# Lower Boise River Tributaries

**2013 Addendum**

Hydrologic Unit Code 17050114

**Image in progress**

**DRAFT**

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

**DRAFT: Friday June 14 2013**

Prepared by:
Hawk Stone
Boise Regional Office
Department of Environmental Quality
1445 N. Orchard Street
Boise, Idaho 83702

# Acknowledgments


- Lower Boise Watershed Council
- Bill Stewart
- Tom Dupuis
- Alex Etheridge
- Michael Fuss
- Tracy Crane
- Susan Beattie
- Lindsay Stanton for the front cover (forthcoming)

*This page intentionally left blank for correct double-sided printing.*

# Table of Contents



## List of Tables

# List of Figures

# 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 |
| **CWA** | Clean Water Act |
| **CWAL** | cold water aquatic life |
| **CWE** | cumulative watershed effects |
| **DEQ** | Department of Environmental Quality |
| **DO** | dissolved oxygen |
| **DOI** | U.S. 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** | U.S. Fish and Wildlife Service |
| **GIS** | Geographical Information Systems |
| **HUC** | Hydrologic Unit Code |
| **I.C.** | Idaho 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

**INFISH** the federal Inland Native Fish Strategy

**IRIS** Integrated Risk Information System

**km** kilometer

**km$^2$** square kilometer

**LA** load allocation

**LC** load capacity

**m** meter

**m$^3$** cubic meter

**mi** mile

**mi$^2$** square miles

**MBI** Macroinvertebrate Biotic Index

**MGD** million gallons per day

**mg/L** milligrams per liter

**mm** millimeter

**MOS** margin of safety

**MRCL** multiresolution land cover

**MWMT** maximum weekly maximum temperature

**n.a.** not applicable

**NA** not assessed

**NB** natural background

**nd** no data (data not available)

**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

**PACFISH** the federal Pacific Anadromous Fish Strategy

**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

**SRP** soluble reactive phosphorus

**SS** salmonid spawning

**SSOC** stream segment of concern

**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

**t/y** tons per year

**U.S.** United States

**U.S.C.** 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

**WET** whole effluence toxicity

**WLA** wasteload allocation

**WQLS** water quality limited segment

**WQMP** water quality management plan

**WQRP** water quality restoration plan

**WQS** water quality standard

This page intentionally left blank for correct doubled-sided printing.

# Executive Summary

This document addresses the sediment and bacterial impairments of 18 assessment units in the Lower Boise watershed in southwest Idaho. The Lower Boise watershed incorporates the Boise River and its tributaries between the outflow of Lucky Peak dam and the Snake River. The assessment describes the physical, biological, and cultural setting; water quality status; pollutant sources; and recent pollution control actions in the 305(b) subbasin, located in southwest Idaho.

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 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) establishes requirements for states and tribes to identify and prioritize water bodies that do not meet water quality standards. States and tribes must periodically publish a prioritized list (a "§303(d) list") of impaired waters. This list is currently published every 2 years as the list of Category 5 waters in the Integrated Report. For waters identified on this list, states and tribes must develop a total maximum daily load (TMDL) of pollutants, set at a level to achieve water quality standards.

The starting point for this assessment was Idaho's current §303(d) list of water quality limited water bodies. The SBA examines the status of §303(d) listed waters and defines the extent of impairment and causes of water quality limitation throughout the subbasin. The TMDL analysis quantifies pollutant sources and allocates responsibility for load reductions needed to return listed waters to a condition of meeting water quality standards.

Rather than address the entire catalog of impaired streams in the watershed, this document focuses on only the sediment and bacteria impairments. This will allow DEQ to address the waters listed in its TMDL settlement agreement in the most efficient manner.

Sediment and E. coli TMDLs were previously established for the mainstem of the Boise River. This document establishes nine new sediment and ten new E. coli TMDLs for the river's impaired tributaries (Table A).

**Table A. Summary of new and revised TMDLs.**

| AU | Description | Pollutant |
|---|---|---|
| ID17050114SW001_02 | Dixie Slough | E. coli |
| ID17050114SW002_04 | Indian Creek downstream of Sugar Ave | Sediment |
| ID17050114SW002_04 | Indian Creek downstream of Sugar Ave | E. coli |
| ID17050114SW003d_02 | Indian Creek and Tributaries upstream of Indian Creek | E. coli |
| ID17050114SW006_02 | Mason Creek entire watershed | Sediment |
| ID17050114SW006_02 | Mason Creek entire watershed | E. coli |
| ID17050114SW007_04 | Fifteenmile Creek from Five/Tenmile confluence to mouth | Sediment |
| ID17050114SW007_04 | Fifteenmile Creek from Five/Tenmile confluence to mouth | E. coli |
| ID17050114SW008_03 | Tenmile Creek Blacks Creek Reservoir to mouth | Sediment |
| ID17050114SW008_03 | Tenmile Creek Blacks Creek Reservoir to mouth | E. coli |
| ID17050114SW010_02 | Ninemile Creek 1st and 2nd order tributaries to Fivemile Creek | E. coli |
| ID17050114SW010_03 | Fivemile Creek 3rd order section | Sediment |
| ID17050114SW010_03 | Fivemile Creek 3rd order section | E. coli |
| ID17050114SW015_03 | Willow Creek 3rd order section (South Fork to mouth) | Sediment |
| ID17050114SW016_03 | Sand Hollow Creek C-line Canal to I-84 | Sediment |
| ID17050114SW017_03 | Sand Hollow Creek I-84 to Sharp Road | Sediment |
| ID17050114SW017_03 | Sand Hollow Creek I-84 to Sharp Road | E. coli |
| ID17050114SW017_06 | Sand Hollow Creek Sharp Road to Snake River | Sediment |
| ID17050114SW017_06 | Sand Hollow Creek Sharp Road to Snake River | E. coli |

Sediment targets were established using a 1996 paper by Newcombe and Jensen. Existing sediment levels were measured using data collected by several government agencies.

E. coli targets were chosen based upon the Idaho water quality standards. Existing E. coli levels were measured using data collected by several government agencies.

To implement this TMDL, nonpoint sources must reduce their sediment and E. coli pollution. Point sources are presently meeting the pollutant targets.

**Table B. Summary of assessment outcomes for the Lower Boise River subbasin.**

| Assessment Unit | Description | Pollutant | Recommended Changes to the 2014 Integrated Report | TMDL Loads |
|---|---|---|---|---|

| Assessment Unit | Description | Pollutant | Recommended Changes to the 2014 Integrated Report | TMDL Loads |
|---|---|---|---|---|
| ID17050114SW001_02 | Dixie Slough | E. coli | Move to 4A – TMDL completed | 126 CFU/100ml, averaged over 30 days.<br><br>The load capacity is flow dependent, according to the following equation:<br><br>LC (in $10^9$ CFU/day) = Q (in cfs) x 3.08 |
| ID17050114SW002_04 | Indian Creek downstream of Sugar Ave | | | |
| ID17050114SW003d_02 | Indian Creek and Tributaries upstream of Indian Creek | | | |
| ID17050114SW006_02 | Mason Creek entire watershed | | | |
| ID17050114SW007_04 | Fifteenmile Creek from Five/Tenmile confluence to mouth | | | |
| ID17050114SW008_03 | Tenmile Creek Blacks Creek Reservoir to mouth | | | |
| ID17050114SW010_02 | Ninemile Creek 1st and 2nd order tributaries to Fivemile Creek | | | |
| ID17050114SW010_03 | Fivemile Creek 3rd order section | | | |
| ID17050114SW017_03 | Sand Hollow Creek I-84 to Sharp Road | | | |
| ID17050114SW017_06 | Sand Hollow Creek Sharp Road to Snake River | | | |
| ID17050114SW002_04 | Indian Creek downstream of Sugar Ave | Sediment | Move to 4A – TMDL completed | 20mg/L, averaged over 4 months.<br><br>The load capacity is flow dependent, according to the following equation:<br><br>LC (in kg/day) = Q (in cfs) x 48.9 |
| ID17050114SW006_02 | Mason Creek entire watershed | | | |
| ID17050114SW007_04 | Fifteenmile Creek from Five/Tenmile confluence to mouth | | | |
| ID17050114SW008_03 | Tenmile Creek Blacks Creek Reservoir to mouth | | | |
| ID17050114SW010_03 | Fivemile Creek 3rd order section | | | |
| ID17050114SW015_03 | Willow Creek 3rd order section (South Fork to mouth) | | | |
| ID17050114SW016_03 | Sand Hollow Creek C-line Canal to I-84 | | | |
| ID17050114SW017_03 | Sand Hollow Creek I-84 to Sharp Road | | | |
| ID17050114SW017_06 | Sand Hollow Creek Sharp Road to Snake River | | | |

## Watershed Overview

The Lower Boise River, Hydrologic Unit Code (HUC) 17050114, is located in southwest Idaho. The watershed drains 1290 square miles of rangeland, forests, agricultural lands, and urban areas. The lower Boise River itself is a 64-mile stretch that flows in a northwesterly direction through Ada and Canyon counties and the cities of Boise and Caldwell, Idaho. The lower Boise River originates at Lucky Peak Dam and flows into the Snake River near Parma, Idaho.

Impaired beneficial uses: Cold water aquatic life, secondary contact recreation

Pollutants addressed in this document: sediment, E. coli

Pollutant sources: stormwater, municipal wastewater treatment, agriculture

Impaired subwatersheds: Indian Creek, Mason Creek, Willow Creek, Sand Hollow Creek, Fivemile Creek, Tenmile Creek, Fifteenmile Creek

The Lower Boise River subbasin is shown in figure 1, with the individual subwatersheds indicated in figure 2.

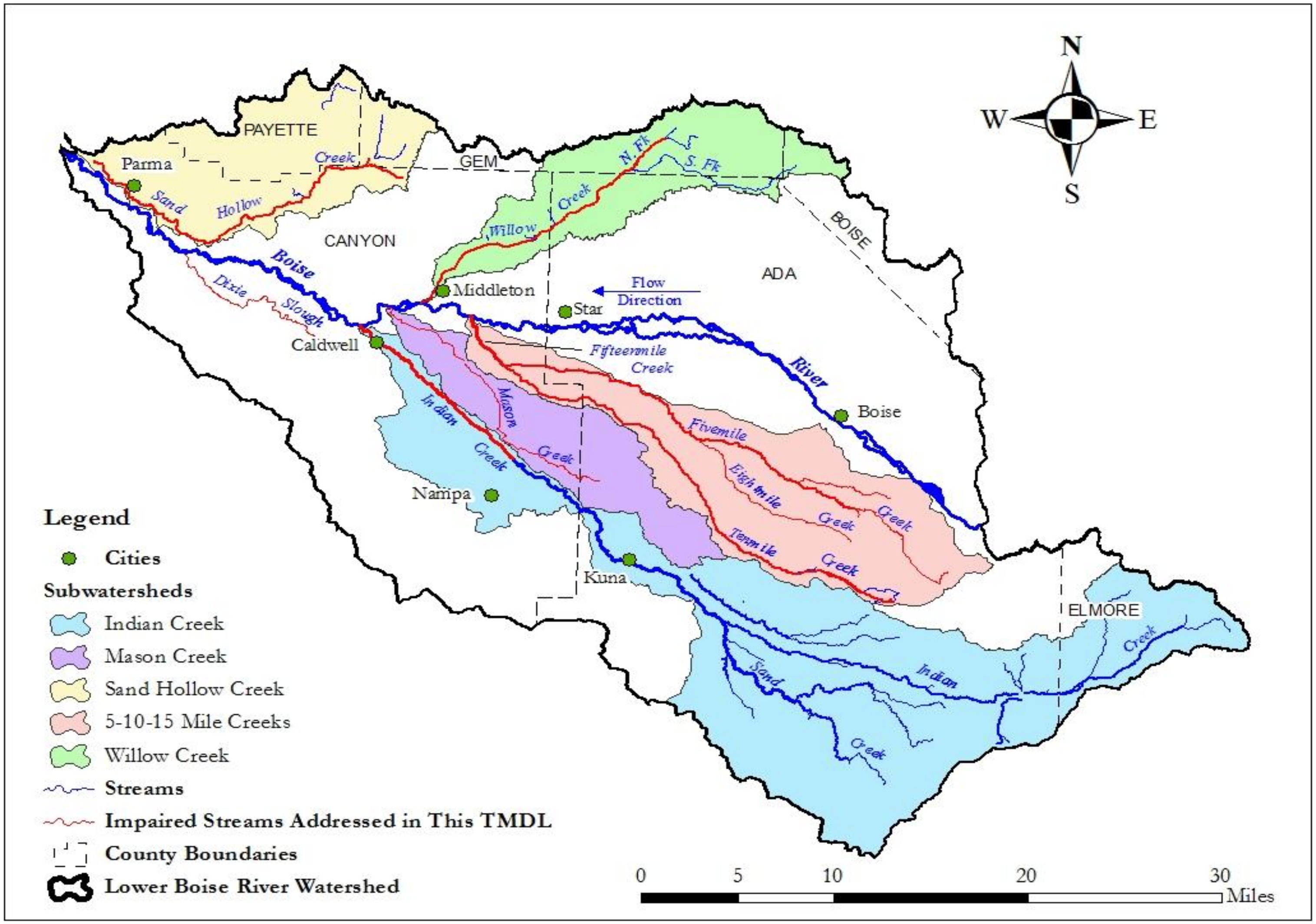



Figure 2: Subwatershed MAP:

Several assessment units were listed on Idaho's 2012 §303(d) list for temperature and E. coli pollution (Table E) (DEQ 2012).

**Table E. Assessment units on Idaho's 2012 §303(d) list.**

| AU | Description | Pollutant |
|---|---|---|
| ID17050114SW002_04 | Indian Creek downstream of Sugar Ave | Sediment |
| ID17050114SW002_04 | Indian Creek downstream of Sugar Ave | E. coli |
| ID17050114SW003d_02 | Indian Creek and Tributaries upstream of Indian Creek | E. coli |
| ID17050114SW006_02 | Mason Creek entire watershed | Sediment |
| ID17050114SW006_02 | Mason Creek entire watershed | E. coli |
| ID17050114SW007_04 | Fifteenmile Creek from Five/Tenmile confluence to mouth | Sediment |
| ID17050114SW007_04 | Fifteenmile Creek from Five/Tenmile confluence to mouth | E. coli |
| ID17050114SW008_03 | Tenmile Creek Blacks Creek Reservoir to mouth | Sediment |
| ID17050114SW008_03 | Tenmile Creek Blacks Creek Reservoir to mouth | E. coli |
| ID17050114SW010_02 | Ninemile Creek 1st and 2nd order tributaries to Fivemile Creek | E. coli |
| ID17050114SW010_03 | Fivemile Creek 3rd order section | Sediment |
| ID17050114SW010_03 | Fivemile Creek 3rd order section | E. coli |
| ID17050114SW015_03 | Willow Creek 3rd order section (South Fork to mouth) | Sediment |
| ID17050114SW016_03 | Sand Hollow Creek C-line Canal to I-84 | Sediment |
| ID17050114SW017_03 | Sand Hollow Creek I-84 to Sharp Road | Sediment |
| ID17050114SW017_03 | Sand Hollow Creek I-84 to Sharp Road | E. coli |
| ID17050114SW017_06 | Sand Hollow Creek Sharp Road to Snake River | Sediment |
| ID17050114SW017_06 | Sand Hollow Creek Sharp Road to Snake River | E. coli |

**Table F. Unlisted but impaired assessment units.**

| Assessment Unit | Description | Pollutant |
|---|---|---|
| ID17050114SW001_02 | Dixie Slough | E. coli |

This subbasin assessment (SBA) and TMDL analysis have been developed to address the water bodies in the Lower Boise River subbasin that have been placed on Idaho's current §303(d) list.

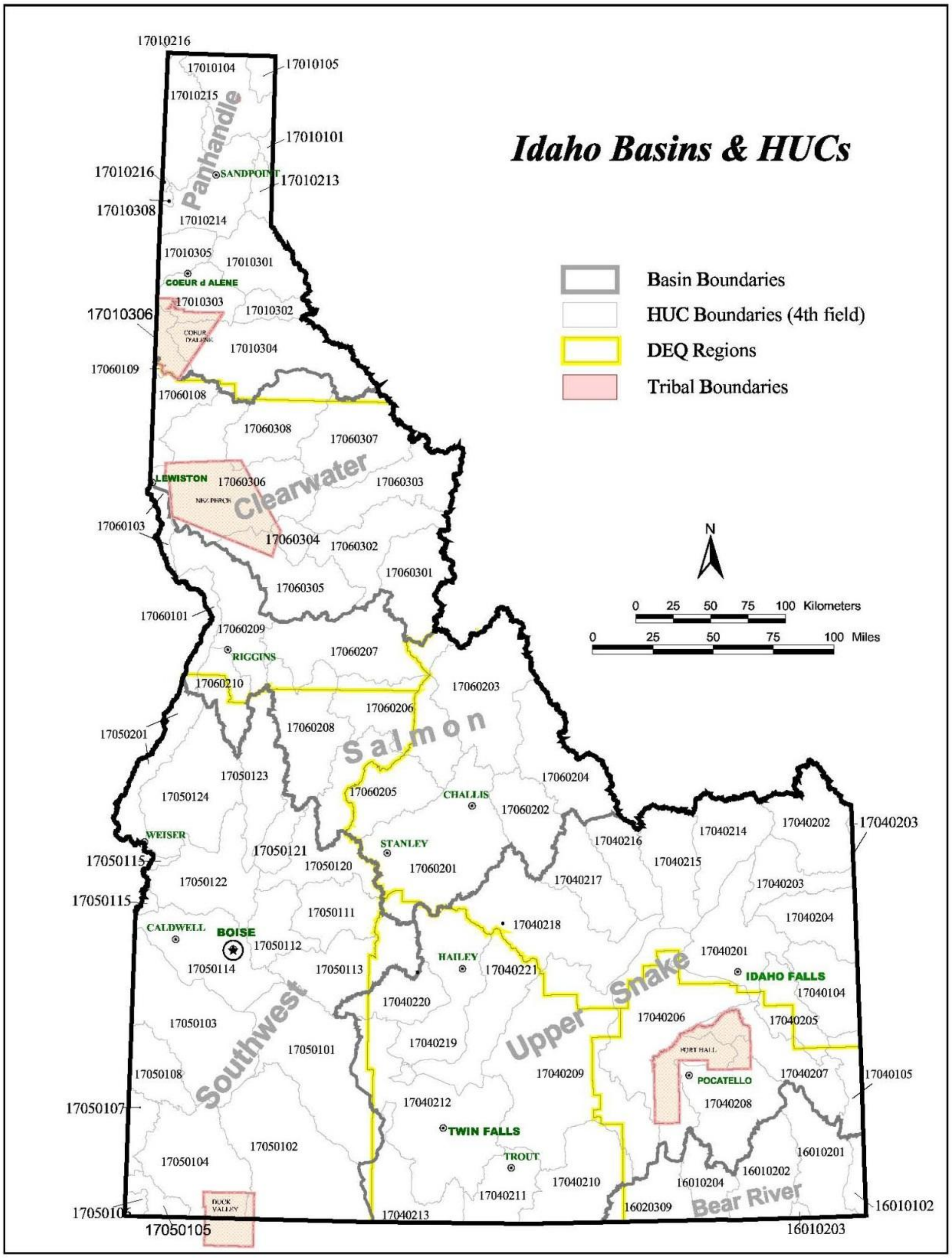



Figure 1. Location of 305(b) Subbasins.

*This page intentionally left blank for correct double-sided printing.*

# 1. Subbasin Assessment – Watershed Characterization

This document addresses the sediment and bacterial impairments of 18 assessment units in the Lower Boise watershed in southwest Idaho. These impairments are identified on Idaho's most recent 303(d) list of impaired waters. This document is an addendum to the 305(b).

## 1.1. Introduction—Regulatory Requirements

This document was prepared in compliance with both federal and state regulatory requirements, as described in the following.

The federal Clean Water Act (CWA) requires that states and tribes restore and maintain the chemical, physical, and biological integrity of the nation's waters. States and tribes, pursuant to Section 303 of the CWA, are to adopt water quality standards necessary to protect fish, shellfish, and wildlife while providing for recreation in and on the nation's waters whenever possible.

Section 303(d) of the CWA establishes requirements for states and tribes to identify and prioritize water bodies that are water quality limited (i.e., water bodies that do not meet water quality standards). States and tribes must periodically publish a priority list (a "§303(d) list") of impaired waters. 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 is an addendum to an existing TMDL, and addresses the water bodies in the Lower Boise River subbasin that have been placed on Idaho's current §303(d) list (DEQ 2012xxx). This addendum establishes xxx new sediment and xxx new E. coli TMDLs.

## 1.2. Public Participation and Comment Opportunities

The development of this document included the following public participation:

September 2012: The technical advisory committee was invited to submit papers addressing the effect of elevated sediments on cold water aquatic life.

October 2012: The technical advisory committee debated E. coli targets, and recommended they be sent to the watershed advisory group. The WAG subsequently voted to approve the E. coli targets

November 2012: The technical advisory committee debated sediment targets and recommended another meeting. The WAG members were individually consulted about the strategy and direction of the TMDL, and about the pollutant targets.

December 2012: The technical advisory committee debated sediment targets and recommended another meeting.

January 2012: The WAG voted to approve the sediment targets

April 2012: The WAG members were individually consulted about the method for allocating the load capacity amongst the various sources.

June 2012: The technical advisory committee was provided a draft copy of the TMDL to review.

XXX

# 1.3. Physical and Biological Characteristics

A detailed discussion of the physical and biological characteristics of the 305(b) Subbasin is provided in the Lower Boise River Subbasin Assessment and TMDL (pages 3-19). This document was approved by EPA in January 2000.

## 1.3.1. Climate

A detailed discussion of the climate characteristics of the Lower Boise River watershed is provided in the Lower Boise River Subbasin Assessment and TMDL (pages 3-19). This document was approved by EPA in January 2000.

The average maximum and minimum air temperature and average annual precipitation have changed slightly since the 2001 Subbasin Assessment. The most recent climate statistics are presented in Table 1 below, and originated from the Western Region Climate Center database.

Table 1. Air temperature and precipitation statistics.

| Location | Average Summer Maximum Air Temperature (ºF) | Average Winter Minimum Air Temperature (ºF) | Average Annual Precipitation (inches) |
|---|---|---|---|
| Boise Airport (1976-2005) | 90.5 | 22.3 | 11.76 |
| Nampa (1976-2005) | 91.1 | 21.5 | 11.2 |
| Caldwell (1976-2005) | 91.1 | 21.5 | 10.6 |

## 1.3.2. Subbasin Characteristics

A detailed discussion of the subbasin characteristics of the 305(b) Subbasin is provided in the Lower Boise River Subbasin Assessment and TMDL (pages 3-19). This document was approved by EPA in January 2000.

The past decade has seen increased development of farmland into housing. XXX percentage increase.

- Update as necessary.

### 1.3.3. Subwatershed Characteristics

The Fivemile and Tenmile Creek subwatersheds drain 83 and 74 square miles of rangeland, agricultural land and urban areas, respectively. Both streams are located in the southeast portion of the lower Boise River watershed. Fivemile and Tenmile Creek flow in a northwesterly direction through Ada and Canyon Counties before they join together to form Fifteenmile Creek, which discharges to the lower Boise River four miles upstream of Middleton.

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.

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

The Indian Creek subwatershed drains 295 square miles of rangeland, agricultural land and urban areas. Indian Creek is 55.68 mile long and is located in the southern portion of the lower Boise River watershed, which is located in southwest Idaho. The headwaters of Indian Creek are in Elmore County, but most of the stream flows through Ada and Canyon Counties. The stream flows in a southwesterly direction from its origin to where it intersects Interstate 84. From Interstate 84 to its confluence with the lower Boise River it flows in a northwesterly direction.

The Willow Creek subwatershed drains xxx square miles of rangeland, agricultural land and mixed rural farmstead. Willow Creek is located in the northern portion of the lower Boise River watershed. Willow Creek flows largely through Ada and Canyon Counties, with its headwaters in parts of Gem and Boise Counties. The stream flows in a southwesterly direction from its origin its confluence with the Boise River near Middleton.

Detailed discussions of the subwatersheds within the Lower Boise River subbasin are provided in the following documents:

- Fivemile and Tenmile Creek Subbasin Assessment (December 2001).
- Mason Creek Subbasin Assessment (December 2001)
- Sand Hollow Creek Subbasin Assessment (December 2001)
- Indian Creek Subbasin Assessment (December 2001)

### 1.3.4. Stream Characteristics

Detailed discussions of the streams within the Lower Boise River subbasin are provided in the following documents:

Fivemile and Tenmile Creek Subbasin Assessment (December 2001)

Mason Creek Subbasin Assessment (December 2001)

Sand Hollow Creek Subbasin Assessment (December 2001)

Indian Creek Subbasin Assessment (December 2001)

In general, each stream slopes gently to its confluence with the Boise River (or the Snake River, in the case of Sand Hollow Creek). The stream channels have been classified as Rosgen 'F' types, which is a deeply entrenched, low gradient (<0.02) stream with a high width/depth ratio, and a riffle/pool morphology (Rosgen, 1994). The entrenched aspect of each channel has been amplified by the extensive deepening and widening that occurred in the early part of the century.

The streambeds ranges from silt-size (<1 mm) material to large cobble (128.1-256 mm), although silt and sand material comprise most of the substrate. Larger substrate material is highly dispersed in cobble and gravel areas and typically embedded. The banks are typically stable with vegetation. In general, the numerous man-modified portions of each stream, along with the regulated irrigation flow have caused a narrowing and straightening of the stream channel. Braiding and sinuosity caused by divergent and out of bank flow events are largely absent.

# 1.4. Cultural Characteristics

A detailed discussion of the cultural characteristics of the 305(b) Subbasin is provided in the Lower Boise River Subbasin Assessment and TMDL (pages 3-19). This document was approved by EPA in January 2000.

Until the 2008 financial crisis, the cities in the Lower Boise River subbasin continued to experience the types of urban expansion described in the Subbasin Assessment. This has provided opportunities for municipal and industrial point sources to improve facilities and implement new technologies to prevent pollution. The city of Kuna recently began operating a wastewater treatment plant using membrane filtration technology that is capable of releasing Class A effluent expected to meet a total phosphorus target of 70µg/L. EPA has recently issued municipal storm water system National Pollutant Discharge Elimination System (NPDES) permits for several entities in the watershed. The storm water management activities required in the permits are consistent with the urban storm water pollution controls identified in the lower Boise River TMDL implementation plan (DEQ, 2003a).

Caldwell is actively developing and implementing plans to restore Indian Creek to an open channel through the city center and recently (2008) completed a three-block section of a seven-block master plan. This project exemplifies changing community attitudes regarding Indian Creek over the past 100 years; from using the stream as a communal wasteway and open sewer to a philosophy that the creek is a valuable asset to be protected and appreciated as a socially and economically beneficial natural resource.

# 2. Subbasin Assessment – Water Quality Concerns and Status

This section provides an overview of the assessment units addressed in this addendum, beneficial uses applicable to those assessment units, and the water quality criteria in place to protect those uses. This section also summarizes existing water quality data and identifies any data gaps found during the TMDL analysis.

## 2.1. Water Quality Limited Assessment Units Occurring in the Subbasin

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

The listing history since the original Subbasin Assessment was approved in 2001 is exceedingly complex, because of Idaho's conversion from a 'named stream' system to one using 'assessment units'. Table 2 identifies the stream segments that will be addressed by this TMDL document. Table 3 shows all the remaining listed streams on the 2012 303(d) list in the Lower Boise subbasin. These will not be addressed by this document.

Table 2. §303(d) Segments in the Lower Boise River Subbasin addressed by this TMDL addendum

| Assessment Unit | Description | Pollutants | Listing Reason |
|---|---|---|---|
| ID17050114SW002_04 | Indian Creek: downstream of Sugar Avenue in Nampa | Sediment | 1988 303(d) list |
| | | E. coli | 2011 DEQ data |
| ID17050114SW003d_02 | Indian Creek above Reservoir: 1st and 2nd order headwaters | E. coli | 2012 DEQ data |
| ID17050114SW006_02 | Mason Creek: entire watershed | E. coli | 2008 ISDA data |
| | | Sediment | 1988 303(d) list |
| ID17050114SW007_04 | Fifteenmile Creek: Five/Tenmile confluence to mouth | Sediment | 1988 303(d) list |
| | | E. coli | 2011 DEQ data |
| ID17050114SW008_03 | Tenmile Creek: Blacks Creek Reservoir to mouth | Sediment | 1988 303(d) list |
| | | E. coli | 2011 DEQ data |

| Assessment Unit | Description | Pollutants | Listing Reason |
|---|---|---|---|
| ID17050114SW010_02 | 1st and 2nd order tributaries to Fivemile Creek | E. coli | 2011 DEQ data |
| ID17050114SW010_03 | Fivemile Creek: 3rd order section | Sediment | 1988 303(d) list |
| | | E. coli | 2011 DEQ data |
| ID17050114SW015_03 | Willow Creek: South Fork to mouth | Sediment | 2001 ISDA data |
| ID17050114SW016_03 | Sand Hollow Creek: C line Canal to I-84 | Sediment | 1988 303(d) list |
| ID17050114SW017_03 | Sand Hollow Creek: I84 to Sharp Road | Sediment | 1988 303(d) list |
| | | E. coli | 2010 DEQ data |
| ID17050114SW017_06 | Sand Hollow Creek: Sharp Road to Snake River | Sediment | 1988 303(d) list |
| | | E. coli | 2010 DEQ data |

The remaining impaired streams and pollutants on the 303(d) list are not addressed by this TMDL addendum.

## 2.2. Applicable Water Quality Standards and Beneficial Uses

Idaho water quality standards, defined in IDAPA 58.01.02, designate beneficial uses, and set water quality goals for the 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 briefly described in the following paragraphs. The *Water Body Assessment Guidance* (Grafe et al. 2002) gives a more detailed description of beneficial uses. A summary of beneficial uses for the assessment units addressed in this addendum and their support status is provided in Tables 3-4.

*Existing uses* under the CWA are "those uses actually attained in the waterbody on or after November 28, 1975, whether or not they are included in the water quality standards." The existing in-stream water uses and the level of water quality necessary to protect the uses shall be maintained and protected (IDAPA 58.01.02.050.02, .02.051.01, and .02.053). Existing uses include uses actually occurring, whether or not the level of quality to support fully the uses exists. A practical application of this concept would be to apply the existing use of salmonid spawning to a water that could support salmonid spawning, but salmonid spawning is not occurring due to other factors, such as dams blocking migration.

### 2.2.1. Designated Uses

Designated uses under the CWA are "those uses specified in water quality standards for each water body or segment, whether or not they are being attained." Designated uses are simply uses officially recognized by the state. In Idaho, these designated uses include aquatic life support, recreation in and on the water, domestic water supply, and agricultural uses. Water quality must be sufficiently maintained to meet the most sensitive use.

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 specifically listed for water bodies in Idaho in tables in the Idaho water quality standards (see IDAPA 58.01.02.003.27 and .02.109-.02.160, in addition to citations for existing uses).

### 2.2.2. Presumed Use Protection

In Idaho, most water bodies listed in the water quality standards do not yet have specific use designations. These undesignated uses are to be designated in the future. In the interim, and absent information on existing uses, the DEQ presumes that most waters in the state will support cold water aquatic life and either primary or secondary contact recreation (IDAPA 58.01.02.101.01). To protect these so-called "presumed uses," DEQ will apply the numeric cold water aquatic life criteria and primary or secondary contact recreation criteria to undesignated waters.

Table 3. Beneficial uses of Section 303(d) listed streams addressed in this document

| Assessment Unit | Description | Beneficial Uses[a] | Use Type[b] | Use Support[c] |
|---|---|---|---|---|
| ID17050114SW001_02 | Dixie Slough | CWAL<br>PCR | DESIG<br>DESIG | NFS<br>NA[d] |
| ID17050114SW002_04 | Indian Creek: downstream of Sugar Avenue in Nampa | CWAL<br>SCR | DESIG<br>DESIG | NFS<br>NFS |
| ID17050114SW003d_02 | Indian Creek above Reservoir: 1st and 2nd order headwaters | CWAL<br>SCR | DESIG<br>DESIG | FS<br>NFS |
| ID17050114SW006_02 | Mason Creek: entire watershed | CWAL<br>SCR | PRES<br>DESIG | NFS<br>NFS |
| ID17050114SW007_04 | Fifteenmile Creek: Five/Tenmile confluence to mouth | CWAL<br>SCR | PRES<br>DESIG | NFS<br>NFS |
| ID17050114SW008_03 | Tenmile Creek: Blacks Creek Reservoir to mouth | CWAL<br>SCR | DESIG<br>DESIG | NFS<br>NFS |
| ID17050114SW010_02 | 1st and 2nd order tributaries to Fivemile Creek | CWAL<br>SCR | DESIG<br>DESIG | NFS<br>NFS |
| ID17050114SW010_03 | Fivemile Creek: 3rd order section | CWAL<br>SCR | DESIG<br>DESIG | NFS<br>NFS |
| ID17050114SW015_03 | Willow Creek: South Fork to mouth | CWAL | PRES | NFS |
| ID17050114SW016_03 | Sand Hollow Creek: C line Canal to I-84 | CWAL<br>SCR | PRES<br>DESIG | NFS<br>FS |
| ID17050114SW017_03 | Sand Hollow Creek: I84 to Sharp Road | CWAL<br>SCR | PRES<br>DESIG | NFS<br>NFS |

| Assessment Unit | Description | Beneficial Uses[a] | Use Type[b] | Use Support[c] |
|---|---|---|---|---|
| ID17050114SW017_06 | Sand Hollow Creek: Sharp Road to Snake River | CWAL<br>SCR | PRES<br>DESIG | NFS<br>NFS |

[a] CWAL – cold water aquatic life, SCR – secondary contact recreation
[b] DESIG = designated, PRES = presumed use protection
[c] NFS = not fully supporting, FS = fully supporting NA = not assessed
[d] Dixie Slough is impaired by E. coli, but was not assessed in time for the 2012 303(d) list.

## 2.3. Criteria to Support Beneficial Uses

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

The sediment criterion is narrative, and in this case, applies to the Cold Water Aquatic Life beneficial use:

**08. Sediment**. Sediment shall not exceed quantities specified in Sections 250 and 252, or, in the absence of specific sediment criteria, quantities which impair designated beneficial uses. Determinations of impairment shall be based on water quality monitoring and surveillance and the information utilized as described in Section 350. (IDAPA 58.01.02.200.08)

The E. coli criterion is numeric, and in this case, applies to the Secondary Contact Recreation beneficial use:

**a.** Geometric Mean Criterion. Waters designated for primary or secondary contact recreation are not to contain E. coli bacteria in concentrations exceeding a geometric mean of one hundred twenty-six (126) E. coli organisms per one hundred (100) ml based on a minimum of five (5) samples taken every three (3) to seven (7) days over a thirty (30) day period. (IDAPA 58.01.02.251.01a)

There is no instantaneous maximum value of E. coli that constitutes a violation of water quality criteria. Single sample values are used as 'trigger values' for measuring the geometric mean:

**b.** Use of Single Sample Values. A water sample exceeding the E. coli single sample maximums below indicates likely exceedance of the geometric mean criterion, but is not alone a violation of water quality standards. If a single sample exceeds the maximums set forth in Subsections 251.01.b.i., 251.01.b.ii., and 251.01.b.iii., then additional samples must be taken as specified in Subsection 251.01.c.: (4-11-06)

i. For waters designated as secondary contact recreation, a single sample maximum of five hundred seventy-six (576) E. coli organisms per one hundred (100) ml; or (4-11-06)

ii. For waters designated as primary contact recreation, a single sample maximum of four hundred six (406) E. coli organisms per one hundred (100) ml; or (4-11-06)

(parts biii and c not shown)

Figure 2 provides an outline of the stream assessment process for determining support status of the beneficial uses of cold water aquatic life, salmonid spawning, and contact recreation.

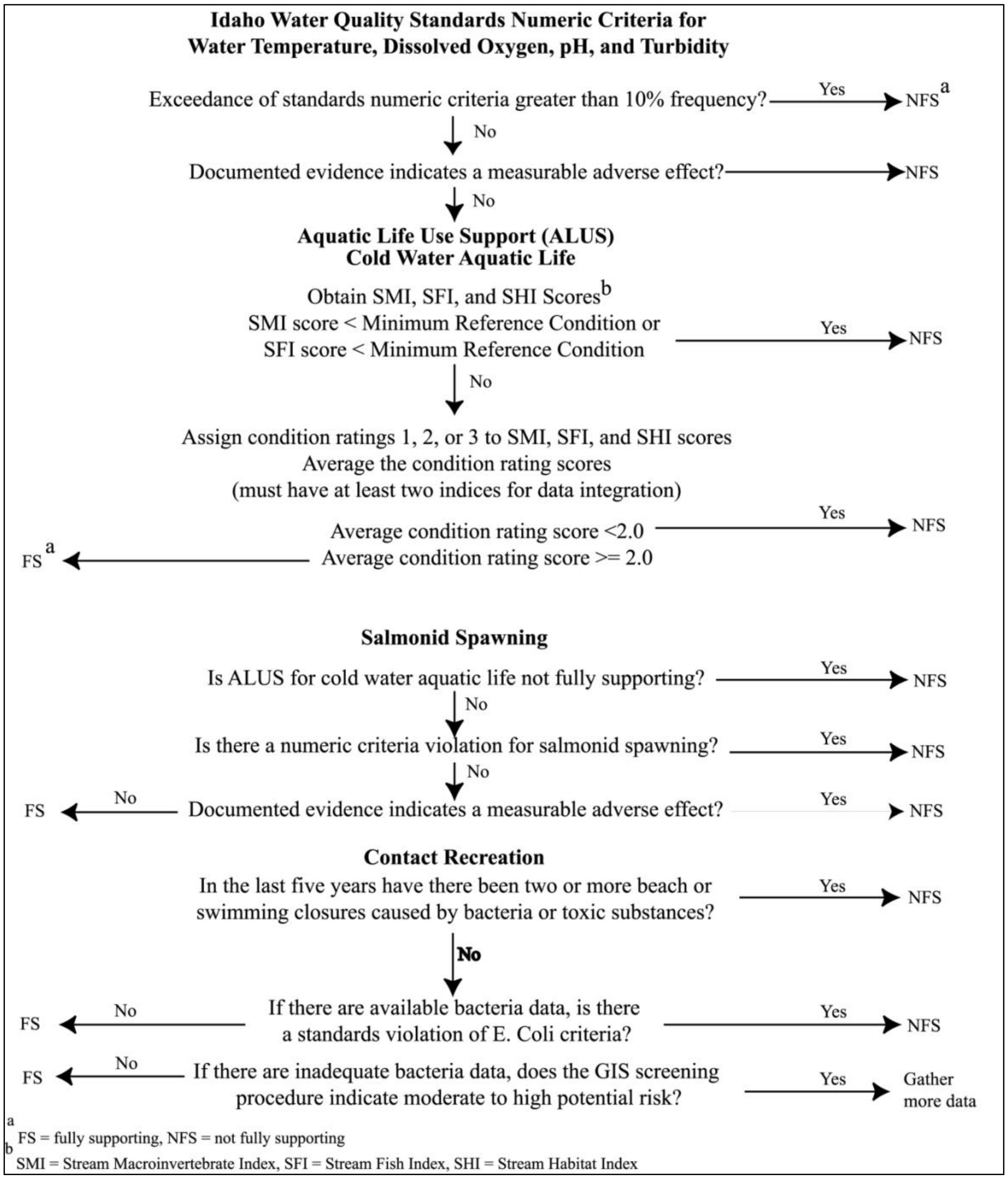



Figure 2. Determination Steps and Criteria for Determining Support Status of Beneficial Uses in Wadeable Streams: *Water Body Assessment Guidance,* Second Addition (Grafe *et al*. 2002)

## 2.4. Summary and Analysis of Existing Water Quality Data

A detailed summary and analysis of existing water quality data prior to 1999 is contained within the Lower Boise River Subbasin Assessment and TMDL, approved by EPA in January 2000.

There has been a large quantity of water quality data collected since 1999, and so for brevity, only data pertaining directly to one of the impaired assessment units is identified here.

New sediment, discharge and E. coli data collected since 1999 on the Boise River tributaries are summarized in table xxx.

Table xxx. Data collected since 1998.

| Creek | Description | Assessment Unit (all begin ID17050114SW…) | Start Date | End Date | Frequency | Collector | TSS? | Q? | E. Coli? |
|---|---|---|---|---|---|---|---|---|---|
| Dixie | at Boise River Road | 001_02 | Aug-11 | Sep-11 | weekly | DEQ & Hyqual | n | n | y |
| Dixie | at Boise River Road | 001_02 | 1986 | 2011 | unknown | Boise | n | y | n |
| Indian | at Broadmore Street in Nampa | 002_04 | May-10 | Nov-10 | bimonthly | USGS | y | y | y |
| Indian | at Sparrow Ave in Caldwell | 002_04 | May-10 | Nov-10 | bimonthly | USGS | y | y | y |
| Indian | at 21st Avenue in Caldwell | 002_04 | May-10 | Nov-10 | bimonthly | USGS | y | y | y |
| Indian | at Simplot Blvd in Caldwell | 002_04 | May-10 | Nov-10 | bimonthly | USGS | y | y | y |
| Indian | at Caldwell | 002_04 | Nov-11 | Sep-12 | 15 minutes | Caldwell | n | y | n |
| Indian | at mouth | 002_04 | May-10 | Nov-10 | bimonthly | USGS | y | y | y |
| Indian | upstream of WWTP | 002_04 | Jan-03 | Jun-09 | weekly | Nampa | y | y | n |
| Indian | downstream of WWTP | 002_04 | Jan-03 | Jun-09 | weekly | Nampa | y | y | n |
| Indian | at mouth | 002_04 | May-98 | Feb-99 | biweekly | ISDA | y | n | n |
| Indian | at mouth | 002_04 | Mar-99 | Mar-00 | biweekly | ISDA | y | y | n |
| Indian | at mouth | 002_04 | Jan-00 | Sep-01 | monthly | USGS | y | y | y |
| Indian | at mouth | 002_04 | May-05 | Aug-05 | monthly | USGS | y | y | y |
| Indian | at Kings Road | 003a_04 | May-08 | Dec-08 | monthly | DEQ | y | y | y |
| Indian | at Robinson Road | 003a_04 | Oct-03 | Oct-03 | one-time | BURP | n | y | y |
| Indian | at Robinson Road | 003a_04 | May-10 | Nov-10 | bimonthly | USGS | y | y | y |
| Indian | at Stroebel Road | 003b_04 | Feb-99 | Sep-99 | monthly | BOR | y | n | y |
| Slater | at Indian Creek Road | 003d_02 | May-12 | May-12 | weekly | DEQ | n | n | y |
| Mason | at Marble Front Road | 006_02 | Apr-98 | Mar-00 | biweekly | ISDA | y | y | y |
| Mason | at Polk Road | 006_02 | Apr-08 | Oct-08 | biweekly | ISDA | y | y | y |
| Mason | at Lakeview Park | 006_02 | Oct-03 | Oct-03 | one-time | BURP | n | y | y |
| Mason | near Caldwell | 006_02 | Apr-99 | Sep-01 | monthly | USGS | n | n | y |

| Creek | Description | Assessment Unit (all begin ID17050114SW…) | Start Date | End Date | Frequency | Collector | TSS? | Q? | E. Coli? |
|---|---|---|---|---|---|---|---|---|---|
| Mason | near Caldwell | 006_02 | Mar-11 | Mar-12 | monthly | USGS | n | n | y |
| Fifteen Mile | at Lincoln Road | 007_04 | Apr-08 | Oct-08 | biweekly | ISDA | y | y | y |
| Fifteen Mile | at mouth | 007_04 | May-05 | Aug-05 | monthly | USGS | y | y | y |
| Fifteen Mile | at mouth | 007_04 | Jan-00 | May-00 | monthly | USGS | y | y | y |
| Fifteen Mile | at mouth | 007_04 | Aug-01 | Aug-01 | one-time | USGS | y | y | y |
| Fifteen Mile | at mouth | 007_04 | Jun-11 | Nov-11 | biweekly | DEQ | y | y | n |
| Fifteen Mile | at mouth | 007_04 | Jul-11 | Jul-11 | weekly | DEQ | n | n | y |
| Fifteen Mile | at mouth | 007_04 | Nov-11 | Nov-11 | weekly | DEQ | n | n | y |
| Ten Mile | at Franklin Road | 008_03 | Apr-00 | Sep-01 | monthly | USGS | y | y | y |
| Ten Mile | at Franklin Road | 008_03 | May-05 | Aug-05 | monthly | USGS | y | y | y |
| Ten Mile | at Franklin Road | 008_03 | Nov-08 | Nov-08 | one-time | USGS | y | y | y |
| Ten Mile | at Franklin Road | 008_03 | Apr-09 | Apr-09 | one-time | USGS | y | y | y |
| Ten Mile | at Franklin Road | 008_03 | Jul-09 | Jul-09 | one-time | USGS | y | y | y |
| Ten Mile | at S Coverdale Road | 008_03 | Nov-08 | Nov-08 | one-time | USGS | y | y | y |
| Ten Mile | at S Coverdale Road | 008_03 | Apr-09 | Apr-09 | one-time | USGS | y | y | y |
| Ten Mile | at S Coverdale Road | 008_03 | Jul-09 | Jul-09 | one-time | USGS | y | y | y |
| Ten Mile | at Eagle Road | 008_03 | Nov-08 | Nov-08 | one-time | USGS | y | y | y |
| Ten Mile | at Eagle Road | 008_03 | Apr-09 | Apr-09 | one-time | USGS | y | y | y |
| Ten Mile | at Eagle Road | 008_03 | Jul-09 | Jul-09 | one-time | USGS | y | y | y |
| Ten Mile | below Blacks Creek Reservoir | 008_03 | Jun-97 | Jun-97 | one-time | BURP | n | y | n |
| Ten Mile | at Franklin Road | 008_03 | Jun-11 | Nov-11 | biweekly | DEQ | y | y | n |
| Ten Mile | at Franklin Road | 008_03 | Jul-11 | Jul-11 | weekly | DEQ | n | n | y |
| Ten Mile | at Franklin Road | 008_03 | Nov-11 | Nov-11 | weekly | DEQ | n | n | y |
| Nine Mile | at Ustick Road | 010_02 | Jun-11 | Nov-11 | biweekly | DEQ | y | y | n |
| Nine Mile | at Ustick Road | 010_02 | Jul-11 | Jul-11 | weekly | DEQ | n | n | y |

| Creek | Description | Assessment Unit (all begin ID17050114SW…) | Start Date | End Date | Frequency | Collector | TSS? | Q? | E. Coli? |
|---|---|---|---|---|---|---|---|---|---|
| Nine Mile | at Ustick Road | 010_02 | Nov-11 | Nov-11 | weekly | DEQ | n | n | y |
| Five Mile | at Franklin Road | 010_03 | Apr-00 | Sep-01 | monthly | USGS | y | y | y |
| Five Mile | at Franklin Road | 010_03 | May-05 | Aug-05 | monthly | USGS | y | y | y |
| Five Mile | at Franklin Road | 010_03 | Nov-08 | Nov-08 | one-time | USGS | y | y | y |
| Five Mile | at Franklin Road | 010_03 | Apr-09 | Apr-09 | one-time | USGS | y | y | y |
| Five Mile | at Franklin Road | 010_03 | Jul-09 | Jul-09 | one-time | USGS | y | y | y |
| Five Mile | at Eagle Road | 010_03 | Apr-09 | Apr-09 | one-time | USGS | y | y | y |
| Five Mile | at Eagle Road | 010_03 | Jul-09 | Jul-09 | one-time | USGS | y | y | y |
| Five Mile | at Victory Road | 010_03 | Apr-09 | Apr-09 | one-time | USGS | y | y | y |
| Five Mile | at Victory Road | 010_03 | Jul-09 | Jul-09 | one-time | USGS | y | y | y |
| Five Mile | upstream of Meridian WWTP | 010_03 | Jun-09 | Jun-09 | daily | Meridian | n | y | n |
| Five Mile | at Meridian Road | 010_03 | Oct-03 | Oct-03 | one-time | BURP | n | y | y |
| Five Mile | at Franklin Road | 010_03 | Jun-11 | Nov-11 | biweekly | DEQ | y | y | n |
| Five Mile | at Franklin Road | 010_03 | Jul-11 | Jul-11 | weekly | DEQ | n | n | y |
| Five Mile | at Franklin Road | 010_03 | Nov-11 | Nov-11 | weekly | DEQ | n | n | y |
| Willow | at mouth | 015_03 | Apr-08 | Oct-08 | biweekly | ISDA | y | y | y |
| Willow | in Middleton | 015_03 | Apr-00 | Mar-01 | biweekly | ISDA | y | y | y |
| Willow | at mouth | 015_03 | Apr-08 | Oct-08 | biweekly | ISDA | y | y | y |
| Willow | in Middleton | 015_03 | Apr-99 | Sep-99 | biweekly | USGS | y | y | y |
| Willow | in Middleton | 015_03 | Oct-99 | May-00 | monthly | USGS | y | y | y |
| Willow | in Middleton | 015_03 | Aug-01 | Aug-01 | one-time | USGS | y | y | y |
| Willow | in Middleton | 015_03 | May-05 | Aug-05 | one-time | USGS | y | y | y |
| Sand Hollow | at Oasis Road | 016_03 | May-08 | Dec-08 | monthly | DEQ | y | y | y |
| Sand Hollow | at Market Road | 017_03 | Jun-10 | Jul-10 | weekly | DEQ | n | y | y |
| Sand Hollow | at Market Road | 017_03 | May-08 | Dec-08 | monthly | DEQ | y | y | y |

| Creek | Description | Assessment Unit (all begin ID17050114SW…) | Start Date | End Date | Frequency | Collector | TSS? | Q? | E. Coli? |
|---|---|---|---|---|---|---|---|---|---|
| Sand Hollow | at Old Fort Boise Road | 017_06 | Apr-08 | Oct-08 | biweekly | ISDA | y | y | y |
| Sand Hollow | at Old Fort Boise Road | 017_06 | Jun-10 | Jul-10 | weekly | DEQ | n | y | y |
| Various | Various | n/a | Jun-08 | Sep-08 | unknown | USEPA | y | n | n |

### 2.4.1. Flow Characteristics

In each case, ISDA collected discharge data bimonthly between 1998 and 2000. This is still the best dataset for each of the tributaries. The following graphs of those data are taken from the 2001 subbasin assessments.

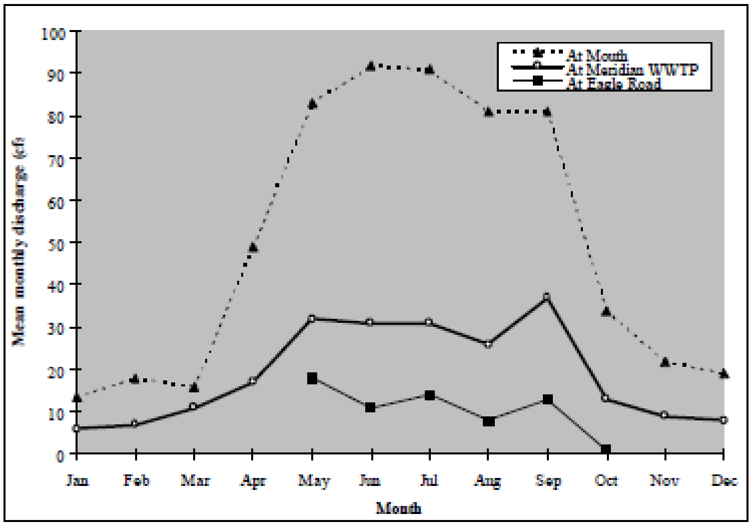



Figure 3 Discharge in Five Mile Creek (1998-2000)

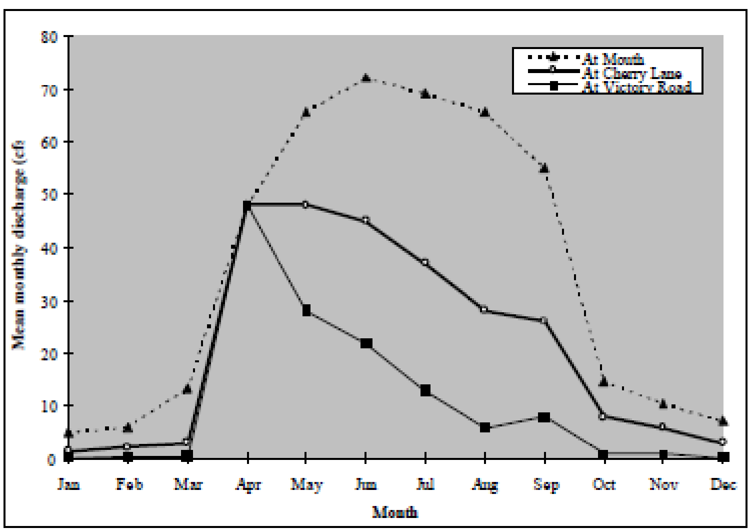



Figure 4 Discharge in Ten Mile Creek (1998-2000)

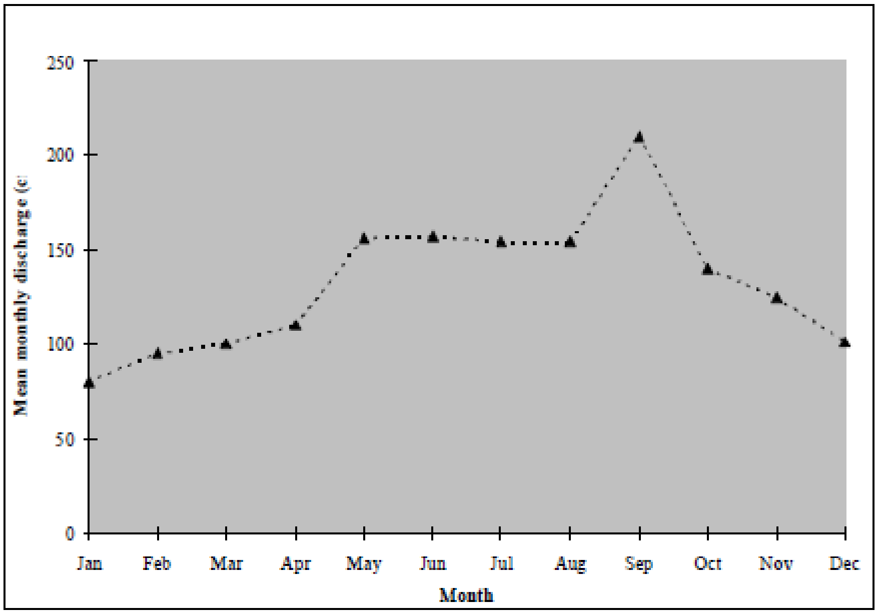



Figure 5 Discharge in Indian Creek (mouth) 1994-2000

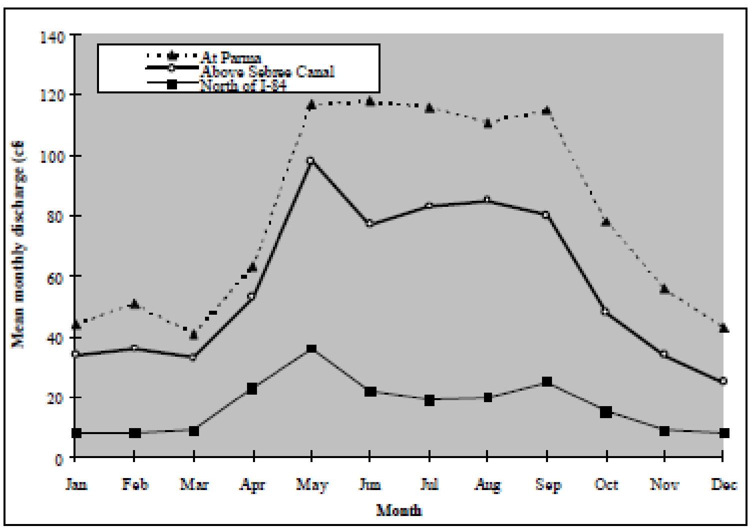



Figure 6 Discharge in Sand Hollow Creek (1998-2000)

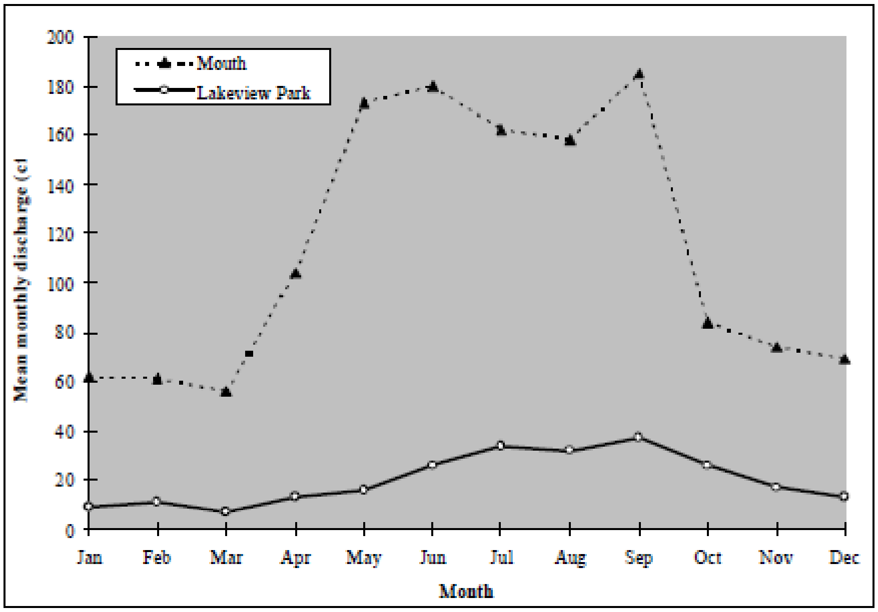



Figure 7 Discharge in Mason Creek (1998-2000)

The most recent year-round discharge data for Fifteenmile Creek were collected by USGS in 1996.

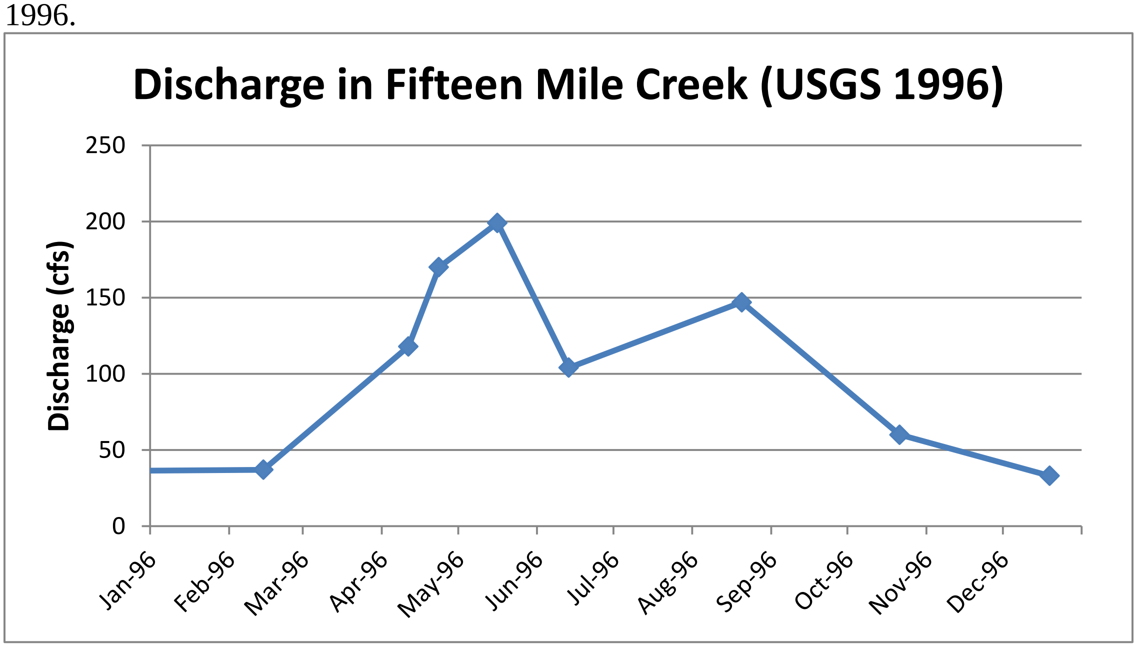



Figure 8 Discharge in Fifteen Mile Creek (1996 USGS)

The City of Boise provided discharge data from Dixie Slough between 1986 and 2011. The median flow was 200cfs:

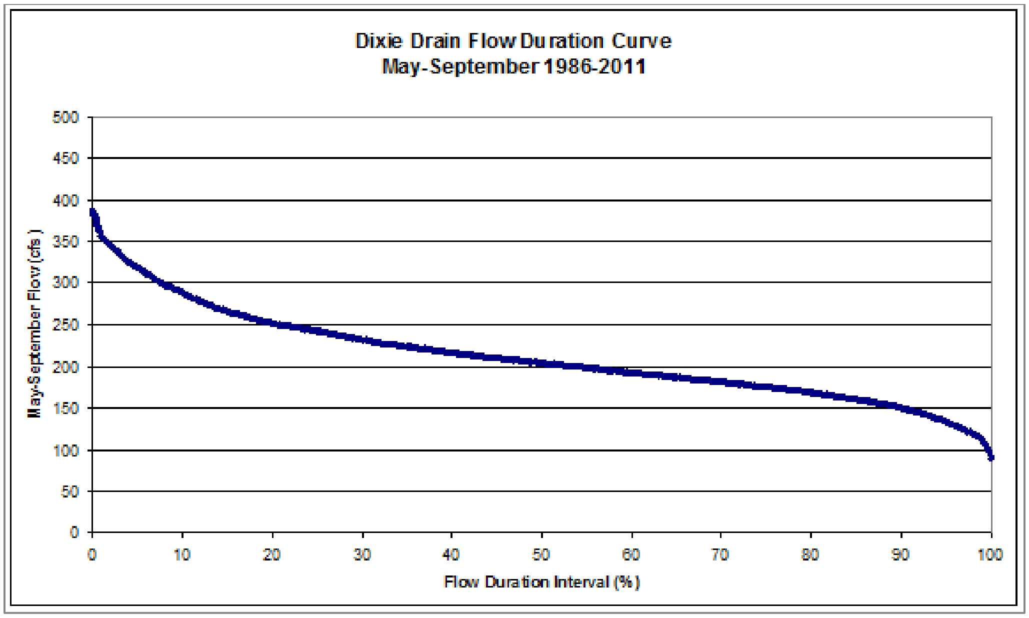



Figure xxz: Flows in Dixie Slough between May and September

The USGS established a gauging station on upper Indian Creek, near Mayfield in 2011. The gauge report is found in appendix XXX, and the hydrograph is shown below in figure xxy:

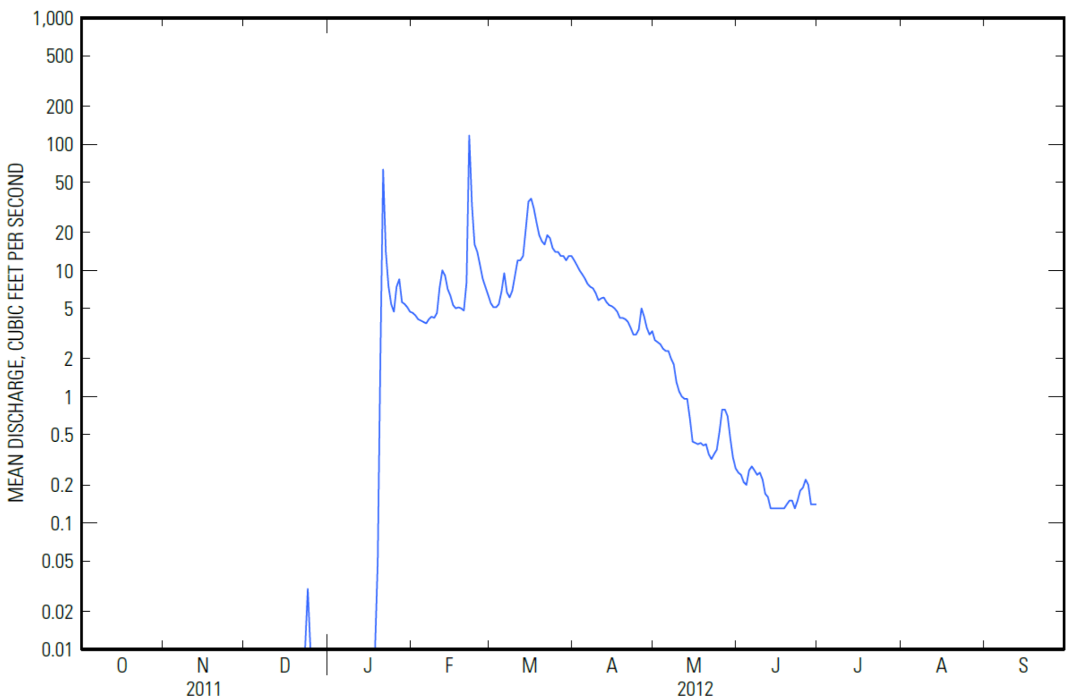



Figure xxy: gauge report for Indian Creek at Mayfield (USGS 2011)

No flow data were available for Ninemile Creek, so the USGS 'Streamstats' model was used to estimate the flow (appendix XXX). The July D50 (i.e. average July flow) was calculated as 10cfs.

### 2.4.2. Water Column Data

– E. coli

Since 2000, DEQ has collected E. coli samples from each of the impaired tributaries to the Boise River except Mason Creek. These samples were all collected according to the 5-sample, 30-day geometric mean format of the Water Quality Standards.

USGS collected monthly E. coli samples from Mason Creek between April 1999 and September 2001, and again between March 2011 and March 2012. ISDA collected biweekly E. coli samples from Mason Creek between April 1998 and March 2000. Either of these sample regimes alone do not meet the frequency requirements for the water quality criterion, but together, a 5-sample, 30-day geometric mean can be calculated:

| Creek | Fivemile | | Ninemile | | Tenmile | | Fifteenmile | | Indian (lower) | Mason | Sand Hollow | Sand Hollow | Indian (upper) | Dixie Slough |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Location** | Franklin Road | | Ustick Road | | Franklin Road | | mouth | | Simplot Boulevard | Marble Front Road | Old Fort Boise Road | Market Road | Indian Creek Road | River Road |
| **Assessment Unit** | 010_03 | | 010_02 | | 008_03 | | 008_04 | | 002_04 | 006_02 | 017_06 | 017_03 | 003d_02 | 001_02 |
| **Date** / **Sample** | Jul-11 | Nov-11 | Jul-11 | Nov-11 | Jul-11 | Nov-11 | Jul-11 | Nov-11 | Jul-11 | Jul-99 | Jul-10 | Jul-10 | May-12 | Aug-11 |
| 1 | 933 | 75 | 488 | 1,120 | 988 | 75 | 579 | 84 | 960 | 700 | 717 | 1187 | *172* | 650 |
| 2 | 435 | 32 | 1,529 | 613 | 345 | 75 | 276 | 53 | 249 | 340 | 411 | 579 | *1,986* | 308 |
| 3 | 990 | 93 | 1,421 | 501 | 1,046 | 34 | 987 | 173 | 517 | 1,000 | 549 | 517 | *2,420* | 738 |
| 4 | 933 | 20 | 411 | 242 | 669 | 25 | 548 | 11 | 816 | 580 | 1,187 | 548 | *2,420* | 201 |
| 5 | 711 | 34 | 411 | 238 | 703 | 40 | 2,723 | 22 | 281 | 1,300 | 459 | 373 | *2,143* | 875 |
| 6 | | | | | | | | | | | 1,017 | 488 | | |
| ***Geometric Mean*** | ***768*** | ***43*** | ***709*** | ***457*** | ***699*** | ***45*** | ***748*** | ***45*** | ***490*** | ***709*** | ***669*** | ***573*** | ***1,338*** | ***482*** |

SUMMARY

Each assessment is impaired by the following levels of E. coli, expressed as a 30-day, 5-sample geometric mean:

| **Creek** | **AU** | **E. coli (CFU/100ml)** |
|---|---|---|
| Five Mile | 010_03 | 768 |
| Nine Mile | 010_02 | 709 |
| Ten Mile | 008_03 | 699 |
| Fifteen Mile | 007_03 | 748 |
| Indian | 002_04 | 490 |
| Upper Indian | 003d_02 | 1,338 |
| Mason | 006_02 | 709 |
| Dixie | 001_02 | 482 |
| Sand Hollow | 017_03 | 573 |
| Sand Hollow | 017_06 | 669 |

## SEDIMENT

In 2008, ISDA collected sediment and discharge (Q) data from Willow, Mason, Sand Hollow and Fifteen Mile Creeks:

| Creek | Sand Hollow | | Willow | | Fifteen Mile | | Mason | |
|---|---|---|---|---|---|---|---|---|
| AU | 017_06 | | 015_02 | | 007_04 | | 006_02 | |
| Date | Q (cfs) | SSC (mg/L) | Q (cfs) | SSC (mg/L) | Q (cfs) | SSC (mg/L) | Q (cfs) | SSC (mg/L) |
| 4/24/2008 | 106.3 | 113 | 44.2 | 30.4 | 187.4 | 70.4 | 138.4 | 136 |
| 5/8/2008 | 98.3 | 76.3 | 35.7 | 25 | 70.1 | 56.5 | 108 | 71.2 |
| 5/22/2008 | 166.3 | 127 | 73.6 | 70.3 | 191.1 | 66 | 295 | 88.9 |
| 6/5/2008 | 187.7 | 66.5 | 83.5 | 22.2 | 309.8 | 37.1 | 282 | 71.5 |
| 6/19/2008 | 114.2 | 103 | 36.2 | 21.3 | 112.7 | 76.4 | 141.4 | 136 |
| 7/2/2008 | 115.1 | 112 | 12.9 | 14.4 | 98.7 | 91.4 | 151.6 | 106 |
| 7/17/2008 | 204.2 | 180 | 27.2 | 27.1 | 85.8 | 85 | 154.6 | 71.6 |
| 7/31/2008 | 152.5 | 117 | 42.5 | 27.4 | 93.7 | 80.7 | 146.2 | 87.4 |
| 8/14/2008 | 150.2 | 118 | 44.6 | 15 | 98.3 | 40.8 | 139.6 | 51.6 |
| 8/28/2008 | 168.8 | 62.1 | 27.1 | 15.3 | 104.2 | 29.7 | 155 | 39.2 |
| 9/11/2008 | 162.7 | 34 | 40 | 13.9 | 108.6 | 18.2 | 136.2 | 32.3 |
| 9/25/2008 | 176 | 30.9 | 39.2 | 30.9 | 111.8 | 27.8 | 141.6 | 26.1 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 10/9/2008 | 132.9 | 30.6 | 36.8 | 10.6 | 82.1 | 12.8 | 114.7 | 21.5 |

ISDA also collected sediment data for Willow Creek between April 2000 and March 2001.

| **Willow Creek Near Hwy. 44 in Middleton AU 015_03** | | |
|---|---|---|
| Date | Discharge (cfs) | TSS (mg/L) |
| 4/4/2000 | 0 | 1 |
| 4/18/2000 | 36.5 | 49 |
| 5/3/2000 | 38.7 | 25 |
| 5/16/2000 | 54.5 | 27 |
| 5/31/2000 | 40.8 | 14 |
| 6/14/2000 | 48.6 | 27 |
| 6/27/2000 | 11.5 | 7 |
| 7/11/2000 | 17.2 | 10 |
| 7/25/2000 | 4.05 | 2 |
| 8/3/2000 | 27.6 | 15 |
| 8/22/2000 | 3.97 | 1 |
| 9/6/2000 | 38.5 | 7 |
| 9/19/2000 | 15.1 | 6 |
| 10/3/2000 | 4.88 | 6 |
| 10/18/2000 | 4.85 | 2 |
| 11/14/2000 | 1.1 | 4 |
| 12/14/2000 | 0.9 | 8 |
| 1/30/2001 | 0 | 0 |
| 2/21/2001 | 7.8 | 196 |
| 3/19/2001 | 0.66 | 4 |

In 2011, DEQ collected sediment data from Five and Ten Mile Creeks:

| Date (2011) | Five Mile Cr. at Franklin Road | | Ten Mile Cr. at Franklin Road | |
|---|---|---|---|---|
| | TSS (mg/L) | Discharge (cfs) | TSS (mg/L) | Discharge(cfs) |
| 16-Jun | 46 | n/a | 36 | n/a |
| 1-Jul | 49 | n/a | 90 | n/a |
| 18-Jul | 70 | 43.2 | 160 | 75.0 |
| 29-Jul | 62 | 69.3 | 230 | 65.6 |
| 10-Aug | 98 | 71.5 | 69 | 66.2 |
| 25-Aug | 50 | 71.9 | 82 | 84.5 |
| 8-Sep | 18 | 65.3 | 64 | 61.5 |
| 19-Sep | 24 | 67.3 | 18 | 61.4 |
| 5-Oct | 38 | 107.8 | 47 | 82.5 |

| | | | | |
|---|---|---|---|---|
| 2-Nov | 5 | 26.0 | 5 | 11.8 |
| 16-Nov | 5 | 28.5 | 5 | 10.1 |

USGS collected sediment data from Indian, Fivemile and Tenmile Creeks between 2008 and 2010:

| Site | Date | SSC | Flow |
|---|---|---|---|
| Indian Creek at Robinson Rd | 5/3/2010 | 47 | 8 |
| Indian Creek at Robinson Rd | 7/26/2010 | 64 | 14 |
| Indian Creek at Robinson Rd | 11/16/2010 | 6 | 10 |
| Indian Creek at Broadmore St | 5/3/2010 | 39 | 40 |
| Indian Creek at Broadmore St | 7/26/2010 | 90 | 23 |
| Indian Creek at Broadmore St | 11/16/2010 | 5 | 36 |
| Indian Creek at Sparrow Ave | 5/3/2010 | 87 | 94 |
| Indian Creek at Sparrow Ave | 7/26/2010 | 94 | 76 |
| Indian Creek at Sparrow Ave | 11/16/2010 | 14 | 61 |
| Indian Creek at 21st St | 5/4/2010 | 89 | 124 |
| Indian Creek at 21st St | 7/27/2010 | 93 | 135 |
| Indian Creek at 21st St | 11/17/2010 | 63 | 240 |
| Indian Creek at Simplot Blvd | 5/4/2010 | 85 | 142 |
| Indian Creek at Simplot Blvd | 7/27/2010 | 93 | 156 |
| Indian Creek at Simplot Blvd | 11/17/2010 | 61 | 255 |
| Indian Creek at Mouth | 5/4/2010 | 89 | 78 |
| Indian Creek at Mouth | 7/27/2010 | 94 | 65 |
| Indian Creek at Mouth | 11/17/2010 | 42 | 340 |
| Fivemile Creek at Victory Rd | 4/28/2009 | 92 | 0.5 |
| Fivemile Creek at Victory Rd | 7/29/2009 | 98 | 1.1 |
| Fivemile Creek at Eagle Rd | 4/28/2009 | 98 | 1.2 |
| Fivemile Creek at Eagle Rd | 7/29/2009 | 93 | 1.1 |
| Tenmile Creek at Cloverdale Rd | 11/17/2008 | 73 | 0.07 |
| Tenmile Creek at Cloverdale Rd | 4/28/2009 | 86 | 3.1 |

| | | | |
|---|---|---|---|
| Tenmile Creek at Cloverdale Rd | 7/29/2009 | 89 | 1.8 |
| Tenmile Creek at Eagle Rd | 11/17/2008 | 76 | 0.05 |
| Tenmile Creek at Eagle Rd | 4/28/2009 | 45 | 1 |
| Tenmile Creek at Eagle Rd | 7/29/2009 | 91 | 3.5 |
| Tenmile Creek at Franklin Rd | 11/17/2008 | 85 | 9.2 |
| Tenmile Creek at Franklin Rd | 4/29/2009 | 81 | 57 |
| Tenmile Creek at Franklin Rd | 7/29/2009 | 89 | 55 |
| Fivemile Creek at Franklin Rd | 11/17/2008 | 93 | 22 |
| Fivemile Creek at Franklin Rd | 4/29/2009 | 86 | 45 |
| Fivemile Creek at Franklin Rd | 7/29/2009 | 98 | 54 |

DEQ collected sediment data from Indian Creek (at Kings Road) and Sand Hollow Creek (2 assessment units) between May and December 2008:

| **Date** | **Sand Hollow at Oasis Road** | | **Sand Hollow at Market road** | | **Indian Creek at Kings Road** | |
|---|---|---|---|---|---|---|
| AU | 016_03 | | 017_03 | | 003a_04 | |
| | Q (cfs) | TSSC (mg/L) | Q (cfs) | TSSC (mg/L) | Q (cfs) | TSSC (mg/L) |
| 5/13/2008 | 2.4 | 9 | n/a | 300 | 10.3 | 7 |
| 6/24/08 | 0.6 e | 5.3 | 17 e | 24 | 22 e | 4.9 |
| 7/30/2008 | 0.45 e | 4.9 | 45 e | 460 | 15 e | 5 |
| 9/4/2008 | 0.25 e | 4.9 | 24 e | 76 | 13 e | 4.9 |
| 10/22/2008 | n/a | n/a | 9.89 | 53 | 38 e | 4.9 |
| 12/1/2008 | n/a | n/a | 10 | 16 | 14 e | 10.00 |

Note e on the Q column means ‘estimate’.

The City of Nampa collected sediment data from upstream and downstream of its wastewater treatment plant between January 2003 and June 2009:

XXX Insert Nampa Data

The City of Caldwell collects discharge data from a weir upstream of the riverside canal every fifteen minutes.

USGS collected sediment data for Willow Creek between April 1999 and August 2005

| **13210835 Willow Creek at Middleton, Idaho AU 015_03** | | |
|---|---|---|
| Date | Discharge (cfs) | SSC (mg/L) |
| 4/19/1999 | 54 | 163 |
| 5/5/1999 | 69 | 79 |

| | | |
|---|---|---|
| 5/18/1999 | 60 | 113 |
| 6/10/1999 | 52 | 30 |
| 6/22/1999 | 28 | 61 |
| 7/7/1999 | 37 | 31 |
| 7/21/1999 | 27 | 20 |
| 8/4/1999 | 15 | 9 |
| 8/30/1999 | 37 | 25 |
| 9/15/1999 | 32 | 12 |
| 9/28/1999 | 20 | 800 |
| 10/26/1999 | 10 | 5 |
| 11/16/1999 | 1.3 | 173 |
| 12/13/1999 | 0.87 | 2 |
| 1/11/2000 | 2.2 | 27 |
| 2/15/2000 | 12 | 158 |
| 3/14/2000 | 3 | 1630 |
| 5/18/2000 | 42 | 49 |
| 8/27/2001 | 8 | 5 |
| 5/4/2005 | 21 | 16 |
| 6/8/2005 | 29 | 22 |
| 7/7/2005 | 30 | 12 |
| 8/10/2005 | 24 | 24 |

## SUMMARY

For each of the assessment units, the sediment concentration was averaged over several time periods. The time periods used are taken from Newcombe and Jensen 1996. The maximum value of this average concentration is shown in table XX below.

| Stream | Five Mile | Ten Mile | Fifteen Mile | Mason | Willow | Indian | Sand Hollow | | |
|---|---|---|---|---|---|---|---|---|---|
| AU | 010_03 | 008_03 | 007_04 | 006_02 | 015_03 | 002_04 | 016_03 | 017_03 | 017_06 |
| Dataset | DEQ 2011 | DEQ 2011 | ISDA 2008 | ISDA 2008 | ISDA 2008 | Nampa 2003 | DEQ 2008 | DEQ 2008 | ISDA 2008 |
| | | | | | | | | | |
| Duration | Maximum average sediment concentration (mg/L) | | | | | | | | |
| 1 day | 98 | 230 | 91 | 136 | 70 | 37 | 9 | 460 | 180 |
| 2 week | 80 | 195 | 88 | 121 | 48 | 31 | n/a | n/a | 149 |
| 2 month | 66 | 126 | 75 | 101 | 34 | 28 | 7 | 268 | 126 |
| 4 month | 51 | 88 | 63 | 86 | 27 | 24 | 6 | 215 | 107 |

### 2.4.3. Biological and Other Data

DEQ collected biological data using its BURP protocols at the following sites:

| BURP Site ID | Stream | Location | SMI | SFI | SHI | Determination |
|---|---|---|---|---|---|---|
| 2011SBOIA036 | Indian Creek 002_04 | near Karcher Mall | | | | Not available yet |
| 2003SBOIA050 | Mason Creek 006_02 | at Lakeview Park | 0 | 0 | 1 | Not supporting Cold Water Aquatic Life use |
| 2003SBOIA052 | Fivemile Creek 010_03 | at Meridian Road | 0 | 1 | 1 | Not supporting Cold Water Aquatic Life use |

## 2.5. Data Gaps

The bulk of the data for Indian Creek were collected either at the Nampa wastewater treatment plant, or at the mouth. Neither location is ideal:

- The Nampa wastewater treatment plant is situated about midway through the assessment unit. A major tributary, Wilson Drain, enters Indian Creek downstream of this point, and so the data do not reflect all the sources of sediment.
- During the irrigation season, the water at the mouth of Indian Creek is largely comprised of spillover water from the Riverside Canal, which intercepts Indian Creek downstream of Simplot Boulevard. The data collected at the mouth of Indian Creek therefore do not represent the rest of the assessment unit. They are reflective of an uncertain mixture of Riverside Canal and Indian Creek water. The incoming water in the Riverside Canal is diverted from the Boise River, which is itself heavily influenced by the nearby confluence with Mason Creek.

This data gap means that we cannot estimate the existing sediment load of Indian Creek in Caldwell (above the riverside canal). However, we do have very detailed flow data at this location, so load allocations can be set using a concentration target.

The recommended location for future monitoring would be upstream of the Riverside Canal, probably at Simplot Boulevard in Caldwell.

# 3. Subbasin Assessment–Pollutant Source Inventory

Detailed discussions of the pollutants within the Lower Boise River subbasin are provided in the following documents:

Fivemile and Tenmile Creek Subbasin Assessment (December 2001)

Mason Creek Subbasin Assessment (December 2001)

Sand Hollow Creek Subbasin Assessment (December 2001)

Indian Creek Subbasin Assessment (December 2001)

## 3.1. Sources of Pollutants of Concern

### 3.1.1. Point Sources

The following point sources impact the impaired assessment units:

| Name | Permit Number | Receiving Water | Type | Monthly Ave lb/day) | Weekly Ave (lbs/day) | Monthly Ave conc. | Weekly Max conc. (mg/ |
|---|---|---|---|---|---|---|---|
| ACHD (and co-permittees) Phase 2 | ID-028185 | Five Mile, Ten Mile, Nine Mile | Stormwater | no numeric limits | | | |
| ACHD (and co-permittees) Phase 1 | IDS-027561 | Five Mile, Ten Mile, Nine Mile | Stormwater | no numeric limits | | | |
| City of Caldwell | IDS-028118 | Indian, Mason | Stormwater | no numeric limits | | | |
| Canyon HD #4 | IDS-028134 | Nampa Urbanized Area | Stormwater | no numeric limits | | | |
| ITD #3 | IDS-028177 | Boise and Nampa Urbanized Areas | Stormwater | no numeric limits | | | |
| City of Meridian | ID-002019-2 | Five Mile Creek | WWTP | no numeric limits | | 30mg/L | 45mg/L |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| City of Middleton | IDS-028100 | Willow Creek | Stormwater | no numeric limits | | | |
| City of Nampa | ID-002206-3 | Indian Creek | WWTP | 3000 | 4500 | 30mg/L | 45mg/L |
| Nampa HD #1 | IDS-028142 | Mason and Indian | Stormwater | no numeric limits | | | |
| City of Nampa | IDS-028126 | Mason and Indian | Stormwater | no numeric limits | | | |
| City of Parma | ID-002177-6 | Sand Hollow Creek | WWTP | 255 | 369 | 45mg/L | 65mg/L |
| Notus-Parma Highway District #2 | IDS-028151 | Sand Hollow Creek | Stormwater | No numeric limits | | | |
| Simplot Meat Products | ID-002696-4 | Indian Creek | MSGP | no permitted sediment discharge - temperature only | | | |
| Sorrento-Lactalis | ID-002803-7 | Mason Creek (via Purdum) | MSGP | 53 | 106 | 13mg/L | 25mg/L |
| City of Greenleaf | ID-002830 4 | Dixie Slough | WWTP | 60 | 90 | 30mg/L | 45mg/L |

### 3.1.2. Nonpoint Sources

Detailed discussions of the nonpoint source pollutants within the Lower Boise River subbasin are provided in the following documents:

Fivemile and Tenmile Creek Subbasin Assessment (December 2001)

Mason Creek Subbasin Assessment (December 2001)

Sand Hollow Creek Subbasin Assessment (December 2001)

Indian Creek Subbasin Assessment (December 2001)

The following text is adapted from the Boise TMDL:

Sediment enters the Boise River tributaries largely from nonpoint sources. The wastewater treatment plants that discharge to the streams are subject to sediment limits in NPDES permits. Nonpoint sources of sediment include agricultural activities, stormwater runoff, runoff from construction activities and bank erosion. The most significant sources of sediment from agricultural practices are likely surface irrigated land and streambank trampling due to unrestricted use of streamside areas by livestock. Construction activities on sites that exceed five acres are subject to a general NPDES permit that requires best management practices to limit sediment releases. Construction in the river channel is subject to stream alteration permits issued by the Idaho Department of Water Resources. These permits generally include requirements for best management practices (BMPs) to reduce sediment releases to the river. Agricultural activities are exempt from stream alteration permits. Agricultural activities that generate sediment include surface irrigated row crops and surface irrigated pastures. A substantial amount of the sediment that erodes from agricultural lands is deposited in drains and canals and may be removed or liberated during maintenance activities.

Most bacteria also likely comes from nonpoint sources. Wastewater treatment plants are subject to effluent limits for bacteria. Possible nonpoint sources of bacteria include agricultural operations (primarily livestock), failed septic systems, and wildfowl populating the stream corridor. Generally, septic systems are designed to prevent any bacteria from reaching either ground water or surface water. However it is possible that there are some failed septic systems in the valley.

Most large confined animal feeding operations (CAFOs), confined feeding areas (CFAs) and dairies are subject to discharge limits under general NPDES permits. To be regulated under a general NPDES permit, CAFOs and CFAs must meet size criteria and be considered significant contributors of pollutants. All dairies that have a permit to sell milk are subject to the Idaho Department of Agriculture (IDA) dairy inspection program. Dairies are required to have adequate waste management practices subject to the Rules Governing Dairy Waste, IDAPA 16.01.02350.03.g and IDAPA 02.04.14. Smaller CAFOs and pasture grazing are not regulated. Animal waste that is removed from dairies, CAFOs and CFAs in liquid or solid form may be applied to agricultural lands as a soil amendment. Operators subject to an NPDES permit are required to land apply waste at agronomic rates and maintain adequate record keeping of waste management. The IDA has proposed draft rules to ensure proper management of land applied animal waste at other facilities, but these activities are currently unregulated. The extent to which land application of animal waste is a source of bacteria is unknown.

### 3.1.3. Pollutant Transport

Virtually all of the monitoring data on each tributary stream have been collected at the mouth. This makes it difficult to evaluate how pollutants are transported through each system.

One exception is Indian Creek, where USGS conducted three synoptic sampling visits in May, July and November 2010. These data show that sediment loads increase significantly between Robinson Road and Simplot Boulevard. Please note that during the irrigation season, the site at the mouth is comprised of spillover from the Riverside Canal, and so is more representative of Boise River (and entrained Mason Creek) water.

| | Date | SSC | Flow | Load |
|---|---|---|---|---|
| Site | | mg/L | cfs | lbs/day |
| Indian Creek at Robinson Rd | 5/3/2010 | 47 | 8 | 921 |
| Indian Creek at Broadmore St | 5/3/2010 | 39 | 40 | 3,822 |
| Indian Creek at Sparrow Ave | 5/3/2010 | 87 | 94 | 20,036 |
| Indian Creek at 21st St | 5/4/2010 | 89 | 124 | 27,038 |
| Indian Creek at Simplot Blvd | 5/4/2010 | 85 | 142 | 29,572 |
| Indian Creek at Mouth | 5/4/2010 | 89 | 78 | 17,008 |
| | | | | |
| Indian Creek at Robinson Rd | 7/26/2010 | 64 | 14 | 2,195 |
| Indian Creek at Broadmore St | 7/26/2010 | 90 | 23 | 5,072 |
| Indian Creek at Sparrow Ave | 7/26/2010 | 94 | 76 | 17,503 |
| Indian Creek at 21st St | 7/27/2010 | 93 | 135 | 30,760 |
| Indian Creek at Simplot Blvd | 7/27/2010 | 93 | 156 | 35,545 |
| Indian Creek at Mouth | 7/27/2010 | 94 | 65 | 14,970 |
| | | | | |
| Indian Creek at Robinson Rd | 11/16/2010 | 6 | 10 | 147 |
| Indian Creek at Broadmore St | 11/16/2010 | 5 | 36 | 441 |
| Indian Creek at Sparrow Ave | 11/16/2010 | 14 | 61 | 2,092 |
| Indian Creek at 21st St | 11/17/2010 | 63 | 240 | 37,044 |
| Indian Creek at Simplot Blvd | 11/17/2010 | 61 | 255 | 38,110 |
| Indian Creek at Mouth | 11/17/2010 | 42 | 340 | 34,986 |

Wilson Drain terminates in Indian Creek a short distance upstream of 21$^{st}$ Street in Caldwell, and is the largest irrigation tributary to Indian Creek. Although it likely contributes sediment and E. coli pollution to Indian Creek, quantitative data have not been collected from the irrigation system.

# 4. Monitoring and Status of Water Quality Improvements

Watershed improvement projects in the subbasin have been directed at improving the water quality in the mainstem Boise River. Without sediment TMDLs in place, the tributaries were assigned reductions based solely on improving water quality in the River itself.

Nevertheless, many of the projects may have had beneficial effects on the tributaries themselves. Before listing the improvements to water quality, it is worth noting how bad water quality used to be. The quote below is excerpted from a 1959 report on Indian Creek:

> At stations 2 and 3, paunch manure and meat scraps were noted floating in the stream. At times, the stream was even reddish in color from the blood wastes. The bottom and sides of the creek were coated with black sludge deposits. A great deal of rat activity also was noted along the banks.

(Report on Pollution Problems in Indian Creek 1958-1959, State of Idaho Department of Health – Engineering and Sanitation Section).

WWTPs

The Boise River TMDL states that "...changes in loads from treatment plants have negligible effects on the Boise River …. Since most of the treatment plants in the valley already remove 85 percent or more of suspended solids, further treatment at this time would result in high costs with little tangible benefit to the river" (DEQ, 2000).

Discharge Monitoring Reports (DMRs) from each of the NPDES-permitted point sources in section 3.1.1 were examined. Even though most of the permits allow for a daily maximum of 45mg/L suspended sediment, typical discharge concentrations were less than 5mg/L.

STORMWATER

The following text was excerpted from the Boise River TMDL 5-Year Review:

The lower Boise River subbasin uses watershed-based permitting for stormwater NPDES permits. This allows for an integrated approach to a watershed-wide program. Based on the information provided by permitted point sources within the subbasin, permit holders are in compliance with permit conditions. Based on the information provided by the responsible agencies, stormwater and point source compliance monitoring in the Boise urban area is taking place as anticipated by the TMDL implementation plan.

Stormwater is regulated at the federal level and the implementation plan recognizes that when required BMPs are implemented through the federal permit system, stormwater contributions of pollutants to impaired waters in the subbasin will diminish. At the time of the TMDL 5-year review, stormwater dischargers anticipated meeting TMDL targets within 10 years of implementation.

Several agencies and organizations share responsibilities for the NPDES MS4 permit and information on meetings, responsibilities, budgets, and reports 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 at: http://www.achd.ada.id.us/Departments/TechServices/Drainage.aspx. All of the required annual and five-year reports have been created and NPDES stormwater co-permittees make their reports available through a partnership internet site http://www.partnersforcleanwater.org/Annual%20Report.asp.

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

## NPDES GENERAL PERMITS

Since the TMDL was approved, EPA has issued general stormwater permits for Confined Animal Feeding Operations (CAFOs), construction sites larger than one acre, and other industrial sectors. These permits intend to reduce, or eliminate, sediment discharges.

## NON-POINT SOURCES

Nonpoint sources in the subbasin are primarily from the agricultural industry sector. In Idaho, irrigated agriculture pollution control is voluntary and return flows from irrigated agriculture are specifically excluded from the definition of "point source" in the CWA. Idaho addresses nonpoint source pollution through industry/activity-specific BMP development. Watershed stakeholders developed the TMDL implementation plan to provide guidance and support to members of the agricultural community who choose to voluntarily reduce or prevent pollution from agricultural activities entering subbasin waters.

The TMDL implementation plan for agricultural lands identifies critical acres and prioritizes land for BMPs by identifying acres that have the greatest effect on pollutant delivery to the Boise River. For sediment pollutant reduction, priority acres are surface-irrigated croplands with the steepest slopes or closest to the Boise River, and riparian acres grazed by livestock. The highest priority watersheds for agricultural BMP implementation to reduce sediment pollution are Dixie Slough, Fifteenmile Creek, Fivemile and Tenmile Creeks, and Mason Creek.

Table includes TMDL implementation details for agricultural lands in the subbasin. The percent of producers implementing and maintaining BMPs is unknown at this time.

**Table xx. Implementation activities in progress and planned for the Lower Boise River subbasin as of May 2008.**

| AU | Year | Target Pollutant | Activity | Completion Status |
|---|---|---|---|---|
| undetermined | 2004 | Sediment | Jerry Glen wetland construction | Completed |
| 002_04 | 2004 | Sediment | Indian Creek, Caldwell low impact development demonstration | Completed |
| 011a_06 | 2004 | Sediment, bacteria | Downtown Boise gray water recycling demonstration | Completed |

| AU | Year | Target Pollutant | Activity | Completion Status |
|---|---|---|---|---|
| 011b_02 | 2005 | Sediment, habitat and flow alteration | Boise River side channel reconstruction | Completed |
| 011a_06 | 2004 | Sediment | Barber Park Living Roof demonstration | Completed |
| undetermined | | Sediment, bacteria | Canyon County Soil Conservation District (SCD), 19 BMPs including a total of 13,666 feet of streambank protected and 35 acres treated | Completed |
| 001_02 | | Sediment, bacteria | Canyon SCD, Conway Gulch, 141 BMPs including a total of 99,138 linear feet of streambank protected and 29,462 acres treated | Completed |
| 001_02 | | Sediment, bacteria | Canyon SCD, Dixie Slough, 75 BMPs including a total of 41,219 linear feet of streambank protected and 1,352 acres treated | Completed |
| 007_04 | | Sediment, bacteria | Ada Soil and Water Conservation District (SWCD), Fifteenmile Creek, 34 BMPs including a total of 14,125 linear feet of streambank protected and 983 acres treated | Completed |

# 5. Total Maximum Daily Load(s)

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

LC = MOS + NB + WLA + LA

Where:

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

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

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

WLA = the wasteload allocation for all point sources

LA = the load allocation for all nonpoint sources

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

## 5.1. In-stream Water Quality Targets

### 5.1.1. Target Selection

E. COLI

The target for E. coli applies in each stream, and is simply the Idaho water quality criterion:

126 colony forming units (CFU) per 100ml, calculated as a geometric mean of 5 samples, collected 3 to 7 days apart, over 30 days (IDAPA 58.01.02.251.02).

It is important to note that there is *no instantaneous maximum* target concentration of E. coli.

SEDIMENT

Idaho's narrative sediment criterion appears in IDAPA 58.01.02.200.08 and states that:

“Sediment shall not exceed quantities … which impair designated beneficial uses.”

In this case, every assessment unit has Cold Water Aquatic Life as its most stringent designated or existing beneficial use. TMDL sediment targets must be based upon attainment of this use. If this use were found to be unattainable, and if its designation were removed, then a new, less stringent sediment target would be required, and this TMDL would have to be modified.

The targets for sediment are based on the paper “Channel Suspended Sediment and Fisheries: A Synthesis for Quantitative Assessment of Risk and Impact” by Charles Newcombe and Jorgen Jensen (Newcombe and Jensen 1996). This paper makes the link between sediment levels and beneficial uses.

Appendix X provides the detailed rationale for the target selection.

The Watershed Advisory Group voted on 1/10/13 to approve the targets contained in Appendix XXX, which provides a detailed rationale. Those sediment targets are twofold:

1. An average of 20mg/L for a maximum of 4 months (see figure XXX, green highlight)
2. For short timescales, other sediment/duration combinations that protect juvenile salmonids to SEV 8 (see figure XXX, yellow highlight)

**Juvenile Salmonids**

Duration of exposure to SS ($\log_e$ hours)

(B) Average severity-of-ill-effect scores (calculated)

| Concentration (mg SS/L) | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | ($\log_e$ mg SS/L) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 162755 | 9 | 10 | 11 | 11 | 12 | 13 | 14 | 14 | - | - | - | 12 |
| 59874 | 9 | 9 | 10 | 11 | 11 | 12 | 13 | 14 | 14 | - | - | 11 |
| 22026 | 8 | 9 | 9 | 10 | 11 | 11 | 12 | 13 | 13 | 14 | - | 10 |
| 8103 | 7 | 8 | 9 | 9 | 10 | 11 | 11 | 12 | 13 | 13 | 14 | 9 |
| 2981 | 6 | 7 | 8 | 9 | 9 | 10 | 11 | 11 | 12 | 13 | 13 | 8 |
| 1097 | 6 | 6 | 7 | 8 | 9 | 9 | 10 | 11 | 11 | 12 | 13 | 7 |
| 403 | 5 | 6 | 6 | 7 | 8 | 9 | 9 | 10 | 11 | 11 | 12 | 6 |
| 148 | 4 | 5 | 6 | 6 | 7 | 8 | 9 | 9 | 10 | 11 | 11 | 5 |
| 55 | 4 | 4 | 5 | 6 | 6 | 7 | 8 | 8 | 9 | 10 | 11 | 4 |
| 20 | 3 | 4 | 4 | 5 | 6 | 6 | 7 | 8 | 8 | 9 | 10 | 3 |
| 7 | 2 | 3 | 4 | 4 | 5 | 6 | 6 | 7 | 8 | 8 | 9 | 2 |
| 3 | 1 | 2 | 3 | 4 | 4 | 5 | 6 | 6 | 7 | 8 | 8 | 1 |
| 1 | 1 | 1 | 2 | 3 | 4 | 4 | 5 | 6 | 6 | 7 | 8 | 0 |
| | 1 | 3 | 7 | 1 | 2 | 6 | 2 | 7 | 4 | 11 | 30 | |
| | Hours | | | Days | | | Weeks | | Months | | | |

**Figure XXX Matrix for Juvenile Salmonids**

The four month timescale was chosen because it is closest to the observed period of elevated sediment concentrations in all the streams in this TMDL. Data from each of the streams indicate that sediment is elevated for a period of about four months. Therefore, the load allocations should be based upon the 4 month target of 20mg/L. It is important to note that fish can withstand the target concentration for a *maximum* of 4 months before they exhibit the effects of SEV8. In other words, after being exposed for the relevant duration, fish 'need a break'.

The second target (expressed as SEV 8 over a range of timescales) is intended to protect against short, high-intensity sediment concentrations. This recognizes that streams naturally experience periods of high sediment during spring runoff, but that these events are infrequent and brief. Except for a single exceedence of the 6 day target on Ten Mile Creek (DEQ 2011), there is no evidence that the short-term targets are exceeded. This means that an additional short-term target is not needed in this TMDL. Only pollutant sources that discharge sediment for a period of four months or longer will be subject to this TMDL and its loading allocations.

Short-duration sediment sources, such as stormwater systems, will be addressed through the NPDES permitting system. Stormwater NPDES permits do not presently contain numeric targets, but if the permitting authority desired a target, it should use a short duration target commensurate with the length of a severe storm event (say, one day), and not the four month target.

The TMDL will be based upon the first target: 20mg/l for a maximum of 4 months, because the data reliably indicate that this target is consistently exceeded. The target is expressed as an *average* of measurements over any 4 month period.

### 5.1.2. Monitoring Points

The ideal monitoring point for each assessment unit is typically the most downstream road crossing. This integrates all the effects of the watershed and provides a convenient place to collect samples. It also enables the sample to be used to assess the creek's impact on the downstream receiving water. A bridge enables samples to be taken even during periods of very high flow.

| **Creek** | **AU** | **Data Location** | **Ideal Location** |
|---|---|---|---|
| Five Mile | 010_03 | Franklin Road | Franklin Road |
| Ten Mile | 008_03 | Franklin Road | Franklin Road |
| Fifteen Mile | 007_04 | Lincoln Road and Mouth | Lincoln Road |
| Sand Hollow | 016_03 | Oasis Road | Old Hwy 30? |
| Sand Hollow | 017_03 | Market Road | Sharp Road? |
| Sand Hollow | 017_06 | Old Fort Boise Road | Old Fort Boise Road |
| Indian | 002_04 | Nampa WWTP, Simplot, Mouth | Simplot Boulevard |
| Dixie Slough | 001_02 | River Road | River Road |
| Upper Indian | 001_02 | Slater Creek at Indian Creek Road | Slater Creek at Indian Creek Road |

| | | | |
|---|---|---|---|
| Mason | 006_02 | Polk Road | Polk Road |
| Willow | 015_03 | Highway 44 | Highway 44 |

## 5.2. Load Capacity

The load capacities for E. coli and sediment are based upon meeting target concentrations. For E. coli, the load capacity is the load that would be present when a **concentration of 126 CFU/100ml** is achieved. For sediment, the load capacity is the load that would be present when a **concentration of 20mg/L** is achieved. Table XXX provides some example load capacities. Since contact recreation and cold water aquatic life are presumed to be possible or occurring at any location in any of the streams during any time of the year, no one flow condition is critical.

The load capacities can also be expressed as equations, with flow as the variable:

The equation for **sediment** is:

$$\text{LA (in kg/day)} = \text{Q (in cfs)} \times 48.9$$

The equation for **E. coli** is:

$$\text{LA (in } 10^9 \text{ CFU/day)} = \text{Q (in cfs)} \times 3.08$$

The coefficients are simply a collection of conversion constants:

Sediment: $20\, mg/L \times \frac{86400\ s/day \times 28.3\ L/cf}{10^6\ mg/kg} = \mathbf{48.9}\ kg/day/cfs$

E. coli: $126\ CFU/100mL \times \frac{86400\ s/day \times 28.3\ L/cf}{0.1\ L/100mL \times 10^9} = \mathbf{3.08} \times 10^9\ CFU/day/cfs$

Table XXX Example load capacities

| **Example Discharge** (cfs) | **Target Concentration** **Sediment** (mg/L) | **E. coli** (CFU/100ml) | **Load Capacity** **Sediment** (kg/day) | **E. coli** ($10^9$ CFU/day) |
|---|---|---|---|---|
| 25 | 20 | 126 | 1,223 | 77 |
| 50 | 20 | 126 | 2,445 | 154 |
| 75 | 20 | 126 | 3,668 | 231 |
| 100 | 20 | 126 | 4,890 | 308 |
| 125 | 20 | 126 | 6,113 | 385 |
| 150 | 20 | 126 | 7,335 | 462 |
| 175 | 20 | 126 | 8,558 | 539 |
| 200 | 20 | 126 | 9,780 | 616 |
| 250 | 20 | 126 | 12,226 | 770 |

| | | | | |
|---|---|---|---|---|
| 300 | 20 | 126 | 14,671 | 924 |

# 5.3. Natural Background

Even unimpaired streams have natural levels of sediment. To quantify this, sample results from EMAP (Environmental Monitoring and Assessment Program) were examined. EMAP was a research program run by EPA to develop the tools necessary to monitor and assess the status and trends of national ecological resource.

153 sample sites in the xeric west were examined, and 25 of these were judged to be in 'least impacted' condition, as evidenced by a ranking of 'good' in both their macroinvertebrate and fish populations (appendix XXX). The average suspended sediment concentration in these least-impacted sites was **2.5mg/L.** This is a reasonable estimate for the natural background concentration of sediment in a stream in the xeric west during the summer months.

The natural background level of sediment must be subtracted from all anthropogenic sources, and therefore represents a reduction in the available load capacity. Said another way, even perfectly pure water would naturally be expected to gain up to 2.5mg/L of sediment as it travelled down the stream, through processes such as bank erosion.

The water quality standards do not make a distinction between anthropogenic and background sources of E. coli. 'Natural' E. coli (from sources such as birds and deer), is also now more likely to enter the streams because of irrigation and storm conveyances. For this reason, the background levels of e. coli will be incorporated in the load allocation.

# 5.4. Load and Wasteload Allocations

Aside from contributions from point sources, the existing in-stream loads are generated by the land uses occurring in each watershed. Load allocations will be established for compliance points near the bottom of each assessment unit, and all land uses upstream of the compliance point that contribute pollutants should make combined reductions to meet the load allocation.

To improve beneficial uses, water quality managers should focus on the target *concentrations*, rather than absolute loads. However, to meet the requirements of the Clean Water Act, flow-variable loads are assigned to each tributary. Loads apply year-round, and are calculated as averages: 30 days for E. coli and 4 months for sediment.

Point source allocations are based on the pollutant targets in section 5.1.1. The E. coli target is 126 CFU/100ml, collected as a 5-sample geometric mean over 30 days. The sediment target is 17.5mg/L, which allows for 2.5mg/L background (section 5.3.1). The sediment target is expressed as a 4 month average.

This TMDL is concentration-based, so the wasteload allocations are based upon the design flow. The equation for **sediment** is:

$$\text{WLA (in kg/day)} = \text{Q (in mgd)} \times 66.2$$

The equation for **E. coli** is:

$$\text{WLA (in } 10^9 \text{ CFU/day)} = \text{Q (in mgd)} \times 4.76$$

If the design flow were to increase, then the wasteload allocation would correspondingly increase, according to the equations above. The present design flows, and wasteload allocations, are shown in table 7.

Again, the coefficients are simply a collection of conversion constants:

Sediment: $$17.5\, mg/L \times \frac{3.785\, L/gal \times 10^6\ gal/million\ gal}{10^6\, mg/kg} = \mathbf{66.2}\ kg/day/mgd$$

E. coli: $$126\, CFU/100mL \times \frac{3.785\, L/gal \times 10^6\, gal/million\ gal}{0.1L/100mL \times 10^9} = \mathbf{4.76} \times 10^9 CFU/\ day/mgd$$

Table 4. Point source wasteload allocations for tributaries in the lower Boise River subbasin.

| Facility | NPDES[a] Number | Present Design Flow (mgd) | Affected AU | Wasteload Allocation at Present Flow | |
|---|---|---|---|---|---|
| | | | | Sediment (kg/day) [b] | E. coli ($10^9$ CFU/day) [c] |
| City of Meridian | ID-002019-2 | 10.2 [3] | 010_03 Five Mile | 675.6 | 49 |
| City of Parma | ID-002177-6 | 0.68 [1] | 017_06 Sand Hollow | 45.0 | 3 |
| City of Nampa | ID-002206-3 | 18 [4] | 002_04 Indian Creek | 1192.3 | 86 |
| Sorrento-Lactalis | ID-002803-7 | 0.65 [2] | 006_02 Mason Creek | 43.1 | 3 |
| City of Greenleaf | ID-0028304 | 0.24 [1] | 001_02 Dixie Slough | n/a | 1 |

[a] National Pollutant Discharge Elimination System (NPDES)
[b] 4 month average
[c] 30 day geometric mean

[1]NPDES permit fact sheet [2] 2011 Wastewater Facility Planning Study [3] 2009 Meridian Citywide Reuse Permit Application [4]Nampa WWTP Supplemental Planning Document November 2012

All point sources in the table above presently meet these wasteload allocations.

NONPOINT SOURCES

Nonpoint source allocations are based on the pollutant targets in section 5.1.1. The E. coli target is 126CFU/100ml. The sediment target is 17.5mg/L, which allows for 2.5mg/L background. *Water quality managers should focus on the concentration targets.*

The load allocations are calculated here, and are based on the flow of water from nonpoint sources. These flows are highly variable, so flow-variable equations are used.

The equation for **sediment** is:

LA (in kg/day) = Q (in cfs) x 42.8

The equation for **E. coli** is:

LA (in $10^9$ CFU/day) = Q (in cfs) x 3.08

If the flows were to increase, then the load allocations would correspondingly increase, according to the equations above. The present nonpoint source flows, and corresponding load allocations, are shown in table 8. These values are merely examples.

**Table 5. Example nonpoint source load allocations for tributaries in the Lower Boise River subbasin.**

| Stream | Assessment Unit | Present NPS Flow (cfs) | Load Allocation at this Flow | |
|---|---|---|---|---|
| | | | Sediment kg/day | E. coli $10^9$ CFU/day |
| Five Mile | 010_03 | 70.9 | 3,042 | 218 |
| Nine Mile | 010_02 | 10.0 | n/a [1] | 31 |
| Ten Mile | 008_03 | 71.0 | 3,046 | 219 |
| Fifteen Mile | 007_04 | 135.2 | 5,800 | 416 |
| Sand Hollow | 016_03 | 0.9 | 39 | n/a [1] |
| Sand Hollow | 017_03 | 28.7 | 1,231 | 88 |
| Sand Hollow | 017_06 | 146.4 | 6,281 | 451 |
| Willow | 015_03 | 42.8 | 1,836 | n/a [1] |
| Dixie | 001_02 | 200 | n/a [1] | 616 |
| Indian | 002_04 | 126.0 [2] | 5,405 | 388 |
| Indian | 003d_02 | 1.1 | n/a [1] | 3 |
| Mason | 006_02 | 171.2 | 7,344 | 527 |

[1] These combinations of assessment units and pollutants are not listed as impaired on the 2012 303(d) list.

[2] This flow was measured at Caldwell, where it has significantly increased from the flow listed in table x3x

The time frame for meeting these allocations as soon as funding permits.

As before, the coefficients are simply a collection of conversion constants:

Sediment: $$17.5\, mg/L \times \frac{86400\ s/day \times 28.3\ L/cf}{10^6\ mg/kg} = \mathbf{42.8}\ kg/day/cfs$$

E. coli: $$126\ CFU/100mL \times \frac{86400\ s/day \times 28.3\ L/cf}{0.1\ L/100mL \times 10^9} = \mathbf{3.08} \times 10^9\ CFU/day/cfs$$

## 5.4.1. Margin of Safety

An implicit margin of safety is built into the TMDL for four reasons:

1. Each of the impaired creeks is heavily influenced by groundwater infiltration. This ground water most likely contains very little sediment or *E. coli*. As such, if all

surface water sources discharged at the target, dilution would become available as a result of groundwater infiltration into the stream.

2. The point sources are discharging at extremely low concentrations (<20 CFU/100ml E. coli and <7 mg/L sediment), thereby providing further dilution.
3. The water quality target was based upon not causing lethal or paralethal effects on juvenile salmonids: a severity rating of '8'. In their paper, Newcombe and Jensen (1996) define the threshold as *between* levels 8 and 9 (equivalent to perhaps level 8.5). Therefore, a level '8' is a slightly more conservative level of protection that would still support the beneficial use.
4. The natural background concentration assumes all the water in the creek is exposed to the streambanks (the source of background sediment) for the creek's entire length. In fact, these streams have no headwater inflow, and their water comes mainly from agricultural return flows. This means that their water enters the creek throughout its length. Water entering at the bottom end of the creek has no streambank contribution and therefore is potentially cleaner than water entering at the top of the creek, which has far more opportunity to collect sediment from the banks. This functions as a margin of safety.

### 5.4.2. Seasonal Variation

Water quality standards apply year-round, and so the *E. coli* target of 126 CFU/100ml must be met all year.

The sediment targets are based upon supporting cold water aquatic life. This beneficial use must be supported year-round, so the target of 20mg/L for 4 months must be met all year. The data from each creek indicate that the highest sediment levels are typically seen between April and mid-September.

### 5.4.3. Reasonable Assurance

Although the impaired watersheds have several point sources of E. coli and sediment pollution, all of these sources discharge at a concentration lower than the water quality criterion. In other words, the point sources are reducing the E. coli and sediment concentrations with their discharge. This means that the only way to reduce E. coli levels to the water quality target is to reduce the pollution from non-point sources. There must be reasonable assurance that these reductions will be implemented and effective in achieving the water quality target

The following discussion is excerpted from the 2001 subbasin assessment.
Under Section 319 of the Clean Water Act, each state is required to develop and submit a nonpoint source management plan. Idaho's most recent Nonpoint Source Management Program was finalized in XXX September 1999. The plan was submitted to and approved by the EPA. Among other things, the plan identifies programs to achieve implementation of nonpoint source BMPs, includes a schedule for program milestones, outlines key agencies and agency roles and is certified by the state attorney general to ensure that adequate authorities exist to implement the plan and identifies available funding sources. Idaho's nonpoint source management program describes many of the voluntary and regulatory approaches the state will take to abate nonpoint pollution sources. One of the prominent programs described in the plan is the provision for public involvement, such as the formation of Basin Advisory Groups (BAGs) and Watershed Advisory Groups (WAGs) (IDAPA 58.01.02.052). The

WAGs are to be established in high priority watersheds to assist DEQ and other state agencies in formulating specific actions needed to decrease pollutant loading from point and nonpoint sources that affect water quality limited waterbodies. The Lower Boise Watershed Council is the designated WAG for the lower Boise River watershed.

The Idaho water quality standards refer to existing authorities to control nonpoint pollution sources in Idaho. Some of these authorities and responsible agencies are listed in Table XX.

Table xx. State of Idaho's regulatory authority for nonpoint pollution sources

| **Authority** | **IDAPA Citation** | **Responsible Agency** |
|---|---|---|
| Rules Governing Solid Waste Management | 58.01.02.350.03(b) | Idaho Department of Health and Welfare |
| Rules Governing Subsurface and Individual Sewage Disposal Systems | 58.01.02.350.03(c) | Idaho Department of Health and Welfare |
| Rules and Standards for Stream-channel Alteration | 58.01.02.350.03(d) | Idaho Department of Water Resources |
| Rules Governing Exploration and Surface Mining Operations in Idaho | 58.01.02.350.03(e) | Idaho Department of Lands |
| Rules Governing Placer and Dredge Mining in Idaho | 58.01.02.350.03(f) | Idaho Department of Lands |
| Rules Governing Dairy Waste | 58.01.02.350.03.(g) | Idaho Department of Agriculture |

The state of Idaho uses a voluntary approach to address agricultural nonpoint sources. However, regulatory authority can be found in the water quality standards (IDAPA 58.01.02.350.01 through 58.01.02.350.03). IDAPA 58.01.02.054.07 refers to the Idaho Agricultural Pollution Abatement Plan (Ag Plan) (IDHW and SCC, 2003) which provides direction to the agricultural community approved BMPs. A portion of the Ag Plan outlines responsible agencies or elected groups (SCDs) that will take the lead if nonpoint source pollution problems need to be addressed. For agricultural activity, it assigns the local SCDs to assist the landowner/operator with developing and implementing BMPs to abate nonpoint pollution associated with the land use. If a voluntary approach does not succeed in abating the pollutant problem, the state may seek injunctive relief for those situations that may be determined to be an imminent and substantial danger to public health or environment (IDAPA 58.01.02.350.02(a)). The Idaho Water Quality Standards and Wastewater Treatment Requirements specify that if water quality monitoring indicates that water quality standards are not being met, even with the use of BMPs or knowledgeable and reasonable practices, the state may request that the designated agency evaluate and/or modify the BMPs to protect beneficial uses. If necessary the state may seek injunctive or other judicial relief against the operator of a nonpoint source activity in accordance with the Director of the Department of Health and Welfare's authority provided in Section 39-108, Idaho Code (IDAPA 58.01.02.350). The water quality standards list designated agencies responsible for reviewing and revising nonpoint source BMPs; the Soil Conservation Commission for grazing and agricultural activities; the Department of Transportation for public road construction; the

Department of Agriculture for aquaculture; and DEQ for all other activities (IDAPA 58.01.02.003).

### 5.4.4. Stormwater Runoff 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).

Stormwater point sources (table 8) are also assigned wasteload allocations, but the volume of discharge is presently unknown. The wasteload allocations apply only to the portion of the discharge that is not specifically allowed by the stormwater permitting authority. These allowed discharges typically include agricultural pass-through, spring water and clean groundwater. The wasteload is based on attaining a target concentration of 17.5mg/L sediment and 126 CFU/100ml E. coli. It is crucial to note that *these targets are averages* (4 months for sediment and 30 days for E. coli), *and only apply to continuous discharges*. Shorter duration events should use the appropriate concentration target in section 5.1.1

Table 8. STORMWATER POINT SOURCES:

<table>
<tr><th rowspan="2">Facility</th><th rowspan="2">NPDES[a] Number</th><th colspan="2">Wasteload Allocation</th></tr>
<tr><th>Sediment<br>kg/day [b]</th><th>E. coli<br>$10^9$ CFU/day [c]</th></tr>
<tr><td>ACHD (and co-permittees) Phase 2</td><td>ID-028185</td><td rowspan="12">Q (in mgd) x 66.2<br>OR<br>Q (in cfs) x 42.8</td><td rowspan="12">Q (in mgd) x 4.76<br>OR<br>Q (in cfs) x 3.08</td></tr>
<tr><td>ACHD (and co-permittees) Phase 1</td><td>IDS-027561</td></tr>
<tr><td>City of Caldwell</td><td>IDS-028118</td></tr>
<tr><td>Canyon HD #4</td><td>IDS-028134</td></tr>
<tr><td>ITD #3</td><td>IDS-028177</td></tr>
<tr><td>Nampa HD #1</td><td>IDS-028142</td></tr>
<tr><td>City of Nampa</td><td>IDS-028126</td></tr>
<tr><td>City of Middleton</td><td>IDS-028100</td></tr>
<tr><td>Notus-Parma Highway District</td><td>IDS-028151</td></tr>
<tr><td>Industrial Facilities</td><td>Multi-Sector General Permit</td></tr>
<tr><td>Construction Activities</td><td>Construction General Permit</td></tr>
<tr><td>Confined Animal Feeding Operations</td><td>IDG010000</td></tr>
</table>

[a] National Pollutant Discharge Elimination System (NPDES)
[b] 4 month average.
[c] 30 day geometric mean

All stormwater point sources in the table above are believed to presently meet these wasteload allocations.

### 5.4.4.1. Municipal Separate Storm Sewer Systems ("MS4")

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.

### 5.4.4.2. 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.

#### 5.4.4.3. 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 Construction General Permit (CGP) from EPA after developing a site-specific SWPPP. The SWPPP must provide for the erosion, sediment, and pollution controls they intend to use; inspection of the controls periodically; and maintenance of BMPs throughout the life of the project. Operators are required to keep a current copy of their SWPPP on site or at an easily accessible location.

**TMDL Construction Stormwater Requirements**

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

**Postconstruction Stormwater Management**

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

### 5.4.5. Reserve for Growth

The TMDLs are each based upon a target *concentration*. Therefore, growth can occur provided that:

1. the creek/ditch can transport the extra effluent
2. the effluent contains concentrations of:
   i. E. coli less than 126 CFU/100ml (30 day geometric mean)
   ii. Suspended sediment less than 17.5mg/L (4 month average)

If these conditions were met, the effluent would actually dilute the impaired streams and reduce the pollutant concentrations. This recognizes that point sources almost always discharge their pollutants *in solution*, and whether the water were 'new' (from wells or ratepayers) or 'old' (taken from the creek itself), as long as it met the above criteria, it would contribute to improving the beneficial uses.

This is in no way a statement about water rights or availability.

This TMDL is concentration-based, so the reserve allocations are based upon the design flow of the future source (Q). The equations are the same as for the wasteload allocations.

For **sediment**, the equation is:

Reserve (in kg/day) = Q (in mgd) x 66.2

The equation for **E. coli** is:

Reserve (in $10^9$ CFU/day) = Q (in mgd) x 4.76

Examples of reserves for growth are shown in table XXZ.

Table XXZ. Reserve for Growth

| **Future Facility Design Flow** | **Maximum Concentration** | | **Reserve For Growth** | |
|---|---|---|---|---|
| | **Sediment** | **E. coli** | **Sediment** | **E. coli** |
| mgd | mg/L | CFU/100ml | kg/day | $10^9$ CFU/day |
| 0.5 | 17.5 | 126 | 33 | 2 |
| 1 | 17.5 | 126 | 66 | 5 |
| 5 | 17.5 | 126 | 331 | 24 |
| 10 | 17.5 | 126 | 662 | 48 |
| 15 | 17.5 | 126 | 994 | 71 |
| 20 | 17.5 | 126 | 1,325 | 95 |
| 25 | 17.5 | 126 | 1,656 | 119 |

| | | | | |
|---|---|---|---|---|
| 30 | 17.5 | 126 | 1,987 | 143 |

## 5.5. Estimates of Existing Pollutant Loads

Data have generally been collected from a single point at the lower end of each assessment unit, and by each point source. There are insufficient data to identify categories of nonpoint source pollution, and so a single load is presented.

Table 6. Current E. coli loads from all sources in the impaired assessment units.

| Stream | AU | Existing E. coli Concentration [8] (CFU/100ml) | Average Discharge [9] (cfs) | Existing E. coli Load ($10^9$ CFU/day) |
|---|---|---|---|---|
| Five Mile | 010_03 | 768 [1] | 56.3 [1] | 1,058 |
| Nine Mile | 010_02 | 709 [1] | 10 [12] | 173 |
| Ten Mile | 008_03 | 700 [1] | 70.3 [1] | 1,204 |
| Fifteen Mile | 007_04 | 748 [1] | 92.7 [4] | 1,696 |
| Sand Hollow | 017_03 | 573 [1] | 45 [5] | 631 |
| Sand Hollow | 017_06 | 669 [1] | 157 [4] | 2,570 |
| Dixie | 001_02 | 482 [13] | 200 [14] | 2362 |
| Indian | 002_04 | 490 [1] | 156 [6] | 1,870 |
| Upper Indian | 003d_02 | 1,338 [10] | 1.06 [11] | 35 |
| Mason | 006_02 | 709 [3] | 87.7 [7] | 1,521 |

1 – DEQ July 2011, 2 – DEQ July 2010, 3 – USGS and ISDA July 1999, 4 – ISDA July 2008, 5 – DEQ July 2008, 6 – USGS July 2010, 7 – ISDA July 1999, 8 – Maximum concentration, collected per IDAPA 58.01.02.251.02, 9 – During the same period as E. coli sample collection, 10 – DEQ May 2012, 11 – USGS Gauge at Mayfield May 2012, 12 – USGS Streamstats website 13 – DEQ and HyQual 2012 14 – City of Boise 1996-2011

In most cases, the highest E. coli values occurred in July. Sand Hollow Creek was highest in August, and upper Indian Creek was highest in May. Five, Nine, Ten and Fifteen Mile Creeks were also monitored in November 2011. Five, Ten and Fifteen Mile Creeks met the water quality criteria. Nine Mile Creek remained above the water quality criteria, albeit at a lower level – 365 CFU/100ml.

Table x3x. Current sediment loads from all sources in the impaired assessment units.

| Stream | AU | Existing Sediment Concentration [5] mg/L | Average Discharge [6] cfs | Existing Sediment Load kg/day |
|---|---|---|---|---|
| Five Mile | 010_03 | 50.6 [1] | 70.9 [1] | 8,775 |
| Ten Mile | 008_03 | 88.4 [1] | 71.0 [1] | 15,352 |
| Fifteen Mile | 007_04 | 63.4 [2] | 135.2 [2] | 20,966 |
| Sand Hollow | 016_03 | 6.0 [3] | 0.9 [3] | 13 |
| Sand Hollow | 017_03 | 215.0 [3] | 28.7 [3] | 15,093 |
| Sand Hollow | 017_06 | 107.5 [2] | 146.4 [2] | 38,495 |
| Willow | 015_03 | 26.8 [2] | 42.8 [2] | 2,806 |
| Indian [7] | 002_04 | 24.2 [4] | 36.7 [4] | 2,172 |
| Mason | 006_02 | 85.9 [2] | 171.2 [2] | 35,971 |

1 – DEQ 2011, 2 – ISDA 2008, 3 – DEQ 2008, 4 – City of Nampa 2003-2009, 5 – maximum recorded 4 month average concentration, 6 – during the same period as sediment data collection, 7 – Note that this site is midway through the assessment unit. There were no sufficiently large datasets available for the preferred location, Simplot Boulevard. The data collected at the mouth is not representative.

POINT SOURCES

Table 7. Current wasteloads from point sources in the impaired assessment units.

| Facility | Per mit # | Affected AU | Existing Flow [1] | Existing Concentration[1] | | Existing Wasteload | |
|---|---|---|---|---|---|---|---|
| | | | | Sed. | E. coli | Sed. | E. coli |
| | | | mgd | mg/L | CFU/day | kg/day | $10^9$ CFU/day |
| City of Meridian | ID-002019-2 | 010_03 Five Mile | 5.6 | 2.4 | 1 | 50 | 0.211 |
| City of Parma | ID-002177-6 | 017_06 Sand Hollow | 0.1 | 4.5 | 1 | 2 | 0.005 |
| City of Nampa | ID-002206-3 | 002_04 Indian Creek | 9.7 | 6.8 | 21.3 | 251 | 7.826 |
| Sorrento-Lactalis | ID-002803-7 | 006_02 Mason Creek | 0.7 | 4.3 | 2.3 | 10 | 0.057 |
| City of | ID- | 001_02 | 0.7 | n/a | 1 | n/a | 0.013 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Greenleaf | 0028 304 | Dixie Slough | | | | | |

1 Annual averages of reported values

Note that the City of Kuna and XL Four Star Beef discharge to an unimpaired section of Indian Creek that is not addressed in this TMDL. They already receive loading allocations from the Boise River TMDL, and will not be assigned further loads by this TMDL. The City of Greenleaf has only recently received its NPDES permit, and only has two months of data available.

# 5.6. Pollution Trading

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

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

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

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

http://www.deq.idaho.gov/water/prog_issues/waste_water/pollutant_trading/pollutant_trading_guidance_entire.pdf

## 5.6.1. Trading Components

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

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

- Point sources create credits by reducing pollutant discharges below NPDES effluent limits set initially by the waste load allocation.
- Nonpoint sources create credits by implementing approved best management practices (BMPs) that reduce the amount of pollutant run-off. Nonpoint sources must follow specific design, maintenance, and monitoring requirements for that BMP, apply discounts to credits generated if required, and provide a water quality

contribution to ensure a net environmental benefit. The water quality contribution also ensures the reduction (the marketable credit), is surplus to the reductions the TMDL assumes the nonpoint source is achieving to meet the water quality goals of the TMDL.

### 5.6.2. Watershed-Specific Environmental Protection

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

### 5.6.3. IV. Trading Framework

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

The elements of a trading document are described in DEQ's Pollutant Trading Guidance:

http://www.deq.idaho.gov/water/prog_issues/waste_water/pollutant_trading/pollutant_trading_guidance_entire.pdf.

## 5.7. Public Participation

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

- BAG members are appointed by DEQ's director for each of Idaho's basins.
- An "Integrated Report" is developed by DEQ every two years that highlights which water bodies in Idaho appear to be degraded.
- DEQ prepares to begin the SBA and TMDL process for individual degraded watersheds.
- A WAG is formed by DEQ (with help from the BAG) for a specific watershed/TMDL.
- With the assistance of the WAG, DEQ develops an SBA and any necessary TMDLs for the watershed.
- The WAG comments on the SBA/TMDL.
- WAG comments are considered and incorporated, as appropriate, by DEQ into the SBA/TMDL.
- The public comments on the SBA/TMDL.
- Public comments are considered and incorporated, as appropriate, by DEQ into the SBA/TMDL.
- DEQ sends the document to the U.S. Environmental Protection Agency (EPA) for approval.
- DEQ and the WAG develop, then implement, a plan to reach the goals of the TMDL.

DEQ will provide the WAG with all available information pertinent to the SBA/TMDL, when requested, such as monitoring data, water quality assessments, and relevant reports. The WAG will also have the opportunity to actively participate in preparing the SBA/TMDL documents.

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

# 5.8. Implementation Strategies

Implementation should focus on reducing nonpoint source pollution. Although small-scale projects may, collectively, produce water quality improvements, large-scale projects may be required to achieve the large reductions necessary.

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

## 5.8.1. Time Frame

The point sources already meet their wasteload allocations. The nonpoint sources will attempt to meet their load allocations as funding permits.

## 5.8.2. Approach

Funding provided under section 319, and other funds, will be used to encourage voluntary projects to reduce nonpoint source pollution.

A survey of the hydrology of each stream should be attempted, with the goal of identifying the major inflows. These inflows could then be prioritized for projects to eliminate sediment and E. coli discharge to the tributary.

## 5.8.3. Responsible Parties

- Identify the federal, state, and local governments; individuals; or entities that will be involved in or responsible for implementing the TMDL.

## 5.8.4. Monitoring Strategy

A repeat survey of sediment and E. coli concentrations should occur ten years after the approval of this TMDL. Measurements should be taken at the ideal locations identified in section 5.1.2. Sediment measurements should be collected every two weeks between April and November, and E. coli samples should be collected in July.

## 5.9. Conclusions

Concentration-based TMDLs are established for sediment and E. coli for the impaired streams in the lower Boise River watershed. Point sources all currently meet the pollutant targets. Implementation should focus on nonpoint sources, as funds allow.

Table 8. Summary of assessment outcomes.

| Assessment Unit | Description | Pollutant | Recommended Changes to the 2014 Integrated Report | TMDL Loads |
|---|---|---|---|---|
| ID17050114SW001_02 | Dixie Slough | E. coli | Move to 4A – TMDL completed | 126 CFU/100ml, averaged over 30 days.<br><br>Load is flow dependent, according to the following equation:<br><br>LA (in $10^9$ CFU/day) = Q (in cfs) x 3.08 |
| ID17050114SW002_04 | Indian Creek downstream of Sugar Ave | | | |
| ID17050114SW003d_02 | Indian Creek and Tributaries upstream of Indian Creek | | | |
| ID17050114SW006_02 | Mason Creek entire watershed | | | |
| ID17050114SW007_04 | Fifteenmile Creek from Five/Tenmile confluence to mouth | | | |
| ID17050114SW008_03 | Tenmile Creek Blacks Creek Reservoir to mouth | | | |
| ID17050114SW010_02 | Ninemile Creek 1st and 2nd order tributaries to Fivemile Creek | | | |
| ID17050114SW010_03 | Fivemile Creek 3rd order section | | | |
| ID17050114SW017_03 | Sand Hollow Creek I-84 to Sharp Road | | | |
| ID17050114SW017_06 | Sand Hollow Creek Sharp Road to Snake River | | | |
| ID17050114SW002_04 | Indian Creek downstream of Sugar Ave | Sediment | Move to 4A – TMDL completed | 20mg/L, averaged over 4 months.<br><br>The load is flow dependent, according to the following equation:<br><br>LA (in kg/day) = Q (in cfs) x 48.9 |
| ID17050114SW006_02 | Mason Creek entire watershed | | | |
| ID17050114SW007_04 | Fifteenmile Creek from Five/Tenmile confluence to mouth | | | |
| ID17050114SW008_03 | Tenmile Creek Blacks Creek Reservoir to mouth | | | |
| ID17050114SW010_03 | Fivemile Creek 3rd order section | | | |
| ID17050114SW015_03 | Willow Creek 3rd order section (South Fork to mouth) | | | |
| ID17050114SW016_03 | Sand Hollow Creek C-line Canal to I-84 | | | |
| ID17050114SW017_03 | Sand Hollow Creek I-84 to Sharp Road | | | |
| ID17050114SW017_06 | Sand Hollow Creek Sharp Road to Snake River | | | |

# 6. References Cited

- The following references are references cited in the boilerplate language and in the glossary. Do not delete any of these references. Add all references you cite using the references listed below as examples.


American Geological Institute. 1962. Dictionary of geological terms. Doubleday and Company. Garden City, NY. 545 p.

Armantrout, N.B., compiler. 1998. Glossary of aquatic habitat inventory terminology. American Fisheries Society. Bethesda, MD. 136 p.

Batt, P.E. 1996. Governor Philip E. Batt's Idaho bull trout conservation plan. State of Idaho, Office of the Governor. Boise, ID. 20 p + appendices.

Clean Water Act (Federal water pollution control act), 33 U.S.C. § 1251-1387. 1972.

EPA. 1996. Biological criteria: technical guidance for streams and small rivers. EPA 822-B-96-001. U.S. Environmental Protection Agency, Office of Water. Washington, DC. 162 p.

Franson, M.A.H., L.S. Clesceri, A.E. Greenberg, and A.D. Eaton, editors. 1998. Standard methods for the examination of water and wastewater, twentieth edition. American Public Health Association. Washington, DC. 1,191 p.

Grafe, C.S., C.A. Mebane, M.J. McIntyre, D.A. Essig, D.H. Brandt, and D.T. Mosier. 2002. The Idaho Department of Environmental Quality water body assessment guidance, second edition-final. Department of Environmental Quality. Boise, ID. 114 p.

Hughes, R.M. 1995. Defining acceptable biological status by comparing with reference condition. In: Davis, W.S. and T.P. Simon, editors. Biological assessment and criteria: tools for water resource planning and decision making. CRC Press. Boca Raton, FL. p 31-48.

Idaho Code § 39.3611. Development and implementation of total maximum daily load or equivalent processes.

Idaho Code § 39.3615. Creation of watershed advisory groups.

IDAPA 58.01.02. Idaho water quality standards and wastewater treatment requirements.

Karr, J.R. 1991. Biological integrity: a long-neglected aspect of water resource management. Ecological Applications 1:66-84.

Rand, G.W., editor. 1995. Fundamentals of aquatic toxicology: effects, environmental fate, and risk assessment, second edition. Taylor and Francis. Washington, DC. 1,125 p.

Strahler, A.N. 1957. Quantitative analysis of watershed geomorphology. Transactions American Geophysical Union 38:913-920.

USGS. 1987. Hydrologic unit maps. Water supply paper 2294. United States Geological Survey. Denver, CO. 63 p.

Water Environment Federation. 1987. The Clean Water Act of 1987. Water Environment Federation. Alexandria, VA. 318 p.

Water Quality Act of 1987, Public Law 100-4. 1987.

Water quality planning and management, 40 CFR Part 130.

#### 6.1.1.1. GIS Coverages

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

- Add list of GIS coverages to end of references (see guidance).

# 7. Glossary

- Remove any terms not used and add any terms that are missing. To expedite searching, select a term and press Ctrl-F. If the term is found, select the *Go To* tab, of the *Find and Replace* window, choose *Bookmark* under *Go to what*, and select *glossary* under *Enter bookmark name*.
- If you add anything to this list (unless it is site-specific), please inform the TMDL Program Manager, so that we may provide everyone the most complete list possible.

## 305(b)

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

## §303(d)

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

## Acre-foot

A volume of water that would cover an acre to a depth of one foot. Often used to quantify reservoir storage and the annual discharge of large rivers.

## Adsorption

The adhesion of one substance to the surface of another. Clays, for example, can adsorb phosphorus and organic molecules

## Aeration

A process by which water becomes charged with air directly from the atmosphere. Dissolved gases, such as oxygen, are then available for reactions in water.

## Aerobic

Describes life, processes, or conditions that require the presence of oxygen.

## Adfluvial

Describes fish whose life history involves seasonal migration from lakes to streams for spawning.

## Adjunct

In the context of water quality, adjunct refers to areas directly adjacent to focal or refuge habitats that have been degraded by human or natural disturbances and do not presently support high diversity or abundance of native species.

## Alevin

A newly hatched, incompletely developed fish (usually a salmonid) still in nest or inactive on the bottom of a water body, living off stored yolk.

## Algae

Non-vascular (without water-conducting tissue) aquatic plants that occur as single cells, colonies, or filaments.

## Alluvium

Unconsolidated recent stream deposition.

## Ambient

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

## Anadromous

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

## Anaerobic

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

## Anoxia

The condition of oxygen absence or deficiency.

## Anthropogenic

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

## Anti-Degradation

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

## Aquatic

Occurring, growing, or living in water.

## Aquifer

An underground, water-bearing layer or stratum of permeable rock, sand, or gravel capable of yielding of water to wells or springs.

# Assemblage (aquatic)

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

# Assessment Database (ADB)

The ADB is a relational database application designed for the U.S. Environmental Protection Agency for tracking water quality assessment data, such as use attainment and causes and sources of impairment. States need to track this information and many other types of assessment data for thousands of water bodies and integrate it into meaningful reports. The ADB is designed to make this process accurate, straightforward, and user-friendly for participating states, territories, tribes, and basin commissions.

# Assessment Unit (AU)

A segment of a water body that is treated as a homogenous unit, meaning that any designated uses, the rating of these uses, and any associated causes and sources must be applied to the entirety of the unit.

# Assimilative Capacity

The ability to process or dissipate pollutants without ill effect to beneficial uses.

# Autotrophic

An organism is considered autotrophic if it uses carbon dioxide as its main source of carbon. This most commonly happens through photosynthesis.

# Batholith

A large body of intrusive igneous rock that has more than 40 square miles of surface exposure and no known floor. A batholith usually consists of coarse-grained rocks such as granite.

# Bedload

Material (generally sand-sized or larger sediment) that is carried along the streambed by rolling or bouncing.

# Beneficial Use

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

# Beneficial Use Reconnaissance Program (BURP)

A program for conducting systematic biological and physical habitat surveys of water bodies in Idaho. BURP protocols address lakes, reservoirs, and wadeable streams and rivers

# Benthic

Pertaining to or living on or in the bottom sediments of a water body

## Benthic Organic Matter.

The organic matter on the bottom of a water body.

## Benthos

Organisms living in and on the bottom sediments of lakes and streams. Originally, the term meant the lake bottom, but it is now applied almost uniformly to the animals associated with the lake and stream bottoms.

## Best Management Practices (BMPs)

Structural, nonstructural, and managerial techniques that are effective and practical means to control nonpoint source pollutants.

## Best Professional Judgment

A conclusion and/or interpretation derived by a trained and/or technically competent individual by applying interpretation and synthesizing information.

## Biochemical Oxygen Demand (BOD)

The amount of dissolved oxygen used by organisms during the decomposition (respiration) of organic matter, expressed as mass of oxygen per volume of water, over some specified period of time.

## Biological Integrity

1) The condition of an aquatic community inhabiting unimpaired water bodies of a specified habitat as measured by an evaluation of multiple attributes of the aquatic biota (EPA 1996).
2) The ability of an aquatic ecosystem to support and maintain a balanced, integrated, adaptive community of organisms having a species composition, diversity, and functional organization comparable to the natural habitats of a region (Karr 1991).

## Biomass

The weight of biological matter. Standing crop is the amount of biomass (e.g., fish or algae) in a body of water at a given time. Often expressed as grams per square meter.

## Biota

The animal and plant life of a given region.

## Biotic

A term applied to the living components of an area.

## Clean Water Act (CWA)

The Federal Water Pollution Control Act (commonly known as the Clean Water Act), as last reauthorized by the Water Quality Act of 1987, establishes a process for states to use to develop information on, and control the quality of, the nation’s water resources.

## Coliform Bacteria

A group of bacteria predominantly inhabiting the intestines of humans and animals but also found in soil. Coliform bacteria are commonly used as indicators of the possible presence of pathogenic organisms (also see Fecal Coliform Bacteria, *E. Coli*, and Pathogens).

# Colluvium

Material transported to a site by gravity.

# Community

A group of interacting organisms living together in a given place.

# Conductivity

The ability of an aqueous solution to carry electric current, expressed in micro (μ) mhos/centimeter at 25 °C. Conductivity is affected by dissolved solids and is used as an indirect measure of total dissolved solids in a water sample.

# Cretaceous

The final period of the Mesozoic era (after the Jurassic and before the Tertiary period of the Cenozoic era), thought to have covered the span of time between 135 and 65 million years ago.

# Criteria

In the context of water quality, numeric or descriptive factors taken into account in setting standards for various pollutants. These factors are used to determine limits on allowable concentration levels, and to limit the number of violations per year. The U.S. Environmental Protection Agency develops criteria guidance; states establish criteria.

# Cubic Feet per Second

A unit of measure for the rate of flow or discharge of water. One cubic foot per second is the rate of flow of a stream with a cross-section of one square foot flowing at a mean velocity of one foot per second. At a steady rate, once cubic foot per second is equal to 448.8 gallons per minute and 10,984 acre-feet per day.

# Cultural Eutrophication

The process of eutrophication that has been accelerated by human-caused influences. Usually seen as an increase in nutrient loading (also see Eutrophication).

# Culturally Induced Erosion

Erosion caused by increased runoff or wind action due to the work of humans in deforestation, cultivation of the land, overgrazing, and disturbance of natural drainages; the excess of erosion over the normal for an area (also see Erosion).

# Debris Torrent

The sudden down slope movement of soil, rock, and vegetation on steep slopes, often caused by saturation from heavy rains.

# Decomposition

The breakdown of organic molecules (e.g., sugar) to inorganic molecules (e.g., carbon dioxide and water) through biological and nonbiological processes.

# Depth Fines

Percent by weight of particles of small size within a vertical core of volume of a streambed or lake bottom sediment. The upper size threshold for fine sediment for fisheries purposes varies from 0.8 to 6.5 millimeters depending on the observer and methodology used. The depth sampled varies but is typically about one foot (30 centimeters).

# Designated Uses

Those water uses identified in state water quality standards that must be achieved and maintained as required under the Clean Water Act.

# Discharge

The amount of water flowing in the stream channel at the time of measurement. Usually expressed as cubic feet per second (cfs).

# Dissolved Oxygen (DO)

The oxygen dissolved in water. Adequate DO is vital to fish and other aquatic life.

# Disturbance

Any event or series of events that disrupts ecosystem, community, or population structure and alters the physical environment.

# *E. coli*

Short for *Escherichia coli*, *E. coli* are a group of bacteria that are a subspecies of coliform bacteria. Most *E. coli* are essential to the healthy life of all warm-blooded animals, including humans, but their presence in water is often indicative of fecal contamination. *E. coli* are used by the state of Idaho as the indicator for the presence of pathogenic microorganisms.

# Ecology

The scientific study of relationships between organisms and their environment; also defined as the study of the structure and function of nature.

# Ecological Indicator

A characteristic of an ecosystem that is related to, or derived from, a measure of a biotic or abiotic variable that can provide quantitative information on ecological structure and function. An indicator can contribute to a measure of integrity and sustainability. Ecological indicators are often used within the multimetric index framework.

# Ecological Integrity

The condition of an unimpaired ecosystem as measured by combined chemical, physical (including habitat), and biological attributes (EPA 1996).

# Ecosystem

The interacting system of a biological community and its non-living (abiotic) environmental surroundings.

# Effluent

A discharge of untreated, partially treated, or treated wastewater into a receiving water body.

# Endangered Species

Animals, birds, fish, plants, or other living organisms threatened with imminent extinction. Requirements for declaring a species as endangered are contained in the Endangered Species Act.

# Environment

The complete range of external conditions, physical and biological, that affect a particular organism or community.

# Eocene

An epoch of the early Tertiary period, after the Paleocene and before the Oligocene.

# Eolian

Windblown, referring to the process of erosion, transport, and deposition of material by the wind.

# Ephemeral Stream

A stream or portion of a stream that flows only in direct response to precipitation. It receives little or no water from springs and no long continued supply from melting snow or other sources. Its channel is at all times above the water table (American Geological Institute 1962).

# Erosion

The wearing away of areas of the earth's surface by water, wind, ice, and other forces.

# Eutrophic

From Greek for "well nourished," this describes a highly productive body of water in which nutrients do not limit algal growth. It is typified by high algal densities and low clarity.

# Eutrophication

1) Natural process of maturing (aging) in a body of water. 2) The natural and human-influenced process of enrichment with nutrients, especially nitrogen and phosphorus, leading to an increased production of organic matter.

# Exceedance

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

# Existing Beneficial Use or Existing Use

A beneficial use actually attained in waters on or after November 28, 1975, whether or not the use is designated for the waters in Idaho's *Water Quality Standards and Wastewater Treatment Requirements* (IDAPA 58.01.02).

# Exotic Species

A species that is not native (indigenous) to a region.

# Extrapolation

Estimation of unknown values by extending or projecting from known values.

## Fauna

Animal life, especially the animals characteristic of a region, period, or special environment.

## Fecal Coliform Bacteria

Bacteria found in the intestinal tracts of all warm-blooded animals or mammals. Their presence in water is an indicator of pollution and possible contamination by pathogens (also see Coliform Bacteria, *E. coli*, and Pathogens).

## Fecal Streptococci

A species of spherical bacteria including pathogenic strains found in the intestines of warm-blooded animals.

## Feedback Loop

In the context of watershed management planning, a feedback loop is a process that provides for tracking progress toward goals and revising actions according to that progress.

## Fixed-Location Monitoring

Sampling or measuring environmental conditions continuously or repeatedly at the same location.

## Flow

See *Discharge*.

## Fluvial

In fisheries, this describes fish whose life history takes place entirely in streams but migrate to smaller streams for spawning.

## Focal

Critical areas supporting a mosaic of high quality habitats that sustain a diverse or unusually productive complement of native species.

## Fully Supporting

In compliance with water quality standards and within the range of biological reference conditions for all designated and exiting beneficial uses as determined through the *Water Body Assessment Guidance* (Grafe et al. 2002).

## Fully Supporting Cold Water

Reliable data indicate functioning, sustainable cold water biological assemblages (e.g., fish, macroinvertebrates, or algae), none of which have been modified significantly beyond the natural range of reference conditions.

## Fully Supporting but Threatened

An intermediate assessment category describing water bodies that fully support beneficial uses, but have a declining trend in water quality conditions, which if not addressed, will lead to a “not fully supporting” status.

## Geographical Information Systems (GIS)

A georeferenced database.

## Geometric Mean

A back-transformed mean of the logarithmically transformed numbers often used to describe highly variable, right-skewed data (a few large values), such as bacterial data.

## Grab Sample

A single sample collected at a particular time and place. It may represent the composition of the water in that water column.

## Gradient

The slope of the land, water, or streambed surface.

## Ground Water

Water found beneath the soil surface saturating the layer in which it is located. Most ground water originates as rainfall, is free to move under the influence of gravity, and usually emerges again as stream flow.

## Growth Rate

A measure of how quickly something living will develop and grow, such as the amount of new plant or animal tissue produced per a given unit of time, or number of individuals added to a population.

## Habitat

The living place of an organism or community.

## Headwater

The origin or beginning of a stream.

## Hydrologic Basin

The area of land drained by a river system, a reach of a river and its tributaries in that reach, a closed basin, or a group of streams forming a drainage area (also see Watershed).

## Hydrologic Cycle

The cycling of water from the atmosphere to the earth (precipitation) and back to the atmosphere (evaporation and plant transpiration). Atmospheric moisture, clouds, rainfall, runoff, surface water, ground water, and water infiltrated in soils are all part of the hydrologic cycle.

## Hydrologic Unit

One of a nested series of numbered and named watersheds arising from a national standardization of watershed delineation. The initial 1974 effort (USGS 1987) described four levels (region, subregion, accounting unit, cataloging unit) of watersheds throughout the United States. The fourth level is uniquely identified by an eight-digit code built of two-digit fields for each level in the classification. Originally termed a cataloging unit, fourth field hydrologic units have been more commonly called subbasins. Fifth and sixth field hydrologic units have since been delineated for much of the country and are known as watershed and subwatersheds, respectively.

## Hydrologic Unit Code (HUC)

The number assigned to a hydrologic unit. Often used to refer to fourth field hydrologic units.

## Hydrology

The science dealing with the properties, distribution, and circulation of water.

## Impervious

Describes a surface, such as pavement, that water cannot penetrate.

## Influent

A tributary stream.

## Inorganic

Materials not derived from biological sources.

## Instantaneous

A condition or measurement at a moment (instant) in time.

## Intergravel Dissolved Oxygen

The concentration of dissolved oxygen within spawning gravel. Consideration for determining spawning gravel includes species, water depth, velocity, and substrate.

## Intermittent Stream

1) A stream that flows only part of the year, such as when the ground water table is high or when the stream receives water from springs or from surface sources such as melting snow in mountainous areas. The stream ceases to flow above the streambed when losses from evaporation or seepage exceed the available stream flow. 2) A stream that has a period of zero flow for at least one week during most years.

## Interstate Waters

Waters that flow across or form part of state or international boundaries, including boundaries with Native American nations.

## Irrigation Return Flow

Surface (and subsurface) water that leaves a field following the application of irrigation water and eventually flows into streams.

## Key Watershed

A watershed that has been designated in Idaho Governor Batt's *State of Idaho Bull Trout Conservation Plan* (1996) as critical to the long-term persistence of regionally important trout populations.

## Land Application

A process or activity involving application of wastewater, surface water, or semi-liquid material to the land surface for the purpose of treatment, pollutant removal, or ground water recharge.

## Limiting Factor

A chemical or physical condition that determines the growth potential of an organism. This can result in a complete inhibition of growth, but typically results in less than maximum growth rates.

## Limnology

The scientific study of fresh water, especially the history, geology, biology, physics, and chemistry of lakes.

## Load Allocation (LA)

A portion of a water body's load capacity for a given pollutant that is given to a particular nonpoint source (by class, type, or geographic area).

## Load(ing)

The quantity of a substance entering a receiving stream, usually expressed in pounds or kilograms per day or tons per year. Loading is the product of flow (discharge) and concentration.

## Load(ing) Capacity (LC)

A determination of how much pollutant a water body can receive over a given period without causing violations of state water quality standards. Upon allocation to various sources, and a margin of safety, it becomes a total maximum daily load.

## Loam

Refers to a soil with a texture resulting from a relative balance of sand, silt, and clay. This balance imparts many desirable characteristics for agricultural use.

## Loess

A uniform wind-blown deposit of silty material. Silty soils are among the most highly erodible.

## Lotic

An aquatic system with flowing water such as a brook, stream, or river where the net flow of water is from the headwaters to the mouth.

## Luxury Consumption

A phenomenon in which sufficient nutrients are available in either the sediments or the water column of a water body, such that aquatic plants take up and store an abundance in excess of the plants' current needs.

## Macroinvertebrate

An invertebrate animal (without a backbone) large enough to be seen without magnification and retained by a 500µm mesh (U.S. #30) screen.

# Macrophytes

Rooted and floating vascular aquatic plants, commonly referred to as water weeds. These plants usually flower and bear seeds. Some forms, such as duckweed and coontail (*Ceratophyllum sp.*), are free-floating forms not rooted in sediment.

# Margin of Safety (MOS)

An implicit or explicit portion of a water body's loading capacity set aside to allow the uncertainly about the relationship between the pollutant loads and the quality of the receiving water body. This is a required component of a total maximum daily load (TMDL) and is often incorporated into conservative assumptions used to develop the TMDL (generally within the calculations and/or models). The MOS is not allocated to any sources of pollution.

# Mass Wasting

A general term for the down slope movement of soil and rock material under the direct influence of gravity.

# Mean

Describes the central tendency of a set of numbers. The arithmetic mean (calculated by adding all items in a list, then dividing by the number of items) is the statistic most familiar to most people.

# Median

The middle number in a sequence of numbers. If there are an even number of numbers, the median is the average of the two middle numbers. For example, 4 is the median of 1, 2, 4, 14, 16; 6 is the median of 1, 2, 5, 7, 9, 11.

# Metric

1) A discrete measure of something, such as an ecological indicator (e.g., number of distinct taxon). 2) The metric system of measurement.

# Milligrams per Liter (mg/L)

A unit of measure for concentration. In water, it is essentially equivalent to parts per million (ppm).

# Million Gallons per Day (MGD)

A unit of measure for the rate of discharge of water, often used to measure flow at wastewater treatment plants. One MGD is equal to 1.547 cubic feet per second.

# Miocene

Of, relating to, or being an epoch of, the Tertiary between the Pliocene and the Oligocene periods, or the corresponding system of rocks.

# Monitoring

A periodic or continuous measurement of the properties or conditions of some medium of interest, such as monitoring a water body.

# Mouth

The location where flowing water enters into a larger water body.

## National Pollution Discharge Elimination System (NPDES)

A national program established by the Clean Water Act for permitting point sources of pollution. Discharge of pollution from point sources is not allowed without a permit.

## Natural Condition

The condition that exists with little or no anthropogenic influence.

## Nitrogen

An element essential to plant growth, and thus is considered a nutrient.

## Nodal

Areas that are separated from focal and adjunct habitats, but serve critical life history functions for individual native fish.

## Nonpoint Source

A dispersed source of pollutants, generated from a geographical area when pollutants are dissolved or suspended in runoff and then delivered into waters of the state. Nonpoint sources are without a discernable point or origin. They include, but are not limited to, irrigated and non-irrigated lands used for grazing, crop production, and silviculture; rural roads; construction and mining sites; log storage or rafting; and recreation sites.

## Not Assessed (NA)

A concept and an assessment category describing water bodies that have been studied, but are missing critical information needed to complete an assessment.

## Not Attainable

A concept and an assessment category describing water bodies that demonstrate characteristics that make it unlikely that a beneficial use can be attained (e.g., a stream that is dry but designated for salmonid spawning).

## 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).

## Not Fully Supporting Cold Water

At least one biological assemblage has been significantly modified beyond the natural range of its reference condition.

## Nuisance

Anything that is injurious to the public health or an obstruction to the free use, in the customary manner, of any waters of the state.

## Nutrient

Any substance required by living things to grow. An element or its chemical forms essential to life, such as carbon, oxygen, nitrogen, and phosphorus. Commonly refers to those elements in short supply, such as nitrogen and phosphorus, which usually limit growth.

## Nutrient Cycling

The flow of nutrients from one component of an ecosystem to another, as when macrophytes die and release nutrients that become available to algae (organic to inorganic phase and return).

## Oligotrophic

The Greek term for "poorly nourished." This describes a body of water in which productivity is low and nutrients are limiting to algal growth, as typified by low algal density and high clarity.

## Organic Matter

Compounds manufactured by plants and animals that contain principally carbon.

## Orthophosphate

A form of soluble inorganic phosphorus most readily used for algal growth.

## Oxygen-Demanding Materials

Those materials, mainly organic matter, in a water body that consume oxygen during decomposition.

## Parameter

A variable, measurable property whose value is a determinant of the characteristics of a system, such as temperature, dissolved oxygen, and fish populations are parameters of a stream or lake.

## Partitioning

The sharing of limited resources by different races or species; use of different parts of the habitat, or the same habitat at different times. Also the separation of a chemical into two or more phases, such as partitioning of phosphorus between the water column and sediment.

## Pathogens

A small subset of microorganisms (e.g., certain bacteria, viruses, and protozoa) that can cause sickness or death. Direct measurement of pathogen levels in surface water is difficult. Consequently, indicator bacteria that are often associated with pathogens are assessed. *E. coli*, a type of fecal coliform bacteria, are used by the state of Idaho as the indicator for the presence of pathogenic microorganisms.

## Perennial Stream

A stream that flows year-around in most years.

## Periphyton

Attached microflora (algae and diatoms) growing on the bottom of a water body or on submerged substrates, including larger plants.

# Pesticide

Substances or mixtures of substances intended for preventing, destroying, repelling, or mitigating any pest. Also, any substance or mixture intended for use as a plant regulator, defoliant, or desiccant.

# pH

The negative $\log_{10}$ of the concentration of hydrogen ions, a measure which in water ranges from very acid (pH=1) to very alkaline (pH=14). A pH of 7 is neutral. Surface waters usually measure between pH 6 and 9.

# Phased TMDL

A total maximum daily load (TMDL) that identifies interim load allocations and details further monitoring to gauge the success of management actions in achieving load reduction goals and the effect of actual load reductions on the water quality of a water body. Under a phased TMDL, a refinement of load allocations, wasteload allocations, and the margin of safety is planned at the outset.

# Phosphorus

An element essential to plant growth, often in limited supply, and thus considered a nutrient.

# Physiochemical

In the context of bioassessment, the term is commonly used to mean the physical and chemical factors of the water column that relate to aquatic biota. Examples in bioassessment usage include saturation of dissolved gases, temperature, pH, conductivity, dissolved or suspended solids, forms of nitrogen, and phosphorus. This term is used interchangeable with the term “physical/chemical.”

# Plankton

Microscopic algae (phytoplankton) and animals (zooplankton) that float freely in open water of lakes and oceans.

# Point Source

A source of pollutants characterized by having a discrete conveyance, such as a pipe, ditch, or other identifiable “point” of discharge into a receiving water. Common point sources of pollution are industrial and municipal wastewater.

# Pollutant

Generally, any substance introduced into the environment that adversely affects the usefulness of a resource or the health of humans, animals, or ecosystems.

# Pollution

A very broad concept that encompasses human-caused changes in the environment which alter the functioning of natural processes and produce undesirable environmental and health effects. This includes human-induced alteration of the physical, biological, chemical, and radiological integrity of water and other media.

# Population

A group of interbreeding organisms occupying a particular space; the number of humans or other living creatures in a designated area.

# Pretreatment

The reduction in the amount of pollutants, elimination of certain pollutants, or alteration of the nature of pollutant properties in wastewater prior to, or in lieu of, discharging or otherwise introducing such wastewater into a publicly owned wastewater treatment plant.

# Primary Productivity

The rate at which algae and macrophytes fix carbon dioxide using light energy. Commonly measured as milligrams of carbon per square meter per hour.

# Protocol

A series of formal steps for conducting a test or survey.

# Qualitative

Descriptive of kind, type, or direction.

# Quality Assurance (QA)

A program organized and designed to provide accurate and precise results. Included are the selection of proper technical methods, tests, or laboratory procedures; sample collection and preservation; the selection of limits; data evaluation; quality control; and personnel qualifications and training (Rand 1995). The goal of QA is to assure the data provided are of the quality needed and claimed (EPA 1996).

# Quality Control (QC)

Routine application of specific actions required to provide information for the quality assurance program. Included are standardization, calibration, and replicate samples (Rand 1995). QC is implemented at the field or bench level (EPA 1996).

# Quantitative

Descriptive of size, magnitude, or degree.

# Reach

A stream section with fairly homogenous physical characteristics.

# Reconnaissance

An exploratory or preliminary survey of an area.

# Reference

A physical or chemical quantity whose value is known and thus is used to calibrate or standardize instruments.

# Reference Condition

1) A condition that fully supports applicable beneficial uses with little affect from human activity and represents the highest level of support attainable. 2) A benchmark for populations of aquatic ecosystems used to describe desired conditions in a biological assessment and acceptable or unacceptable departures from them. The reference condition

can be determined through examining regional reference sites, historical conditions, quantitative models, and expert judgment (Hughes 1995).

## Reference Site

A specific locality on a water body that is minimally impaired and is representative of reference conditions for similar water bodies.

## Representative Sample

A portion of material or water that is as similar in content and consistency as possible to that in the larger body of material or water being sampled.

## Resident

A term that describes fish that do not migrate.

## Respiration

A process by which organic matter is oxidized by organisms, including plants, animals, and bacteria. The process converts organic matter to energy, carbon dioxide, water, and lesser constituents.

## Riffle

A relatively shallow, gravelly area of a streambed with a locally fast current, recognized by surface choppiness. Also an area of higher streambed gradient and roughness.

## Riparian

Associated with aquatic (stream, river, lake) habitats. Living or located on the bank of a water body.

## Riparian Habitat Conservation Area (RHCA)

A U.S. Forest Service description of land within the following number of feet up-slope of each of the banks of streams:

300 feet from perennial fish-bearing streams
150 feet from perennial non-fish-bearing streams
100 feet from intermittent streams, wetlands, and ponds in priority watersheds.

## River

A large, natural, or human-modified stream that flows in a defined course or channel or in a series of diverging and converging channels.

## Runoff

The portion of rainfall, melted snow, or irrigation water that flows across the surface, through shallow underground zones (interflow), and through ground water to creates streams.

## Sediments

Deposits of fragmented materials from weathered rocks and organic material that were suspended in, transported by, and eventually deposited by water or air.

## Settleable Solids

The volume of material that settles out of one liter of water in one hour.

## Species

1) A reproductively isolated aggregate of interbreeding organisms having common attributes and usually designated by a common name. 2) An organism belonging to such a category.

## Spring

Ground water seeping out of the earth where the water table intersects the ground surface.

## Stagnation

The absence of mixing in a water body.

## Stenothermal

Unable to tolerate a wide temperature range.

## Stratification

A Department of Environmental Quality classification method used to characterize comparable units (also called classes or strata).

## Stream

A natural water course containing flowing water, at least part of the year. Together with dissolved and suspended materials, a stream normally supports communities of plants and animals within the channel and the riparian vegetation zone.

## Stream Order

Hierarchical ordering of streams based on the degree of branching. A first-order stream is an unforked or unbranched stream. Under Strahler's (1957) system, higher order streams result from the joining of two streams of the same order.

## Storm Water Runoff

Rainfall that quickly runs off the land after a storm. In developed watersheds the water flows off roofs and pavement into storm drains that may feed quickly and directly into the stream. The water often carries pollutants picked up from these surfaces.

## Stressors

Physical, chemical, or biological entities that can induce adverse effects on ecosystems or human health.

## Subbasin

A large watershed of several hundred thousand acres. This is the name commonly given to $4^{th}$ field hydrologic units (also see Hydrologic Unit).

## Subbasin Assessment (SBA)

A watershed-based problem assessment that is the first step in developing a total maximum daily load in Idaho.

## Subwatershed

A smaller watershed area delineated within a larger watershed, often for purposes of describing and managing localized conditions. Also proposed for adoption as the formal name for 6th field hydrologic units.

## Surface Fines

Sediments of small size deposited on the surface of a streambed or lake bottom. The upper size threshold for fine sediment for fisheries purposes varies from 0.8 to 605 millimeters depending on the observer and methodology used. Results are typically expressed as a percentage of observation points with fine sediment.

## Surface Runoff

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

## Surface Water

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

## Suspended Sediments

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

## Taxon

Any formal taxonomic unit or category of organisms (e.g., species, genus, family, order). The plural of taxon is taxa (Armantrout 1998).

## Tertiary

An interval of geologic time lasting from 66.4 to 1.6 million years ago. It constitutes the first of two periods of the Cenozoic Era, the second being the Quaternary. The Tertiary has five subdivisions, which from oldest to youngest are the Paleocene, Eocene, Oligocene, Miocene, and Pliocene epochs.

## Thalweg

The center of a stream's current, where most of the water flows.

## Threatened Species

Species, determined by the U.S. Fish and Wildlife Service, which are likely to become endangered within the foreseeable future throughout all or a significant portion of their range.

## 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 bases. 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.

# Total Dissolved Solids

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

# Total Suspended Solids (TSS)

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

# Toxic Pollutants

Materials that cause death, disease, or birth defects in organisms that ingest or absorb them. The quantities and exposures necessary to cause these effects can vary widely.

# Tributary

A stream feeding into a larger stream or lake.

# Trophic State

The level of growth or productivity of a lake as measured by phosphorus content, chlorophyll *a* concentrations, amount (biomass) of aquatic vegetation, algal abundance, and water clarity.

# Total Dissolved Solids

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

# Total Suspended Solids (TSS)

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

# Toxic Pollutants

Materials that cause death, disease, or birth defects in organisms that ingest or absorb them. The quantities and exposures necessary to cause these effects can vary widely.

# Tributary

A stream feeding into a larger stream or lake.

# Trophic State

The level of growth or productivity of a lake as measured by phosphorus content, chlorophyll *a* concentrations, amount (biomass) of aquatic vegetation, algal abundance, and water clarity.

# Turbidity

A measure of the extent to which light passing through water is scattered by fine suspended materials. The effect of turbidity depends on the size of the particles (the finer the particles, the greater the effect per unit weight) and the color of the particles.

## Vadose Zone

The unsaturated region from the soil surface to the ground water table.

## Wasteload Allocation (WLA)

The portion of receiving water's loading capacity that is allocated to one of its existing or future point sources of pollution. Wasteload allocations specify how much pollutant each point source may release to a water body.

## Water Body

A stream, river, lake, estuary, coastline, or other water feature, or portion thereof.

## Water Column

Water between the interface with the air at the surface and the interface with the sediment layer at the bottom. The idea derives from a vertical series of measurements (oxygen, temperature, phosphorus) used to characterize water.

## Water Pollution

Any alteration of the physical, thermal, chemical, biological, or radioactive properties of any waters of the state, or the discharge of any pollutant into the waters of the state, which will or is likely to create a nuisance or to render such waters harmful, detrimental, or injurious to public health, safety, or welfare; to fish and wildlife; or to domestic, commercial, industrial, recreational, aesthetic, or other beneficial uses.

## Water Quality

A term used to describe the biological, chemical, and physical characteristics of water with respect to its suitability for a beneficial use.

## Water Quality Criteria

Levels of water quality expected to render a body of water suitable for its designated uses. Criteria are based on specific levels of pollutants that would make the water harmful if used for drinking, swimming, farming, or industrial processes.

## Water Quality Limited

A label that describes water bodies for which one or more water quality criterion is not met or beneficial uses are not fully supported. Water quality limited segments may or may not be on a §303(d) list.

## Water Quality Limited Segment (WQLS)

Any segment placed on a state's §303(d) list for failure to meet applicable water quality standards, and/or is not expected to meet applicable water quality standards in the period prior to the next list. These segments are also referred to as "§303(d) listed."

## Water Quality Management Plan

A state or area-wide waste treatment management plan developed and updated in accordance with the provisions of the Clean Water Act.

## Water Quality Modeling

The prediction of the response of some characteristics of lake or stream water based on mathematical relations of input variables such as climate, stream flow, and inflow water quality.

## Water Quality Standards

State-adopted and U.S. Environmental Protection Agency-approved ambient standards for water bodies. The standards prescribe the use of the water body and establish the water quality criteria that must be met to protect designated uses.

**Water Table**

The upper surface of ground water; below this point, the soil is saturated with water.

## Watershed

1) All the land which contributes runoff to a common point in a drainage network, or to a lake outlet. Watersheds are infinitely nested, and any large watershed is composed of smaller "subwatersheds." 2) The whole geographic region which contributes water to a point of interest in a water body.

## Water Body Identification Number (WBID)

A number that uniquely identifies a water body in Idaho and ties in to the Idaho water quality standards and GIS information.

## Wetland

An area that is at least some of the time saturated by surface or ground water so as to support with vegetation adapted to saturated soil conditions. Examples include swamps, bogs, fens, and marshes.

## Young of the Year

Young fish born the year captured, evidence of spawning activity.

This page intentionally left blank for correct doubled-sided printing.

# Appendix A. Unit Conversion Chart

This page intentionally left blank for correct double-sided printing.

Table 9. Metric - English unit conversions.
UPDATE WITH:
Kg/day to lbs/day
Cfs to mgd
Seconds per day

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

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

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

This page intentionally left blank for correct doubled-sided printing.

# Appendix B. State and Site-Specific Standards and Criteria

- Include salmonid spawning information in this appendix

This page intentionally left blank for correct doubled-sided printing.

-

# Appendix C. Data Sources

This page intentionally left blank for correct doubled-sided printing.

# Appendix D. Distribution List

Lee Van De Bogart, City of Caldwell
Liz Paul, Idaho Rivers United
Robbin Finch, City of Boise
Steve Sweet, Quadrant Consulting
Dan Steenson, Sawtooth Law
Alan Newbill, Pioneer Irrigation District
Robert Braun, Amalgamated Sugar
Henry Hamanishi, JR Simplot Company
Erica Anderson-Maguire, Ada County Highway District
Jack Harrison, HyQual
Melanie Miller, Lower Boise Watershed Council
Marti Bridges, IDEQ
Bill Stewart, EPA
Hawk Stone, IDEQ

## Appendix E. Public Comments/Public Participation

This page intentionally left blank for correct double-sided printing.

# Appendix X. Sedient Targets in the Lower Boise River Tributaries

This document was developed in consultation with the watershed advisory group in January 2013.

The streams, and their corresponding assessment units, are identified below:

## Summary of Proposed Targets

To protect the beneficial use of Cold Water Aquatic Life:

1. Average of 20mg/L suspended sediment for a maximum of 4 months
2. Other sediment/duration combinations that protect juvenile salmonids to SEV 8

These targets provide the same level of protection as the Lower Boise River sediment TMDL, but with timeframes that are specific to the nature of the sediment pollution in the tributaries.

## Rationale for Using Newcombe and Jensen (1996)

Idaho's narrative sediment criterion is expressed in IDAPA 58.01.02.200.08 and states that:

> "Sediment shall not exceed quantities … which impair designated beneficial uses."

In this case, every assessment unit has Cold Water Aquatic Life as its most stringent designated or existing beneficial use. TMDL sediment targets must be based upon attainment of this use. The Lower Boise River ("mainstem") TMDL used a 1996 paper by Charles Newcombe and Jorgen Jensen to make the link between sediment levels and beneficial uses.

Although there have been many studies that investigated how sediment affects fish, they were conducted over various timescales and species, and measured different response variables. Newcombe and Jensen performed a meta-analysis, and were able to unify and rationalize the results from 80 different studies. They found an empirical relationship between the concentration and duration of sediment, for a given effect on fish. According to DEQ and EPA scientists, this paper is still the best resource for establishing the effects of sediment on fish.

Newcombe and Jensen essentially say that the duration of a sediment concentration is as important as the concentration itself. The article provides charts that relate the concentration, duration and severity of impairment. To use the charts, we have to answer the following questions:

1. Which grouping of fish are we trying to protect?
2. What level of protection do we want to provide?
3. What is the likely duration of the elevated sediment?

The chart output will then be the concentration of sediment that satisfies the three answers above.

### 1. Which grouping of fish are we trying to protect?

Newcombe and Jensen's model contained five groupings of aquatic life, including adult salmonids, juvenile salmonids, and eggs and larvae.

The beneficial use of cold water aquatic life includes fish and insects, and juvenile salmonids are the most sensitive life stage. If juvenile salmonids were protected, all other cold water aquatic life would be too, and the beneficial use would be supported.

Salmonids are also a popular research target, and appear in most of the studies used in producing the sediment response charts. A large number of data points (in this case 108) ensures a more reliable analysis.

Finally, juvenile salmonids is also the grouping used in the 1998 Lower Boise River TMDL. Where possible, DEQ should use consistent targets.

**We should continue to use the matrix for juvenile salmonids**.

## 2. What level of protection do we want to provide?

Newcombe and Jensen categorized the negative effects on fish on a scale of severity between 0 and 14. They further divided the scale into 3 categories: 'behavioral effects', 'sublethal effects', and 'lethal and paralethal effects'.

We must choose a severity level (SEV) that is protective of cold water aquatic life.

SEV9 is the lowest score in the 'lethal and paralethal effects' category. In addition to high levels of physiological stress, the density of fish is reduced and their growth is retarded by as much as 84%. At SEV9, an angler is less likely to catch a fish because of its behavioral and feeding problems, and any fish he does catch will be a runt, with skin and gill damage. This clearly does not support the Clean Water Act's goal of 'fishable'.

SEV8 represents the highest level of impacts in the 'sub-lethal' category. In other words, fish experience stress, but it is not sufficient to cause death or growth defects. This stress can be severe, and includes skin and gill damage, but although the fish are clearly having difficulty, they are still alive and present in the stream. This meets the Clean Water Act's goal of a 'fishable' stream, so the beneficial use is supported.

The 1998 mainstem Boise River TMDL set a chronic sediment target at 50mg/L for 60 days. This is most closely equivalent to a SEV8 on Newcombe and Jensen's juvenile salmonid chart:

**Juvenile Salmonids**

Duration of exposure to SS ($\log_e$ hours)

(B) Average severity-of-ill-effect scores (calculated)

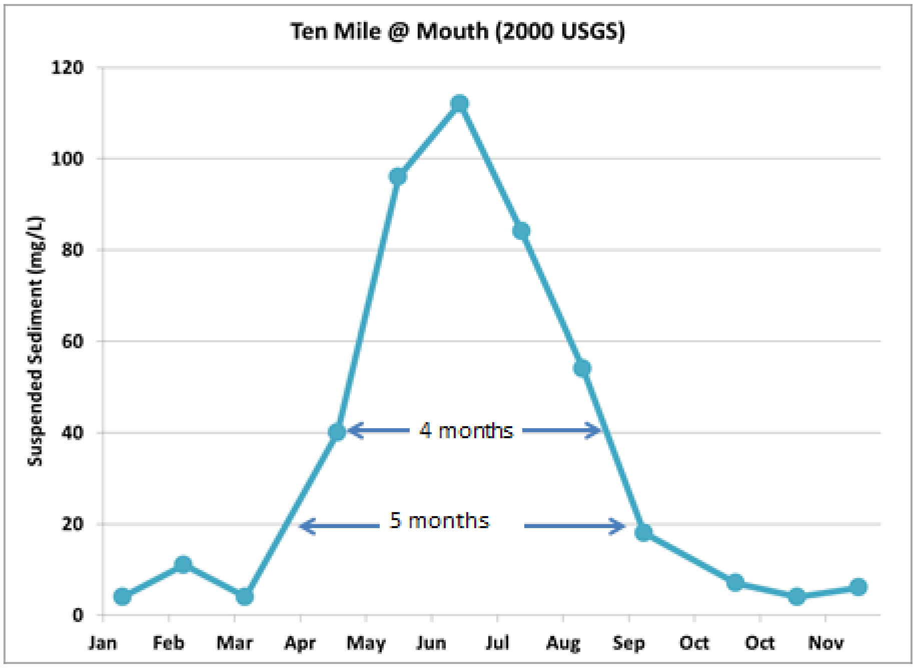
| Concentration (mg SS/L) | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | ($\log_e$ mg SS/L) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 162755 | 9 | 10 | 11 | 11 | 12 | 13 | 14 | 14 | - | - | - | 12 |
| 59874 | 9 | 9 | 10 | 11 | 11 | 12 | 13 | 14 | 14 | - | - | 11 |
| 22026 | 8 | 9 | 9 | 10 | 11 | 11 | 12 | 13 | 13 | 14 | - | 10 |
| 8103 | 7 | 8 | 9 | 9 | 10 | 11 | 11 | 12 | 13 | 13 | 14 | 9 |
| 2981 | 6 | 7 | 8 | 9 | 9 | 10 | 11 | 11 | 12 | 13 | 13 | 8 |
| 1097 | 6 | 6 | 7 | 8 | 9 | 9 | 10 | 11 | 11 | 12 | 13 | 7 |
| 403 | 5 | 6 | 6 | 7 | 8 | 9 | 9 | 10 | 11 | 11 | 12 | 6 |
| 148 | 4 | 5 | 6 | 6 | 7 | 8 | 9 | 9 | 10 | 11 | 11 | 5 |
| 55 | 4 | 4 | 5 | 6 | 6 | 7 | 8 | 8 | 9 | 10 | 11 | 4 |
| 20 | 3 | 4 | 4 | 5 | 6 | 6 | 7 | 8 | 8 | 9 | 10 | 3 |
| 7 | 2 | 3 | 4 | 4 | 5 | 6 | 6 | 7 | 8 | 8 | 9 | 2 |
| 3 | 1 | 2 | 3 | 4 | 4 | 5 | 6 | 6 | 7 | 8 | 8 | 1 |
| 1 | 1 | 1 | 2 | 3 | 4 | 4 | 5 | 6 | 6 | 7 | 8 | 0 |
| | 1 | 3 | 7 | 1 | 2 | 6 | 2 | 7 | 4 | 11 | 30 | |
| | Hours | | | Days | | | Weeks | | Months | | | |

Based upon the above descriptions, and maintaining consistency with the mainstem TMDL, DEQ believes that **SEV8 is protective of the cold water aquatic life beneficial use**.

### 3. What is the likely duration of the elevated sediment?

At the time the mainstem durations were chosen, there was an "absence of TSS-duration data" (1998 CH2MHill Technical Memorandum). Instead, 60 days was used because it represented half of the length of the 120-day irrigation season. The Memorandum goes on to say that if we had data, we should "select a TSS concentration that would be protective over a duration equal to the maximum length of time for which an elevated TSS concentration would be sustained."

Since that time, DEQ, USGS and ISDA have gathered at least six months of biweekly sediment data from each of the Boise River tributaries. These data enable us to see for how long the elevated concentrations persist, and therefore to pick an appropriate duration, consistent with the guidance in the Technical Memorandum. Each of the tributaries has a slightly different pattern of sediment, but the 2000 USGS Ten Mile Creek dataset provides the clearest example:




With the exception of upper Sand Hollow Creek, every assessment unit has elevated sediment levels for at least 4 months. All the creeks drop to a relatively low baseline by November.

The charts in Newcombe and Jensen offer a limited choice of timescales. The one most closely matching the actual period of elevated sediment concentrations is 4 months. **Therefore, we should use a timescale of 4 months.**

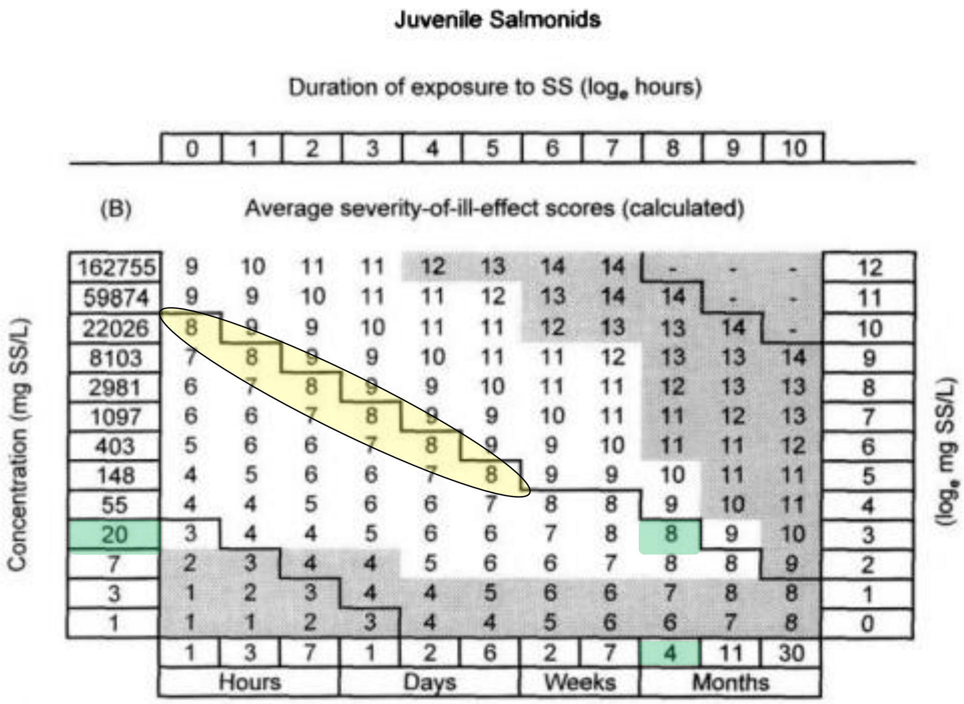
DEQ is also concerned to address the effects of shorter-term spikes in sediment, which will typically be associated with storms and runoff events. The effects of a storm may last for hours or days, and it is unclear which timescale (and therefore concentration), should be used as an appropriate target. Rather than arbitrarily picking a duration, we need a flexible target that is protective of cold water aquatic life over multiple timescales.

We can **use Newcombe and Jensen's severity level of 8 for juvenile salmonids as a flexible target** for storm timescales (6 days or less). This could eventually provide for a set of short-term numeric targets (such as for MS4 permits) that vary depending on the period of elevated sediment.

### *Calculating Proposed Targets*

The following figure reproduces chart 3B in Newcombe and Jensen (1996), and is the matrix for juvenile salmonids. Highlighted in green, it shows that to offer SEV 8 protection for 4 months, an average sediment concentration of 20mg/L is required.

The short term targets are highlighted in yellow.




| Concentration (mg SS/L) | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | (log$_e$ mg SS/L) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 162755 | 9 | 10 | 11 | 11 | 12 | 13 | 14 | 14 | - | - | - | 12 |
| 59874 | 9 | 9 | 10 | 11 | 11 | 12 | 13 | 14 | 14 | - | - | 11 |
| 22026 | 8 | 9 | 9 | 10 | 11 | 11 | 12 | 13 | 13 | 14 | - | 10 |
| 8103 | 7 | 8 | 9 | 9 | 10 | 11 | 11 | 12 | 13 | 13 | 14 | 9 |
| 2981 | 6 | 7 | 8 | 9 | 9 | 10 | 11 | 11 | 12 | 13 | 13 | 8 |
| 1097 | 6 | 6 | 7 | 8 | 8 | 9 | 10 | 11 | 11 | 12 | 13 | 7 |
| 403 | 5 | 6 | 6 | 7 | 8 | 9 | 9 | 10 | 11 | 11 | 12 | 6 |
| 148 | 4 | 5 | 6 | 6 | 7 | 8 | 9 | 9 | 10 | 11 | 11 | 5 |
| 55 | 4 | 4 | 5 | 6 | 6 | 7 | 8 | 8 | 9 | 10 | 11 | 4 |
| 20 | 3 | 4 | 4 | 5 | 6 | 6 | 7 | 8 | 8 | 9 | 10 | 3 |
| 7 | 2 | 3 | 4 | 4 | 5 | 6 | 6 | 7 | 8 | 8 | 9 | 2 |
| 3 | 1 | 2 | 3 | 4 | 4 | 5 | 6 | 6 | 7 | 8 | 8 | 1 |
| 1 | 1 | 1 | 2 | 3 | 4 | 4 | 5 | 6 | 6 | 7 | 8 | 0 |
| | 1 | 3 | 7 | 1 | 2 | 6 | 2 | 7 | 4 | 11 | 30 | |
| | Hours | | | Days | | | Weeks | | Months | | | |

**Figure 9 Matrix for Juvenile Salmonids**

It is important to note that the fish can withstand the target concentration for a *maximum* of 4 months before they exhibit the effects of SEV8. In other words, after being exposed for the relevant duration, the fish 'need a break'. The target should be expressed as:

An *average* of 20mg/l for a *maximum* of 4 months.

## References


Channel Suspended Sediment and Fisheries: A Synthesis for Quantitative Assessment of Risk and Impact (Newcombe and Jensen 1996)

Guide to Selection of Sediment Targets for Use in Idaho TMDLs (Idaho DEQ, June 2003)

Selection of a Total Suspended Sediment (TSS) Target Concentration for the Lower Boise River TMDL (CH2M Hill 1998)

## F. List of Notices of Intent filed under the Multi-Sector General Permit

For waters in the Boise River Valley.

| PERMIT_NUMBER | ORGANIZATION_NAME | RECEIVING_WATER | Notes |
|---|---|---|---|
| IDR05CI33 | C A PAVING CO | BOISE RIVER | Boise River impaired, TMDL complete |
| IDR05C278 | Masco dba Knife River | Boise River | Boise River impaired, TMDL complete for one segment, TMDL not complete for another segment/parameter |
| IDR05C279 | Masco dba Knife River | Boise River | Boise River impaired, TMDL complete for one segment, TMDL not complete for another segment/parameter |
| IDR05CN94 | Masco dba Knife River | Boise River | Boise River impaired, TMDL complete |
| IDR05C218 | STAKER PARSON COMPANIES | Boise River | Boise River impaired, TMDL complete |
| IDR05C225 | STAKER PARSON COMPANIES | Boise River | Boise River impaired, TMDL complete |
| IDR05C232 | STAKER PARSON COMPANIES | Boise River | Boise River impaired, TMDL complete for one segment, TMDL not complete for another segment/parameter |
| IDR05C243 | STAKER PARSON COMPANIES | Boise River | Boise River impaired, TMDL complete |

| | | | |
|---|---|---|---|
| IDR05C417 | SIMPLOT TRANSPORTATION | BOISE RIVER (VIA DIXIE DRAIN AND MS4) | Boise River impaired, TMDL complete for one segment, TMDL not complete for another segment/parameter |
| IDR05CD07 | Rambo Sand and Gravel, Inc. | Boise River- Indian Creek to Mouth | Boise River impaired, TMDL complete for one segment, TMDL not complete for another segment/parameter |
| IDR05CO01 | Highway District #1 | Famers Cooperative Canal | Farmers Cooperative Creek impaired, TMDL complete for one segment, TMDL not complete for another segment/parameter |
| IDR05C574 | Basalite Concrete Products | Five Mile Creek | Five Mile Creek impaired, no data on TMDL |
| IDR05C321 | CENTRAL PAVING CO., INC | LOWER BOISE RIVER | Lower Boise River impaired, TMDL complete |