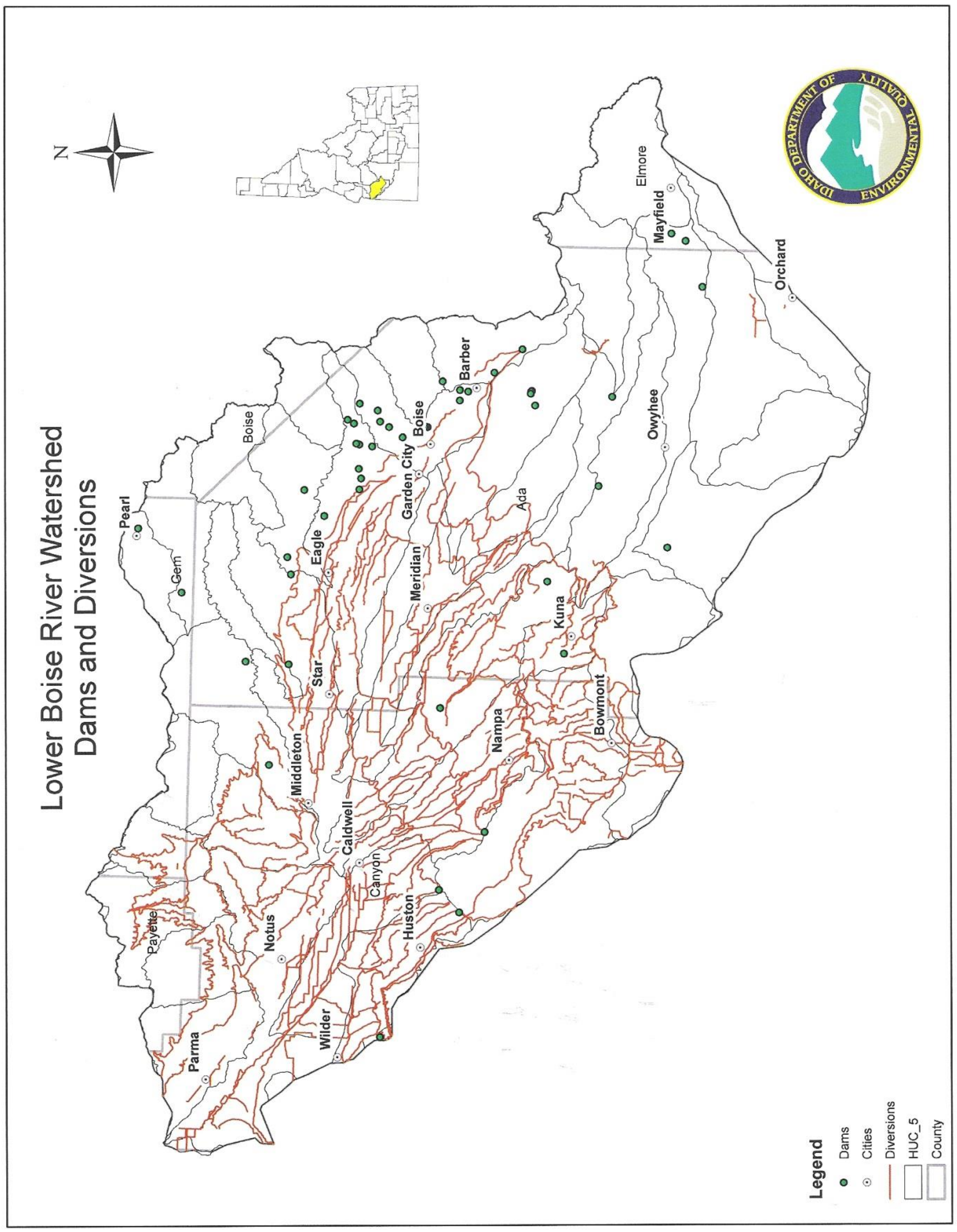



**Figure 7. Lower Boise River dams and diversions (canals) permitted through the Idaho Department of Water Resources (IDWR) (DEQ 2009).**

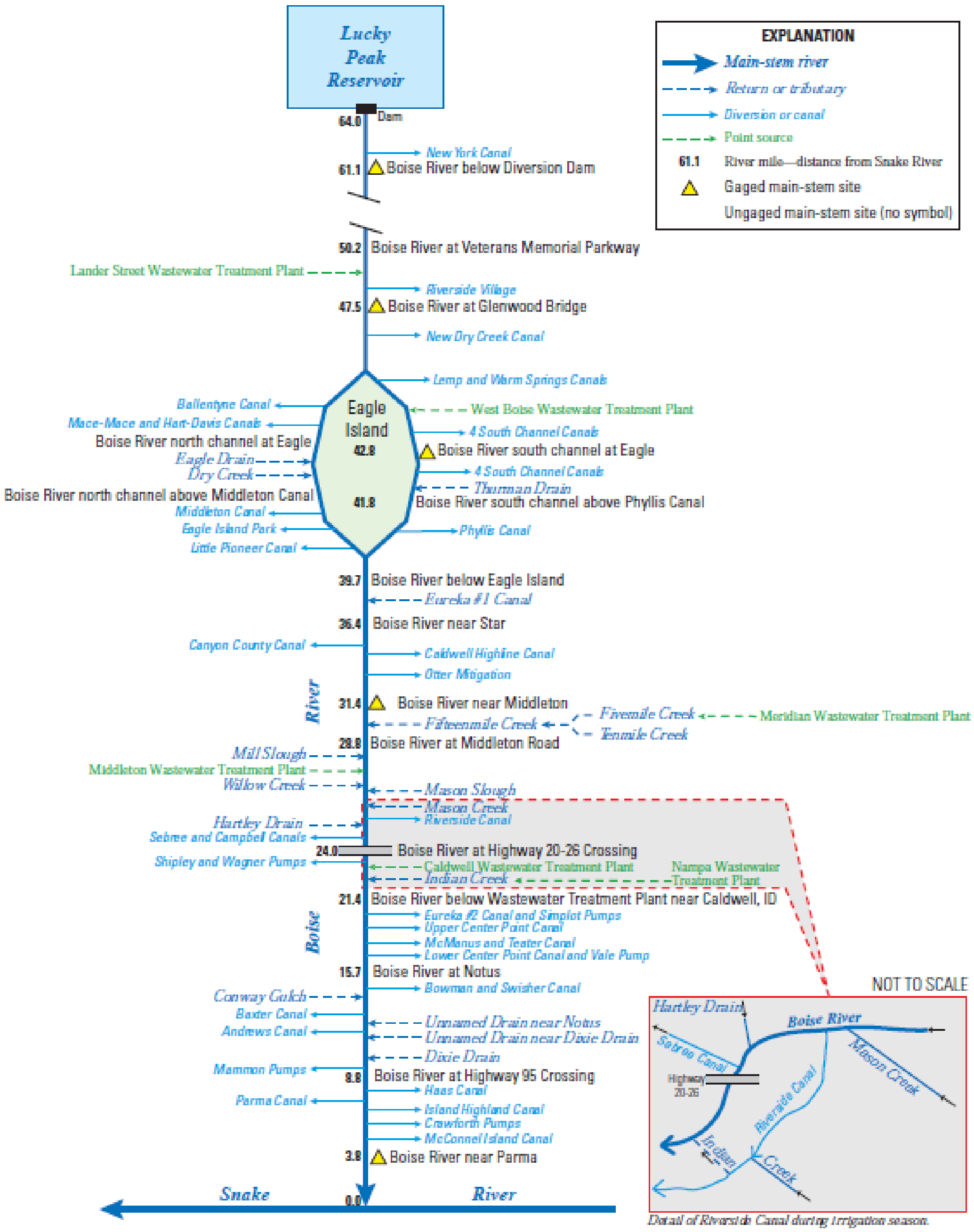



**Figure 8. Diversions, drains, and tributaries along the lower Boise River, southwestern Idaho (Etheridge 2013).**

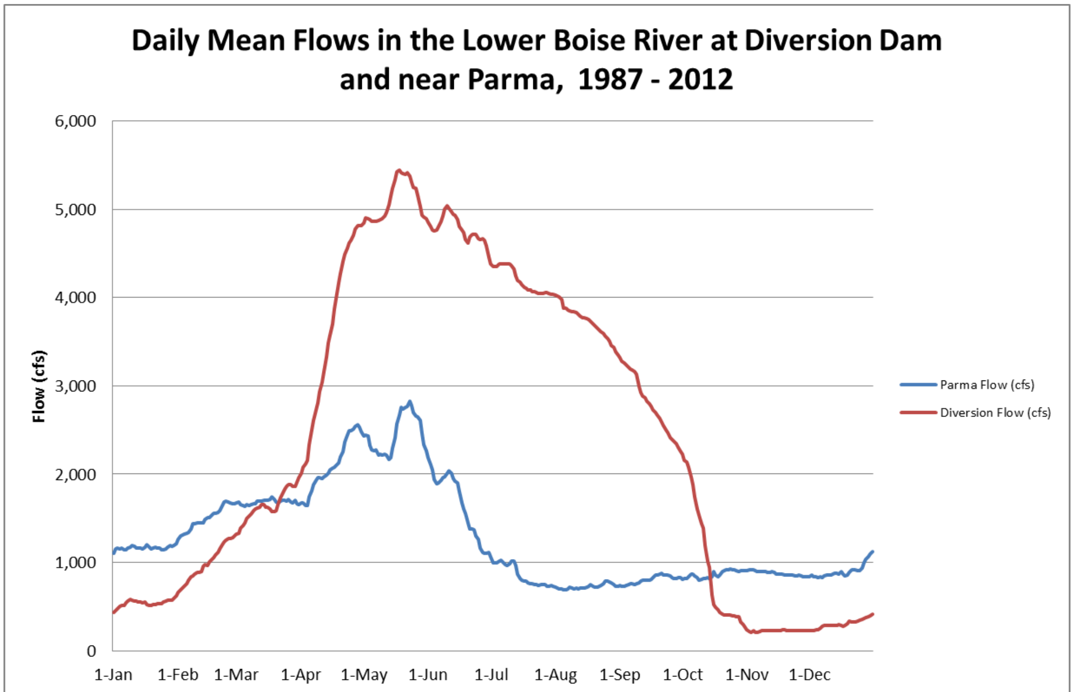



**Figure 9. Daily mean flows (cfs) in the lower Boise River at Diversion Dam (USBR data) and near Parma (USGS stream gage 13213000) from 1987 through 2012.**



### Lower Boise River

The addendum addresses two lower Boise River main stem AUs identified as impaired on the 2010 §303(d) list (Figure 10):

- 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

This addendum addresses one Mason Creek AU identified as impaired on the 2010 §303(d) list (**Figure 10**):

- 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

The addendum addresses one Mason Creek AU identified as impaired on the 2010 §303(d) list (**Figure 10**):

- 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. However, the headwaters are located in Gem and Payette Counties, north of the town of Notus along the topography separating the lower Boise River and lower Payette River subbasins. 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 approximately one mile north of the Boise River.

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*

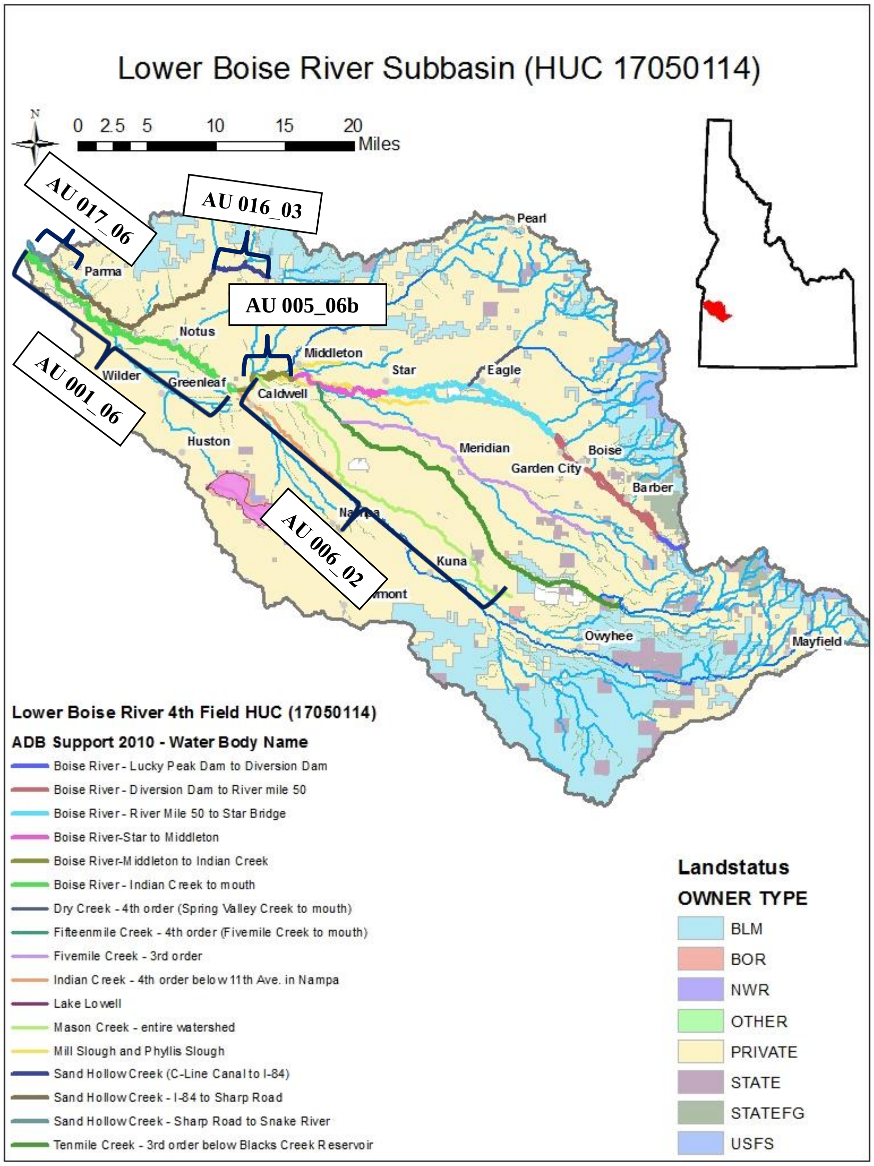



**Figure 10. The lower Boise River subbasin. The impaired AUs specifically addressed in this TMDL addendum are identified by their AU number on the map (impaired AUs in this TMDL addendum begin with 17050114).**

# 2 Subbasin Assessment—Water Quality Concerns and Status

This section identifies §303(d)-listed waters that are addressed in the TMDL, listing history, and the rationales for listing, the listed pollutants, and a summary and analyses of existing water quality data in the subbasin.

## 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.

Listed Waters The two AUs on the main stem lower Boise River 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 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 return the lower Boise River 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*

Table 7 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.

The two AUs on the main stem lower Boise River 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 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 return the lower Boise River 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*

**Table 7. 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 8.

**Table 8. 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–<br>Middleton to Indian Creek | ID17050114SW005_06b | COLD, SS, PCR | Designated |
| Boise River–<br>Indian Creek to Mouth | ID17050114SW001_06 | COLD, PCR | Designated |
| Mason Creek–<br>Entire Watershed | ID17050114SW006_02 | COLD<br>SCR | Presumed<br>Designated |
| Sand Hollow Creek–<br>C-Line Canal to I-84 | ID17050114SW016_03 | COLD<br>SCR | Presumed<br>Designated |
| Sand Hollow Creek–<br>Sharp Road to Snake River | ID17050114SW017_06 | COLD<br>SCR | Presumed<br>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 9).

**Table 9. 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<br>*E. coli*/100 mL[b] | <126<br>*E. coli*/100 mL | — | — |
| • Single sample | ≤406<br>*E. coli*/100 mL | ≤576<br>*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<br>**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<br>**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)

In consultation with the LBWC, DEQ has identified a numeric target to describe nuisance aquatic growth that may impair AUs of the lower Boise River: benthic (periphyton) chlorophyll a biomass $\leq$ 150 mg/m$^2$. The target was based largely on work conducted in Montana in which 70% of the public identified periphyton biomass of $\leq$ 150 mg/m$^2$ as acceptable for recreation. In contrast, less than 30% of the public identified $\geq$ 200 mg/m$^2$ as acceptable for recreation (Suplee et al. 2009). The target is consistent with other locations, including Montana, Minnesota, Colorado, and the Clark Fork River, for which the seasonal maximum periphyton target is 150 $mg/m^2$ (TSIC 1998, MDEQ 2008, CDPHE 2012, MPAC 2013).

Additional scientific findings support the use of a benthic chlorophyll a target of $\leq$150 $mg/m^2$ as appropriate for recreation and cold water aquatic life beneficial uses. For example, nuisance aquatic algae are likely attained between 100 and 200 $mg/m^2$ and enriched waters often have benthic chlorophyll a concentrations > 150 $mg/m^2$ (Welch et al. 1988, Dodds and Welch 2000). Biggs (2000) asserted that chlorophyll-a biomass levels > 150-200 $mg/m^2$ are very conspicuous in streams, are probably unnaturally high, and can compromise the use of rivers for contact recreation and productive sports fisheries (Welch et al. 1988, Dodds et al. 1998). Some of the management problems caused by enrichment, and associated benthic algal proliferations, include aesthetic degradation, alteration of fish and invertebrate communities nutrient enrichment and algae proliferation, and degradation of water quality (particularly dissolved oxygen and pH) (e.g.Miltner and Rankin 1998, Welch et al. 1988, Biggs 2000, Miltner 2010). Further, research indicates that total nutrients provide better overall correlation to eutrophication in streams than do soluble nutrients and that TN and TP may be minimum acceptable nutrient criteria (Dodds et al. 1997).

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 11).

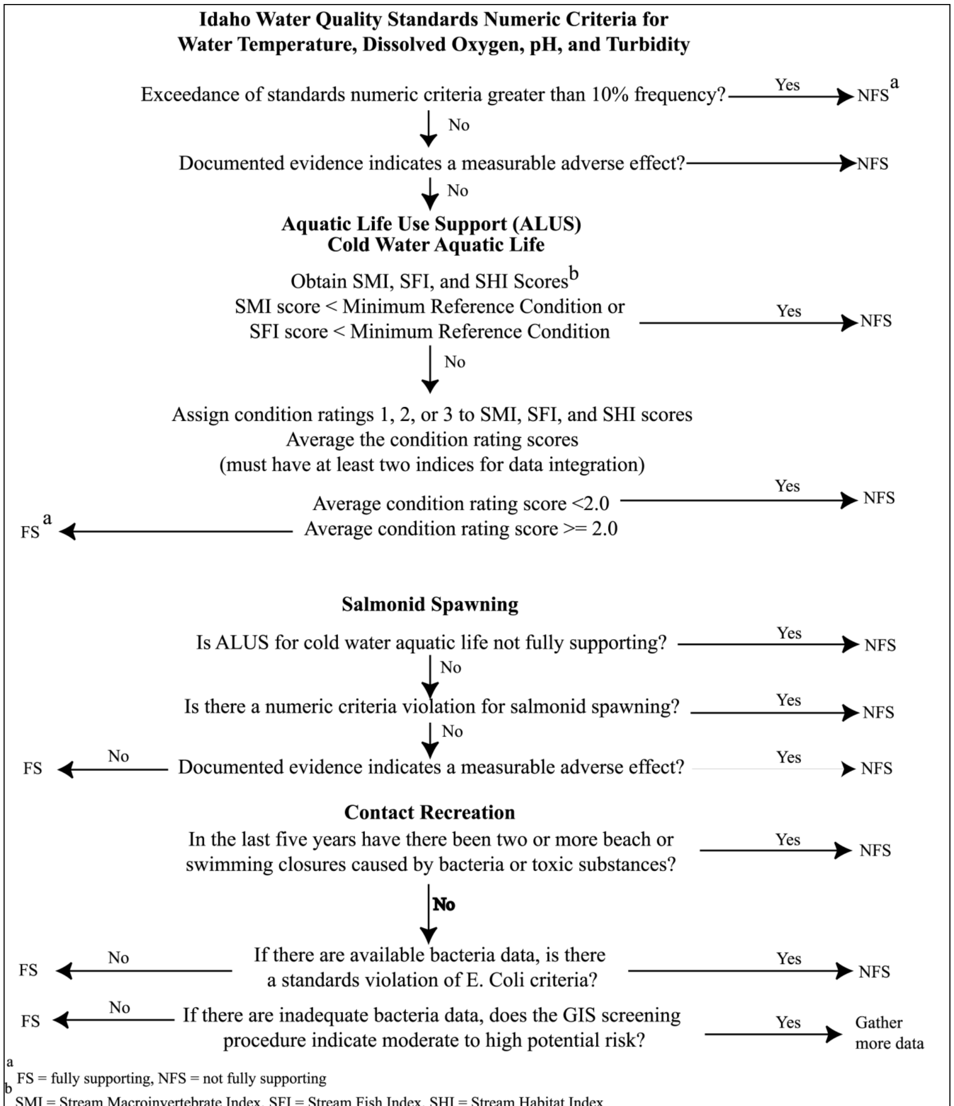



**Figure 11. Determination steps and criteria for determining support status of beneficial uses in wadeable streams (Grafe et al. 2002).**

## 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, water quality and quantity data have continued to be collected in the lower Boise River subbasin by DEQ, USGS, ISDA, municipalities, and other agencies and organizations (see Appendix B – Data Sources).

### Lower Boise River

The DEQ Beneficial Use Reconnaissance Program (BURP) has monitored several sites on the lower Boise River and within the subbasin (Figure 12). However, due to higher flows in the lower Boise River than are typically feasible for completing BURP activities, BURP protocol could not be completed at these main stem sties, yielding limited data collection and analyses (specifically stated in the 1995SBOIC029 site data, and presumed for the remaining two main stem sites). 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/*.

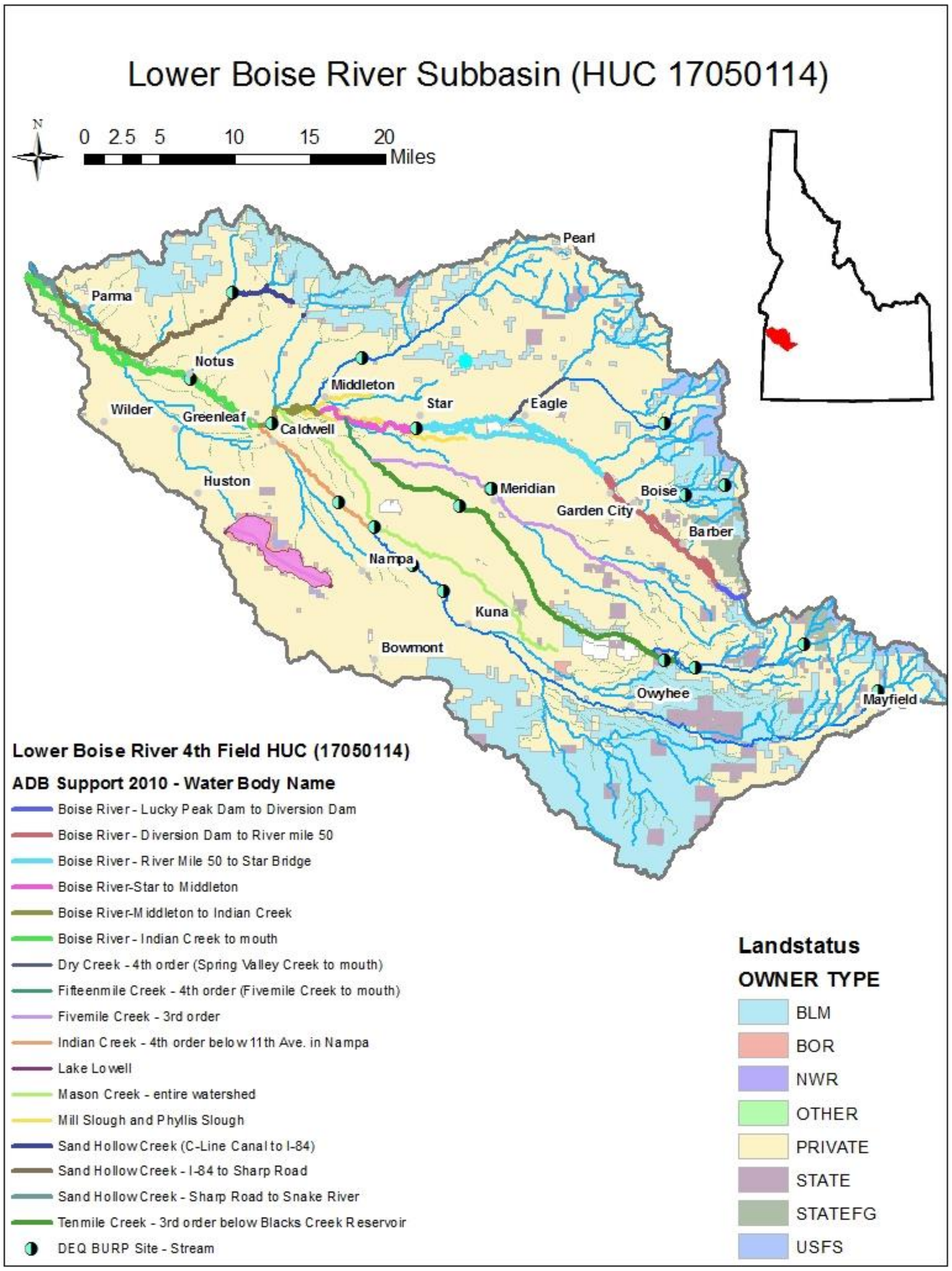
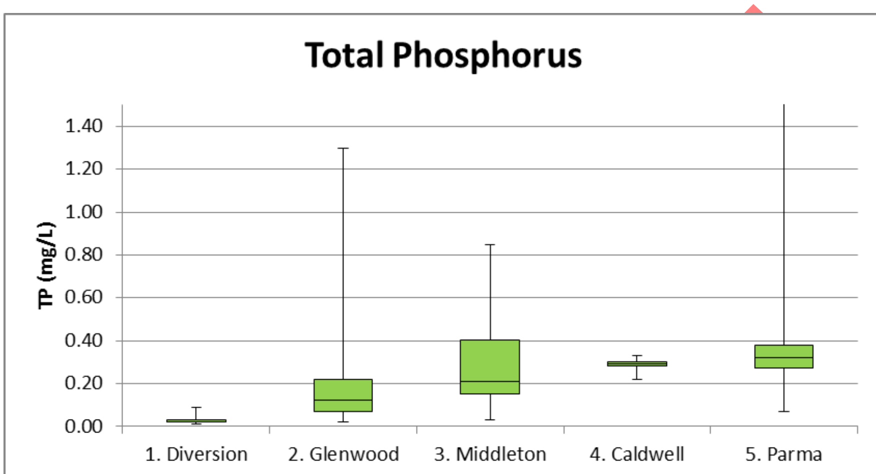



**Figure 12. DEQ BURP sites in the lower Boise River Subbasin.**

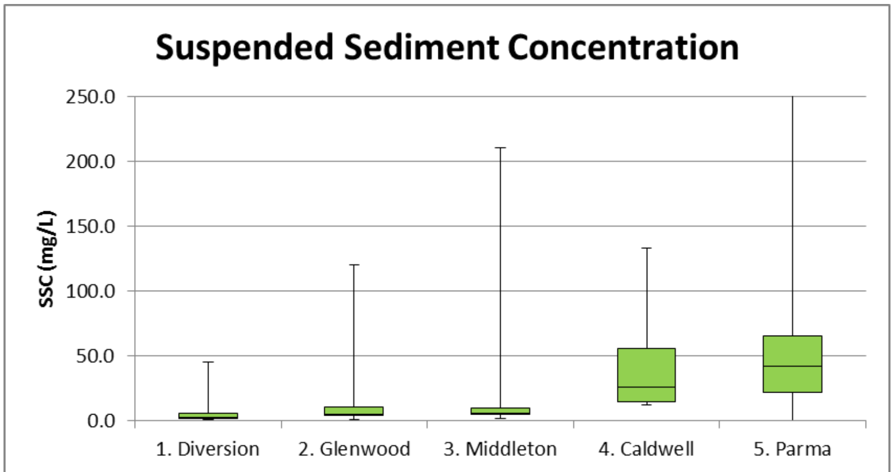
Over the past several decades, water quality and habitat data have been collected in the lower Boise River subbasin. Historical USGS water quality data on the lower Boise River illustrate variable upstream to downstream patterns depending on the water quality constituent of interest. For example, median TP concentrations at Glenwood Bridge (0.12 mg/L) are approximately 6 times greater than at Diversion Dam (0.02 mg/L); whereas, subsequent TP concentration near Parma (0.32 mg/L) are only 2.7 times greater than at Glenwood Bridge (Figure 13). The TP concentrations in the Boise River near Parma are approximately 16 times greater than at the upstream monitoring location of Diversion Dam.




| | 1. Diversion | 2. Glenwood | 3. Middleton | 4. Caldwell | 5. Parma |
|---|---|---|---|---|---|
| Average | 0.03 | 0.18 | 0.29 | 0.29 | 0.33 |
| Min | 0.01 | 0.02 | 0.03 | 0.22 | 0.07 |
| Q1 | 0.02 | 0.07 | 0.15 | 0.28 | 0.27 |
| Median | 0.02 | 0.12 | 0.21 | 0.29 | 0.32 |
| Q3 | 0.03 | 0.22 | 0.40 | 0.30 | 0.38 |
| Max | 0.09 | 1.30 | 0.85 | 0.33 | 3.90 |

**Figure 13. Total phosphorus data collected by USGS on the lower Boise River between 1969 and 2013. The green boxes, indicate the 25th and 75th data percentiles and are parted by the line representing the median value. The error bars indicate the maximum and minimum observed values. Note, although not fully shown on the figure, the Parma maximum TP value reaches 3.9 mg/L.**

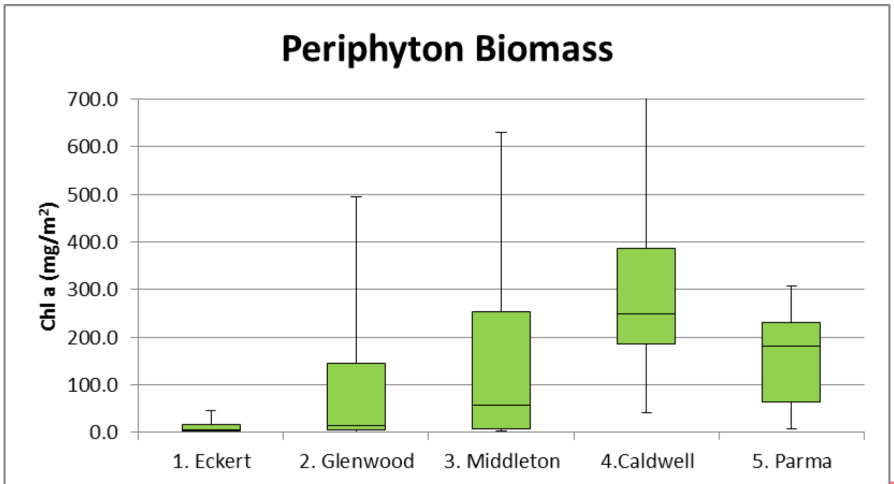
Historical USGS suspended sediment concentration (SSC) data show a similar, but slightly different gradient (Figure 14). Median SSC values increase by approximately 1.2 to 1.7 times greater from each upstream monitoring station, with the exception of Caldwell. Median SSC values at Caldwell (26.0 mg/L) are approximately 4.3 times greater than those at Middleton (6.0 mg/L). However, similar to TP, SSC in the Boise River near Parma are approximately 14 times greater than at the upstream monitoring location of Diversion Dam.




| | 1. Diversion | 2. Glenwood | 3. Middleton | 4. Caldwell | 5. Parma |
|---|---|---|---|---|---|
| Average | 5.8 | 11.2 | 11.4 | 45.8 | 55.7 |
| Min | 1.0 | 1.0 | 2.0 | 12.0 | 0.0 |
| Q1 | 2.0 | 4.0 | 5.0 | 14.5 | 22.0 |
| Median | 3.0 | 5.0 | 6.0 | 26.0 | 42.0 |
| Q3 | 6.0 | 10.5 | 10.3 | 55.8 | 65.5 |
| Max | 45.0 | 120.0 | 211.0 | 133.0 | 664.0 |

**Figure 14. Suspended sediment concentration (SSC) data collected by USGS on the lower Boise River between 1972 and 2013. The green boxes, indicate the 25th and 75th data percentiles, and are parted by the line representing the median value. The error bars indicate the maximum and minimum observed values. Note, although not fully shown on the figure, the Parma maximum SSC value reaches 664 mg/L.**

USGS periphyton chlorophyll a biomass data show different gradient variation (Figure 15). Median chlorophyll a biomass is approximately 2.7 times at Glenwood Bridge (13.9 mg/m$^2$) than Eckert Road (5.0 mg/m$^2$). The median chlorophyll a biomass increases from Glenwood and Middleton (58.2 mg/m$^2$), and Middleton to Caldwell (249.0 mg/m$^2$) by approximately 4.2 times each. Conversely, median chlorophyll a biomass at Parma (181.0 mg/m$^2$) actually decreases by approximately 30% relative to Caldwell.




| | 1. Eckert | 2. Glenwood | 3. Middleton | 4.Caldwell | 5. Parma |
|---|---|---|---|---|---|
| Average | 11.4 | 90.7 | 149.5 | 308.5 | 157.7 |
| Min | 0.0 | 0.0 | 2.5 | 41.7 | 8.3 |
| Q1 | 1.9 | 4.7 | 8.5 | 185.8 | 63.0 |
| Median | 5.0 | 13.9 | 58.2 | 249.0 | 181.0 |
| Q3 | 17.5 | 144.8 | 254.5 | 387.5 | 232.0 |
| Max | 46.0 | 496.0 | 630.0 | 933.0 | 307.0 |

**Figure 15. Periphyton chlorophyll a biomass data collected by USGS on the lower Boise River between 1995 and 2013. The green boxes, indicate the 25th and 75th data percentiles, and are parted by the line representing the median value. The error bars indicate the maximum and minimum observed values. Note, although not fully shown on the figure, the Caldwell maximum chlorophyll a biomass value reaches 933 mg/m$^2$.**

Comprehensive data were recently collected by the USGS in 2012 and 2013, in part to specifically aid in the development of this TMDL addendum (Etheridge 2013). 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 (a sampling event that takes place over a relatively short timeframe and under relatively stable hydrologic conditions). 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 sites on the main stem of the Boise River, 2 sites on the north channel of the Boise River, 2 sites on the Snake River, one upstream and one downstream of the mouth of 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).

A TP mass-balance model was developed by the USGS to evaluate sources of phosphorus to the Boise River during the sampling timeframe (Etheridge 2013). The timing of each synoptic sampling event 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).

According to the USGS mass-balance model and report:

> "…point and nonpoint sources (including groundwater) contributed phosphorus loads to the Boise River during irrigation season. Groundwater exchange within the Boise River in October 2012 and March 2013 was not as considerable as that measured in August 2012. However, groundwater discharge to agricultural tributaries and drains during non-irrigation season was a large source of discharge and phosphorus in the lower Boise River in October 2012 and March 2013. Model results indicate that point sources represent the largest contribution of phosphorus to the Boise River year round, but that reductions in point and nonpoint source phosphorus loads may be necessary to achieve seasonal total phosphorus concentration targets at Parma (RM 3.8) from May 1 through September 30, as set by the 2004 Snake River-Hells Canyon Total Maximum Daily Load document."

The report is further 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 $\geq$ 0.29 mg/L during each of the synoptic events (Table 10).

**Table 10. 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).
[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 2013).

### Mason Creek

DEQ BURP data have been collected on Mason Creek. 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/*.

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 11).

**Table 11. 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).

### Sand Hollow

DEQ BURP data have been collected on Sand Hollow Creek. 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/*.

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 12). These concentrations result in TP loads that directly contribute to the Snake River.

**Table 12. 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).

### 2.3.1 Data Gaps

This addendum identifies several data gaps that, if eliminated, could help produce a more robust assessment of the effects of TP and periphyton on beneficial uses. The best available data was used to develop the current TMDL addendum. However, DEQ acknowledges there are additional questions to be investigated (Table 13).

Additional monitoring efforts (Sections 4.1 and 5.1.5) are either underway, have been planned, or are the subject of ongoing discussions DEQ, the LBWC, and stakeholders. Subsequent information developed through these efforts may be used to appropriately revise portions of the TMDL and adjust implementation methods and control measures. Changes in the TMDL will be addressed through supplementary documentation or replacing chapters or appendices. The goal will be to build upon rather than replace the original work wherever practical. The schedule and criteria for reviewing new data is more appropriately addressed in the implementation plan, due 18 months after approval of this document. The opportunity to revise the TMDL and necessary control measures is consistent with current and developing EPA TMDL guidance which emphasizes an iterative approach to TMDL development and implementation. However, any additional effort on the part of DEQ to revise the TMDL or implementation plan and control measures must be addressed on a case-by-case basis as additional funding becomes available.

**Table 13. Data gaps identified during the development of the lower Boise River TMDL addendum.**

| Pollutant or Factor | Data Gap | Potential Remedy |
| --- | --- | --- |
| Phosphorus | Better understanding of the phosphorus concentrations and loads in the Boise River, particularly, near Parma | USGS real time water quality monitoring near Parma – Initiated in 2014 |
| Phosphorus | Better understanding of how phosphorus is diverted, used, and returned to the river (quantities, qualities, types, durations, etc.) | Additional studies utilizing markers to track phosphorus through the subbasin. |
| Groundwater | Better understanding of groundwater behavior (rates of flow and load contributions, timing, etc.) | Additional studies examining water movement in the shallow ground water aquifer relative to lower Boise River flows |
| Periphyton | Better understanding of spatial and temporal periphyton growth patterns and conditions in the river | More frequent and intensive periphyton sampling in the River |

### 2.3.2 Status of Beneficial Uses

Based on an 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 water bodies, impacts to other water quality and aesthetic parameters (see Section 2.2.5), along with contributing nutrient, algal, and other water quality impacts to the Snake River, downstream. A combination of point sources (e.g. WWTFs, stormwater, and industrial discharge) and nonpoint sources (e.g. agricultural return water, ground water, septic, and unmeasured flows) contribute to this TP loading in the lower Boise River.

# 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 (see Section 2.2.5). TP load and wasteload allocations have not previously been established for the lower Boise River subbasin; however, 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) (tributary to the Snake River)

In addition, DEQ has determined that the information provided in the 2008 TP Implementation Plan and the 2009 5-year review remains largely applicable.

## 3.1 Point Sources

Major point sources within the lower Boise River watershed are mostly WWTFs. These WWTFs treat raw sewage and discharge effluent to meet water quality requirements of their EPA-issued National Pollutant Discharge Elimination System (NPDES) permits. While these WWTFs reduce pollutants from the raw sewage, some amount of phosphorus is discharged in the effluent. EPA-permitted point source facilities 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 phosphorus loads from these facilities are calculated based discharge monitoring data flows and effluent concentrations (Table 14).

**Table 14. Estimated current annual point source discharge to the lower Boise River and the Snake River (directly and indirectly).**

| Source | NPDES Permit No. | Main stem RM[1] or Receiving Water | Mean Discharge (MGD)[2] | Mean TP Concentration (mg/L)[2] | Mean TP Load (lbs/day)[2] |
|---|---|---|---|---|---|
| **Boise River - Main stem** | | | | | |
| 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 |

| Source | NPDES Permit No. | Main stem RM[1] or Receiving Water | Mean Discharge (MGD)[2] | Mean TP Concentration (mg/L)[2] | Mean TP Load (lbs/day)[2] |
|---|---|---|---|---|---|
| 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 (Riverside Canal to Dixie Drain) | ?? | ?? | ?? |
| ConAgra (XL 4 Star) | ID-000078-7 | Indian Creek | Not Active | Not Active | Not Active |
| | | | | | |
| **Snake River** | | | | | |
| Parma WWTF | ID-002177-6 | Sand Hollow Drain | 0.11 | 0.15 | 0.1 |

Note: These data are only meant to represent contributions to the Boise River, and they do not account for downstream diversions or uptake (e.g. agriculture, municipal, industrial, or biogeochemical).

[1] River Miles as identified by USGS in lower Boise River mass balance report (Etheridge 2013); 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] Mean TP concentrations calculated 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.

Storm water is the surface runoff that results from rain and snow melt. The NPDES storm water regulations establish permit requirements for discharges from publicly owned ditches, pipes and other conveyances in urban areas.

The term "municipal separate storm sewer" is defined at 40 CFR §122.26(b)(8) and (b)(16), respectively. MS4s include any publicly-owned conveyance or system of conveyances used for collecting and conveying storm water and which discharges to waters of the United States. MS4s are designed for conveying storm water only, and are not part of a combined sewer system, nor part of a publicly owned treatment works. These systems may include roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains (EPA 2008a, 2008b).

There are several EPA stormwater permittees that discharge phosphorus into the lower Boise River, directly or indirectly, through drains, tributaries, and other hydrological connections (Table 15). 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: *http://www.partnersforcleanwater.org/default.asp*.
An annual report is published and made available through ACHD's web site: *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.

**Table 15. 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 TP Load to LBR (lbs/day)[2] | Mean TP Load (lbs/day) |
|---|---|---|---|---|---|
| Boise/Ada County MS4 | IDS-028185<br>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** |

Note: These data are only meant to represent contributions to the Boise River, and they do not account for downstream diversions or uptake (e.g. agriculture, municipal, industrial, or biogeochemical).
[1] Area ratio = the area contribution of each individual MS4 relative to the total service area for MS4s.
[2] Based on estimated stormwater loads identified in the *2008 Lower Boise River Implementation Plan Total Phosphorus* (DEQ 2008).

The MS4s addressed in this TMDL addendum are located within the boundaries of the Boise (Figure 16) and Nampa (Figure 17) Urbanized Areas, located in Ada and Canyon Counties, as defined by the Year 2000 Decennial Census (EPA 2008a, 2008b).

MSGPs – Although 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 that BMPs appropriate to the site are applied and maintained to prevent water quality impairment. Table 16 identifies the list active MSGP permits in Ada and Canyon counties.

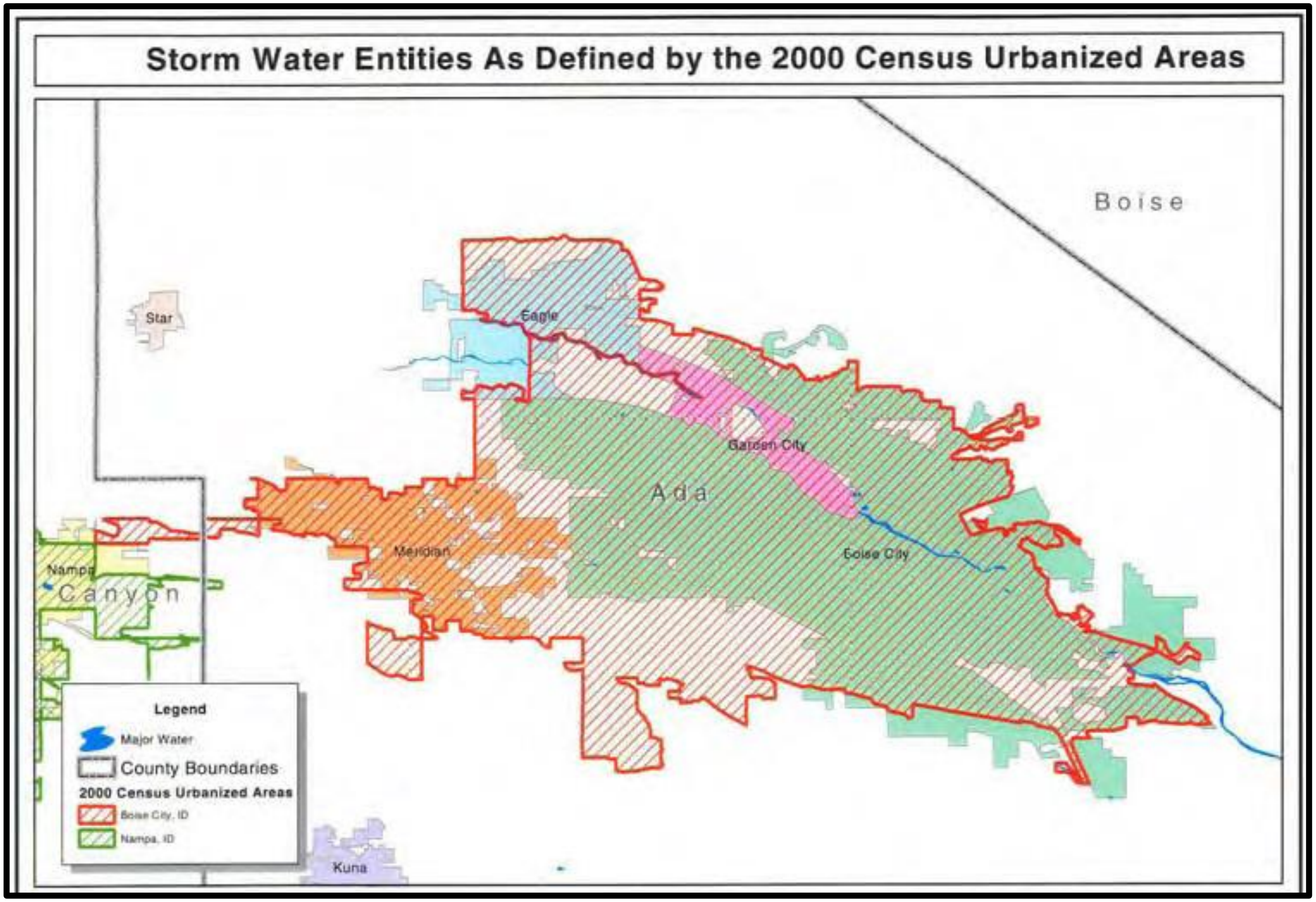



**Figure 16. 2000 census Urbanized Area boundaries, within which MS4s addressed in this TMDL are located (EPA 2008a, 2008b).**

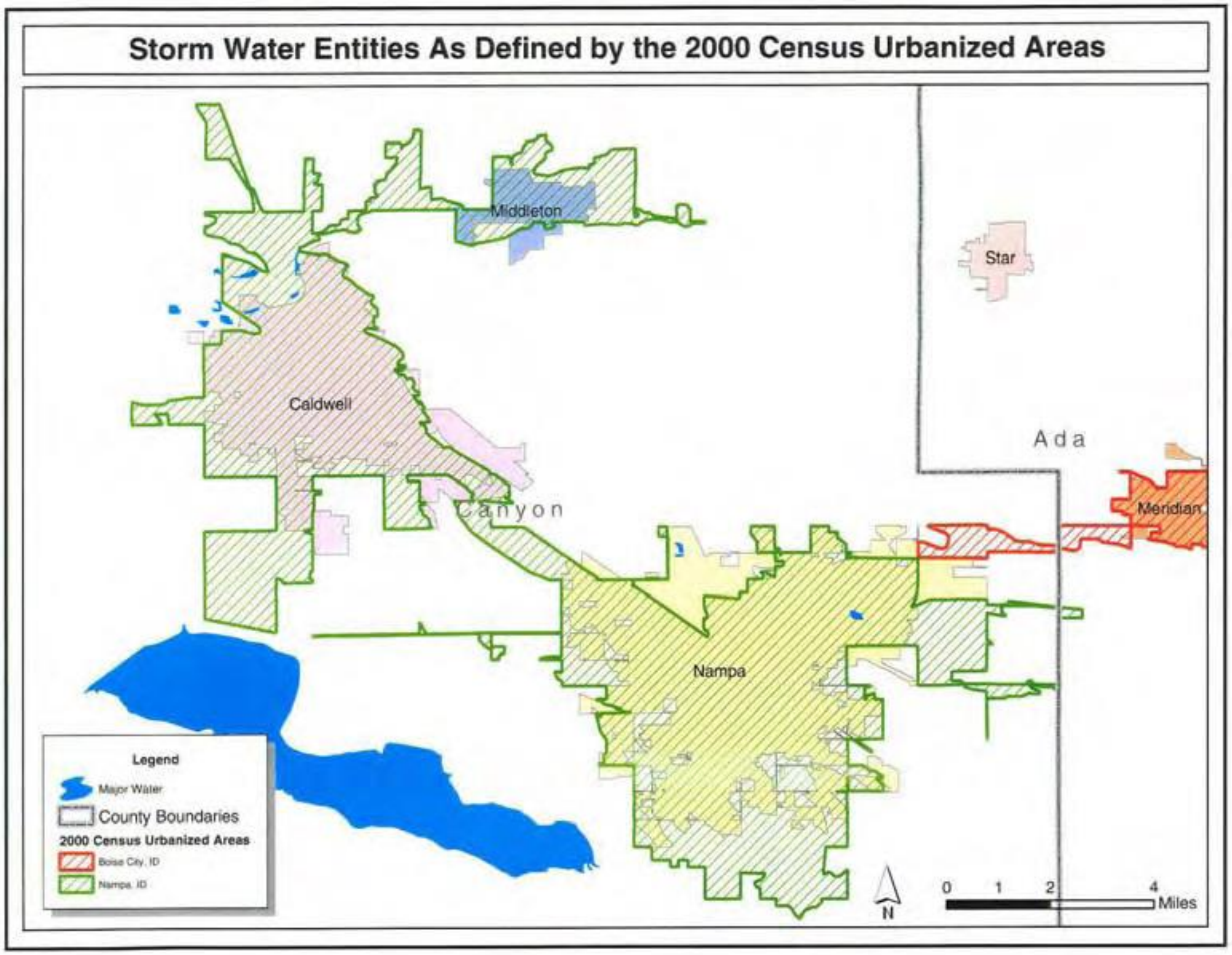



**Figure 17. 2000 census Urbanized Area boundaries, within which MS4s addressed in this TMDL are located (EPA 2008a, 2008b).**

**Table 16. Active MSGP facilities permitted by the EPA in Ada and Canyon counties.**

| NUMBER | COVERAGE DATE | APPLICATION | ORGANIZATION | PROJECT NAME | COUNTY | CITY | STATUS |
|---|---|---|---|---|---|---|---|
| IDR05C218 | June 18, 2009 | Industrial | STAKER PARSON COMPANIES | Idaho Concrete Eagle | Ada | Eagle | Active |
| IDR05CW52 | August 22, 2013 | Industrial | Delta Global Services | Boise Airport Terminal | Ada | Boise | Active |
| IDR05C375 | June 26, 2009 | Industrial | IDAHO NATIONAL GUARD | BOISE AIR TERMINAL (GOWEN FIELD) | Ada | BOISE | Active |
| IDR05C415 | July 02, 2009 | Industrial | UNITED PARCEL SERVICE, INC. | UPS - BOISE GATEWAY | Ada | BOISE | Active |
| IDR05C350 | June 25, 2009 | Industrial | Cityof Boise | Boise Airport | Ada | Boise | Active |
| IDR05C239 | June 27, 2009 | Industrial | STAKER PARSON COMPANIES | Idaho Sand Gravel Cole Road | Ada | Kuna | Active |
| IDR05C285 | June 18, 2009 | Industrial | Southern Foods Group, LLC | Meadow Gold Dairies | Ada | Boise | Active |
| IDR05C291 | June 25, 2009 | Industrial | MICRON TECHNOLOGY INC | Micron Technology Inc | Ada | Boise | Active |
| IDR05C413 | July 02, 2009 | Industrial | UNITED PARCEL SERVICE, INC. | UPS - BOISE HUB | Ada | BOISE | Active |
| IDR05C220 | July 18, 2009 | Industrial | STAKER PARSON COMPANIES | Idaho Sand Gravel Federal Way | Ada | Boise | Active |
| IDR05C219 | June 27, 2009 | Industrial | STAKER PARSON COMPANIES | Idaho Concrete East Boise | Ada | Boise | Active |
| IDR05C231 | July 27, 2009 | Industrial | STAKER PARSON COMPANIES | Idaho Sand Gravel Tenmile | Ada | Kuna | Active |
| IDR05C051 | April 30, 2009 | Industrial | Photronics, Inc. | Photronics, Inc. nanoFab | Ada | Boise | Active |
| IDR05C146 | May 23, 2009 | Industrial | PACIFIC STEEL AND RECYCLING | PACIFIC STEEL AND RECYCLING | Ada | BOISE | Active |
| IDR05C234 | June 27, 2009 | Industrial | STAKER PARSON COMPANIES | Idaho Concrete Joplin | Ada | Boise | Active |
| IDR05C040 | June 26, 2009 | Industrial | Clements Concrete Co. | Joplin | Ada | Boise | Active |
| IDR05C574 | September 23, 2009 | Industrial | Basalite Concrete Products | Basalite Concrete Products | Ada | Meridian | Active |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| IDR05C646 | October 27, 2009 | Industrial | UNITED PARCEL SERVICE, INC. | UPS FREIGHT BOISE TERMINAL | Ada | BOISE | Active |
| IDR05C622 | August 14, 2009 | Industrial | PLUM CREEK NORTHWEST LUMBER IN | PLUM CREEK NORTHWEST LUMBER INC | Ada | MERIDIAN | Active |
| IDR05CA20 | May 31, 2010 | Industrial | MotivePower | Truck and Engine Annex | Ada | Boise | Active |
| IDR05C914 | December 10, 2009 | Industrial | FEDEX EXPRESS CORPORATION | FedEx Express Corp-BOIR | Ada | Boise | Active |
| IDR05CC01 | April 25, 2010 | Industrial | GREYHOUND LINES, INC. #770055 | GREYHOUND LINES, INC. #770055 | Ada | BOISE | Active |
| IDR05C918 | February 05, 2010 | Industrial | Alscott Hangar LLC | Boise Airport Alscott Hangar | Ada | Boise | Active |
| IDR05CI00 | November 25, 2010 | Industrial | Southwest Airlines Co. | SWA BOI | Ada | Boise | Active |
| IDR05CI33 | January 11, 2011 | Industrial | C A PAVING CO | CA PAVING COMPANY BATCH PLANT | Ada | KUNA | Active |
| IDR05CI85 | January 24, 2011 | Industrial | MICRON TECHNOLOGY INC | Micron Technology Inc | Ada | Boise | Active |
| IDR05CJ94 | May 02, 2011 | Industrial | IDAHO SAND AND GRAVEL CO | Southridge Gravel Source | Ada | Meridian | Active |
| IDR05CF60 | August 26, 2010 | Industrial | Idaho National Guard | Gowen Field National Guard base | Ada | Boise | Active |
| IDR05CG57 | October 29, 2010 | Industrial | NAMPA PAVING ASPHALT | Plesant valley | Ada | boise | Active |
| IDR05CK24 | May 25, 2011 | Industrial | AWS - BOISE TRANFSER STATION | AWS - BOISE TRANSFER STATION | Ada | BOISE | Active |
| IDR05CM22 | August 19, 2011 | Industrial | ADA COUNTY HIGHWAY DISTRICT | Schmidt Pit | Ada | Boise | Active |
| IDR05CK25 | May 25, 2011 | Industrial | ALLIED WASTE SERVICES OF BOISE | ALLIED WASTE SERVICES OF BOISE | Ada | BOISE | Active |
| IDR05CT30 | July 20, 2012 | Industrial | NAMPA PAVING ASPHALT | Look Lane gravel pit | Ada | Caldwell | Active |
| IDR05CS39 | June 10, 2012 | Industrial | WF CONSTRUCTION & SALES LLC | BSU ATHLETIC FOOTBALL COMPLEX | Ada | BOISE | Active |
| IDR05CU22 | September 25, 2012 | Industrial | PTM of Boise, LLC | Valley Regional Transit/Orchard Street Facility | Ada | Boise | Active |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| IDR05CS38 | June 10, 2012 | Industrial | WF CONSTRUCTION & SALES LLC | BSU ATHLETIC FOOTBALL COMPLEX | Ada | BOISE | Active |
| IDR05CQ94 | March 25, 2012 | Industrial | Darigold Corp. | Boise | Ada | Boise | Active |
| IDR05CT84 | August 16, 2012 | Industrial | Allied Waste Services of North America,LLC | Franklin Road Facility | Ada | Meridian | Active |
| IDR05CN94 | August 26, 2011 | Industrial | Masco dba Knife River | Knife River Eagle Pit | Ada | Eagle | Active |
| IDR05CS54 | May 17, 2012 | Industrial | Consolidated Properties of Idaho, LLC | STAR PROPERTY | Ada | STAR | Active |
| IDR05CU26 | August 19, 2012 | Industrial | NAMPA PAVING ASPHALT | Nampa Paving Asphalt - Altec Property | Ada | Meridian | Active |
| IDR05CV64 | April 14, 2013 | Industrial | KNIFE RIVER | Anderson Source | Ada | Eagle | Active |
| IDR05CV67 | April 26, 2013 | Industrial | C A PAVING CO | Ten Mile Creek Road - Gravel Pit | Ada | Boise | Active |
| IDR05CV98 | June 05, 2013 | Industrial | STAKER PARSON COMPANIES | Idaho Concrete Heron River | Ada | Star | Active |
| IDR05CV34 | January 28, 2013 | Industrial | STAKER PARSON COMPANIES | Idaho Concrete Moyle | Ada | Star | Active |
| IDR05CV57 | March 30, 2013 | Industrial | Preserve LLC | Preserve Subdivision # 1 | Ada | Eagle | Active |
| IDR05CV62 | April 08, 2013 | Industrial | Knife River Corporation-Northwest dba Knife River | Johnson Source | Ada | Meridian | Active |
| IDR05C058 | April 29, 2009 | Industrial | YRC INC | YRC INC | Ada | BOISE | Active |

## 3.2 Nonpoint Sources

Although the locations of agricultural diversions, dams, drains, and return flows can sometimes be identified 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 and implementation plans could include details regarding future data collection from these sources.

### 3.2.1 Agricultural Discharges

Of the approximately 475,000 acres that drain to the lower Boise River below Diversion Dam, 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 nonpoint loading of phosphorus. Within the watershed, TP is delivered from irrigated cropland and animal-related phosphorus sources (grazing and dairies/feedlots). For example, tributaries (including agricultural drains) and predictive groundwater contributed approximately 880 lbs/day and 562 lbs/day of TP, respectively, relative to approximately 1,440 lbs/day attributed to point sources during the USGS August 2012 synoptic sampling (Etheridge 2013). Although less in October 2012, TP contributions from tributaries and groundwater were approximately 483 lbs/day relative to point source contributions of approximately 1,050 lbs/day. This was similar to March 2013, when TP contributions from tributaries and groundwater were approximately 378 lbs/day relative to point source contributions of approximately 1,220 lbs/day. Table 17 provides estimated annual discharges and loads to the lower Boise River from major tributaries and drains.

**Table 17. 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 |
| Willow Creek | 27.0 | 32.6 | 0.21 | 37 |
| Mason Slough | 25.6 | 8.2 | 0.31 | 14 |

| 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] |
|---|---|---|---|---|
| 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 |

Note: These data are only meant to represent contributions to the Boise River, and they do not account for downstream diversions or uptake (e.g. agriculture, municipal, industrial, or biogeochemical).

[1] As identified by USGS in lower Boise River mass balance report (Etheridge 2013).

[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 (Diversion Dam) 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 synoptic work on the lower Boise River in 2012 and 2013, USGS identified current background TP concentrations as $\leq$ 0.02 mg/L during all three sample periods (Table 18). 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). While there are human-caused changes in the upstream watershed (due to 3 reservoirs), DEQ has determined background TP concentration of 0.02 mg/L as appropriate for this TMDL, based on the median TP concentration (n=119) in the Boise River below Diversion Dam (RM 61.1), including a statistical analysis of non-detect results using the Kaplan-Mier method (Helsel, 2005) (Etheridge 2013).

**Table 18. Estimated background concentrations for the lower Boise River between Diversion Dam and Parma.**

| Sampling Date | Parma Flow (cfs)[1] | Background TP 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% |

Note: These data are only meant to represent contributions to the Boise River, and they do not account for downstream diversions or uptake (e.g. agriculture, municipal, industrial, or biogeochemical).
[1] As identified by USGS in lower Boise River mass balance model (Etheridge 2013).
[2] Estimated as Parma Flow (cfs) x Concentration (mg/L) x 5.39 standard conversion factor (Hammer 1986).
[3] Estimated as Potential TP Background Load at Parma (lbs/day) / TP Load at Parma (lbs/day).

Conservatively assuming 100% of background TP load reaches Parma, estimates range from approximately 34 to 50 lbs/day at Parma, which represents approximately 2.9 to 3.4%.of the load. Although the actual percentage of background TP loads reaching Parma from Diversion Dam is unknown due to the diversions and returns, this conservative approach estimates that in the absence of diversions and returns along the lower Boise River, TP loads corresponding to concentrations of approximately 0.01 mg/L at Parma would be attributed to background.

### 3.2.3 Ground Water and Unmeasured Sources

The gaining and losing reaches of the main stem lower Boise River vary spatially and temporally. In addition to work that has been conducted previously, the USGS synoptic sampling and mass balance model have provided additional information to 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 tributaries and river is complex due the uses and plumbing of the water conveyance in the subbasin. 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 nonpoint source tributary and drain additions. As a result, it is understood and explicitly assumed that shallow subsurface ground water and unmeasured nonpoint source 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, and bank recharge.

During the USGS August 2012 synoptic sample, 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). 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 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).

## 3.3 Pollutant Transport

Phosphorus is discharged into the river from both point and nonpoint sources. It is difficult to determine pollutant delivery potential in such a complex watershed with 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.

Because of the lower Boise River watershed complexity, water is diverted and often reused downstream from its original source. To assess the relative impact of sources on TP loads at Parma, the potential relative contribution of each source sector has been calculated and is discussed throughout Section 5 of this TMDL. The relative contribution from each source was calculated as the ratio of predicted TP load at Parma, relative to the total TP inputs from the various sources. The relative contribution quantifies the relationship between TP loading into the river and loads reaching Parma. The major assumption in these calculations is that each TP source has the same potential to reach Parma as any other source. This simplistic but straightforward calculation quantifies potential loading relationships without requiring additional complex assumptions about TP use and reuse throughout the watershed.

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 and sewer lines) 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. For example, Ferguson (1999) estimates that an average range of 40 to 60% of irrigation water applied to cropland in the south-central and south-west areas of Idaho flows off of surface irrigated fields. And Carter (2002) and Ferguson (1999) also identify BMPs that can be implemented to reduce subsequent pollutant delivery from these fields.

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 and nutrients) from reaching surface waters (Table 19). 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. For example,

**Table 19. 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.

[2] 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%.

**Soil and Water Conservations Districts**

In addition to 319 project grants, numerous projects have been completed within the lower Boise River subbasin through federal programs, such as the Conservation Stewardship Program, Environmental Quality Incentives Program, and Wildlife Habitat Incentives Program. The conservation partnership (Ada Soil and Water Conservation District, Canyon Soil Conservation District, Idaho Association of Soil Conservation Districts , Natural Resources Conservation Service, Idaho Soil and Water Conservation Commission, and landowners) addresses agricultural nonpoint source pollution through voluntary BMPs. Table 20 provides a list of BMPs installed in the Lower Boise River subbasin from 2008-2013.

**Table 20.** Best Management Practices (BMPs) installed in the lower Boise River Subbasin between October 2008 and December 2013).

| Practice Name | Practice Code | Sum of Applied Amount | Applied Units | Sum of Land Unit Acres |
|---|---|---|---|---|
| Above Ground, Multi-Outlet Pipeline | 431 | 760.0 | ft | 62.4 |
| Agricultural  Energy Management Plan, Landscape - Written | 124 | 1.0 | no | 136.2 |
| Agricultural Energy Management Plan, Headquarters - Written | 122 | 1.0 | no | 5.9 |
| Anionic Polyacrylamide (PAM) Application | 450 | 58.4 | ac | 58.4 |
| Channel Bank Vegetation | 322 | 2.0 | ac | 12.8 |
| Channel Bed Stabilization | 584 | 2,000.0 | ft | 15.0 |
| Comprehensive Nutrient Management Plan | 100 | 1.0 | no | 10.0 |
| Conservation Cover | 327 | 17.2 | ac | 49.5 |
| Conservation Crop Rotation | 328 | 1,306.3 | ac | 1,311.2 |
| Cover Crop | 340 | 67.4 | ac | 100.6 |
| Dam, Diversion | 348 | 1.0 | no | 12.8 |
| Fence | 382 | 8,743.0 | ft | 151.4 |
| Field Border | 386 | 7.6 | ac | 18.1 |
| Forage and Biomass Planting | 512 | 130.6 | ac | 141.1 |
| Forage Harvest Management | 511 | 98.4 | ac | 114.5 |
| Integrated Pest Management (IPM) | 595 | 656.2 | ac | 655.7 |
| Irrigation Pipeline | 430 | 59,984.0 | ft | 833.8 |
| Irrigation Regulating Reservoir | 552 | 1.0 | no | 16.2 |
| Irrigation Reservoir | 436 | 0.4 | ac-ft | 4.7 |
| Irrigation System, Microirrigation | 441 | 593.2 | ac | 675.2 |
| Irrigation System, Surface and Subsurface | 443 | 39.8 | ac | 39.8 |
| Irrigation Water Conveyance, Corrugated Metal Pipeline | 780 | 172.0 | ft | 80.6 |
| Irrigation Water Conveyance, Ditch and Canal Lining, Plain Concrete | 428A | 755.0 | ft | 30.6 |
| Irrigation Water Conveyance, Pipeline, High-Pressure, Underground, Plastic | 430DD | 17,155.0 | ft | 368.3 |
| Irrigation Water Conveyance, Pipeline, Low-Pressure, Underground, | 430EE | 780.0 | ft | 74.5 |

| | | | | |
|---|---|---|---|---|
| Plastic | | | | |
| Irrigation Water Conveyance, Pipeline, Steel | 430FF | 348.0 | ft | 112.8 |
| Irrigation Water Management | 449 | 1,894.4 | ac | 1,949.1 |
| Livestock Pipeline | 516 | 18,241.0 | ft | 1,217.4 |
| Mulching | 484 | 0.5 | ac | 1.7 |
| **Practice Name** | **Practice Code** | **Sum of Applied Amount** | **Applied Units** | **Sum of Land Unit Acres** |
| Non-forested riparian zone enhancement for fish and wildlife | ANM13 | 1,247.7 | linear ft | 71.4 |
| Nutrient Management | 590 | 1,804.6 | ac | 1,811.2 |
| Nutrient Management Plan - Written | 104 | 1.0 | no | 37.4 |
| Prescribed Grazing | 528 | 7,600.6 | ac | 11,927.7 |
| Pumping Plant | 533 | 32.0 | no | 693.8 |
| Range Planting | 550 | 98.3 | ac | 220.9 |
| Residue and Tillage Management, Reduced Till | 345 | 4.2 | ac | 4.2 |
| Retrofit watering facility for wildlife escape | ANM18 | 27.0 | ac | 404.7 |
| Riparian Forest Buffer | 391 | 4.2 | ac | 15.0 |
| Riparian Herbaceous Cover | 390 | 1.0 | ac | 2.2 |
| Seasonal High Tunnel System for Crops | 798 | 7,013.0 | sq ft | 21.7 |
| Sediment Basin | 350 | 10.0 | no | 182.1 |
| Solar powered electric fence charging systems | ENR02 | 6.0 | no | 127.4 |
| Sprinkler System | 442 | 1,034.6 | ac | 1,160.0 |
| Stream Habitat Improvement and Management | 395 | 2.2 | ac | 2.2 |
| Streambank and Shoreline Protection | 580 | 1,400.0 | ft | 2.2 |
| Structure for Water Control | 587 | 57.0 | no | 847.3 |
| Subsurface Drain | 606 | 720.0 | ft | 18.8 |
| Surface Roughening | 609 | 63.3 | ac | 63.3 |
| Tree/Shrub Establishment | 612 | 4.5 | ac | 55.5 |
| Tree/Shrub Site Preparation | 490 | 2.0 | ac | 12.8 |
| Underground Outlet | 620 | 2,206.0 | ft | 93.7 |

| | | | | |
|---|---|---|---|---|
| Upland Wildlife Habitat Management | 645 | 80.8 | ac | 152.7 |
| Watering Facility | 614 | 4.0 | no | 1,126.7 |
| Wetland Enhancement | 659 | 8.7 | ac | 49.5 |
| Wetland Wildlife Habitat Management | 644 | 21.7 | ac | 56.0 |
| Windbreak/Shelterbelt Establishment | 380 | 10,020.0 | ft | 32.6 |

**Simplot Caldwell Potato Processing Plant**

The Simplot potato processing plant and land application site is adjacent to the lower Boise River, west of Caldwell. 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):

- 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 current (2012) 637 MGY.
- In 2009, a double cropping system was installed for the land that has nearly doubled 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 reverse osmosis to evaporate the concentrate from the treatment plant

**City of Meridian**

Meridian operates a WWTF that was constructed in 1978. There have been numerous capacity upgrades and treatment improvements since the original construction. Flow through the plant has increased from about 3.2 to 5.6 mgd (annual averages from 2001 and 2013, respectively), representing nearly a 5-percent annual increase in response to population growth within the city. Discharge is permitted to two outfalls, Fivemile Creek and Boise River. Upgrades and improvements have included:

- Biological treatment process improvements to provide both biological phosphorus removal and nitrification and denitrification for ammonia and total nitrogen reduction.
- Tertiary filtration.
- Return activated sludge denitrification.
- Primary sludge fermentation is under construction.
- Investment in Class A recycled water program

**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 Nampa
- City of Star
- City of Wilder
- Darigold

## 4.1 Water Quality Monitoring

A 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), other USGS data collection, ongoing City of Boise data collection throughout the river (unpublished data), Discharge Monitoring Reports (DMRs) and other data collected by municipal, stormwater, and industrial dischargers, 319 grant and other nonpoint source monitoring efforts.

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).

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)
- 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 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 of beneficial uses 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 Projected Conditions

Projected 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, projected conditions are discussed separately for the $\leq$ 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 TP load in the lower Boise River 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 specific to the lower Boise River subbasin have not been fully developed. Given this limitation, TP load capacities have been developed:

- To comply with the SR-HC May – September target allocation of $\leq$ 0.07 mg/L TP in the lower Boise River at the mouth (Parma),
- Using scientific literature-based values examining recreation and aquatic life impacts,
- Using ecological modeling to evaluate relationships among nutrients, algae growth, and other environmental factors,
- Through consultation with the LBWC and other stakeholders to define nuisance aquatic growth in the lower Boise River.

The TP load capacity values for the lower Boise River, Mason Creek, and Sand Hollow §303(d)-listed AUs are based on the following assumptions:

- 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.
- 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)

***<u>May 1 through September 30</u> – TP concentrations (or mass equivalent) $\leq$ 0.07 mg/L in the lower Boise River near Parma to comply with the 2004 Snake River-Hells Canyon TMDL***

The final SR-HC TMDL was approved by EPA in September 2004 (DEQ 2004). The TMDL addressed point and nonpoint 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 achieve TP concentrations of $\leq$ 0.07 mg/L in the Snake River and Brownlee Reservoir from May 1 through September 30 (IDEQ/ODEQ 2004; p. ii):

> “Site-specific chlorophyll a and total phosphorus targets (less than 14 ug/L and less than or equal to 0.07 mg/L respectively) were identified by the TMDL. These targets are seasonal in nature and apply from May through September. … Inflowing tributaries have been assigned load allocations to meet the 0.07 mg/L total phosphorus target at their inflow to the Snake River.”

Therefore, compliance with the SR-HC TMDL will require achieving the 0.07 target at the mouth of the lower Boise River near Parma.

For this TMDL addendum, the May 1 through September 30 TP target of ≤ 0.07 mg/L is defined as monthly mean TP concentration (or mass equivalent) relative to corresponding monthly mean flows in the lower Boise River near Parma. This target is also expected to be protective of cold water aquatic life and contact recreation by reducing and maintaining phytoplankton biomass, measured as chlorophyll a, in the Snake River and reservoirs < 14 μg/L. Achieving this monthly TP target in the lower Boise River will help reduce the frequency, magnitude, and duration of algal blooms and their associated aesthetic, ecological, and physical impacts on contact recreation and cold water aquatic life, in both the Snake River and the lower Boise River.

***Mean Benthic Chlorophyll-a Biomass Target of < 150 mg/m$^2$ – TP concentrations (or mass equivalent) correlated with periphyton in the lower Boise River:***

a. Estimated within individual AUs on the main stem lower Boise River,

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, has identified and developed a set of metrics that relate nuisance algae growth with the impairment of beneficial uses in the lower Boise River…

This target is similar to those developed and implemented for waters in Montana (MDEQ 2008), Minnesota (MPCA 2013) and Colorado (CDPHE 2012), and corresponds with scientific literature values that support contact recreation and cold water aquatic life (see Section 2.2.5).

### 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. An adaptive management approach, as part of the 5-year review, will help to determine if subsequent changes to load allocations are necessary to reach full support of beneficial uses in Mason Creek.

### 5.1.4 Target Selection (Sand Hollow Creek)

The target selection for Sand Hollow Creek, a tributary to the Snake River, 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. An adaptive management approach, as part of the 5-year review, will help to determine if subsequent changes to load allocations are necessary to reach full support of beneficial uses in Sand Hollow Creek.

### 5.1.5 Water Quality Monitoring Points

USGS 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 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).

Additional language regarding future periphyton and other WQ monitoring, etc…

## 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)). The margin of safety accounts for uncertainty about assimilative capacity, the relationship between the selected target and support of beneficial uses, and includes 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 developed for the lower Boise River are based on the instream loads when a monthly TP concentration (or mass equivalent) 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), under the five corresponding flow scenarios (Table 21, Figures 18-21). These load capacities comply with the target TP allocation identified in the SR-HC TMDL.

**Table 21. Total Phosphorus load allocations for the lower Boise River, Mason Creek and Sand Hollow, May 1 – September 30. The flows, TP concentrations, and TP load allocations are measured/estimated for: 1) the Boise River near Parma; 2) Mason Creek near the confluence with the Boise River, and: 3) Sand Hollow near the confluence with the Snake River.**

| Water Body[1] | Flow[2] (cfs) | Flow Rank (%) | Current Load[3] TP Conc. (mg/L) | Current Load[3] TP Load (lbs/day) | Target TP Conc. (mg/L) | Load Capacity[3] Target TP Load (lbs/day) | Target TP Load Reductions (lbs/day [%]) | TP Allocations[4] (lbs/day) | TP Load Reductions[4] (lbs/day [%]) |
|---|---|---|---|---|---|---|---|---|---|
| **Lower Boise River** | | | | | | | | | |
| Boise River near Parma– (AU 001_06) | 3268 | 10th | 0.21 | 3747 | 0.07 | 1233 | -2514 (67%) | 1117 | -2630 (70%) |
| | 912 | 40th | 0.31 | 1531 | 0.07 | 344 | -1187 (78%) | 333 | -1197 (78%) |
| | 705 | 60th | 0.31 | 1190 | 0.07 | 266 | -924 (78%) | 259 | -931 (78%) |
| USGS August Synoptic Sample[5] | 624 | 69th | 0.30 | 1010 | 0.07 | 235 | -775 (77%) | 234 | -776 (77%) |
| | 383 | 90th | 0.36 | 738 | 0.07 | 145 | -594 (80%) | 141 | -597 (81%) |
| | | | | | | | | | |
| Mason Creek– (AU 006_02) | 139 | Mean | 0.43 | 323 | 0.1 to 0.07 | 74 to 52 | -249 to -271 (77 to 81%) | 74 to 52 | -249 to -271 |
| | | | | | | | | | |
| **Snake River** | | | | | | | | | |
| Sand Hollow– (AU 017_06) | 141 | Mean | 0.4 | 304 | 0.07 | 53 | -251 (83%) | 53 | -251 |

[1] All assessment units (AUs) begin with ID17050114.
[2] Lower Boise River – based on flow, concentration, and load duration curve for May 1 – September 30, 1987 through 2012.
Mason Creek – based on USGS mean data from May 1 – September 30, 1995 through 2012.
Sand Hollow – based on ISDA and USGS mean data from May 1 – September 30, 1998 through 2012.
[3] Lower Boise River - current loads and load capacities are estimated using flow and load duration curves for the range of flows.
Mason Creek and Sand Hollow Creek – current loads and load capacities are estimated using a portion of the standard pollutant mixing equation with a built-in conversion factor: (conc×flow×5.39) (Hammer 1986).

[4] For NPDES purposes, TP allocations and load reductions in this table are intended as monthly values to correspond with appropriate monthly flows.
[5] Flows, TP concentrations, and loads as measured and identified during the USGS August 2012 synoptic sample (Etheridge 2013).

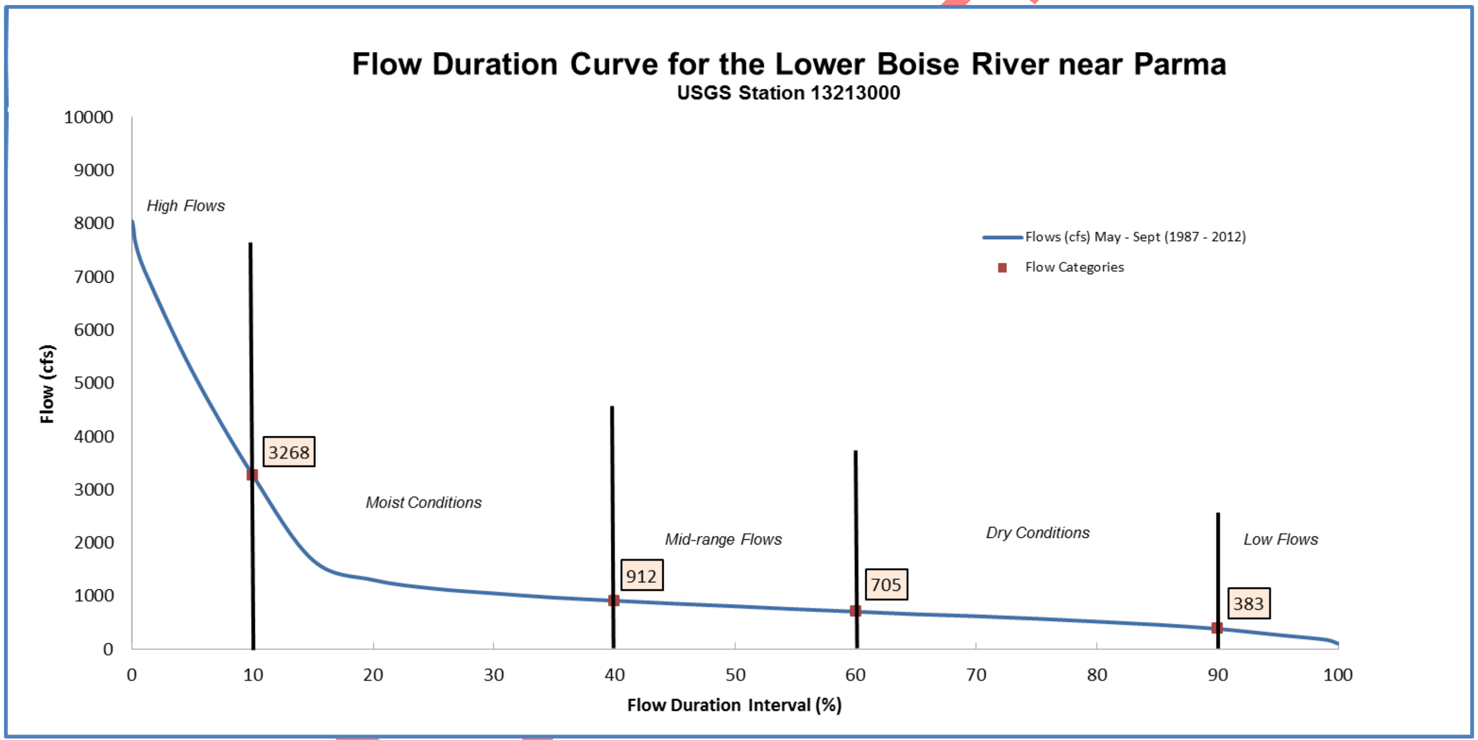



**Figure 18. Flow duration curve for the lower Boise River near Parma from May – September, 1987-2012.**

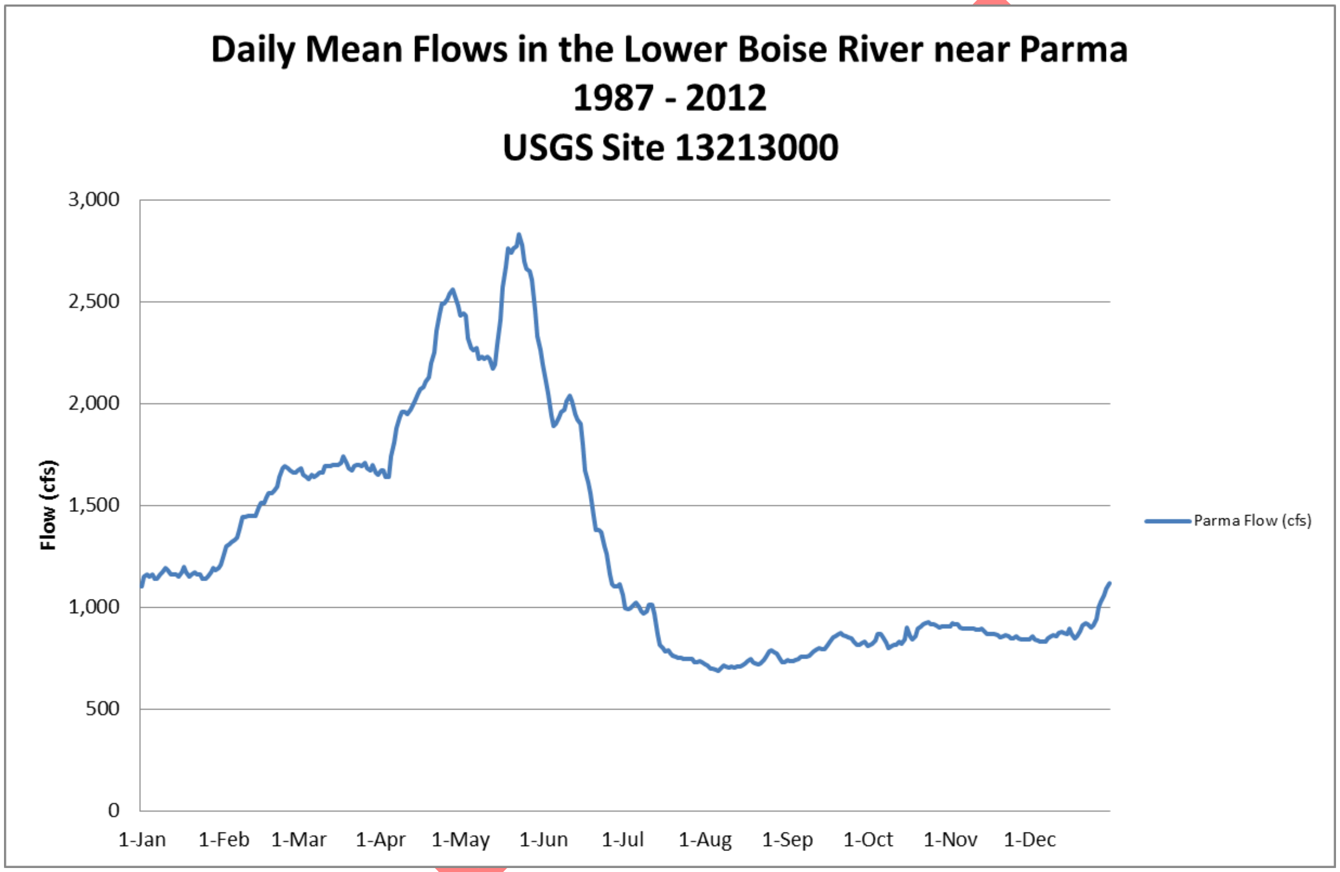



**Figure 19. Daily mean flows for the lower Boise River near Parma from 1987-2012.**

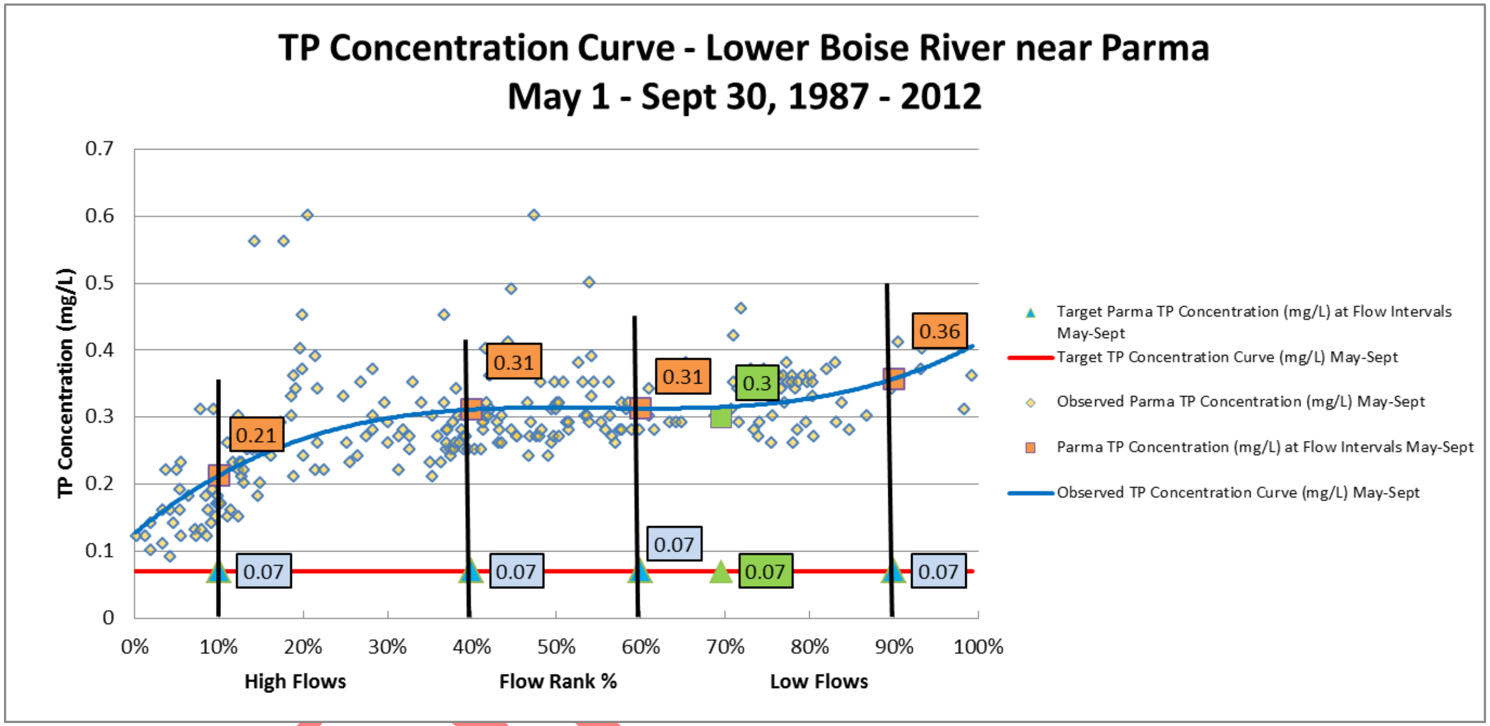



**Figure 20. Concentration curve for the lower Boise River in relation to the TP concentration target of ≤ 0.07 mg/L May - September.**

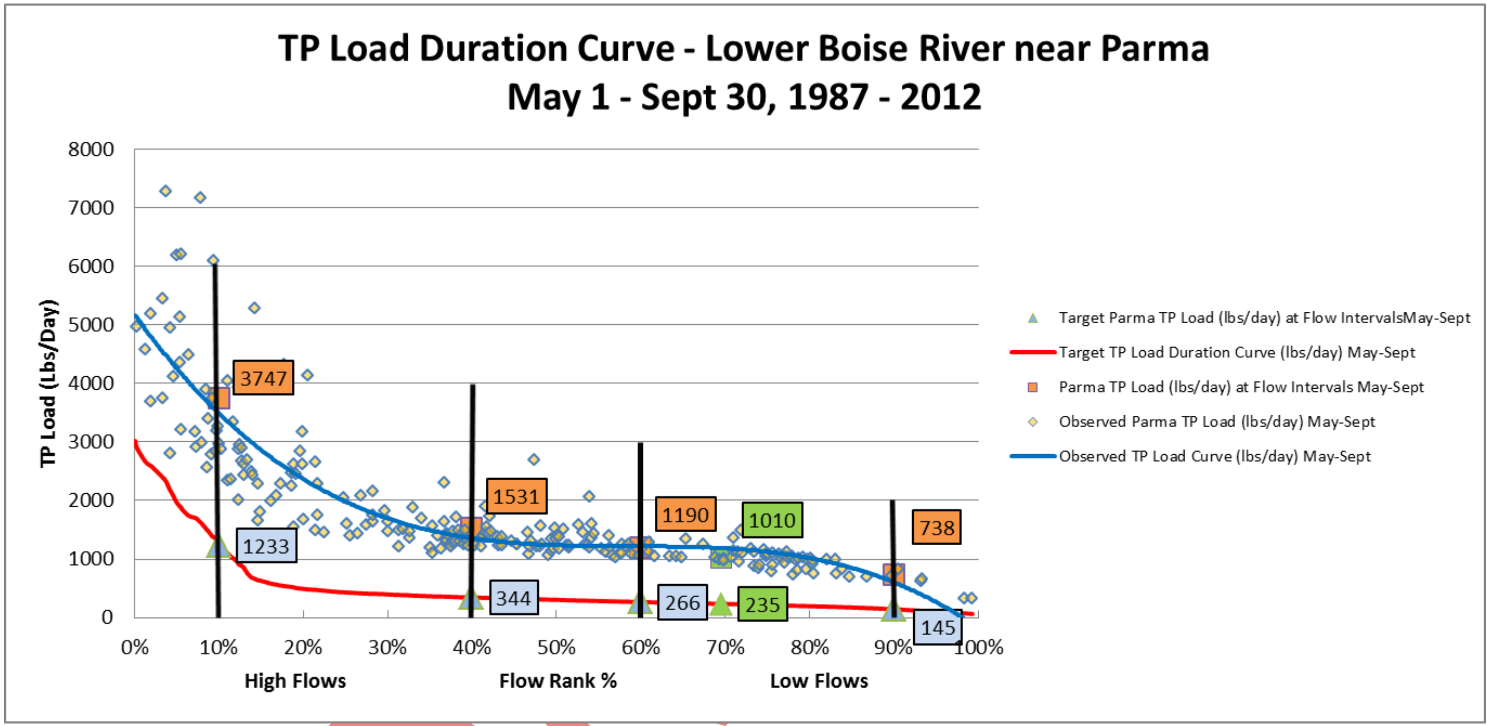



**Figure 21. Load duration curve for the lower Boise River in relation to the TP target mass equivalent of ≤ 0.07 mg/L May – September.**

### 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

Start with the boilerplate sentence below. Then an estimate must be made for each point source. Nonpoint sources are typically estimated based on the type of sources (land use) and area (such as a subwatershed), but may be aggregated by type of source or area. To the extent possible, background loads should be distinguished from human-caused increases in nonpoint loads.

- Summarize or reference method(s) of estimation. Put details in an appendix. Be sure to reference the appendix.
- Describe the data used and all assumptions made.
- Discuss sources and degree of uncertainty in estimates.
- Be sure to consider seasonal variation in loads characteristic of each source type.
- Present loading rates for each parameter.
- What is background load and the extent to which it is purely background or aggregated with other nonpoint loads? Remember "background" load is a load that is not reducible.

.

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 were estimated based on DMR and/or facility-supplied data from May 1 – September 30, 2012, as available (Table 22). 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) (Table 23).

Nonpoint source tributary contributions were estimated based on available USGS and ISDA data for May 1 – September 30 from 1983 through 2013, as available (Table 24). This long-term data 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.

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) and professional judgment using the August 2012 lower Boise River mass balance model to adjust groundwater interactions in the lower Boise River under various flow scenarios (Alex Etheridge pers. comm. 2014). This data represents the best and most current ground water and unmeasured flow data for the lower Boise River.

**Table 22. Estimated and permitted point source TP discharge from May - September in the lower Boise River (directly and indirectly).**

| Source | NPDES Permit No. | Main stem RM[1] or Receiving Water | Mean Discharge May – Sept (MGD)[2] | Projected 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 - Main stem** | | | | | | | | |
| Lander WWTF | ID-002044-3 | RM 50.0 | 12.7 | 15 | 2.1 | 0.07/monthly avg<br>0.0931/weekly avg | 22.5 | 8.7/monthly avg<br>11.6/weekly avg |
| West Boise WWTF | ID-002398-1 | RM 44.2 | 16.1 | 24 | 4.47 | 0.07/monthly avg<br>0.084/weekly avg | 600.5 | 14/monthly avg<br>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<br>(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. | Main stem RM[1] or Receiving Water | Mean Discharge May – Sept (MGD)[2] | Projected 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<br>0.14/weekly avg | 0.2 | 0.29/monthly avg<br>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<br>0.105/weekly avg | 0.2 | 1.1/monthly avg<br>1.65/weekly avg |
| IDFG-Nampa[3] | IDG-130042 (current permit not subject to WLA) | Wilson Drain and Pond<br>(Indian Creek) | 17.86 | 17.86 | 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 | None | 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** | | | **76.54** | **98.65** | **2.37** | | **1504.1** | |

[1] River Miles as identified by USGS in lower Boise River Mass Balance Report (Etheridge 2013). 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 May 1 through September 2012 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 – Projected flow is higher than 7, but permitted flow was 7 when issued in 1999. The receiving water was commonly Fivemile Creek; however, the City is permitted to discharge to the south channel of the Boise River.
[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 23. 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<br>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 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 24. Estimated May - September tributary 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 | 36.3 | 0.11 | 22 |
| Dry Creek | 42.5 | 5.3 | 0.08 | 2 |
| Thurman Drain | 41.9 | 15.0 | 0.11 | 9 |
| Fifteenmile Creek | 30.3 | 129.9 | 0.31 | 218 |
| Mill Slough | 27.2 | 127.0 | 0.21 | 142 |
| Willow Creek | 27.0 | 37.0 | 0.18 | 35 |
| Mason Slough | 25.6 | 13.0 | 0.22 | 15 |
| Mason Creek | 25.0 | 139.4 | 0.43 | 323 |
| Hartley Gulch (E. and W.) | 24.4 | 35.0 | 0.24 | 45 |
| Indian Creek | 22.4 | 91.7 | 0.46 | 227 |
| Conway Gulch | 14.2 | 42.2 | 0.38 | 86 |
| Dixie Drain | 10.5 | 227.7 | 0.39 | 476 |
| **Total** | | **899.4** | **Mean = 0.33** | **1602** |
| **Tributary Loads excluding WWTF TP Loads[3]** | | | | |
| | May 1 – Sept 30 | **843.5** | **Mean = 0.24** | **1081** |
| | May 1 – July 13 (Mean Daily Boise River Flows > 912 cfs) | **850.3** | **Mean = 0.25** | **1163** |
| | July 14 – Sept 30 (Mean Daily Boise River Flows ≤ 912 cfs) | **833.9** | **Mean = 0.22** | **979** |

[1] River Miles as identified by USGS in lower Boise River Mass Balance Report (Etheridge 2013).
[2] Values estimated from available USGS and/or ISDA for data available data from 1983 – 2013.
[3] Tributary flows and loads calculated by subtracting WWTF flows and loads during two periods of time: 1) May 1 – July 13, when daily mean Boise River flows near Parma are > 912 cfs, and 2) July 14 – September 30, when daily mean Boise River flows near Parma are ≤ 912 cfs.

Based on available information for each of the sources, current loads by sector are estimated in Table 25. Several assumptions are inherent as part of this analysis:

1. Lower Boise River TP inputs do not translate directly into TP loads at Parma. Instead, current TP inputs were estimated relative to TP loadings at Parma over various flow scenarios to develop delivery ratios.
    a. The percentage of TP loads at Parma relative to TP inputs were estimated for each flow range (Table 25). The resulting ratios indicate that TP loads at Parma represent from 24% of TP inputs during low flows (383 cfs), up to 252% of TP inputs at high flows (3268 cfs).
2. Diversions and returns play intricate and complex roles in the lower Boise River. However, due to uncertainty regarding the diversions and returns of specific TP sources throughout the subbasin, it is assumed that the TP inputs relative to loads at Parma occur in equal proportion for all sources (except that 100% of background TP inputs are conservatively assumed to reach Parma).
3. Point source loads are estimated from flows and concentrations in facility-supplied data and DMRs from May 1 – September 30, 2012.
    a. It is assumed that point source loadings remain relatively constant under various Boise River flow scenarios because they are more dependent on factors such as population, service area, etc., and less dependent on in-river flows.
4. Stormwater loads are estimated from the 2008 Lower Boise River Implementation Plan Total Phosphorus (DEQ 2008). The loads were adjusted to reflect data identifying that 25% of the annual precipitation (hence runoff) occurs between May 1 – September 30 (WRCC 2010).
    a. It is assumed that stormwater loadings remain relatively constant under various Boise River flow scenarios because they are more dependent on factors such as population, service area, etc., and less dependent on in-river flows,
5. Tributary loads and concentrations were calculated from USGS and ISDA data from May 1 – September 30, 1983 – 2013. Tributary loads were identified as:
    a. May 1 – July 13 when daily mean Boise River flows near Parma are > 912 cfs
    b. July 14 – September 30 when daily mean Boise River flows near Parma are ≤ 912 cfs.
    c. Additionally, tributary loads are calculated by removing the flows and TP loads attributed to point sources.
6. Ground water loads identified in the USGS August 2012 synoptic sampling event (Etheridge 2013) were adjusted based on expected ground water conditions under the various flow scenarios in the lower Boise River, according the USGS August 2012 mass balance model (Alex Etheridge pers. comm. 2014).
7. It is conservatively assumed that 100% of background TP reaches Parma for Margin of Safety purposes (see Section 5.4.3).
    a. Background median TP concentration of 0.02 mg/L (n=119) in the Boise River below Diversion Dam (RM 61.1) was identified, including a statistical analysis of non-detect results using the Kaplan-Mier method (Helsel, 2005) (Etheridge 2013).
    b. During the USGS August 2012 synoptic sample, USGS identified background TP concentration as 0.01 mg/L.

The USGS August 2012 mass balance model (Etheridge 2013) was used to identify contributing source flows and loads for the time period measured (e.g. August 2012 with Boise River flows near Parma at 624 cfs) and to help derive approximate ground water flows associated with the various flow scenarios in the lower Boise River near Parma. However, upon recommendation from the USGS model developer (Alex Etheridge pers. comm. 2014), the mass balance model was not utilized to estimate lower Boise River TP concentrations or loads near Parma under adjusted flows scenarios. This is because altering river flows in the mass balance model also requires altering groundwater, tributary, background flows throughout the system to maintain the balance. However, the complex relationships among the various sources are not well understood and require utilizing additional assumptions. Further, although the mass balance model clearly illustrates the flow and TP relationships throughout the river during one week in August 2012 when flows near Parma were 624 cfs, it does not account for varying flow and TP relationships in the subbasin.

**Table 25. Current TP loads estimated by sector for the lower Boise River, May 1 – September 30. The green highlight represents data directly attributed to the USGS August 2012 mass balance model for the lower Boise River (Etheridge 2013).**

| Parma Flow | Current Background TP Inputs | | Current WWTF TP Inputs | | | Current Tributary TP Inputs w/o WWTFs | | | Current Ground Water TP Inputs | | | Current Storm Water TP Inputs | Current TP Inputs | Current Parma TP Load | TP Inputs Reaching Parma |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cfs) | (mg/L) | (lbs/day) | (cfs) | (mg/L) | (lbs/day) | (cfs) | (mg/L) | (lbs/day) | (cfs) | (mg/L) | (lbs/day) | (lbs/day) | (lbs/day) | (lbs/day) | (%) |
| 3268 | 0.02 | 352 | 117.9 | 2.37 | 1504 | 850 | 0.25 | 1163 | -1390 | 0.21 | -1573 | 44 | 1490 | 3747 | 252% |
| 912 | 0.02 | 98 | 117.9 | 2.37 | 1504 | 850 | 0.25 | 1163 | 164 | 0.21 | 186 | 44 | 2995 | 1531 | 51% |
| 705 | 0.02 | 76 | 117.9 | 2.37 | 1504 | 834 | 0.22 | 979 | 300 | 0.21 | 340 | 44 | 2942 | 1190 | 40% |
| 624 | 0.01 | 34 | 84.0 | 3.18 | 1440 | 888 | 0.18 | 880 | 485 | 0.21 | 562 | | 2916 | 1010 | 35% |
| 383 | 0.02 | 41 | 117.9 | 2.37 | 1504 | 834 | 0.22 | 979 | 398 | 0.21 | 450 | 44 | 3019 | 738 | 24% |

[1] Background is calculated as the potential TP load at Diversion Dam that could reach Parma (assuming 100% reaches Parma) based on long-term median data. The USGS August 2012 synoptic data identified TP background as 0.1 mg/L (Etheridge 2013), which could result in a potential Parma load of 34 lbs/day.
[2] WWTF data are calculated for May 1 – September 30, 2012, and represent all facilities identified in Table 22. The USGS August 2012 synoptic sample data represent only WWTF contributions from Lander, West Boise, Meridian, Middleton, Nampa, and Caldwell facilities (Etheridge 2013).
[3] Mean tributary flows of 850 and 834cfs are estimated occur when daily mean Boise River flows near Parma are ≤ 912 and > 912 cfs, respectively. Tributary data were calculated by removing all WWTF flows, concentrations, and loads that discharge into tributaries. The USGS August 2012 synoptic sample calculated tributaries by removing the contributions from only the Meridian and Nampa facilities (Etheridge 2013).
[4] Ground water was estimated using the USGS August 2012 mass balance model to adjust likely groundwater contributions, including ground water loss (e.g. -1390 cfs) under various flow scenarios (Alex Etheridge pers. comm. 2014). The USGS August 2012 synoptic identified ground water flows as 485 cfs with 0.21 mg/L concentration (Etheridge 2013).
[5] Stormwater contributions were estimated based on the 2008 Lower Boise River Implementation Plan Total Phosphorus (DEQ 2008). It is assumed that approximately 25% of annual precipitation occurs during the May – September months from 1981 through 2010 (WRCC 2010).
[6] USGS August 2012 mass balance model identified the total diversions as -1,590 cfs at 0.22 mg/L TP, resulting in 1,890 lbs/day of TP.

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

Table 26 and Table 27 present estimated May through September point source and nonpoint source discharge, TP concentrations, and TP loadings into Sand Hollow Creek, which is a tributary to the Snake River.

**Table 26. 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] | Projected 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 27. Estimated May - September nonpoint source discharge in Sand Hollow Creek (a tributary to the Snake River).**

| 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** | | | | |
| Nonpoint, 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

Write a short introductory paragraph. The total allocations must include a margin of safety to take into account seasonal variability and uncertainty. Uncertainty arises in selection of water quality targets, load capacity, and estimates of existing loads, and may be attributed to incomplete knowledge or understanding of the system, such as assimilation not well known, sketchy data, or variability in data. The margin of safety is effectively a reduction in loading capacity that "comes off the top" (i.e., before any allocation to sources). Second in line is the background load, a further reduction in loading capacity available for allocation. It is also prudent to allow for growth by reserving a portion of the remaining available load for future sources.

Apportion load capacity among existing and future pollutant sources. Allocations may take into account equitable cost, cost effectiveness, and credit for prior efforts, but all within the ceiling of remaining available load. These allocations may take the form of percent reductions rather than actual loads. Each point source must receive an allocation. Nonpoint sources may be allocated by subwatershed, land use, responsibility for actions, or a combination. It is not necessary to allocate a reduction in load for all nonpoint sources so long as water quality targets can be met with the reductions that are specified. Keep the following points in mind:

- Each point source must receive a wasteload allocation.
- Nonpoint sources can be allocated by subwatershed, land use category, responsibility for actions, or a combination (a.k.a. load allocation).
- Not all nonpoint sources need to be allocated a reduction so long as water quality targets can be met by the aggregate reductions of those sources that are prescribed a reduction in load.
- Allocations are best summarized in a table or tables.
- A time must be specified by which each (or all) allocations will be met.

Comment [DEQ3]: AUTHOR: Please fill in the table below. Add or delete rows as necessary.

This table can be changed/customized to specific situations if you have a preferred way to display the information, such as by pollutant..

**Table 28. Point source wasteload allocations for lower Boise River subbasin.**

| Facility/ Source | NPDES[a] Number | Pollutant | Allocation | | | Time Frame for Meeting Allocations |
|---|---|---|---|---|---|---|
| | | | Daily | Monthly | Yearly | |
| | | | | | | (1 permit cycle, 2 permit cycles, etc.) |

[a] National Pollutant Discharge Elimination System (NPDES)

Comment [DEQ4]: AUTHOR: Please fill in the table below. Add or delete rows as necessary. Nonpoint source loads should be by sector or land use (e.g., agriculture, forestry, roads) or else BLM, Forest Service, private agriculture, etc.

This table can be changed/customized to specific situations if you have a preferred way to display the information, such as by pollutant.

**Table 29. Nonpoint source load allocations for lower Boise River subbasin.**

| Source | Land Use | Pollutant | Allocation | | | Time Frame for Meeting Allocations |
|---|---|---|---|---|---|---|
| | | | Daily | Monthly | Yearly | |
| | | | | | | |

### 5.4.1 Boise River Load and Wasteload Allocations (May – September)

As with the current loading estimates, several assumptions are inherent as part of the load and wasteload analyses to help meet the overall TP mass equivalent target of ≤ 0.07 in the lower Boise River near Parma from May 1 – September 30:

1. Lower Boise River TP inputs do not translate directly into TP loads at Parma. Instead, current TP inputs were compared to TP loadings at Parma over various flow scenarios to develop delivery ratios (see section 5.3.1).
2. Diversions and returns play intricate and complex roles in the lower Boise River. However, due to uncertainty regarding the specific TP sources throughout the subbasin, it is assumed that the TP inputs relative to loads at Parma occur in equal proportion for all sources, as are the necessary reductions (except that 100% of background TP inputs are conservatively assumed to reach Parma).
3. Point source allocations are based on projected facility flows.
    a. It is assumed that point source loadings remain relatively constant under various Boise River flow scenarios because they are more dependent on factors such as population, service area, etc., and less dependent on in-river flows.
4. Stormwater allocations were reduced by 50 % in equal proportions, across all service areas.
    a. It is assumed that stormwater loadings remain relatively constant under various Boise River flow scenarios because they are more dependent on factors such as population, service area, etc., and less dependent on in-river flows.
5. Tributary load allocations were reduced in equal proportions, across all tributaries, and allocations were separated into two categories when:
    a. Daily mean Boise River flows near Parma are > 912 cfs
    b. Daily mean Boise River flows near Parma are ≤ 912 cfs
    c. Additionally, tributary loads are calculated by removing the projected flows and TP loads attributed to point sources.
6. Ground water loads identified in the August 2012 synoptic sampling event (Etheridge 2013) were adjusted based on expected ground water conditions under the various flow scenarios in the lower Boise River (Alex Etheridge pers. comm. 2014).
7. It is conservatively assumed that 100% of background TP reaches Parma for Margin of Safety purposes (see Section 5.4.3).
    a. Background median TP concentration of 0.02 mg/L (n=119) in the Boise River below Diversion Dam (RM 61.1) was identified, including a statistical analysis of non-detect results using the Kaplan-Mier method (Helsel, 2005) (Etheridge 2013).
    b. During the USGS August 2012 synoptic sample, USGS identified background TP concentration as 0.01 mg/L.

The USGS August 2012 mass balance model (Etheridge 2013) was used to identify contributing source flows and loads for the time period measured (e.g. August 2012 with Boise River flows near Parma at 624 cfs) and to help derive approximate ground water flows associated with the various flow scenarios in the lower Boise River near Parma. However, upon recommendation from the USGS model developer (Alex Etheridge pers. comm. 2014), the mass balance model was not utilized to estimate lower Boise River TP concentrations or loads near Parma under adjusted flows scenarios. This is because altering river flows in the mass balance model also requires altering groundwater, tributary, background flows throughout the system to maintain the balance. However, the complex relationships among the various sources are not well understood and require utilizing additional assumptions. Further, although the mass balance model clearly illustrates the flow and TP relationships throughout the river during one week in August 2012 when flows near Parma were 624 cfs, it does not account for varying flow and TP relationships in the subbasin.

From the tables and figures in section 5.2.1., the lower Boise River TP loadings near Parma must be reduced by 67% to 81% from May 1 – September 30 in order to meet the TP mass equivalent target of $\leq$ 0.07 mg/L.  As such, Tables 30-31 and Figure 22 outlines gross allocations for each flow scenario to meet the target.

Note for this draft:  The allocation strategy could utilize equal proportion or other reduction methodologies that best meet sector objectives, as long as the total loading at Parma still achieves the target.

**Table 30. Gross load and wasteload allocations and TP reductions for the lower Boise River, May 1 – September 30. The green highlight represents data adjusted from the USGS August 2012 mass balance model for the lower Boise River (Etheridge 2013).**

| | TP Inputs into the Boise River | | | | TP Loads in the Boise River near Parma | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Parma Flow | Current TP Inputs | TP Input Allocations | TP Input Reductions | | Current Parma TP Load | Current Parma TP Conc. | Parma TP Target (0.07 mg/L) | Parma TP Load Allocations | Parma TP Conc. Allocations | Parma TP Load Reductions | |
| (cfs) | (lbs/day) | (lbs/day) | (lbs/day) | % | (lbs/day) | mg/L | (lbs/day) | (lbs/day) | mg/L | (lbs/day) | % |
| 3268 | 1490 | 444 | -1046 | 70% | 3747 | 0.21 | 1233 | 1117 | 0.063 | -2630 | 70% |
| 912 | 2995 | 652 | -2342 | 78% | 1531 | 0.31 | 344 | 333 | 0.068 | -1197 | 78% |
| 705 | 2942 | 640 | -2302 | 78% | 1190 | 0.31 | 266 | 259 | 0.068 | -931 | 78% |
| 624 | 2916 | 676 | -2240 | 77% | 1010 | 0.30 | 235 | 234 | 0.070 | -776 | 77% |
| 383 | 3019 | 577 | -2442 | 81% | 738 | 0.36 | 145 | 141 | 0.068 | -597 | 81% |

**Table 31. Gross load and wasteload allocations by sector for the lower Boise River, May 1 – September 30. The green highlight represents data adjusted from the USGS August 2012 mass balance model for the lower Boise River (Etheridge 2013).**

| Parma Flow | Background TP Allocations | | Projected WWTF Flow and TP Allocations | | | Tributary TP Allocations w/o WWTF Projected Flows and Loads | | | Ground Water TP Allocations | | | Storm Water TP Allocations | TP Input Allocations | TP Inputs Reaching Parma | Parma TP Load Allocations |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cfs) | (mg/L) | (lbs/day) | (cfs) | (mg/L) | (lbs/day) | (cfs) | (mg/L) | (lbs/day) | (cfs) | (mg/L) | (lbs/day) | (lbs/day) | (lbs/day) | (%) | (lbs/day) |
| 3268 | 0.02 | 352 | 152.7 | 0.30 | 247 | 783 | 0.1 | 422 | -1390 | 0.08 | -599 | 22 | 444 | 252% | 1117 |
| 912 | 0.02 | 98 | 152.7 | 0.15 | 123 | 783 | 0.08 | 338 | 164 | 0.08 | 71 | 22 | 652 | 51% | 333 |
| 705 | 0.02 | 76 | 152.7 | 0.10 | 82 | 767 | 0.08 | 331 | 300 | 0.08 | 129 | 22 | 640 | 40% | 259 |
| 624 | 0.01 | 34 | 105.5 | 0.09 | 51 | 885 | 0.08 | 382 | 485 | 0.08 | 209 | | 676 | 35% | 234 |
| 383 | 0.02 | 41 | 152.7 | 0.09 | 74 | 767 | 0.07 | 289 | 398 | 0.07 | 150 | 22 | 577 | 24% | 141 |

[1] Background is calculated as the potential TP load at Diversion Dam that could reach Parma (assuming 100% reaches Parma) based on long-term median data. The USGS August 2012 synoptic data identified TP background as 0.1 mg/L (Etheridge 2013), which could result in a potential Parma load of 34 lbs/day.

[2] WWTF data are based on projected facility flows, and represent all facilities identified in Table 22. The USGS August 2012 synoptic sample data represent only WWTF contributions from Lander, West Boise, Meridian, Middleton, Nampa, and Caldwell facilities (Etheridge 2013).

[3] Mean tributary flows of 783 and 767cfs are projected to occur when daily mean Boise River flows near Parma are ≤ 912 and > 912 cfs, respectively. Tributary data were calculated by removing all projected WWTF flows, concentrations, and loads that discharge into tributaries. The USGS August 2012 synoptic sample calculated tributaries by removing the contributions from only the Meridian and Nampa facilities (Etheridge 2013).

[4] Ground water was estimated using the USGS August 2012 mass balance model to adjust likely groundwater contributions, including ground water loss (e.g. -1390 cfs) under various flow scenarios (Alex Etheridge pers. comm. 2014). The USGS August 2012 synoptic identified ground water flows as 485 cfs with 0.21 mg/L concentration (Etheridge 2013).

[5] Stormwater allocations were reduced by 50% from the current estimate of 44 lbs/day. It is assumed that approximately 25% of annual precipitation occurs during the May – September months from 1981 through 2010 (WRCC 2010).

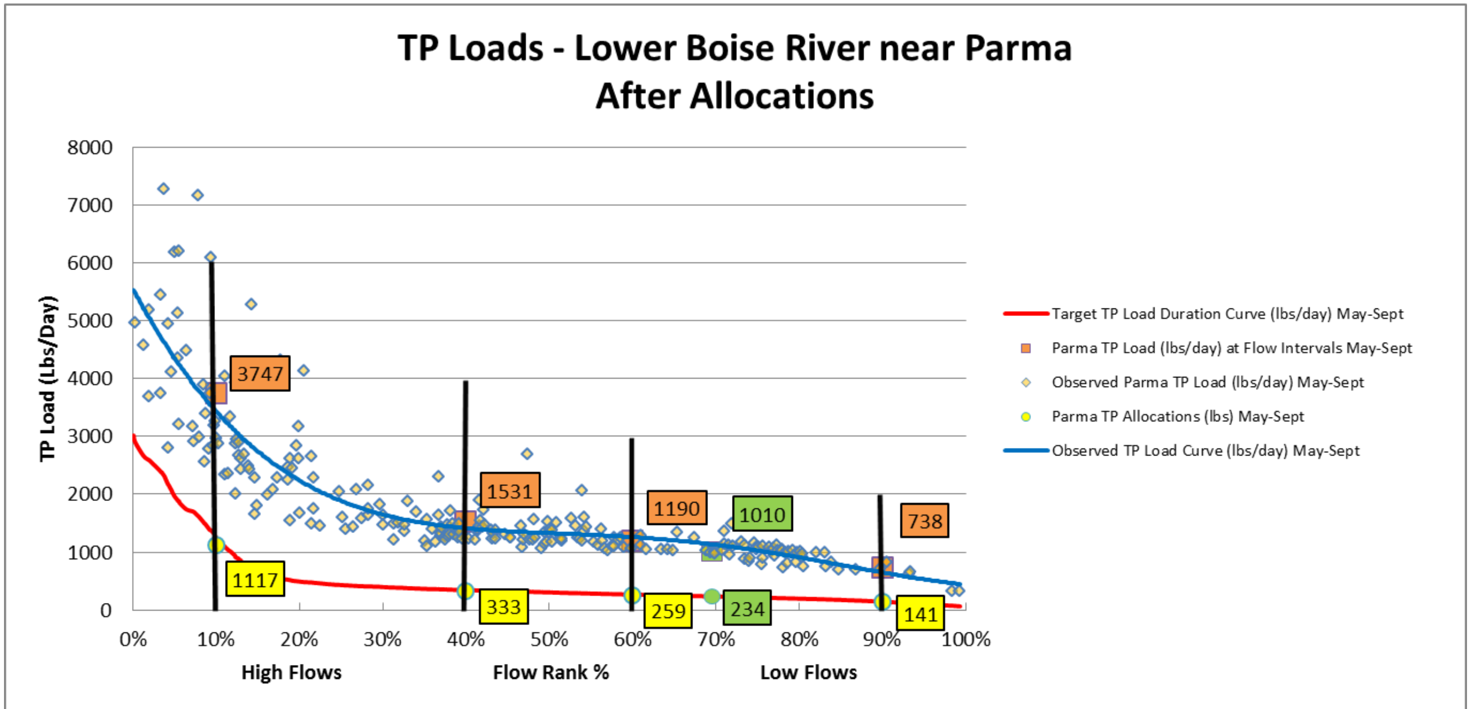



**Figure 22. Current TP loads (orange markers and labels) and TP load allocation scenarios (yellow markers and labels) for the lower Boise River near Parma, relative to the TP target mass equivalent of ≤ 0.07 mg/L. The green markers and labels represent the current load calculated from USGS August synoptic sampling event (Etheridge 2013) and the corresponding load allocation to meet the TP mass target equivalent of ≤ 0.07 mg/L.**

**Tables 32 and 33 identify specific point source wasteload allocations, while**

Table 34 identifies the nonpoint source load allocations for the lower Boise River.

**Table 32. Point source wasteload allocations for the lower Boise River, May 1 – September 30.**

| Point Source | Projected Flow (MGD) | Monthly Wasteload Allocations at Load Capacity (lbs/day)[1,2] | | | | |
|---|---|---|---|---|---|---|
| | | Boise River at Parma = 3268 cfs | Boise River at Parma = 912 cfs | Boise River at Parma = 705 cfs | Boise River at Parma = 624 cfs | Boise River at Parma = 383 cfs |
| | | TP (0.3 mg/L) | TP (0.15 mg/L) | TP (0.1 mg/L) | TP (0.09 mg/L) | TP (0.09 mg/L) |
| **Boise River - Main stem** | | | | | | |
| Lander Street WWTF | 15 | | | | | |
| West Boise WWTF | 24 | | | | | |
| Middleton WWTF | 1.83 | | | | | |
| Caldwell WWTF | 8.5 | | | | | |
| IDFG Eagle | 4.25 | | | | | |
| Darigold | 1.7 | | | | | |
| **Boise River - Tributary** | | | | | | |
| Avimor WWTF – Dry Creek | ?? | | | | | |
| Star WWTF– Lawrence-Kennedy Canal | 0.33 | | | | | |
| Meridian WWTF– Fivemile Creek and Boise River | 7 | | | | | |
| Sorrento Lactalis– Purdham Drain | 1.8 | | | | | |
| Nampa WWTF– Indian Creek | 11.8 | | | | | |
| Kuna WWTF– Indian Creek | 3.5 | | | | | |
| IDFG Nampa– Indian Creek | 17.86 | | | | | |
| Notus WWTF– Conway Gulch | 0.11 | | | | | |
| Wilder WWTF– Wilder Ditch Drain | 0.25 | | | | | |
| Greenleaf WWTF– West End Drain | 0.24 | | | | | |
| ConAgra (XL 4 Star)– Indian Creek | 0.48 | | | | | |
| **Total** | | | | | | |

[1] WLAs will be governed by the projected flows in facility-specific permit applications, which are expected to be more robust, based on more complete information than is available currently. WLAs contained herein are a placeholder for better flow information expected to be generated in subsequent permit application cycles.
[2] The WLAs and load reductions are estimates that meet the $\leq$ 0.07 TP target in the lower Boise River based flow and load duration curves developed for May 1 – September 30, 1983 through 2012 near Parma. The WLAs and Load

Reductions identified in NPDES permits will depend on actual lower Boise River flows at Parma. It is expected that all NPDES point source facilities will meet the wasteload allocation targets with 2 permit cycles.

**Table 33. Stormwater wasteload allocations for the lower Boise River, May 1 – September 30.**

| | **Current Load** | **Wasteload Allocations at Load Capacity (lbs/day)[1,2]** | | | | |
|---|---|---|---|---|---|---|
| **LBR Stormwater** | **Estimated May – September Stormwater Load to LBR (lbs/day)[1]** | **Boise River at Parma = 3268 cfs** | **Boise River at Parma = 912 cfs** | **Boise River at Parma = 705 cfs** | **Boise River at Parma = 624 cfs** | **Boise River at Parma = 383 cfs** |
| Boise/Ada County MS4 | 28.1 | | | | | |
| Canyon Hwy District #4 MS4 | 1.9 | | | | | |
| Middleton MS4 | 1.2 | | | | | |
| Nampa MS4 | 7.1 | | | | | |
| Nampa Hwy District MS4 | 2.0 | | | | | |
| Caldwell MS4 | 2.9 | | | | | |
| Notus-Parma MS4 | 0.5 | | | | | |
| **Total** | **43.6** | **21.7** | **21.7** | **21.7** | **21.7** | **21.7** |

[1] The current stormwater loads estimated from the *2008 Lower Boise River Implementation Plan Total Phosphorus* (DEQ 2008). These values consider the area ratio (area of contribution for each individual MS4 relative to the total service area for all MS4s) and are based on estimated ~25% of annual precipitation occurring during the May – September months from 1981 through 2010 (WRCC 2010).

**Table 34. Nonpoint source (tributary, ground water and unmeasured, and background) load allocations for the lower Boise River, May 1 – September 30.**

| | Load Allocations at Load Capacity (lbs/day [mg/L])1,2 | | | | |
|---|---|---|---|---|---|
| **Source** | **Boise River at Parma = 3268 cfs** | **Boise River at Parma = 912 cfs** | **Boise River at Parma = 705 cfs** | **Boise River at Parma = 624 cfs** | **Boise River at Parma = 383 cfs** |
| Tributaries | 422 (0.1) | 338 (0.08) | 331 (0.08) | 382 (0.08) | 289 (0.07) |
| | | | | | |
| Ground water and unmeasured | -599 (0.08) | 71 (0.08) | 129 (0.08) | 209 (0.08) | 150 (0.07) |
| | | | | | |
| Background | 352 (0.02) | 98 (0.02) | 76 (0.02) | 34 (0.02) | 41 (0.02) |

[1] Mean tributary flows of 783 and 767 cfs are projected to occur when daily mean Boise River flows near Parma are ≤ 912 cfs > 912 cfs, respectively. Tributary data were calculated by removing all projected WWTF flows, concentrations, and loads that discharge into tributaries. The USGS August 2012 synoptic sample calculated tributaries by removing the contributions from only the Meridian and Nampa facilities (Etheridge 2013).
[2] Ground water and unmeasured flows (485 cfs) are estimated from the August 2012 synoptic sampling event (USGS 2013 – Draft).
[3] Background calculated as percentage of TP input that could potentially reach Parma (assuming 100% of background TP reaches Parma).

### 5.4.2 Sand Hollow Creek Load and Wasteload Allocations (May – September)

Table 35 identifies point nonpoint source TP allocations for Sand Hollow Creek, a tributary to the Snake River.

**Table 35. Point source wasteload allocations for the Snake River, May 1 – September 30.**

| | Flow (cfs) | | Current Load | Current Load* | Load Capacity | Load Capacity | Load Reduction |
|---|---|---|---|---|---|---|---|
| | | | TP Conc. (mg/L) | Load (lbs/day) | TP Conc. (mg/L) | Load (lbs/day) | (lbs/day [%]) |
| **Sand Hollow Creek** | | | | | | | |
| Parma WWTF | 1.05* | | 0.21 | 1.2 | 0.07 | 0.4 | -0.8 (66%) |
| Nonpoint, ground water and unmeasured | 140* | | 0.4 | 302 | 0.07 | 53 | -249 (83%) |
| **Total** | **141** | | **0.4** | **303** | **0.07** | **53** | **-251 (83%)** |

[1]As permits are developed, WLAs will be governed by the projected flows contained in facility-specific permit applications, which are expected to be more robust, based on more complete information than is available currently. Therefore, WLAs contained herein are a placeholder for better projected flow information expected to be generated in subsequent permit application cycles.

[2]The Load Capacity and Wasteload Reductions are mean monthly concentration-based estimates between May 1 – September 30, 1983 through 2012. *The Wasteload Allocations and Load Reductions identified in NPDES permits will depend on actual lower Boise River flows at Parma. It is expected that all NPDES point source facilities will meet the wasteload allocation targets with 2 permit cycles.*

* Parma WWTF is projected flow; nonpoint, ground water, and unmeasured are mean flows from May – September (1983 – 2012) minus flows and loads from the WWTF.

### 5.4.3 Margin of Safety

**May 1 – September 30**

There are several conservative measures and assumptions that contribute to a margin of safety (MOS) in this TMDL.

1. A explicit 13% MOS was applied to the TP load allocations and capacity for the SR-HC TMDL as determined by the accuracy and representativeness of sampling techniques and analytical methods. This MOS was incorporated into the identification of the 0.07 mg/L TP target for the SR-HC TMDL. Applying this MOS to the initial 16 µg/L threshold value yielded a target of 14 µg/L chlorophyll a.
2. Utilizing the USGS Mass Balance Model to help in addition to long-term flow, load, and concentration data sets (1987-2012) to help develop the load and wasteload allocations utilizes a conservative mass balance approach to account for nutrients.
3. 100% of the background TP loading is assumed to reach the monitoring control points for each water body (e.g. lower Boise River – near Parma; Mason Creek – near lower Boise River; Sand Hollow Creek – near Snake River).

**Mean Benthic Chlorophyll a < 150 mg/m$^2$**

Depending on AQUATOX and subsequent analysis…

### 5.4.4 Seasonal Variation

**May 1 – September 30**

The May 1 through September 30, monthly TP target $\leq$ 0.07 mg/L is believed to be protective of cold water aquatic life and contact recreation by reducing and maintaining phytoplankton biomass in the Snake River and reservoirs < 14 µg/L. Achieving this monthly $\leq$ 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 contact recreation, as well as ecological impacts for cold water aquatic life, the Snake River the lower Boise River, Mason Creek, and Sand Hollow Creek.

**Mean Benthic Chlorophyll a < 150 mg/m$^2$**

Through the TMDL process, DEQ, in consultation with the LBWC, developed a target that relates nuisance algae growth to the impairment of beneficial uses in the lower Boise River. Specifically, the target strives for mean benthic chlorophyll a biomass (indicator of nuisance algae) $\leq$ 150 mg/m$^2$ within impaired AUs of the lower Boise River. This target was further refined to include XXXX to XXXXX months.

This target is believed to protect contact recreation and cold water aquatic life beneficial uses. The target also corresponds well with values established in the academic literature (see Section 2.2.5) and is similar to targets developed and implemented for waters in Montana (MDEQ 2008), Minnesota (MPCA 2013) and Colorado (CDPHE 2012).

### 5.4.5 Reasonable Assurance

In this TMDL, the point source WLAs and nonpoint source LAs are complimentary in effectively achieving the TP load capacity for the lower Boise River. However, because point source contributions are regulated by the EPA through NPDES permits, the reasonable assurances for this TMDL apply almost exclusively toward nonpoint source agricultural load reductions.

Achieving the TP reductions identified in the TMDL will require effort and effective BMP implementation; however, based on the USGS mass balance model and report (Etheridge 2013) and other data, DEQ believes that TP concentrations and loads from nonpoint sources can be effectively reduced to meet the TMDL targets in the lower Boise River. The necessary reductions will result from the combination of regulated point source reductions (which inherently reduces the amount of TP moving through the system via subsequent use by nonpoint sources) and voluntary nonpoint source reductions, which will depend on funding, cost-sharing, and willing partners to achieve the target.

Idaho water quality standards assign specific agencies responsibility for implementing, evaluating, and modifying BMPs to restore and protect impaired water bodies. The State of Idaho is committed to developing implementation plans within 18 months of EPA TMDL approval. DEQ, and the LBWC, will assist designated management agencies (e.g. SWCC) to develop an implementation plan, and DEQ will periodically reassess the beneficial use support status. BMP implementation and revision will continue until full beneficial use support status is documented and the TMDL target is achieved.

Nonpoint sources (e.g. agricultural) meet their water quality obligations under the Clean Water Act through voluntary implementation of BMPs typically identified by the SWCC Conservation Commission. Idaho water quality standards, IDAPA 58.01.02.055, identify that water bodies not fully supporting beneficial uses:

"*…shall require the development of TMDLs or other equivalent processes, as described under Section 303(d)(1) of the Clean Water Act*."

Whereas Idaho Statute 39-3610(1) states:

"*…nothing in this section shall be interpreted as requiring best management practices for agricultural operations which are not adopted on a voluntary basis*."

Whereas Idaho Statute 39-3611(10) states:

"*Nothing in this section shall be interpreted as requiring best management practices for agricultural nonpoint source activities which are not adopted on a voluntary basis…*"

### 5.4.6 Background

Synoptic sampling efforts (USGS 2013) identified background concentrations near Diversion Dam as < 0.02 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). While there are human-caused changes in the upstream watershed (due to 3 reservoirs), DEQ has determined a background TP concentration of 0.02 mg/L as appropriate for this TMDL, based on the median TP concentration (n=119) in the Boise River below Diversion Dam (RM 61.1), including a statistical analysis of non-detect results using the Kaplan-Mier method (Helsel, 2005) (Etheridge 2013).

The resulting estimated load from background ranges from approximately 11 to 364 lbs/day for at Parma, which represents approximately 2 to 8%.of the load at Parma (assuming 100% of background reaches Parma).

### 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.

#### Post-construction Stormwater Management

Many communities throughout Idaho are currently developing rules for post-construction 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

Where applicable, states must include an allowance for future loading in their TMDL that accounts for reasonably foreseeable increases in pollutant loads with careful documentation of the decision-making process. This allowance is based on existing and readily available data at the time the TMDL is established. In the case of the lower Boise River TP TMDL addendum, an allowance for future growth is not recommended until such time as reductions indicate that beneficial uses have been restored or state water quality standards have been met. Any new point sources discharging directly or indirectly to the lower Boise River, Mason Creek, or Sand Hollow Creek would receive a wasteload allocation of zero and the allowance for future growth is zero. Alternatively, growth can only occur under the following auspices of: (1) pollutant trading, (2) no net increase above the instream TP target of $\leq$ 0.07 mg/L, and (3) no discharge where land application is the preferred option.

## 5.5 Implementation Strategies

The purpose of the implementation strategy is to outline the pathway by which the SWCC and Ada and Canyon Soil and Water Conservation Districts 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 5.4.55) 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) presented strategies to meet the May 1 – September 30 SR-HC TP allocation target on the lower Boise River. Activities within a 70-year timeframe, included assessing the effects:

- TP reductions from point source facilities
    - Effluent concentration targets as stipulated in the staged implementation approach
    - Projected 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 nonpoint 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 (see Section 5.5.5).

### 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.

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.
- **WAG** and other agencies for other activities—Idaho Statute 39-3616 states: *"…recommending those specific actions needed to control point and nonpoint sources of pollution within the watershed so that, within reasonable periods of time, designated beneficial uses are fully supported and other state water quality plans are achieved..consult with the director and participate in the development of each TMDL and any supporting subbasin assessment for water bodies within the watershed, and shall develop and recommend actions needed to effectively control sources of pollution…"*
- **DEQ** for 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

The objectives of a monitoring strategy should be to demonstrate long-term recovery, better understand natural variability, track implementation of projects and BMPs, and track the TMDL implementation effectiveness. This monitoring and feedback mechanism is a major component of the "reasonable assurance" component of the TMDL and implementation plan.

Monitoring will provide information on progress being made toward achieving TMDL allocations and achieving water quality standards, and will help in the interim evaluation of progress, including in the development of 5-year reviews and future addendums.

The implementation monitoring strategy should specifically focus on several aspects:

**1. <u>May 1 – September 30</u>**

a. Identify TP concentration trends (mg/L) and loading mass equivalents (lbs/day) in the lower Boise River near Parma relative to the SR-HC May 1 – September 30 TP allocation target of $\leq$ 0.07 mg/L.
b. Identify TP concentration trends (mg/L) and loading mass equivalents (lbs/day) in Mason Creek near the mouth relative to the its allocation target identified in this TMDL for the May 1 – September 30 time period.
c. Identify TP concentration trends (mg/L) and loading mass equivalents (lbs/day) in Sand Hollow Creek near the mouth relative to the SR-HC May 1 – September 30 TP allocation target of $\leq$ 0.07 mg/L.

**2. Mean Benthic Chlorophyll a < 150 mg/m²**

a. Identify TP concentration trends (mg/L) and loading mass equivalents (lbs/day) in the lower Boise River and near the mouth of Mason Creek relative TP allocation target designed to help meet the mean benthic chlorophyll a (periphyton) biomass target of ≤ 150 $mg/m^2$.

b. Identify mean benthic chlorophyll a (periphyton) biomass in the two lower Boise River AUs that are currently listed as impaired for TP in the 2010 Integrated Report (DEQ 2011) in order to help determine the extent in which changes in TP concentrations and loading mass equivalents are helping to achieve the algae growth target.

The Implementation Monitoring Strategy should be designed by DEQ, USGS, designated management agencies, the LBWC, and other affected agencies/organizations/individuals to help ensure scientifically-defensible and meaningful methodologies are utilized to help to track progress toward meeting the TMDL objectives. All sampling and analyses would be conducted under DEQ, USGS, SWCC, or other scientifically-defensible and approved protocols.

### 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, 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 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 designed to help achieve the mean benthic chlorophyll a (periphyton) biomass target of $\leq$ 150 mg/m$^2$ from XXX - XXX. 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 36 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 36. 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

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

Add list of GIS coverages to end of references (see guidance). If you have maps, you used GIS and should list that information here. If you don't have any, delete this section.

## 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.

**Synoptic**

A sampling event that takes place over a relatively short timeframe and under relatively stable hydrologic conditions.

**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 | |

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IDAHO ADMINISTRATIVE CODE IDAPA 58.01.02
Department of Environmental Quality Water Quality Standards

| 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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*IDAHO ADMINISTRATIVE CODE* *IDAPA 58.01.02*
*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<br>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 |
| Greenleaf 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
73. January 9, 2014, LBWC Meeting
74. January 21, 2014 Model Work Session
75. January 23, 2014 LBWC TAC
76. February 13, 2014 LBWC Meeting
77. February 18, 2014 Model Work Session
78. February 26, 2014 LBWC TAC

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

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# Appendix D. Distribution List

Ben Cope and Bill Stewart, EPA

BOR Pacific Northwest Region and Snake River Office

Lower Boise Watershed Council, TAC, 319 TAC, and Model Workgroup

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