Total Maximum Daily Loads (TMDL) for the Brownlee Reservoir (Weiser Flat) Subbasin

Dennett Creek, Hog Creek, Scott Creek, Warm Springs Creek and Jenkins Creek

Idaho Department of Environmental Quality
Final - July 2003

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Acknowledgments

Countless hours have been expended in the preparation of this document by volunteers, state and federal agency personnel and many others. We gratefully acknowledge the time and effort that have been dedicated by so many individuals and organizations.

We would like to acknowledge the efforts of local citizens, county governments, local industries, municipalities, soil and water conservation districts, watershed councils, irrigation districts and companies, local Watershed Advisory Groups, Idaho Department of Fish and Game, Idaho State Department of Agriculture, environmental stakeholders and federal entities including the US Environmental Protection Agency, US Forest Service, US Geological Survey, US Department of Agriculture and numerous others. The help we have received from these entities in collecting and evaluating data and in developing and reviewing this TMDL is deeply appreciated. We extend our heartfelt gratitude to all of these individuals and look forward to a continued opportunity to work together as this project progresses.

Finally, we thank the citizens of Idaho for their support of water quality in the Weiser Flat area and participation in its restoration.

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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)

BLM United States Bureau of Land Management

BMP Best management practice

BURP Beneficial Use Reconnaissance Program

ºC Degrees Celsius

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

cfs Cubic feet per second

CFU Colony forming units (refers to the amount of bacteria in a surface water sample)

CWA Clean Water Act

CWAL Cold water aquatic life

DEQ Idaho Department of Environmental Quality

DO Dissolved oxygen

EPA United States Environmental Protection Agency

ESA Endangered Species Act

ºF Degrees Fahrenheit

GIS Geographical Information Systems

HUC Hydrologic Unit Code

IAPAP Refers to citations of Idaho Agricultural Pollution Abatement Plan

I.C. Idaho Code

IDAPA Refers to citations of Idaho administrative rules

IDFG Idaho Department of Fish and Game

ISDA Idaho State Department of Agriculture

L Liter

LA Load allocation

LC Load capacity

µg/L Micrograms per liter

mg Milligram

mg/L Milligrams per liter

MOS Margin of safety

NFS Not fully supporting

NPDES National Pollutant Discharge Elimination System

NRCS Natural Resources Conservation Service

NTU Nephelometric turbidity units (a measure of turbidity)

PAT Public Advisory Team

PCR Primary contact recreation

PFC Proper functioning condition

RM River mile

SBA Subbasin assessment

SCD Soil Conservation District

SFI Stream Fish Index

SHI Stream Habitat Index

SMI Stream Macroinvertabrate Index

SR-HC Snake River – Hells Canyon

SS Salmonid spawning

SWCD Soil and Water Conservation District

TAG Technical Advisory Group

TKN Total Kjeldahl nitrogen

TMDL Total maximum daily load

TP Total phosphorus

TSS Total suspended solids

USBR United States Bureau of Reclamation

USDA United States Department of Agriculture

USFS United States Forest Service

USGS United States Geological Survey

WAG Watershed Advisory Group

WBAG Water Body Assessment Guidance

WBID Water body identification number

WLA Waste load allocation

WQI Water Quality Index

WQLS Water quality limited segment

WRCC Western Regional Climate Center

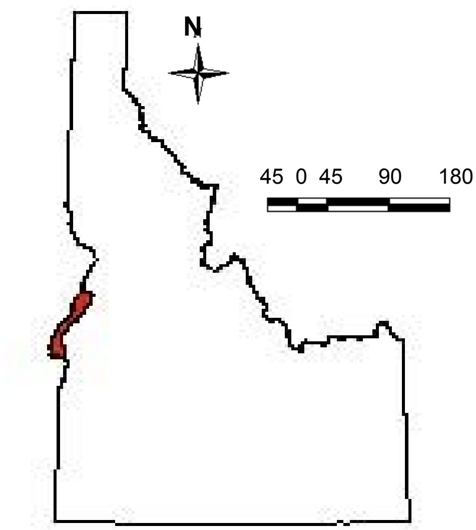
WY Water year

Executive Summary

The federal Clean Water Act (CWA) requires that states and tribes restore and maintain the chemical, physical and biological integrity of the nation's waters (33 USC § 1251.101). 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 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 of impaired waters, currently every two years. For waters identified on this list, states and tribes must develop a total maximum daily load (TMDL) for the pollutants, set at a level to achieve water quality standards. This document addresses the water bodies in the Brownlee Reservoir (Weiser Flat) Subbasin that have been placed on what is known as the "§303(d) list."

This subbasin assessment and TMDL analysis has been developed to comply with Idaho's TMDL schedule. This assessment describes the physical, biological and cultural setting; water quality status; pollutant sources; and recent pollution control actions in the subwatersheds of Dennett Creek, Hog Creek, Scott Creek, Warm Springs Creek and Jenkins Creek all of which are located in the Brownlee Reservoir (Weiser Flat) Subbasin in southwest Idaho. The first part of this document, the subbasin assessment, is an important first step in leading to the TMDL. The starting point for this assessment was Idaho's current §303(d) list of water quality limited water bodies. These segments of the Brownlee Reservoir (Weiser Flat) Subbasin were included on this list with a TMDL due date of 2001 in addition to Brownlee Reservoir and the Snake River segments addressed in the Snake River – Hells Canyon Total Maximum Daily Load (SR-HC TMDL) (DEQ, 2002). The subbasin assessment portion of this document examines the current status of §303(d) listed waters and defines the extent of impairment and causes of water quality limitation throughout the subbasin. The loading analysis quantifies pollutant sources and allocates responsibility for load reductions needed to return listed waters to a condition of meeting water quality standards.

Subbasin at a Glance



Brownlee Reservoir (Weiser Flat) Subbasin

HUC#:	17050201
WQLS#s:	2825, 2829, 2830, 2828, 2831
Streams:	Dennett Creek, Hog Creek, Scott Creek, Warm Springs Creek, Jenkins Creek
Pollution Sources:	Nonpoint sources
Eco-Regions:	Snake River – High Desert Blue Mountains
Size:	99,806 acres

Figure A. Locator map for the Brownlee Reservoir (Weiser Flat) Subbasin

The Brownlee Reservoir (Weiser Flat) Subbasin, hydrologic unit code (HUC) 17050201, encompasses the area draining into the Snake River downstream of the Weiser River inflow and upstream of Brownlee Reservoir. This subbasin is located along the central portion of the Idaho-Oregon border. The headwaters for these creeks originate in extreme western Idaho in the Hitt Mountains. The watershed size is 99,806 acres.

Within the subbasin, there are five water quality limited streams, four of which (Dennett, Hog, Scott and Warm Springs Creeks) were placed on the Idaho 1998 §303(d) list and one of which (Jenkins Creek) that was removed from the list in 1998 but recent monitoring has identified water quality concerns below the original assessment site that necessitate re-listing. Figure B shows the Idaho 1998 §303(d) listed segments in the Brownlee Reservoir (Weiser Flat) Watershed.

Listed pollutants of concern are:

Dennett Creek……………… Flow alteration, temperature and sediment
Hog Creek………………….. Nutrients and sediment
Scott Creek…………………Nutrients and sediment
Warm Springs Creek………..Nutrients and sediment
Jenkins Creek………………Not currently listed

All listed streams are undesignated and are therefore presumed to support cold water aquatic life and secondary contact recreation as well as the state-wide uses of agricultural and industrial water supply, wildlife habitat and aesthetics. Jenkins Creek is designated for cold water aquatic life and primary contact recreation. Through the Brownlee Reservoir (Weiser Flat) Watershed subbasin assessment process it was determined that the four streams on the

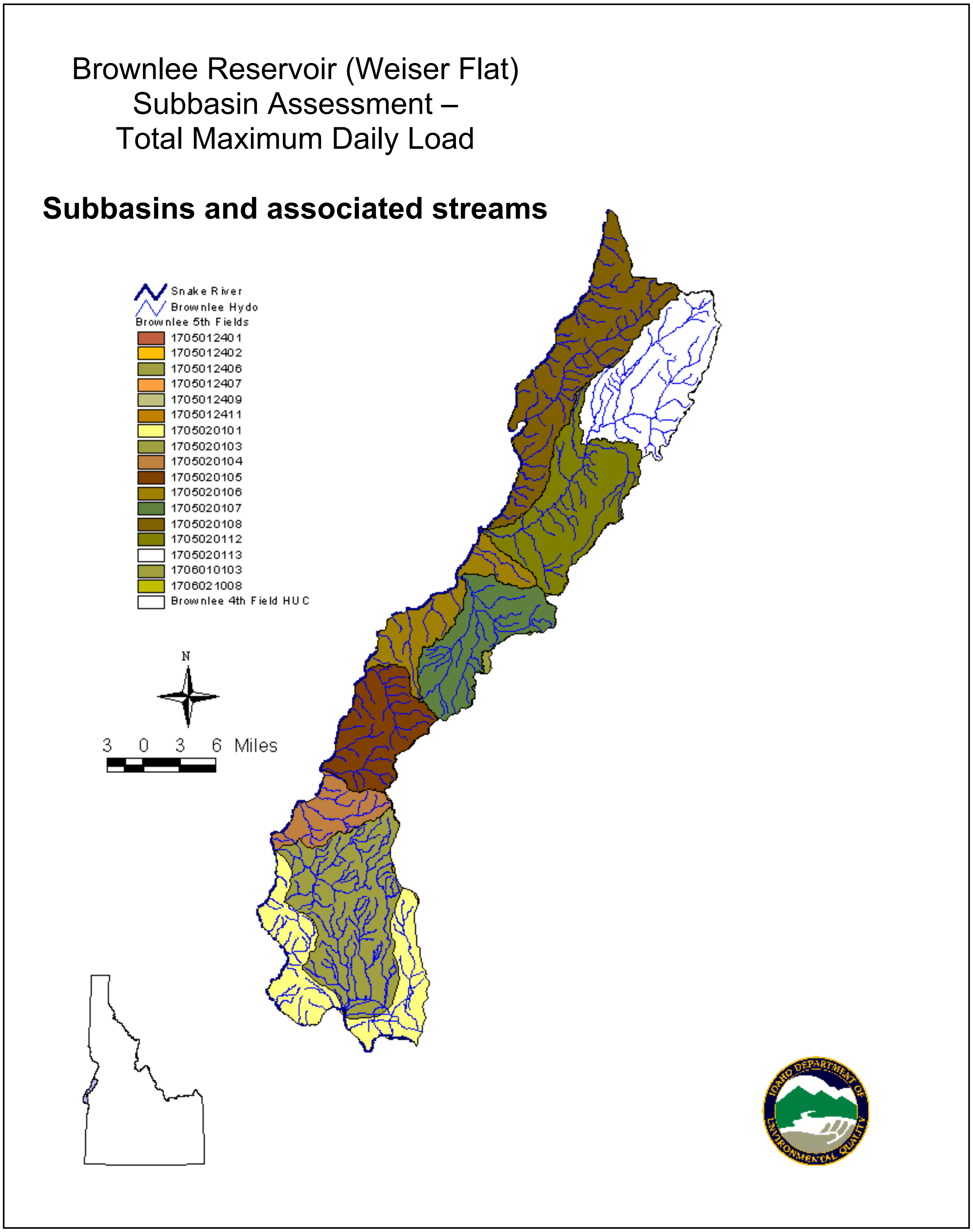


Figure B. Location of the Brownlee Reservoir (Weiser Flat) Watershed and Dennett Creek, Hog Creek, Scott Creek, Warm Springs Creek and Jenkins Creek.

Idaho 1998 §303(d) list in the Brownlee Reservoir (Weiser Flat) Watershed have cold water aquatic life and secondary contact recreation as existing uses. In some cases, data show these uses are not supported.

In accordance with the Beneficial Use Reconnaissance Program's (BURP) multi-index scoring including the stream macroinvertabrate index (SMI), the stream fish index (SFI) and the stream habitat index (SHI), was used to evaluate the support status of cold water aquatic life for Dennett Creek, Hog Creek, Scott Creek and Warm Springs Creek, however, BURP data for all but Warm Springs Creek were collected in 1995 and 1996 therefore, the status at the time of assessment may not reflect the current status.

The cold water aquatic life use was assessed as not fully supported in Dennett Creek, Hog Creek and Scott Creek (DEQ BURP data collected in 1995 and 1996). The cold water aquatic life use was assessed as not fully supported in Warm Springs Creek (DEQ BURP data collected in 1998).

Available bacteria information was used to evaluate the support status of secondary contact recreation for Hog Creek, Scott Creek and Warm Springs Creek, and primary contact recreation for Jenkins Creek. Bacteria data for all streams were collected from 1999 through 2000 and so is considered current for the purposes of this TMDL. Secondary contact recreation was shown to be not fully supported due to exceedance of Idaho water quality standards for bacteria observed in Hog Creek, Scott Creek and Warm Springs Creek. Primary contact recreation was shown to be not fully supported due to exceedance of Idaho water quality standards for bacteria observed in Jenkins Creek. Data were not available to determine the support status of secondary contact recreation in Dennett Creek.

This document contains the subbasin assessment and pollutant specific TMDLs that have been written for nutrients (Hog Creek, Scott Creek, Warm Springs Creek and Jenkins Creek) and sediment (Dennett Creek, Scott Creek, Warm Springs Creek and Jenkins Creek). Bacteria is proposed to be listed for Hog Creek, Scott Creek, Warm Springs Creek and Jenkins Creek as a §303(d) pollutant as part of the first §303(d) list submitted by the State of Idaho subsequent to the approval of this TMDL. Scheduling for the bacteria TMDLs will be identified at the time of listing.

Available bacteria information was used to evaluate the support status of secondary contact recreation for Hog Creek, Scott Creek and Warm Springs Creek, and primary contact recreation for Jenkins Creek. Bacteria data for all streams were collected from 1999 through 2000 and so is considered current for the purposes of this TMDL. Those water bodies determined to be not fully supporting their designated or existing beneficial uses and not meeting applicable water quality standards are required to have a TMDL developed.

Table A details each listed segment, impaired uses and pollutants of concern.

A TMDL has been developed for each stream determined to be not fully supporting beneficial uses in accordance with state of Idaho water quality standards. The TMDLs address pollutant reductions required to meet state of Idaho water quality standard criteria

Table A. Water Quality Limited Segment Number (WQLS#), AU/WBID# = Assessment Unit/Water Body Identification Number (AU/WBID#), 303(d) Listed Pollutants of Concern and Beneficial Uses for Dennett Creek, Hog Creek, Scott Creek and Warm Springs Creek.

Segment	WQLS #	AU/WBID#	Idaho §303(d) Listed Pollutants	Beneficial Uses
Dennett Creek (headwaters to the Snake River)	2825	17050201 SW012_02	flow alteration, temperature, sediment	*Undesignated segment*: presumed to support cold water aquatic life and secondary contact recreation *State-wide*: agricultural and industrial water supply, wildlife habitat and aesthetics
Hog Creek (headwaters to the Snake River)	2829	17050201 SW008_02 SW008_03	nutrients, sediment	*Undesignated segment*: presumed to support cold water aquatic life and secondary contact recreation *State-wide*: agricultural and industrial water supply, wildlife habitat and aesthetics
Scott Creek (headwaters to the Snake River)	2830	17050201 SW006_02 SW006_03	nutrients, sediment	*Undesignated segment*: presumed to support cold water aquatic life and secondary contact recreation *State-wide*: agricultural and industrial water supply, wildlife habitat and aesthetics
Warm Springs Creek (headwaters to the Snake River)	2828	17050201 SW007_02 SW007_03	nutrients, sediment	*Undesignated segment*: presumed to support cold water aquatic life and secondary contact recreation *State-wide*: agricultural and industrial water supply, wildlife habitat and aesthetics
Jenkins Creek (headwaters to the Snake River)		17050201 SW005_02	none currently listed	*Designated*: cold water aquatic life and primary contact recreation *State-wide*: agricultural and industrial water supply, wildlife habitat and aesthetics

and/or in-stream sediment goals to maintain or restore cold water aquatic life. The TMDLs use management objectives dealing with riparian conditions to obtain these goals.

There are no known point source discharges on any of the Idaho 1998 §303(d) listed segments in the Brownlee Reservoir (Weiser Flat) Watershed. Any activity to address the goals and targets of the TMDL will need to be undertaken through the use of best management practices on the current land uses.

The goals of the TMDLs are to achieve state of Idaho water quality standards for nutrients and sediment in the listed creeks, to minimize impacts on water quality in downstream waters and to restore and maintain a healthy and balanced biological community for the full support of cold water aquatic life and secondary contact recreation. The load allocations and targets consist of load reductions for nutrients and sediment.

Table B (1 and 2) identifies the key indicators of impairment, the pollutant sources and the target concentrations identified to meet water quality standards in the subbasin. Loading analyses were performed where adequate tributary water quality data were available. In order to attain/protect downstream water quality within the SR-HC TMDL reach, nutrient and sediment targets from the SR-HC TMDL (DEQ, 2002) were applied. It is assumed that the attainment of these targets will result in support of beneficial uses within the tributary segments and will contribute to attainment of beneficial use support in the SR-HC TMDL reach.

Table B-1. Target Concentrations for Brownlee Reservoir (Weiser Flat) Subbasin § 303 (d) Listed Streams

Pollutant Target Concentrations
Bacteria: Less than 126 *E. coli* organisms/100 mL as a 30 day log mean with a minimum of 5 samples and no sample greater than 576 *E. coli* organisms/100 mL (IDAPA 58.01.02.251.01.a and b) for secondary contact recreation
Nutrients: No greater than 0.07 mg/L total phosphorus from May through September (IDAPA 58.01.02.200.06 [narrative] and target from the SR-HC TMDL [numeric] DEQ, 2002)
Sediment: No greater than 50 mg/L total suspended solids as a monthly average and no greater than 80 mg/L TSS for events lasting less than 14 days (IDAPA 58.01.02.200.08 [narrative] and targets from the SR-HC TMDL [numeric] DEQ, 2002)
Temperature: 22 ^{o}C or less instantaneous temperature and no greater than 19 ^{o}C maximum daily average (IDAPA 58.01.02.250.02.b)

Due to the findings from the SR-HC TMDL (DEQ, 2002), total phosphorus has been defined as the nutrient of concern for these creeks. However, as further data are collected, the effects of existing nitrogen concentrations will be assessed. If nitrogen management is warranted, appropriate load allocations will be identified and incorporated into the implementation planning for management of these tributary streams. Table C lists the segments and the pollutants for which TMDLs were developed.

Loading analyses were performed where adequate tributary water quality data were available. In order to attain/protect downstream water quality within the SR-HC TMDL reach, nutrient and sediment targets from the SR-HC TMDL (DEQ, 2002) were applied. It is assumed that the attainment of these targets will result in support of beneficial uses within the tributary segments and will contribute to attainment of beneficial use support in the SR-HC TMDL reach.

Due to the findings from the SR-HC TMDL (DEQ, 2002), total phosphorus has been defined as the nutrient of concern for these creeks. However, as further data are collected, the effects of existing nitrogen concentrations will be assessed. If nitrogen management is warranted, appropriate load allocations will be identified and incorporated into the implementation planning for management of these tributary streams. Table C lists the segments and the pollutants for which TMDLs were developed.

As part of the investigation into water quality in the Brownlee Reservoir (Weiser Flat) Subbasin, Jenkins Creek was sampled for bacteria, temperature, total suspended solids (TSS) and nutrients. The data collected for the two years showed that the stream violated water quality standards for bacteria and had elevated levels of sediment and nutrients (concentrations above the targets identified for protection of downstream waters). The stream had been delisted using BURP data, but the BURP site was above the lower part of the watershed and the majority of anthropogenic activity. Jenkins Creek will be proposed for Jenkins Creek will be proposed for listing for bacteria in first §303(d) list submitted by the State of Idaho subsequent to the approval of this TMDL. TMDLs for nutrients and sediment for Jenkins Creek were written as part of this document.

Table B-2. Pollutant Sources for Brownlee Reservoir (Weiser Flat) Subbasin § 303 (d) Listed Streams

Waterbody	Key Indicators of Impairment*	Pollutant Sources
Dennett Creek	Poor or declining channel stability Poor or declining riparian vegetation BURP data (1996) indicate that CWAL was not fully supported in either the lower or middle reaches	Roads Legacy mining Natural sources Domestic livestock grazing
Hog Creek	Elevated bacteria concentrations Elevated sediment concentrations Poor or declining channel stability Poor or declining riparian vegetation Elevated nutrient concentrations BURP data (1995) indicate that CWAL was not fully supported in either the lower or middle reaches	Roads Natural sources Large elk and deer populations Agricultural activity/domestic livestock grazing
Scott Creek	Elevated bacteria concentrations Elevated sediment concentrations Poor or declining channel stability Poor or declining riparian vegetation Elevated nutrient concentrations BURP data (1995) indicate that CWAL was not fully supported in the assessed reach	Roads Natural sources Agricultural activity/domestic livestock grazing
Warm Springs Creek	Elevated bacteria concentrations Elevated sediment concentrations Poor or declining channel stability Poor or declining riparian vegetation Elevated nutrient concentrations BURP data (1998) indicate that CWAL is not fully supported in the lower reach but is supported in the upper reach	Roads Natural sources Large elk and deer populations Agricultural activity/domestic livestock grazing
Jenkins Creek	Elevated bacteria concentrations Elevated sediment concentrations Poor or declining channel stability Poor or declining riparian vegetation Elevated nutrient concentrations	Roads Natural sources Large elk and deer populations Agricultural activity/domestic livestock grazing

* BURP is the beneficial use reconnaissance program, CWAL is cold water aquatic life.

Appendix C contains the data available for Jenkins Creek. Bacteria TMDLs will be scheduled at the time of §303(d) listing for bacteria.

Key Findings

There are clear indications that recreational beneficial uses are not fully supported for Hog, Scott, Warm Springs and Jenkins Creeks subwatersheds, however, the available information for cold water aquatic life uses is limited. Continued monitoring is necessary to ensure that the characterization of these watersheds is complete, that appropriate best management practices (BMPs) are used and to quantify BMP efficiency as reductions are made. The TMDL process is iterative to ensure that refinements can be made as needed.

Table C. Streams and Pollutants for which TMDLs[1] were Developed or Identified as Necessary

Stream	Pollutant(s)
Streams for which TMDLs have been written	
Dennett Creek*	Sediment
Hog Creek	Nutrients
Scott Creek	Nutrients, Sediment
Warm Springs Creek	Nutrients, Sediment
Jenkins Creek	Nutrients, Sediment
Streams for which TMDLs will be written following §303(d) listing	
Hog Creek	Bacteria
Scott Creek	Bacteria
Warm Springs Creek	Bacteria
Jenkins Creek	Bacteria

[1]Total Maximum Daily Loads

*Although flow alteration can adversely affect beneficial uses, there are no Idaho water quality standards or criteria that address it. Flow alteration is not suitable for estimation of load capacity or load allocation and it is the policy of DEQ that TMDLs will not be written to address it. Therefore, although Dennett Creek is listed for flow alteration, a TMDL for flow alteration will not be written at this time.

The targets established and load reductions determined in this TMDL, in concert with the implementation process, will ensure that these waterbodies support cold water aquatic life uses. The §303(d) listed waterbodies in the Brownlee Reservoir (Weiser Flat) Subbasin all exhibit monitored concentrations of total phosphorus that are above the target identified to improve water quality in the SR-HC TMDL reach of the Snake River. The total phosphorus goals identified in this TMDL in concert with the implementation of the SR-HC TMDL (DEQ, 2002) will ensure that these waterbodies and the SR-HC TMDL reach of the Snake River will support cold water aquatic life and other beneficial uses. The implementation of some agriculture and domestic livestock grazing BMPs that are already underway and in the planning stages, as well as additional BMPs implemented as part of this effort will have long reaching effects in terms of wildlife habitat, recreation and aesthetic improvements.

Dennett, Hog, Scott, and Warm Springs Creeks are undesignated waters and are thus presumed to support cold water aquatic life and secondary contact recreation in addition to the state-wide use designations of agricultural and industrial water supply, wildlife habitat and aesthetics. Data are not available to differentiate among existing aquatic life uses within the cold water aquatic life category; therefore, the cold water aquatic life use is presumed (IDAPA 58.01.02.101.01a). The beneficial uses affected by water quality in these streams are summarized in Table D. Jenkins Creek is designated for cold water aquatic life and primary contact recreation.

Table D. Beneficial Uses Affected

Stream	Use
Dennett Creek	Downstream water quality Cold water aquatic life not fully supported in the lower and middle reaches according to 1996 BURP data
Hog Creek	Secondary contact recreation, downstream water quality Cold water aquatic life not fully supported according to 1995 BURP data
Scott Creek	Secondary contact recreation, downstream water quality Cold water aquatic life not fully supported according to 1995 BURP data
Warm Springs Creek	Secondary contact recreation, downstream water quality Cold water aquatic life not fully supported in the lower reach according to 1998 BURP data
Jenkins Creek	Primary and secondary contact recreation, downstream water quality

Secondary contact recreation is not supported in Hog, Scott, Warm Springs or Jenkins Creeks due to exceedences of bacteria standards during the spring and summer months. The most likely sources of bacteria within these watersheds are grazing livestock and wild populations of deer, elk and waterfowl. Bacteria data are not available for Dennett Creek; therefore, the support status of recreational use in Dennett Creek is unknown.

Support of cold water aquatic life uses cannot be determined specific to nutrient and sediment concentrations due to lack of aquatic life data. Interpretation of data available for nutrients and sediments is therefore tied to the attainment of full support of downstream waters (SR-HC TMDL) shown to be impaired due to excessive nutrient and sediment loading. In order to reduce degradation to downstream waters, the targets for nutrients (total phosphorus) and sediment (TSS) for the SR-HC TMDL (DEQ, 2002) must be met in discharging waters (Table B).

Elevated concentrations of total phosphorus observed in Hog, Scott, Warm Springs and Jenkins Creeks contribute to impairment of downstream waters in the Snake River. High concentrations of total suspended solids during spring and summer months in Scott, Warm Springs and Jenkins Creeks also contribute to impairment of downstream waters in the Snake River. The most common sources of total phosphorus and sediment loading within these watersheds are agricultural practices, livestock, wildlife populations, roadways and natural erosion. Based on total inflow volumes, the extent to which these streams influence downstream water quality is considered to be small.

Violations of the cold water aquatic life temperature standards were not observed within the data available for Dennett, Hog, Scott, Warm Springs or Jenkins Creeks. If impairment is occurring, it is most likely not due to water temperature exceedences. Therefore, water temperatures observed indicate that cold water aquatic life is an appropriate presumed use for these creeks. Surface water temperatures are therefore judged to be supportive of cold water aquatic life uses within these segments.
A more specific discussion of the data available for each stream is provided in the following sections.

Dennett Creek

Bacteria
No bacteria data are available for Dennett Creek. Potential sources of bacteria present are domestic livestock and native wildlife.

Nutrients
No nutrient data are available for Dennett Creek. Potential sources of nutrients present are domestic livestock grazing, roads and natural sources.

Sediment
No suspended sediment data are available for Dennett Creek. Potential sources of sediment present are domestic livestock grazing, roads and natural sources.

Most of Dennett Creek's main stem and forks are A4 and A5 Rosgen streams (Rosgen, 1996). According to Rosgen (1996), these channels have high sediment supply and transport rates and are typically unstable with steep banks that contribute large quantities of sediment through fluvial erosion, bank collapse, freeze/thaw cycles and lateral scour form debris flow. Down-cutting was evident throughout the middle fork reach. Large woody debris in Dennett Creek creates dams that collect large quantities of sediment in step pools. Rosgen (1996) states that type A4/A5 streams are extremely sensitive to grazing-induced soil disturbance and have poor recovery potential.

Temperature
Data available for surface water temperatures in Dennett Creek show no violations of the 22 ^{o}C or less instantaneous temperature standard and no violations of the 19 ^{o}C or less maximum daily average temperature standard for the protection of cold water aquatic life (BLM, 2001 a and b). Temperature measurements are available for the summer season when water temperatures would be expected to be the highest, but no exceedences were observed in the available data set (2001). As no exceedences of the cold water aquatic life target were observed and the data set available represents a low water, worst case scenario water year, it is proposed that this stream segment be removed from the §303(d) list for temperature as part of the first §303(d) list submitted by the State of Idaho subsequent to the approval of this TMDL.

Hog Creek

Bacteria

The bacteria data available for Hog Creek show exceedences of the secondary contact recreation standards during April, May, June, July, August and September (1999 through 2000) in the downstream portion of the creek. Potential sources of bacteria present are domestic livestock and native wildlife. Substantial, routine exceedences of the secondary contact recreation bacteria standard were observed over the two year monitoring period. The average arithmetic mean *E. coli* concentration observed at the downstream site was 1,411 CFU/100 mL. It is proposed that this stream segment be added to the §303(d) list for bacteria as part of the first §303(d) list submitted by the State of Idaho subsequent to the approval of this TMDL. Scheduling for the bacteria TMDL will be identified at the time of listing.

Nutrients

Data available for Hog Creek showed total phosphorus concentrations that exceeded the target set to restore water quality in the Snake River (0.07 mg/L total phosphorus, DEQ, 2002), the water body to which Hog Creek discharges. This target applies May through September; exceedences were observed throughout this time frame (1999 through 2000). Total phosphorus concentrations in excess of the SR-HC TMDL (DEQ, 2002) target were observed in Hog Creek at both upstream (seasonal mean concentration was 0.17 mg/L) and downstream (seasonal mean concentration was 0.26 mg/L) locations. Potential sources of nutrients present are domestic livestock grazing, roads and natural sources in the upper reach and agricultural activity and natural sources in the lower reach.

Sediment

Instantaneous measurements of sediment concentrations in the upper portion of Hog Creek and background concentrations measured when irrigation flows were not substantially present in the watershed showed concentrations well below 50 mg/L (1999 through 2000). Total loading from the upstream section is not projected to be above that achieved by maintaining a monthly average of no more than 50 mg/L. Instantaneous measurements of sediment concentrations in the lower portion of Hog Creek showed concentrations in exceedence of the 50 mg/L monthly average for the month of May (1999) only. The average concentration was calculated to be 23.07 mg/L. Total loading is not projected to be greater than that achieved by maintaining a monthly average of no more than 50 mg/L (1999 through 2000). Potential sources of sediment present are the same as those outlined for nutrients. In addition, Henley Basin Road contributes sediment loads to Hog Creek during rainfall events and spring runoff (BLM, 2001 a and b).

Temperature

Continuous water temperature data are not available for Hog Creek. Instantaneous measurements of water temperature in Hog Creek show no violations of the 22 ^{o}C or less instantaneous temperature standard for the protection of cold water aquatic life. Instantaneous temperature measurements are available for the summer season when water temperatures would be expected to be the highest, but no exceedences were observed in the available data set (1999 through 2000).

Scott Creek

Bacteria

The bacteria data available for Scott Creek show exceedences of the secondary contact recreation standards during May, June, July, August, September and October (1999 through 2000) in the downstream portion of the creek. Potential sources of bacteria present are domestic livestock and native wildlife. Substantial, routine exceedences of the secondary contact recreation bacteria standard were observed over the two year monitoring period. The average arithmetic mean *E. coli* concentration observed at the downstream site was 754 CFU/100 mL. It is proposed that this stream segment be added to the §303(d) list for as part of the first §303(d) list submitted by the State of Idaho subsequent to the approval of this TMDL. Scheduling for the bacteria TMDL will be identified at the time of listing.

Nutrients

Data available for Scott Creek showed total phosphorus concentrations that exceeded the target set to restore water quality in the Snake River (0.07 mg/L total phosphorus, DEQ, 2002), the water body to which Scott Creek discharges. This target applies May through September; exceedences were observed throughout this time frame (1999 through 2000). Total phosphorus concentrations in excess of the SR-HC target were observed in Scott Creek at both upstream (seasonal mean concentration was 0.09 mg/L) and downstream (seasonal mean concentration was 0.37 mg/L) locations. Potential sources of nutrients present are domestic livestock grazing, roads and natural sources in the upper reach and agricultural activity and natural sources in the lower reach.

Sediment

Instantaneous measurements of sediment concentrations in the upstream portion of Scott Creek showed concentrations below 50 mg/L (1999 through 2000). Total loading from the upstream section is not projected to be above that achieved by maintaining a monthly average of no more than 50 mg/L. Instantaneous measurements of sediment concentrations in the downstream portion of Scott Creek showed concentrations in exceedence of the 50 mg/L monthly average (1999 through 2000). The average sediment concentration was calculated to be 107.13 mg/L. Total loading is projected to be greater than two times that achieved by maintaining a monthly average of no more than 50 mg/L. Monthly averages from the available data set exceeded 50 mg/L sediment throughout the spring, summer and fall months for the downstream section of Scott Creek (1999 through 2000). Potential sources of sediment present are the same as those outlined for nutrients.

Temperature

Continuous water temperature data are not available for Scott Creek. Instantaneous measurements of water temperature in the downstream portion of Scott Creek show no violations of the 22 ^{o}C or less instantaneous temperature standard for the protection of cold water aquatic life. Instantaneous temperature measurements are available for the summer season when water temperatures would be expected to be the highest, but no exceedences were observed in the available data set (1999 through 2000).

Warm Springs Creek

Bacteria

The bacteria data available for Warm Springs Creek show exceedences of the secondary contact recreation standards during May, June, July, August and September (1999 through 2000) in the downstream portion of the creek. Potential sources of bacteria present are domestic livestock and native wildlife. Substantial, routine exceedences of the secondary contact recreation bacteria standard were observed over the two year monitoring period. The average arithmetic mean *E. coli* concentration observed at the downstream site was 764 CFU/100 mL. It is proposed that this stream segment be added to the §303(d) list for bacteria as part of the first §303(d) list submitted by the State of Idaho subsequent to the approval of this TMDL. Scheduling for the bacteria TMDL will be identified at the time of listing.

Nutrients

Data available for Warm Springs Creek showed total phosphorus concentrations that exceeded the target set to restore water quality in the Snake River (0.07 mg/L total phosphorus, DEQ, 2002), the water body to which Warm Springs Creek discharges. This target applies May through September; exceedences were observed throughout this time frame (1999 through 2000). Total phosphorus concentrations in excess of the SR-HC target were observed in Warm Springs Creek at both upstream (seasonal mean concentration was 0.18 mg/L) and downstream (seasonal mean concentration was 0.28 mg/L) locations. Potential sources of nutrients present are domestic livestock grazing, roads and natural sources in the upper reach and agricultural activity and natural sources in the lower reach.

Sediment

Instantaneous measurements of sediment concentrations in the upstream portion of Warm Springs Creek showed concentrations well below 50 mg/L (1999 through 2000). Total loading from the upstream section is not projected to be above that achieved by maintaining a monthly average of no more than 50 mg/L. Instantaneous measurements of sediment concentrations in the downstream portion of Warm Springs Creek showed concentrations in exceedence of the 50 mg/L monthly average (1999 through 2000). The average sediment concentration was calculated to be 88.12 mg/L. Total loading is projected to be approximately two times greater than that achieved by maintaining a monthly average of no more than 50 mg/L. Monthly averages from the available data set exceeded 50 mg/L sediment throughout the spring, summer and fall months for the downstream section (1999 through 2000). Potential sources of sediment present are the same as those outlined for nutrients.

Temperature

Continuous water temperature data are not available for Warm Springs Creek. Instantaneous measurements of water temperature in the downstream portion of Warm Springs Creek show no violations of the 22 ^{o}C or less instantaneous temperature standard for the protection of cold water aquatic life. Instantaneous temperature measurements are available for the summer season when water temperatures would be expected to be the highest, but no exceedences were observed in the available data set (1999 through 2000).

Jenkins Creek

Bacteria

The bacteria data available for Jenkins Creek show exceedences of the secondary contact recreation standards during May, June, July, August, September and October (1999 through 2000) in the downstream portion of the creek. Potential sources of bacteria present are domestic livestock and native wildlife. Substantial, routine exceedences of the secondary contact recreation bacteria standard were observed over the two year monitoring period. The average arithmetic mean *E. coli* concentration observed at the downstream site was 1,465 CFU/100 mL. It is proposed that this stream segment be added to the §303(d) list for bacteria as part of the first §303(d) list submitted by the State of Idaho subsequent to the approval of this TMDL. Scheduling for the bacteria TMDL will be identified at the time of listing.

Nutrients

Data available for Jenkins Creek showed total phosphorus concentrations that exceeded the target set to restore water quality in the Snake River (0.07 mg/L total phosphorus, DEQ, 2002), the water body to which Jenkins Creek discharges. This target applies May through September; exceedences were observed throughout this time frame (1999 through 2000). Total phosphorus concentrations in excess of the SR-HC target were observed in Jenkins Creek at both upstream (seasonal mean concentration was 0.13 mg/L) and downstream (seasonal mean concentration was 0.63 mg/L) locations. Potential sources of nutrients present are natural erosion, domestic and wildlife grazing and roads in the upper reach and agricultural activity in the lower reach.

Sediment

Instantaneous measurements of sediment concentrations in the upstream portion of Jenkins Creek showed concentrations well below 50 mg/L (1999 through 2000). Total loading from the upstream section is not projected to be above that achieved by maintaining a monthly average of no more than 50 mg/L. Instantaneous measurements of sediment concentrations in the downstream portion of Jenkins Creek showed concentrations in exceedence of the 50 mg/L monthly average (1999 through 2000). The average sediment concentration was calculated to be 162.54 mg/L. Total loading is projected to be greater than three times that achieved by maintaining a monthly average of no more than 50 mg/L. Monthly averages from the available data set exceeded 50 mg/L sediment throughout the spring, summer and fall months for the downstream section (1999 through 2000). Potential sources of sediment present are the same as those outlined for nutrients.

Temperature

Continuous water temperature data are not available for Jenkins Creek. Instantaneous measurements of water temperature in the downstream portion of Jenkins Creek show no violations of the 22 ^{o}C or less instantaneous temperature standard for the protection of cold water aquatic life. Instantaneous temperature measurements are available for the summer season when water temperatures would be expected to be the highest, but no exceedences were observed in the available data set (1999 through 2000).

Given the available data, proposed changes to the 1998 § 303 (d) list are outlined in Table E.

Public Process

Throughout this TMDL process, local experience and participation have been and will continue to be invaluable in the identification of water quality issues and reduction strategies appropriate on a local scale. The public committees created for the Weiser River Subbasin, known as the Weiser River Watershed Advisory Group (WAG) and Technical Advisory Group (TAG), have been involved in the review and assessment of this TMDL document due to the fact that the creeks evaluated in this TMDL are in close proximity to the Weiser River and many of the land owners associated with the Weiser River TMDL process are also

Table E. Listing Changes Proposed for Waterbodies in the Brownlee Reservoir (Weiser Flat) Subbasin

Water Body Segment	Pollutant	Recommended Changes to §303(d) List	Justification
Dennett Creek	Temperature	Delist	BLM riparian surveys IDFG stream surveys DEQ instream temperature data BLM instream temperature data
Hog Creek	Bacteria	List	ISDA Monitoring Data
Scott Creek	Bacteria	List	ISDA Monitoring Data
Warm Springs Creek	Bacteria	List	ISDA Monitoring Data
Jenkins Creek	Bacteria	List	ISDA Monitoring Results

BLM is United States Bureau of Land Management, IDFG is Idaho Department of Fish and Game, DEQ is Idaho Department of Environmental Quality and ISDA is Idaho State Department of Agriculture.

associated with the management of lands within or adjacent to these creeks. To a lesser extent, the SR-HC TMDL Public Advisory Team (SR-HC PAT) has participated in review and comment on water quality targets and land management issues associated with the segment of the Snake River to which Dennett Creek, Hog Creek, Scott Creek and Warm Springs Creeks discharge.

The Weiser River WAG and TAG and the SR-HC PAT provide an opportunity for concerned citizens, representing a number of stakeholder interest groups, to see the TMDL process through from start to finish. Additionally, Weiser River WAG and SR-HC PAT members represent a critical mechanism in disseminating information to their respective interest groups and relaying concerns and advice from these interest groups to the Idaho Department of Environmental Quality. Interested citizens not involved directly through these groups can get involved in the TMDL process through attending public comment and informational meetings as well as Weiser River WAG, TAG and SR-HC PAT meetings.

The public comment period on the draft Weiser Flat TMDL was opened on April 15, 2003, and closed on May 30, 2003. An informational meeting to present background on the TMDL and answer questions was provided preceding the public comment period. A public information meeting was held on Thursday, May 15, 2003 from 7 to 9 PM at the Vendome located at 309 State Street in Weiser, Idaho. DEQ did not receive any public comments during the public comment period. DEQ received comments on the draft TMDLs from two individuals representing the Idaho Association of Soil and Water Conservation Districts and the Idaho State Department of Agriculture, and comments from the Weiser River WAG and TAG prior to the public comment period. These comments were incorporated into the document to the extent possible. The DEQ also received comments from USEPA during the public comment period and these comments were also incorporated into the document to the extent possible. The Response to Comments document, included in Appendix H, summarizes the issues raised, and DEQ's prepared responses and revisions to the TMDLs.

Reasonable Assurance

The state of Idaho uses a voluntary approach to control agricultural nonpoint sources. However, regulatory authority can be found in the state water quality standards (IDAPA 58.01.02350.01 through 58.01.02350.03). IDAPA 58.01.02054.07 refers to the Idaho Agricultural Pollution Abatement Plan (IAPAP) which provides direction to the agricultural community for approved BMPs.

For nonpoint sources, a feedback loop will be used to achieve water quality goals. If monitoring indicates a violation of standards despite use of approved BMPs or knowledgeable and reasonable efforts, then BMPs for the nonpoint source activity must be modified by the appropriate agency to ensure protection of beneficial uses (Idaho Water Quality Standards and Wastewater Treatment Requirements, IDAPA 58.01.350.02.b.ii).

As stated previously, the state of Idaho uses a voluntary approach to control agricultural nonpoint sources. It is expected that a voluntary approach will be sufficient to achieve the load allocations needed as the local agricultural/ranching community has demonstrated a willingness to implement BMPs and protect water quality. In the event that BMPs for nonpoint sources are not implemented adequately using a voluntary approach, the Idaho Department of Environmental Quality will use existing regulatory authorities to seek water quality improvements.

The load reductions for these watersheds rely on nonpoint source reductions to achieve desired water quality and to restore beneficial uses. To ensure that these nonpoint source mechanisms are operating effectively and to calculate reduction efficiency, monitoring will be conducted. Monitoring in the Brownlee Reservoir (Weiser Flat) Watershed of Hog, Scott, Warm Springs and Jenkins Creeks will continue at the same locations as the Idaho State Department of Agriculture (ISDA) monitoring and will allow quantification of reductions from the agricultural area and also from the rangeland. If instream monitoring indicates that improvement is not occurring then BMPs or other efforts will be modified as necessary to ensure the protection of beneficial uses.

Dennett Creek will be monitored on a triennial basis using the Natural Resources Conservation Service (NRCS) erosion inventory, which will allow identification of vulnerable stream areas as well as assessment of channel stability improvements. The BMPs can then be adjusted accordingly.

Implementation Considerations

It is recognized that the TMDL addresses a complex system that includes a combination of diverse natural and nonpoint pollutant sources. Limited data are available to this TMDL effort for the evaluation of water quality violations and beneficial use support status. This TMDL has therefore adopted a phased approach to implementation that will identify interim, measurable milestones for determining whether management measures or other action controls are being implemented and a process for implementing stronger and more effective management measures if necessary. It is expected that information will continue to be collected to fill existing data gaps and allow a more accurate determination of the status of beneficial uses within the reach and the impact of pollutants delivered to and processed by the system.

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1. Subbasin Assessment – Watershed Characterization

The federal Clean Water Act (CWA) requires that states and tribes restore and maintain the chemical, physical and biological integrity of the nation's waters (33 USC § 1251.101). 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 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 of impaired waters, currently every two years. For waters identified on this list, states and tribes must develop a total maximum daily load (TMDL) for the pollutants, set at a level to achieve water quality standards. This document addresses the water bodies in the Brownlee Reservoir (Weiser Flat) Subbasin that have been placed on what is known as the "§303(d) list."

The overall purpose of this subbasin assessment and TMDL is to characterize and document pollutant loads within the Brownlee Reservoir (Weiser Flat) Subbasin. The first portion of this document, the subbasin assessment, is partitioned into four major sections: watershed characterization, water quality concerns and status, pollutant source inventory and a summary of past and present pollution control efforts (Chapters 1 through 4). This information will then be used to develop a TMDL for each pollutant of concern for the Brownlee Reservoir (Weiser Flat) Subbasin (Chapter 5). Additional TMDL process information is available in Chapter 6.

1.1 Introduction

In 1972, Congress passed public law 92-500, the Federal Water Pollution Control Act, more commonly called the Clean Water Act. The goal of this act was to "restore and maintain the chemical, physical and biological integrity of the Nation's waters" (Water Pollution Control Federation, 1987). The act and the programs it has generated have changed over the years as experience and perceptions of water quality have changed. The CWA has been amended 15 times, most significantly in 1977, 1981 and 1987. One of the goals of the 1977 amendment was protecting and managing waters to insure "swimable and fishable" conditions. This goal, along with a 1972 goal to restore and maintain chemical, physical and biological integrity, relates water quality with more than just chemistry.

Background

The federal government, through the U.S. Environmental Protection Agency (EPA), assumed the dominant role in defining and directing water pollution control programs across the county. The Idaho Department of Environmental Quality (DEQ) implements the CWA in Idaho, while the EPA oversees Idaho and certifies the fulfillment of CWA requirements and responsibilities.

Section 303 of the CWA requires DEQ to adopt, with EPA approval, water quality standards and to review those standards every three years. Additionally, DEQ must monitor waters to identify those not meeting water quality standards. For those waters not meeting standards, DEQ must establish TMDLs for each pollutant impairing the waters. Further, the agency must set appropriate controls to restore water quality and allow the water bodies to meet their beneficial uses. These requirements result in a list of impaired waters called the "§303(d) list." This list describes water bodies not meeting water quality standards. Waters identified on this list require further analysis. A subbasin assessment and TMDL provide a summary of the water quality status and allowable TMDL for water bodies on the §303(d) list. This report provides this summary for the currently listed waters in the Brownlee Reservoir (Weiser Flat) Subbasin.

The subbasin assessment section of this report (Chapters 1 through 4) includes an evaluation and summary of the current water quality status, pollutant sources and control actions in the Brownlee Reservoir (Weiser Flat) Subbasin to date. While this assessment is not a requirement of the TMDL, DEQ performs the assessment to ensure impairment listings are up to date and accurate. The TMDL is a plan to improve water quality by limiting pollutant loads. Specifically, a TMDL is an estimation of the maximum pollutant amount that can be present in a water body and still allow that water body to meet water quality standards (40 CFR § 130). Consequently, a TMDL is water body- and pollutant-specific. The TMDL also includes individual pollutant allocations among various sources discharging the pollutant. The EPA considers certain unnatural conditions, such as flow alteration, a lack of flow, or habitat alteration, that are not the result of the discharge of a specific pollutant, as "pollution." TMDLs are not required for a water body impaired by pollution, but not specific pollutants. Therefore, TMDLs are not required for conditions such as flow alteration, lack of flow or habitat alteration at this time. 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.

The Brownlee Reservoir (Weiser Flat) Subbasin, hydrologic unit code (HUC) 17050201, encompasses the area draining into the Snake River downstream of the Weiser River inflow and upstream of Brownlee Reservoir. This subbasin is located along the central portion of the Idaho-Oregon border.

Within this subbasin are the watersheds of Dennett Creek, Hog Creek, Scott Creek, Warm Springs Creek and Jenkins Creek. All are subwatersheds of the Snake River – Hells Canyon (SR-HC) TMDL reach. Hog, Scott, Warm Springs and Jenkins Creeks are relatively close to the city of Weiser and flow through an area known as the Weiser Flat. All four creeks lie in Washington County in southwestern Idaho. Figure 1.1 shows the location of the creeks in relation to the larger SR-HC Watershed. Appendix D contains topographic map coverages of the watershed.

Dennett, Hog, Scott and Warm Springs Creeks were placed on the Idaho 1998 §303(d) list. Jenkins Creek was removed from the list in 1998 but recent monitoring has been identified water quality concerns below the original assessment site that necessitate re-listing. Listed pollutants of concern are nutrients, sediment, flow alteration and temperature.

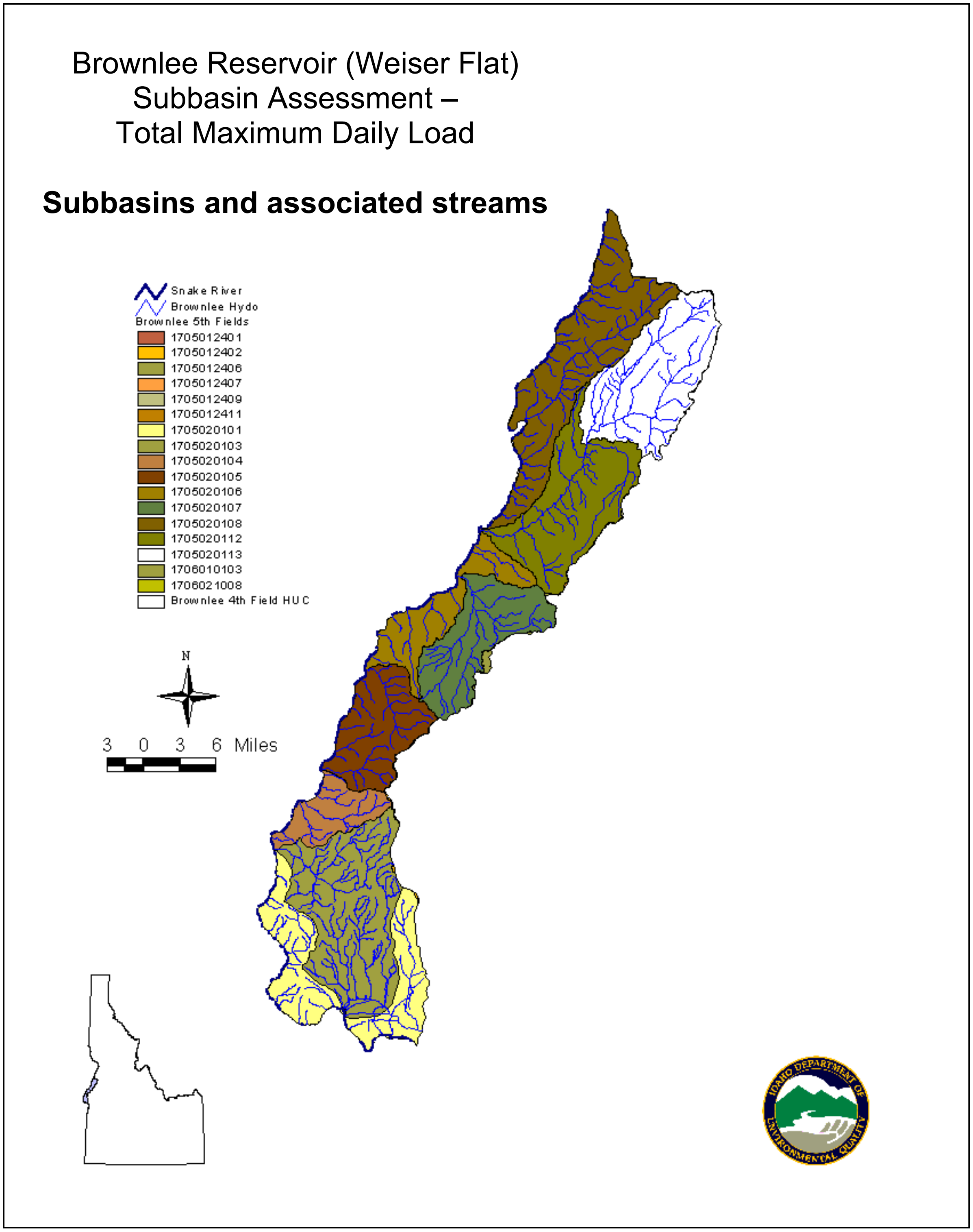

Figure 1.1 Brownlee Reservoir (Weiser Flat) Subbasin and associated watershed boundaries.

In accordance with the Beneficial Use Reconnaissance Program's (BURP) multi-index scoring including the stream macroinvertabrate index (SMI), the stream fish index (SFI) and the stream habitat index (SHI), was used to evaluate the support status of cold water aquatic life for Dennett Creek, Hog Creek, Scott Creek and Warm Springs Creek, however, BURP data for all but Warm Springs Creek were collected in 1995 and 1996 therefore, the status at the time of assessment may not reflect the current status.

Available bacteria information was used to evaluate the support status of secondary contact recreation for Hog Creek, Scott Creek and Warm Springs Creek, and primary contact recreation for Jenkins Creek. Bacteria data for all streams were collected from 1999 through 2000 and so is considered current for the purposes of this TMDL. Those water bodies determined to be not fully supporting their designated or existing beneficial uses and not meeting applicable water quality standards are required to have a TMDL developed.

All listed streams are undesignated and are therefore presumed to support cold water aquatic life and secondary contact recreation as well as the state-wide uses of agricultural and industrial water supply, wildlife habitat and aesthetics. Through the Brownlee Reservoir (Weiser Flat) Watershed subbasin assessment process it was determined that the four streams on the Idaho 1998 §303(d) list in the Brownlee Reservoir (Weiser Flat) Watershed have cold water aquatic life and secondary contact recreation as existing uses. In some cases, data show these uses are not supported due to exceedence of the state of Idaho water quality standard bacteria criteria. In other cases, biological information showed non-support of cold water aquatic life. Of the listed, undesignated streams presumed to support secondary contact recreation, monitoring has indicated that all but Dennett Creek are impaired due to the presence of elevated levels of bacteria. Due to time and personnel constraints within DEQ, bacteria TMDLs for these creeks have been scheduled to be completed by 2006.

A TMDL has been developed for each stream determined to be not fully supporting beneficial uses in accordance with state of Idaho water quality standards. The TMDLs address pollutant reductions required to meet state of Idaho water quality standard criteria and/or in-stream sediment goals to maintain or restore cold water aquatic life. The TMDLs use management objectives dealing with riparian conditions to obtain these goals. Each segment has been addressed separately in this TMDL.

There are no known point source discharges on any of the Idaho 1998 §303(d) listed segments in the Brownlee Reservoir (Weiser Flat) Watershed. Any activity to address the goals and targets of the TMDL will need to be undertaken through the use of best management practices on the current land uses.

The goals of the TMDLs are to achieve state of Idaho water quality standards for nutrients and sediment in the listed creeks, to minimize impacts on water quality in downstream waters and to restore and maintain a healthy and balanced biological community for the full support of cold water aquatic life and secondary contact recreation. The load allocations and targets consist of load reductions for nutrients and sediment.

Idaho's Role

Idaho adopts water quality standards to protect public health and welfare, enhance the quality of water and protect biological integrity. A water quality standard defines the goals of a water body by designating the use or uses for the water, setting criteria necessary to protect those uses and preventing degradation of water quality through antidegradation provisions. The state may assign or designate beneficial uses for particular Idaho water bodies to support. These beneficial uses are identified in the Idaho water quality standards and include:

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

The Idaho legislature designates uses for water bodies. Industrial water supply, wildlife habitat and aesthetics are designated beneficial uses for all water bodies in the state. If a water body is unclassified, then cold water aquatic life and primary contact recreation are used as additional default beneficial uses when water bodies are assessed.

A subbasin assessment entails analyzing and integrating multiple types of water body data, such as biological, physical/chemical and landscape data to address several objectives:

- Determine the degree of beneficial use support of the water body (i.e., attaining or not attaining water quality standards).
- Determine the degree of achievement of biological integrity.
- Compile descriptive information about the water body, particularly the identity and location of pollutant sources.
- When water bodies are not attaining water quality standards, determine the causes and extent of the impairment.

1.2 Physical and Biological Characteristics

This document focuses on the watersheds of Dennett Creek, Hog Creek, Scott Creek, Warm Springs Creek and Jenkins Creek, all of which are located in the Snake River Basin and are subwatersheds of the Brownlee Reservoir (Weiser Flat) Subbasin (HUC 17050201). All of these streams discharge to the Snake River within the SR-HC TMDL reach (Figure 1.1).

Dennett Creek is the northern-most of the five streams. It flows generally east to west and its drainage area is located in Washington County in southwestern Idaho. Dennett Creek discharges into Brownlee Reservoir within the SR-HC TMDL reach.

Hog Creek, Scott Creek, Warm Springs Creek and Jenkins Creek are located in the southern portion of the Brownlee Reservoir (Weiser Flat) Subbasin, relatively close to the city of Weiser and the Weiser River Watershed in the Weiser Flat. They flow generally north to south through most of their length, turning slightly westward near their mouths. Hog Creek, Scott Creek, Warm Springs Creek and Jenkins Creek discharge directly to the Snake River, upstream of Brownlee Reservoir within the SR-HC TMDL reach.

Climate

The climate of these watersheds is semi-arid: hot and dry in the summer and cold and dry in the winter as shown in Figures 1.2 and 1.3 (WRCC, 2000). The hottest days occur in July when the mean monthly temperature is 73 °F. The frost-free growing season in the

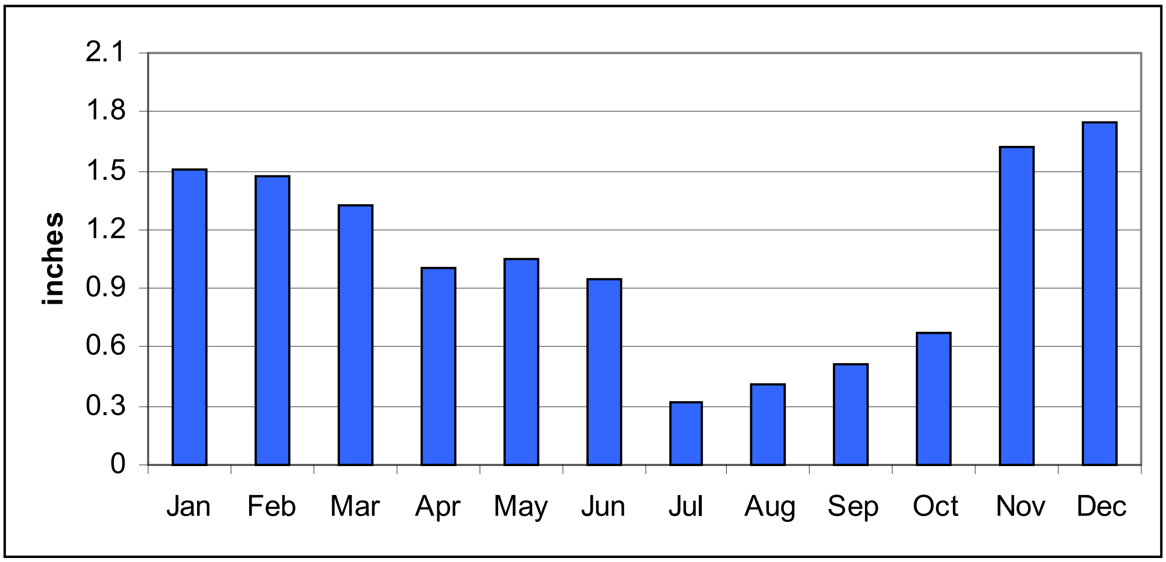

Figure 1.2 Average total precipitation as measured at Weiser, Idaho (1971 – 2000)

Hog, Scott, Warm Springs and Jenkins Creek subwatersheds is 129 days from about May 18 to September 24 (Southern Washington County Water Quality Project).

Precipitation occurs in a bi-modal fashion with intense, short duration summer storms and milder, longer duration winter storms. More than half of the precipitation falls during the period from November through January. Much of the water in this reach is derived from snowmelt runoff from high elevations and upstream reaches of the mainstem and the creeks. As shown in Figure 1.2, precipitation averages approximately 11.3 inches per year at Weiser (located near the listed creeks) (period of record 1971 to 1990) (WRCC, 2000).

Subbasin Characteristics

Hydrography

Dennett Creek, Hog Creek, Scott Creek, Warm Springs Creek and Jenkins Creek discharge directly to the Snake River. No flow gages are present in these streams. Measurements of flow were conducted using portable field equipment. A weather station is available near the city of Weiser. Data from this station was utilized in this subbasin assessment. Due to

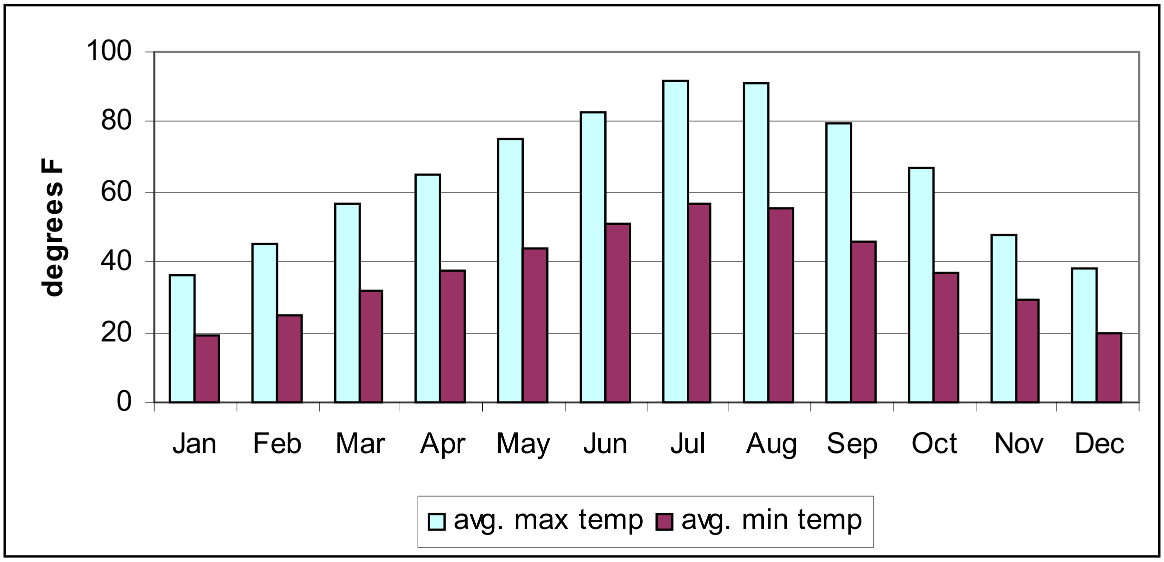

Figure 1.3 Average maximum and minimum air temperatures as measured at Weiser, Idaho (1971 – 2000).

precipitation characteristics, these streams generally experience brief periods of high intensity flow correlated with spring runoff, followed by a decrease in flow until irrigation recharge augments flow later in the summer. Late fall and winter flows are generally very low volume.

Geology

The Weiser River Valley is a broad terraced alluvial plain with a westward sloping surface. Hog, Scott, Warm Springs and Jenkins Creeks are all located in the Boise-Malheur-King Hill section of the Snake River Plain subprovince, part of the Columbia River plateau geomorphic province. The valley is a structural basin filled with sedimentary deposits formed by alluvial action and lacustrine influence due to basalt dams and volcanic deposition. Present topography reflects meandering and braided channels and alluvial deposits superimposed on lakebed and volcanic uplands.

The bedrock consists of tertiary and quaternary age lake and stream sediments interbedded with Columbia River basalt. The hills that the streams originate from are formed from Tertiary age sedimentary arkosic sandstone with some volcaniclastic rock and basalt mixed in. The more recent deposits in the hills include Quaternary age sediment gravels and landslides.

The Dennett Creek watershed is located in an area of Snake River Quaternary basalts along the western end of the Hitt Mountains. This mountain range is characterized by north-northwest trending faults and anticlinal uplifts. Several faults are located proximate to the watershed. The Idaho Formation deposits in the area were formed by basalt flows as well as other volcanic activity.

The watershed is dominated by Jurassic age sedimentary lithologies. Big Hill Wacke outcroppings (poorly sorted sedimentary rock) dot the watershed. Phyllite, a metamorphic rock, is common throughout the watershed. Tate shale occurs above the Middle and North Forks of Dennett Creek. Above North Fork Dennett Creek are outcroppings of Dennett Creek Limestone. Unconsolidated Quaternary aged alluvium is present in the stream channels and in terraced deposits.

Soils

Most of the watershed is covered in shallow to moderately deep soils. Runoff from soils is moderate to moderately rapid. The erosion potential from water is slight to moderate where slopes are less than 30 percent. Where slopes are greater than 30 percent, the erosion potential is high. Slopes in the watershed range from 3 to over 60 percent, but most areas have slopes in a range of 6 to 25 percent (BLM, 2001a and b). Table 1.1 contains information on soils and locations in the subbasin. Figure 1.4 shows the typical pattern of soils and underlying material in the watersheds.

Table 1.1 Soil-Type Information

Map Unit	Landform	Elevation	Description
Gem-Reywat-Bakeoven	Foothills/mountains	2300 to 4800’	Rangeland and wildlife habitat
Deshler-Agerdelly-Glasgow	Foothills Lacustrine terraces	2100 to 3500’	Cropland, rangeland/wildlife habitat Moderately deep and very deep, well drained soils that formed in residuum derived from volcanic tuff and siltstone
Greenleaf-Bissell	Terraces	2100 to 2500’	Cropland, homesites, wildlife habitats Very deep, well drained soils formed in lacustrine sediment and alluvium derived from mixed sources
Baldock-Moulton-Cashmere	Stream terraces Fan terraces Alluvial fans	2100 to 2500’	Cropland, homesites, wildlife habitat; Very deep, poorly drained, somewhat poorly drained and well drained soils that formed in alluvium derived from mixed sources

Topography

As shown in Figure 1.4, the Brownlee Reservoir (Weiser Flat) Subbasin encompasses relatively high elevations (5,250 feet elevation on the eastern edge of Dennett Creek watershed) and steep slopes on the east, gradually sloping down to a flat, shallow floodplain along the Snake River on the west (roughly 2,100 feet elevation). The subbasin is long and narrow with a north to south orientation along the mainstem Snake River. The Dennett Creek subwatershed is relatively steep sloped throughout its length from the Hitt Mountains to the Snake River. The other subwatersheds (Hog Creek, Scott Creek, Warm Springs Creek and Jenkins Creek) have relatively steeply sloped headwaters but decrease in slope as they move down to a flat shallow plain along the floodplain of the Snake River.

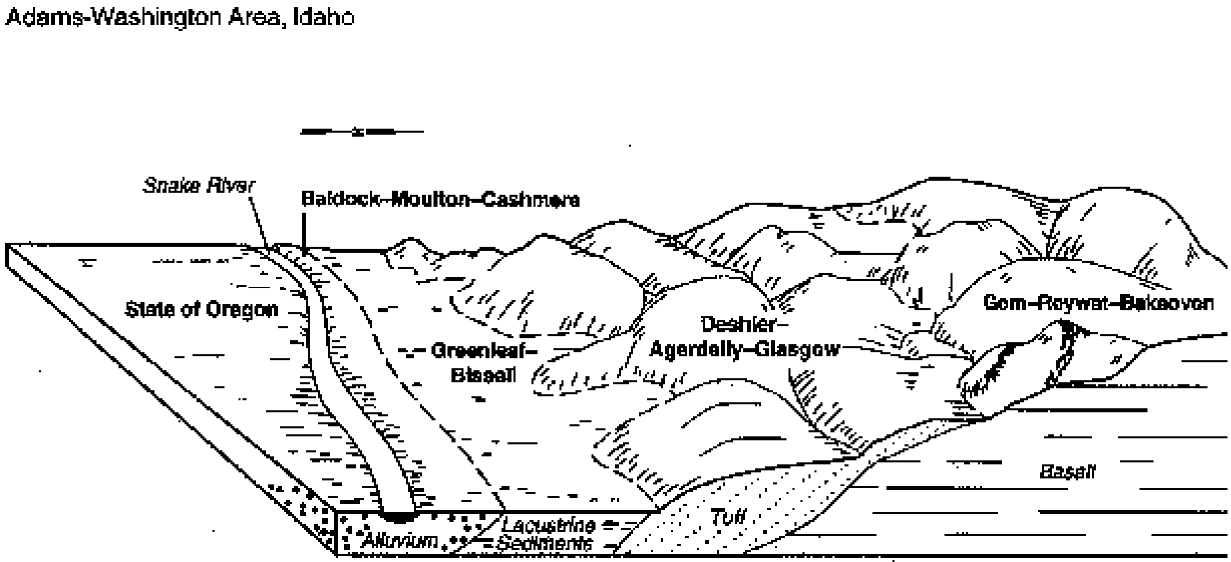

Figure 1.4 Soil types in the Brownlee Reservoir (Weiser Flat) Subbasin. (From Weiser River Soil Conservation District, General Soil Map for the Adams-Washington Area, Idaho.)

Vegetation

The flora of these watersheds is dominated by shrubland vegetation with narrow strips of riparian vegetation along the streams. The lower portions of the watershed have converted to predominantly annual grass cover whereas higher in the watershed, sagebrush steppe cover dominates with plant communities in various seral stages. The Bureau of Land Management (BLM) categorizes 50 percent of their management units in this area as “at risk” to increasingly disturbed states that are susceptible to noxious weed invasion (BLM, 2001 a and b). Riparian vegetation is primarily scrub shrub wetlands and shore and bottom lands communities.

In addition to grassland, sagebrush and shrubfield vegetation, the Dennett Creek watershed has stands of Douglas fir on steep, north facing slopes high up in the watershed. This watershed is also home to one of the few stands of western juniper in the area, located near the townsite of Mineral. In this watershed, aspect is the predominant factor in determining vegetation community. As a result, annual grasses are common on south-facing slopes, aspen dominated vegetation is common in the upper stream reaches and mixed deciduous shrub communities are common in the lower reaches. A recent ecological survey found that approximately 51 percent of the grassland, bitterbrush and big sagebrush communities are in mid-seral condition. No climax communities were noted. Two rare plants, Snake River goldenweed and Snake Canyon milvetch are present in the watershed. This watershed and the Raft Creek watershed to the north support the largest populations of goldenweed in Idaho. (Mancuso, 1995)

Wildlife

There is a large diversity of wildlife that inhabits these vegetation communities. Large game animals include mule and white tail deer, elk, bighorn sheep and mountain lions. In addition there are a number of smaller mammals including coyote, mink, bobcat, otter, badger, red fox and beaver. These watersheds are all located in important overwintering areas for elk and deer. The Weiser River Subbasin is managed by the Idaho Department of Fish and Game (IDFG) as elk habitat. Data collected by IDFG (personal communication, Jeff Rohlman, 2002) show that elk represent a substantial population in the watersheds of Warm Springs Creek and Hog Creek (~125 elk and 100 deer overwinter) and, to a lesser extent, Dennett Creek (< 10 elk and 375 deer overwinter) and Scott Creek (~8 elk and no deer overwinter).

A wide variety of birds use the upland vegetation including western meadow larks, valley and mountain quail, western kingbirds, lark sparrows, mourning doves, Brewer's blackbirds, lazuli buntings, spotted towhees, brownheaded cowbirds, Bullock's orioles, black billed magpies, chukars, sage sparrows, gray partridges and rock wrens. The riparian vegetation is also used by many species including lazuli buntings, spotted towhees, blackcapped chickadees, yellow breasted chats, cedar waxwings, warbling vireos, blackheaded grosbeaks, black billed magpies, song sparrows, western tanagers and red-eyed vireos. Northern harriers, red-tailed hawks, nighthawks, American kestrels and golden eagles are common raptors. The river and reservoirs provide food for a number of other birds including great blue herons and a variety of geese, ducks and gulls.

In addition to the above fauna, these streams provide habitat for several amphibian species and a large variety (approximately 200 species) of invertebrates. The amphibians in the SR-HC Watershed include spadefoot, western and Woodhouse's toads; longtoed salamanders; Pacific tree, spotted and tailed frogs; and bullfrogs.

Fisheries

The creeks are home to several native and non-native fish. The native fish that are known to use the SR-HC tributaries include redband trout, northern pike minnow and mountain whitefish. The non-native fish include large and small mouth bass, yellow perch, blue gill, black and white crappies and hatchery rainbow trout. Some of these fish utilize the tributaries only transiently from the Snake River and/or small ponds near the tributaries. Fisheries data specific to these creeks are minimal. BLM surveys in the 1980s found that redband trout were rare in upper and North Dennett Creeks. A perched culvert was listed as a potential migratory problem near the mouth of Dennett Creek.

Subwatershed Characteristics

As shown in Figure 1.4, the Brownlee Reservoir (Weiser Flat) Subbasin encompasses a transition from high mountains on the east to low, level floodplains on the west. This slope results in streams that have high velocities in the headwaters and slow gradually as they near their confluence with the Snake River. Figures 1.5 through 1.9 show each of the subwatersheds in greater detail.

Dennett Creek

Dennett Creek (Figure 1.5) is a second order, moderately sinuous stream that originates off the western flank of the Hitt Mountains at about 5,250 feet elevation. The mainstem segment is approximately 6.5 miles in length with an associated 10 additional miles of tributaries. Characterized by steeper terrain and narrower stream corridors than the other Weiser Flat

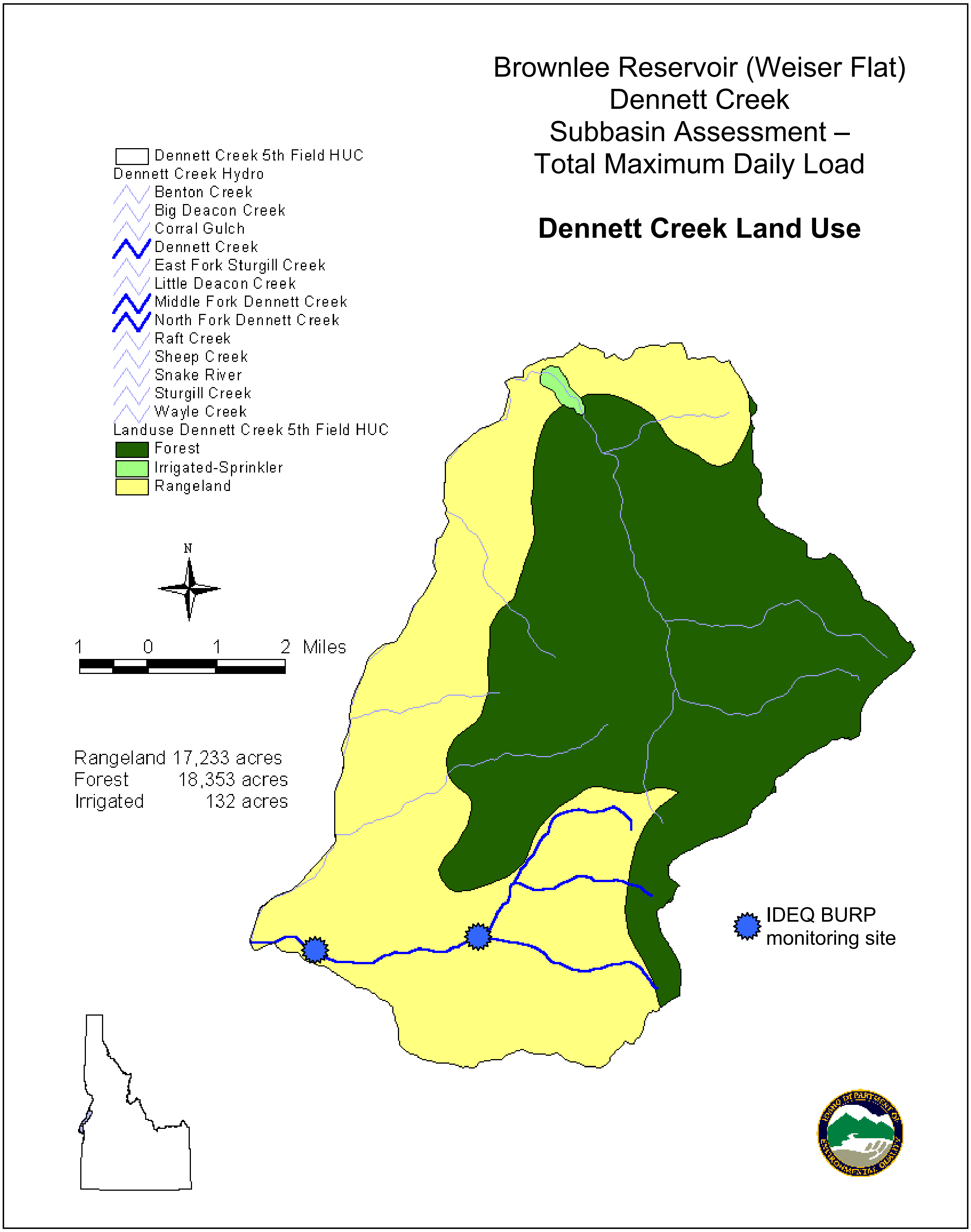

Figure 1.5 Dennett Creek Watershed, located in the Brownlee Reservoir (Weiser Flat) Subbasin.

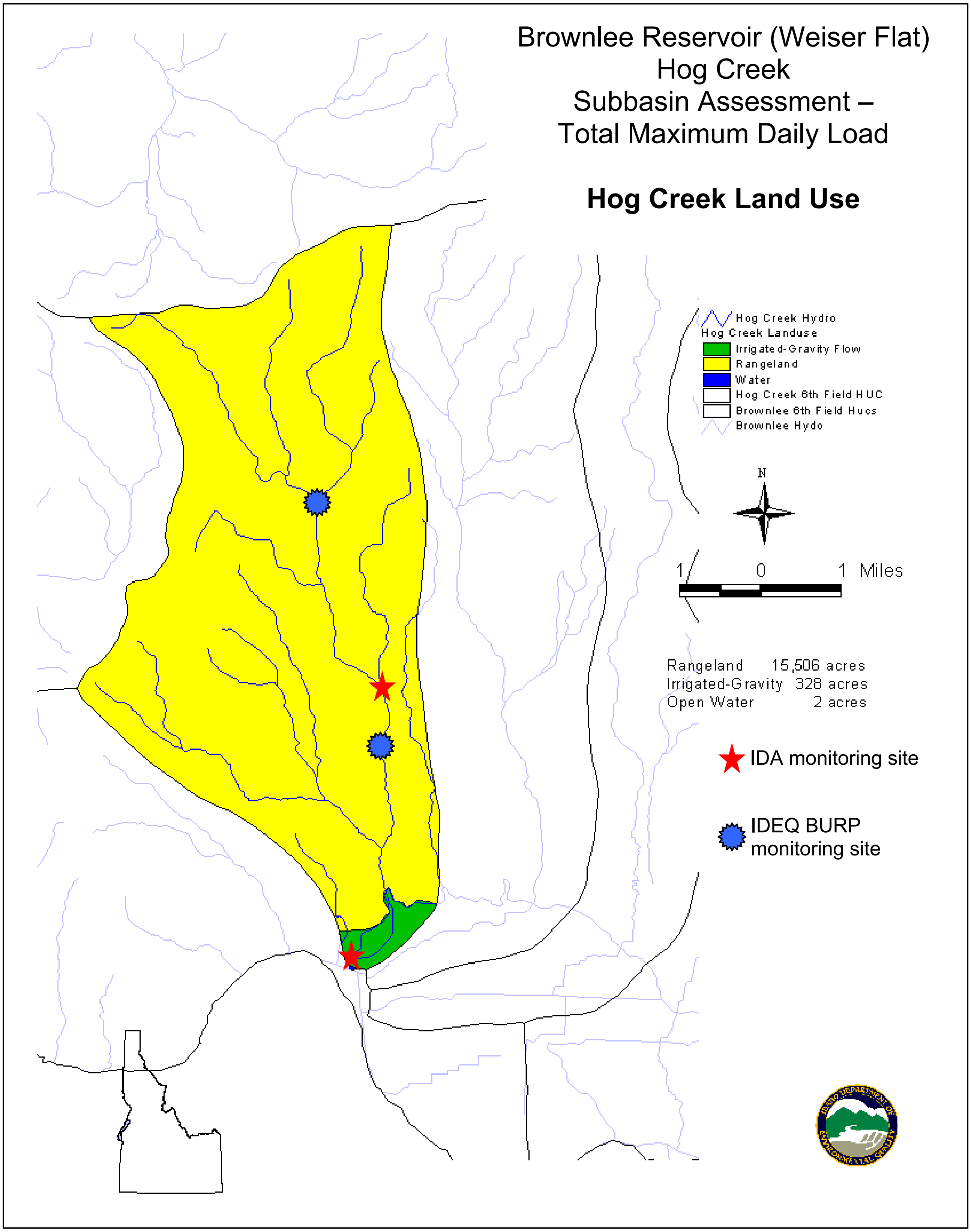

Figure 1.6 Hog Creek Watershed, located in the Brownlee Reservoir (Weiser Flat) Subbasin.

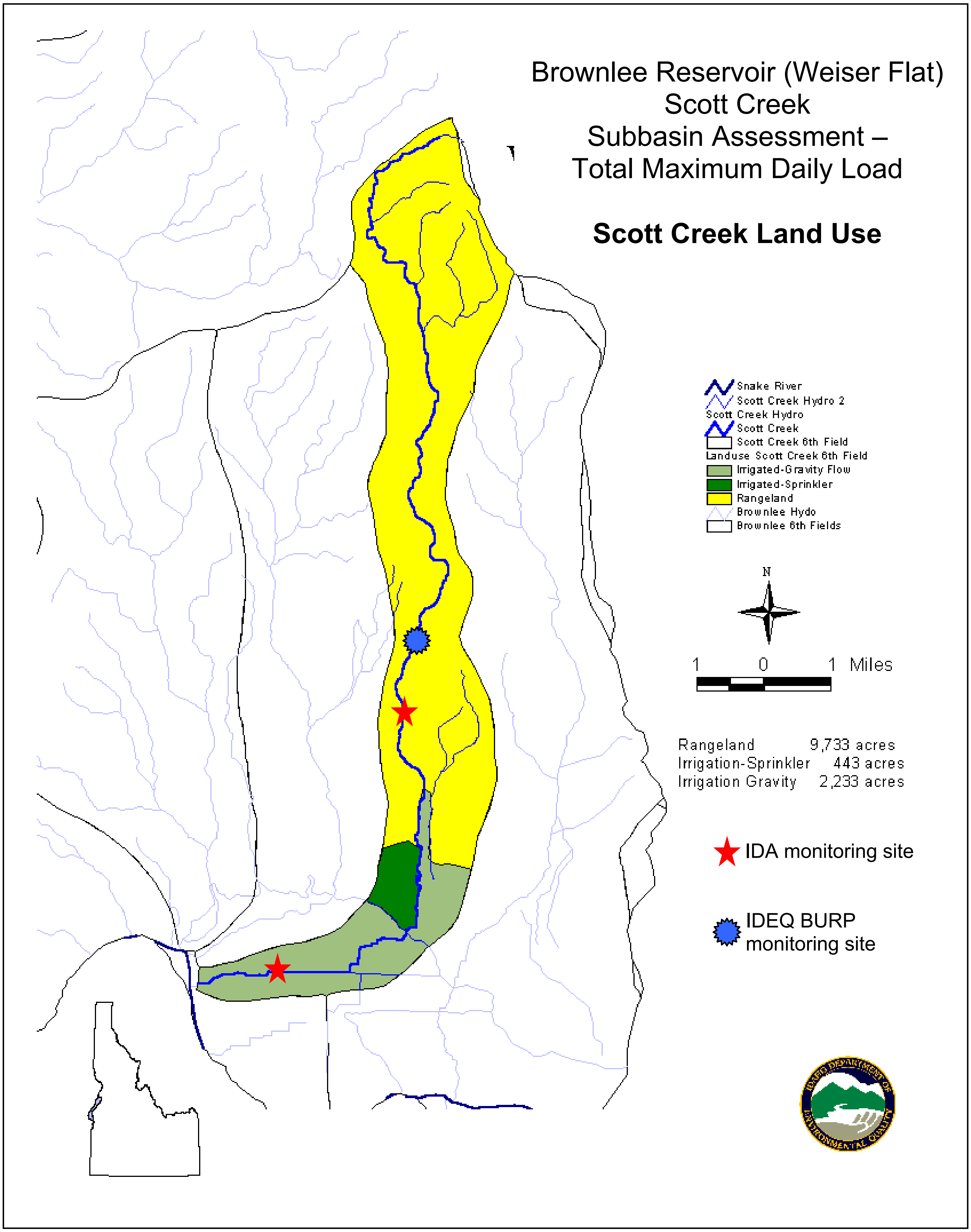

Figure 1.7 Scott Creek Watershed, located in the Brownlee Reservoir (Weiser Flat) Subbasin.

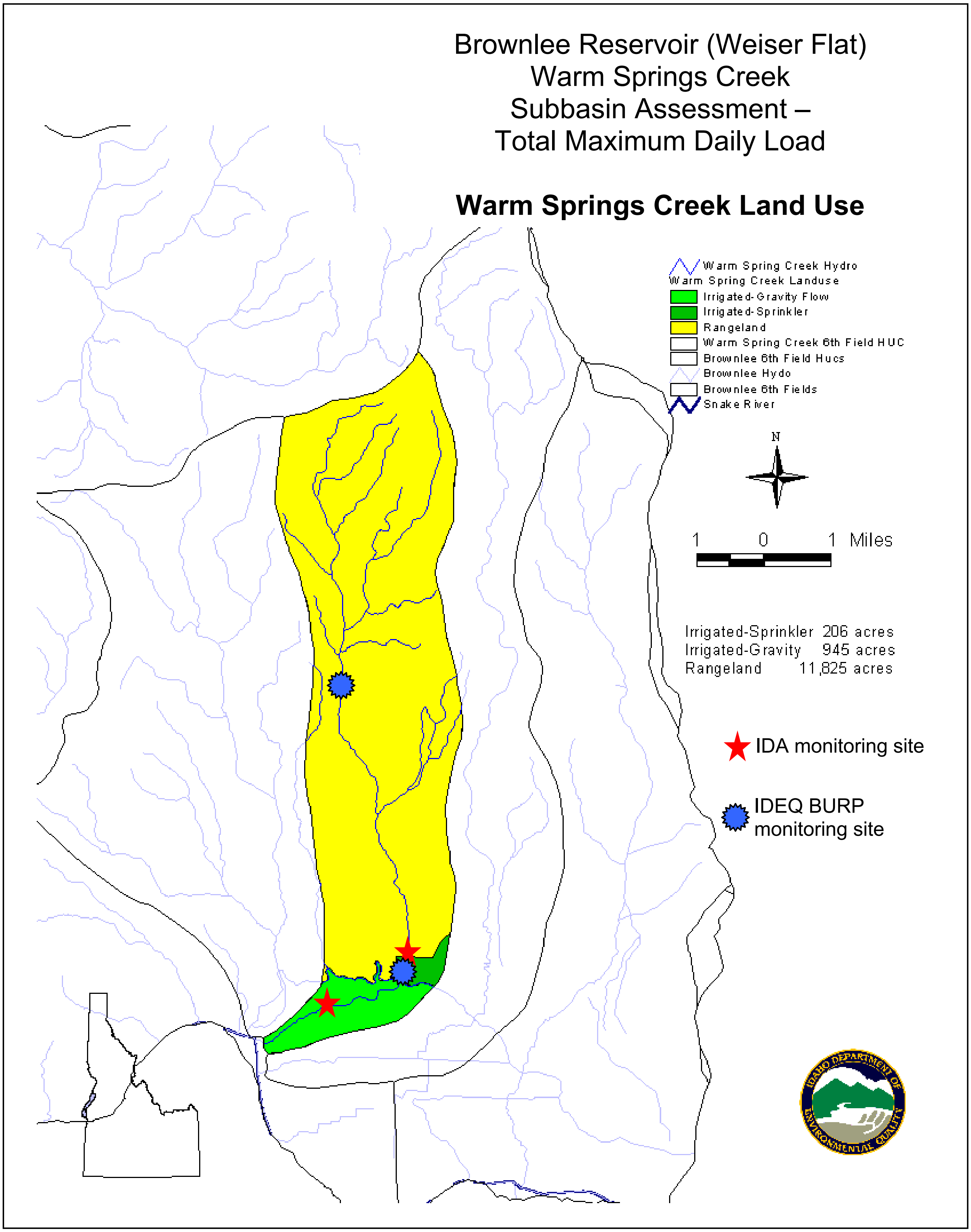

Figure 1.8 Warm Springs Creek Watershed, located in the Brownlee Reservoir (Weiser Flat) Subbasin.

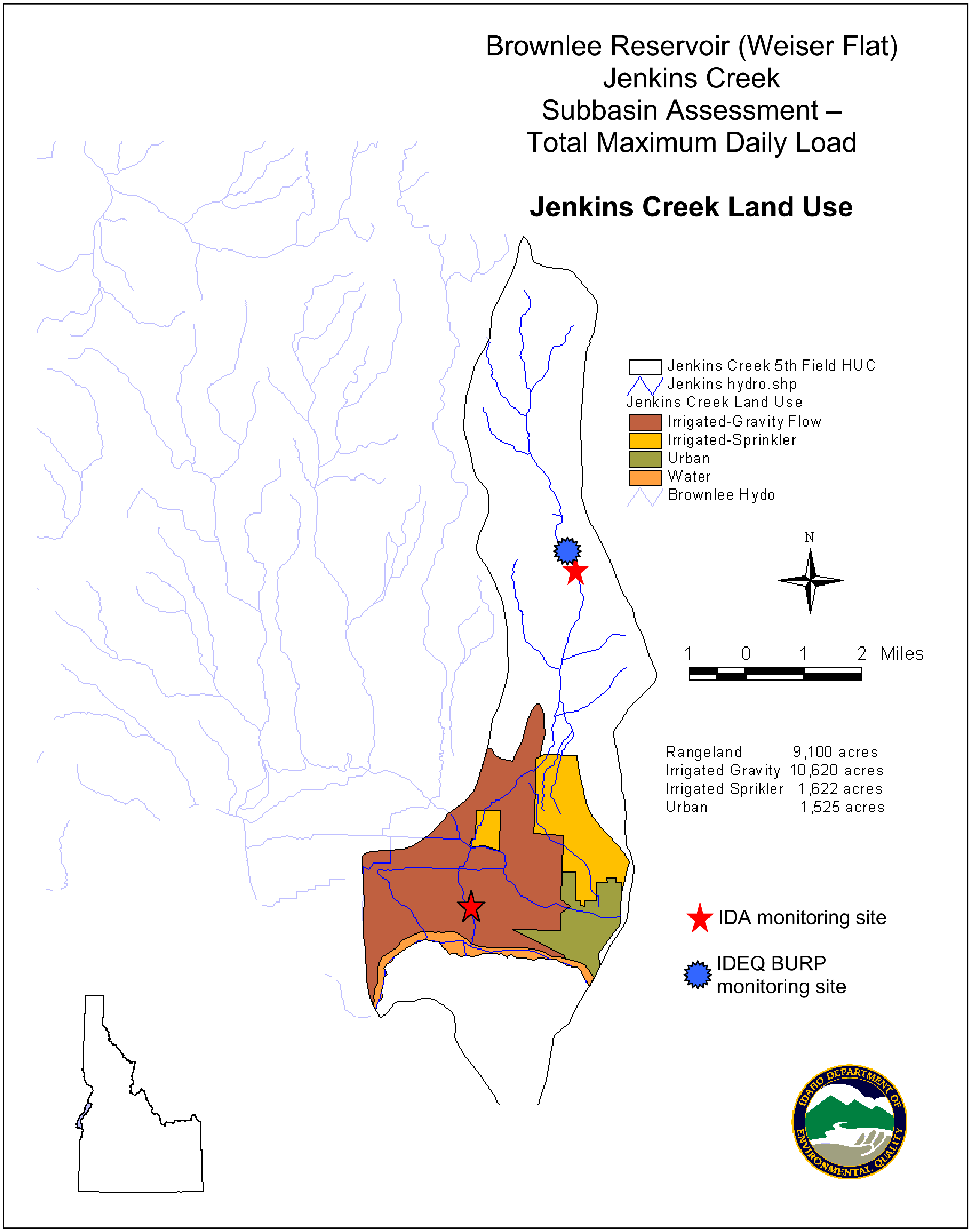

Figure 1.9 Jenkins Creek Watershed, located in the Brownlee Reservoir (Weiser Flat) Subbasin.

watersheds, the Dennett Creek watershed has moderately sloping, west to southwest trending ridges dividing the drainages of Dennett Creek's forks with associated steep sided spur ridges. The watershed is characterized by steep topography dominated by grassland, sagebrush and shrubfield vegetation. Conifer stands are restricted to steep north facing upper slopes.

Hog Creek
Hog Creek (Figure 1.6) originates from springs in the Henley Basin at about 3,500 feet elevation. The main stem of Hog Creek is 9.9 miles in length and there are an additional 27.5 miles of mostly seasonal tributaries. Hog Creek is predominantly a second order stream although it becomes a third order stream for about 1.5 miles from where it enters the Snake River.

Scott Creek
Scott Creek (Figure 1.7) is a second order intermittent stream originating at 4,590 feet elevation from the southern end of the Hitt Mountains. The main stem of Scott Creek is 15.6 miles in length and there are an additional 14.4 miles of mostly seasonal tributaries. Portions of Scott Creek are intermittent (NRCS, 2000; ISDA, 2001).

Warm Springs Creek
Warm Springs Creek (Figure 1.8) is a third order, moderately sinuous stream originating at 3,900 feet elevation, south of the Hitt Mountains. The main stem of Warm Springs Creek is 12.6 miles in length and there are an additional 25.1 miles of mostly seasonal tributaries. As implied by the name, there are warm springs in the watershed.

Jenkins Creek
Jenkins Creek (Figure 1.9) is a third order, moderately sinuous stream originating at approximately 3,500 feet elevation, south of the Hitt Mountains. The main stem of Jenkins Creek is 13 miles in length with an additional 9.7 miles of mostly seasonal tributaries.

Physical and spatial attributes for these stream segments are summarized in Table 1.2.

Table 1.2 Physical and Spatial Attributes for §303(d) Listed Subwatersheds in the Brownlee Reservoir (Weiser Flat) Subbasin

Subwatershed	Area (acres)	Segment length (miles)	Elevation (feet)	Average Slope (feet/foot)
Dennett Creek	35,718	6.5	5,250 to 2,100	0.090
Hog Creek	15,836	9.9	3,500 to 2,100	0.027
Scott Creek	12,409	18.3	4,590 to 2,100	0.025
Warm Springs Creek	12,976	12.6	3,900 to 2,100	0.027
Jenkins Creek	22,867	13.0	3,500 to 2,100	0.020

Surface Water

Flows within the Snake River system are strongly seasonal. The majority of in-river flow is a result of snowmelt and runoff from those areas of the watershed where precipitation falls mostly as snow, although ground water does represent a substantial source in some areas. Snowmelt-driven flow regimes commonly result in low flows during the fall and winter months and high flows during the spring and early summer months. The total volume and timing of surface runoff is highly variable from year to year. In the upstream drainage areas of these creeks, ground water discharge to streams is generally constant throughout the year, but varies somewhat from year to year depending on the relative level of annual precipitation and the duration and timing of the snowmelt.

Dennett Creek
Dennett Creek (Figure 1.5) experiences seasonal high flows and summer cloudburst events that often lead to scouring of vegetation and soil from the stream channel, particularly in Middle Dennett Creek. A 1997 fish survey of Dennett Creek found that the stream channel downstream from the confluence of North Dennett Creek alternated between reaches with and without water.

Channel stability and riparian proper functioning condition (PFC) information is available for Dennett Creek. PFC surveys give information on bank stability and stream entrenchment. Streams with a riparian area in PFC are less susceptible to bank scour and are better able to filter runoff. An example of a field form used by the IDFG Conservation Data Center to assess PFC is included in Appendix E.

Hog Creek
Hog Creek (Figure 1.6) has moderately incised C4, C5 and G5 channel types. Portions of Hog Creek are intermittent (NRCS, 2000; ISDA, 2001). Flow in the lower portions of the creek during late summer is a result of irrigation runoff and overflow. Flow patterns in Hog Creek are discussed in Section 2.3. Bank stability was observed to be low and excessive width/depth ratios are present due to cantilever failures and bank slumpage (BLM, 2001 a and b).

Scott Creek
Portions of Scott Creek (Figure 1.7) are intermittent (NRCS, 2000; ISDA, 2001). Flow in the lower portions of the creek during late summer is a result of irrigation runoff and overflow. The stream channel has been altered in the Weiser Flat section for agricultural purposes. Flow patterns in Scott Creek are discussed in Section 2.3. A riparian survey on BLM land showed that all of the 4.4 miles surveyed were in PFC.

Warm Springs Creek
Portions of Warm Springs Creek (Figure 1.8) are intermittent (NRCS, 2000; ISDA, 2001). Flow in the lower portions of the creek during late summer is a result of irrigation runoff and overflow. In the lower section of the watershed, the stream channel has been altered (i.e. straightened) in places where it crosses agricultural land. The riparian area in the lower region has been constrained by access roads and fields. Flow patterns in Warm Springs Creek are discussed in Section 2.3. The lower portions of the creek are expected to have fairly high levels of percent fines since naturally the sediment supply to these stream types is moderate to high. The surface fines found in the BURP study do not indicate a great amount of disturbance in the upper site.

Jenkins Creek

Jenkins Creek (Figure 1.9) also functions in part due to irrigation runoff and overflow in the late summer months. In the lower section of the watershed, the stream channel has been altered (i.e. straightened) in places where it crosses agricultural land. The riparian area in the lower region has been constrained by access roads and fields.

Ground Water

Dennett Creek overlies Quaternary Snake River Basalts, while Hog, Scott, Warm Springs and Jenkins Creeks overlie Columbia River Basalt. The sediments above the basalts generally yield restricted quantities of ground water to domestic and stock watering wells while the basalt aquifers generally yield quantities suitable for irrigation and municipal supplies (Young *et al.,* 1977).

Recharge to the basalt aquifers is primarily from precipitation and stream leakage that enters fractures and joints in the basalts where exposed in the highlands. The sedimentary aquifers are primarily recharged by irrigation water, stream leakage and snowmelt (Young *et al.,* 1977). Ground water flow is generally from northeast to southwest.

The following discussion focuses on the shallow aquifer in the Weiser Flat area specific to Hog, Scott, Warm Springs and Jenkins Creeks. In the Weiser Valley, the shallow aquifer is unconfined to semi-confined and provides both agricultural and drinking water. Ground water is also used to meet virtually all domestic, public supply and industrial requirements in the Snake River Basin (USBR, 1998).

Generally, the shallow aquifer is composed of sand and gravel from Snake and Weiser River deposits. A silt and clay layer in the first 20 feet is thought to be from “slackwater” deposits of the Lake Bonneville Flood.

Within the Snake River Basin, surface and ground water systems are commonly interconnected. Changes in ground water recharge or discharge have been observed to affect surface water flows (DEQ, 1988). Similarly, infiltrating water from irrigation systems and streamflows represent a significant portion of the ground water budget (IDWR, 2000).

The thickness of the shallow aquifer ranges from 5 to 200 feet and averages 20 feet. The aquifer is generally saturated throughout and recharge is from seepage and percolation. Irrigation is a major factor in recharge; precipitation plays only a minor role.

While there are exceptions in some cases where concerted efforts have been made to prevent or reverse negative impacts, general ground water quality trends in the watershed indicate an increasing occurrence of nitrate contamination. In a 1995 well testing study conducted by the Weiser River Soil Conservation District (SCD), Washington County Farm Bureau, University of Idaho and the Idaho State Department of Agriculture (ISDA), 30 percent of the 89 wells tested had nitrate levels above the state drinking water standard. The Weiser Flat area has been identified as a 2001 Nitrate Priority Area. Due to the overlap in pollutant sources for ground and surface water, nitrates concentrations occurring in these creeks will be monitored to assist in understanding of connectivity and effectiveness of the implementation measures associated with the ground water management plan.

1.3 Cultural Characteristics

Land Use and Ownership - Historical and Current

Dennett, Hog, Scott, Warm Springs and Jenkins Creeks are located along the Snake River in Washington County, Idaho (Figure 1.10). The county, located in southwestern Idaho, is home to approximately 10,000 residents. The city of Weiser, with approximately 5,600 residents, is the largest population center in the subbasin.

Land use within the Brownlee Reservoir (Weiser Flat) Subbasin is predominantly agricultural with a small amount of forested and urban/suburban acreage. Due to the arid climate, agriculture in this area is heavily dependent on irrigation. Sources of irrigation water include surface water and ground water. Agricultural water use is seasonal, correlating strongly with the summer growing season and reflecting local temperature and precipitation variations. While still providing the primary economy of the basin, agriculture is slowly being replaced by urban/suburban and industrial land uses. In the early 1900s, over 90 percent of Idaho's population was rural, by the 1950s this had dropped to about 50 percent, in 1998 this figure had dropped to 36 percent. Over the last 10 years the number of farms and farm acres have decreased in the state of Idaho, down by nearly 20 percent between 1969 and 1997. The number of individuals listing their primary occupation as farmer on the 1997 Census of Agriculture decreased by 17.2 percent between 1987 and 1997 (IDC, 1999). As the urban population has increased, recreational usage in the Snake River Basin has also increased. Recreation now represents a significant contribution to the local economy. Most recreational use within the watershed occurs during the summer season, but some level of recreational use occurs year round. Most recreational use of the Brownlee Reservoir (Weiser Flat) Subbasin is dependent on water quality and aquatic habitat.

Dennett Creek

Dennett Creek (Figure 1.5) is located in a more remote area than the Weiser Flat streams and has a history of mining activity; domestic livestock grazing is currently the primary anthropogenic activity in the Dennett Creek subwatershed. The subwatershed is split between forested land (51.4%) and rangeland (48.2%) with only a very small portion (0.4%) of irrigated land in the northern portion of the subwatershed. Historically, Dennett Creek was an active mining area but now is mainly used as rangeland. There has been logging in the highest elevations of the subwatershed. A dirt road runs along almost the entire length of the main fork of Dennett Creek.

Hog Creek

Hog Creek (Figure 1.6) subwatershed is predominantly rangeland (97.9%) with only a very small portion (2.1%) of irrigated land in the southern portion of the subwatershed. Hog Creek is affected by dirt roads and domestic livestock and wildlife grazing in the upper reach and intensive agricultural activity in the lower reach. Henley Basin Road contributes sediment loads to Hog Creek during rainfall events and spring runoff (BLM, 2001 a and b).

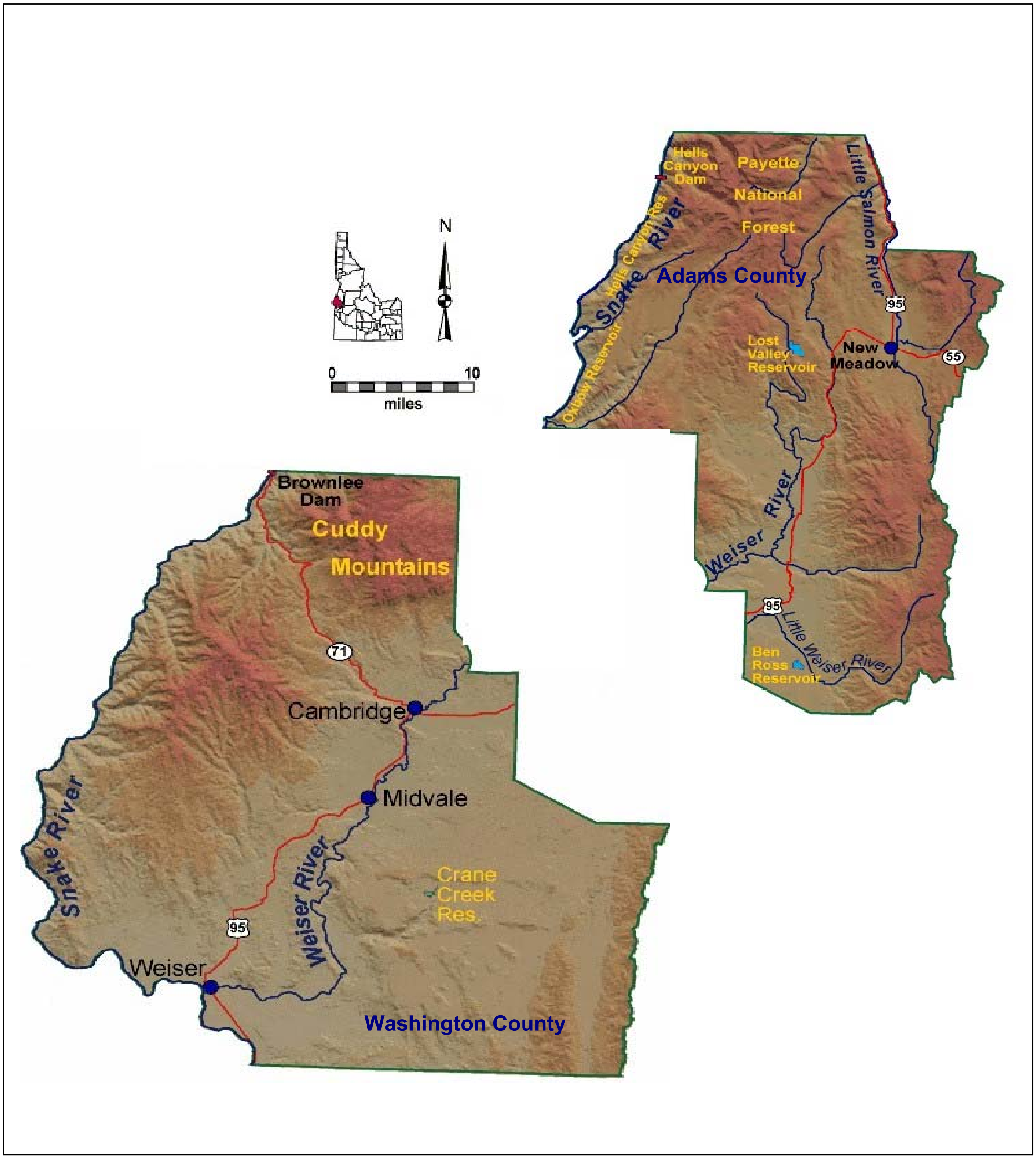

Figure 1.10 Washington County, Idaho and Adams County, Idaho, the Brownlee Reservoir (Weiser Flat) Subbasin area.

A beef cattle wintering area of about 150 head exists in the area, but it is fenced off from the creek. There is also a feedlot with a 300 head (cattle) capacity but the potential runoff to the creek is small due to the installation of waste lagoons.

Scott Creek

The Scott Creek subwatershed (Figure 1.7) is predominantly rangeland (78.4%) with some irrigated land (21.6%) in the southern portion of the subwatershed. Scott Creek is affected by various activities including agriculture and domestic livestock grazing. Utilization pattern mapping on the BLM allotment showed that most of the land received light use with moderate use along Scott Creek (BLM, 2001 a and b).

Warm Springs Creek

The Warm Springs Creek subwatershed (Figure 1.8) is mostly private land. There is a small section of BLM land in the upper watershed. The subwatershed is predominantly rangeland (91.1%) with a small amount of irrigated land (9.6%) in the southern portion of the subwatershed. There are three small, winter feeding operations for cattle in the area with 150 head of cows each.

Jenkins Creek

The Jenkins Creek subwatershed (Figure 1.9) is divided up into rangeland (39.8%) and irrigated land (53.5%). Irrigation occurs primarily in the southern portion of the subwatershed. Crop rotations include sugar beets, onions, alfalfa and grain crops. Urban/suburban land use in the southeast portion of the subwatershed represents 6.7 percent of the total acreage. Land use attributes for these subwatersheds are summarized in Table 1.3.

Table 1.3 Land Use Attributes for Subwatersheds in the Brownlee Reservoir (Weiser Flat) Subbasin

Watershed	Irrigated acreage (%)	Rangeland acreage (%)	Forested acreage (%)	Urban/suburban acreage (%)
Dennett Creek	132 (0.4%)	17,233 (48.2%)	18,353 (51.4%)	0 (0.0%)
Hog Creek	328 (2.1%)	15,506 (97.9%)	0 (0.0%)	0 (0.0%)
Scott Creek	2,676 (21.6%)	9,733 (78.4%)	0 (0.0%)	0 (0.0%)
Warm Springs Creek	1,251 (9.6%)	11,825 (91.1%)	0 (0.0%)	0 (0.0%)
Jenkins Creek	12,242 (53.5%)	9,100 (39.8%)	0 (0.0%)	1,525 (6.7%)

Tribal Use

Native Americans that used this area historically include the Nez Perce, Shoshone, Bannock and Paiute Tribes. The primary use of the area is identified as a travel route. Several small-scale surveys by BLM archaeologists have recorded prehistoric and historic isolated artifacts, open campsites, lithic scatters, pit houses, burials, quarries, rock shelters and other types of sites. This area may contain archaeological, historic and sacred or religious sites important to Native Americans (BLM, 2001 a and b).

Agriculture

Agriculture in these subwatersheds includes both irrigated and non-irrigated uses; the latter includes crop production and open-range domestic livestock grazing. The Dennett Creek subwatershed is predominantly rangeland with some forested areas in the higher elevations as shown in Figure 1.5. The Hog Creek subwatershed is also predominantly rangeland but the southern most portion of the watershed (approximately 2 percent of the watershed area) is irrigated agriculture as shown in Figure 1.6. The Scott Creek subwatershed is predominantly rangeland in the upstream portion of the watershed and irrigated agriculture in the lower elevations as shown in Figure 1.7. The Warm Springs Creek subwatershed is mainly rangeland and about 8 percent of the total watershed area is irrigated agricultural land in the lower portion of the watershed as shown in Figure 1.8. The Jenkins Creek subwatershed is mostly rangeland (39.8%) and irrigated land (53.5%), with a small amount of urban/suburban land use in the southeast portion of the subwatershed (6.7%). The Natural Resources Conservation Service (NRCS) (2000) reports that there are several animal feeding operations in the area, mainly winter feeding operations. There is one large feedlot operation (hosting 300 head of cattle) in the Hog Creek watershed and that operation has installed waste lagoons.

From early settlement to the late 1960s and 1970s, the predominant irrigation practices included furrow and flood irrigation techniques. In the first case, water is diverted from a larger surface water supply (creek, canal, ditch, etc.) and allowed to move laterally down a secondary ditch or furrow, saturating the adjacent soil. In flood irrigation, water is allowed to move across the top of the soil in a sheet and saturation occurs from the surface downward. During the 1960s and 1970s, sprinkler systems were constructed in many areas of the Snake River Basin, allowing lands that were previously not irrigated due to elevation or location to be brought under irrigation. Furrow, flood, sprinkle and drip irrigation methods continue to be used in many areas of the basin.

The agricultural trend in these watersheds (excluding Dennett Creek) has been a shift from small dairies with pasture and hayland to intensive row cropping with an accompanying increase in the use of fertilizers and herbicides.

In the downstream areas of Hog, Scott, Warm Springs and Jenkins Creeks, nitrate and phosphate levels in ground water are high. Efforts have been undertaken in many areas of the drainage to reduce the negative impacts of past practices and restore water quality. Riparian restoration, domestic livestock grazing and irrigation management improvements are being applied on a voluntary basis in some areas. While these projects cannot promise instant improvements in water quality, over time concerted efforts show positive results such as reductions in the amount of fertilizers and pesticides being applied.

Mining

There is no active mining in these subwatersheds. Minerals were discovered in the Dennett Creek watershed around 1870 and mining activity peaked around 1890. Silver, lead, gold and copper were all mined in the area. Over the 45 years that silver was intermittently mined

in the area, an estimated 50,000 pounds of silver was extracted, most of which was obtained before 1890. The town of Mineral, located in the upper watershed, had two smelters and numerous residences, saloons and stores. The peak population was about 1,000 people. Only derelict buildings and the remains of a smelter remain today.
An open pit gypsum mine was historically located at the top of the divide between the main and Middle Forks of Dennett Creek. The mine is not active at this time.

Urbanization

Idaho has been predominantly rural from its initial settlement until the fairly recent past (~1960). Original territory and later state economies were based on agriculture (livestock and irrigated croplands), timber and mining. Over the last 30 years, significant population increases have occurred. Although the majority of population growth has been centered primarily around the municipality of Boise, the city of Weiser, which is the closest population center to these streams has experienced a slight shift from agricultural-based land use to more urban/suburban land use. Over the past 10 years, Weiser's population has grown nearly 20 percent. Although the Hog Creek, Scott Creek, Warm Springs Creek and Jenkins Creek watersheds have experienced some growth in the Weiser Flat area, they still remain lightly populated in the lower elevations of the watersheds and completely unpopulated in the uppermost elevations of the watersheds. Dennett Creek watershed is farther north and is sparsely populated. As with the expansion of agricultural land use discussed earlier, increasing urbanization also results in increased pressures on environmental quality.

Urban/suburban runoff from impervious surfaces and roadways, lawn-based fertilizers and pesticides, poorly treated effluent from failing or improperly functioning septic systems and many other factors negatively affect both ground and surface-water quality (DEQ, 1998a; Arnold and Gibbons, 1996; Chandler, 1994). Advancements in wastewater and stormwater treatment have resulted in reductions in loading to surface water systems over the past two decades.

Recreation

Recreation within these creeks historically included many of the same opportunities available today. Accounts detailing fishing, hunting and camping are plentiful from the time of the first recorded contact with the area by both native peoples and the white settlers who came later. Early recreational use was limited by accessibility and flow volume in some areas, but continued to grow as the local population increased.

Most, if not all, of these recreational opportunities are directly dependent on water quality in one form or another. Activities such as fishing and wading depend on the attainment of water quality standards for safety in contact recreation and for adequate habitat for aquatic life. Somewhat less obvious is the link between recreational activities such as hunting, hiking or camping and water quality. However, wildlife habitat and forest and riparian area health can be directly affected by water quality. Water also provides an aesthetic component to many land-based activities that do not require a body of water but are generally enhanced by association with water (USBR, 1998). Operational and flow management conditions can also have a substantial affect on recreational uses. Both direct usage and local economies may be affected to a noticeable degree by water quality and water quantity management practices. Recreational opportunities specific to these streams are described in more detail below.

Fishing/Wading
Fishing activity peaks in early summer after the spring runoff and remains high through October. Fishing is popular in Dennett and Scott Creeks while light fishing activity occurs in the lower reaches of Hog and Warm Springs Creek during times that bass and crappie come up from the Snake River. Because of the low water levels observed in these stream segments during the summer season, primary contact recreation such as swimming or diving is not likely to occur. Secondary contact recreation such as wading occurs seasonally in some areas of these stream segments.

Wildlife Viewing
Like fishing, wildlife viewing is a popular recreational activity in these watersheds. The variety of wildlife inhabiting these streams and their adjacent subwatersheds is listed in previous sections. Bird watching is an activity that is growing in popularity in many areas of the subbasin.

Hunting
Hunting is another popular recreational activity in these watersheds. Wildlife that are hunted or trapped in the area include bear, deer, mountain lions, elk and a multitude of birds. These creeks are all in important winter habitat for elk and deer. There are established hunting seasons for a number of these animals as well as for various types of waterfowl and upland birds in the fall and winter months. All the creeks receive moderately heavy local hunting use, while Dennett Creek is heavily used by both locals and non-residents alike.

Camping
There are no formal campgrounds on any of these subbasins although camping may take place informally on public land, particularly in the Dennett Creek Watershed.

Trail Use
In the Dennett Creek Watershed, the primary landowner has allowed private land to be used by hikers, equestrians, mountain bikers, campers and hunters. Offroad vehicle use is technically limited to existing trails; however there has been a significant amount of offroad vehicle use away from the existing trails. Concern about trail cutting may cause future limits on offroad vehicle access. Access to public lands is limited in Hog Creek, Scott Creek, Warm Springs Creek and Jenkins Creek.

History and Economics

Water is a scarce commodity in this area and helps to fuel local business and industry through agriculture and recreation. The economy of these watersheds is fueled predominantly by agriculture and domestic livestock grazing. Agriculture is in turn heavily dependent on irrigation. Sources of irrigation water include these creeks and ground water. Agricultural water use is seasonal, correlating strongly with the summer growing season and reflectant of local temperature and precipitation variations. While still providing the primary economy of these subwatersheds, the lower ends of Hog Creek, Scott Creek, Warm Springs Creek and Jenkins Creek are experiencing an increase in small ranchette size parcels as the city of Weiser grows in size and attracts population from such towns as Payette and Ontario. Over the past 10 years, Weiser has increased in size almost 20 percent (personal communication, Weiser City Clerk, 2001). Currently the population is 5,600 and as the population increases, more development is occurring in the lower reaches of Hog Creek, Scott Creek, Warm Springs Creek and Jenkins Creek. Dennett Creek is in a more remote area and has not experienced substantial growth.

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2. Subbasin Assessment – Water Quality Concerns and Status

This section represents an assessment of water quality concerns and status for Dennett, Scott, Hog, Warm Springs and Jenkins Creeks located in the Brownlee Reservoir (Weiser Flat) Subbasin. This assessment is a joint effort between DEQ and local stakeholders, with participation by the EPA.

2.1 Water Quality Limited Segments Occurring in the Subbasin

Under section 303(d) of the CWA, waters that are not able to support their beneficial uses and do not meet water quality standards even with the implementation of technology-based effluent limits (40 CFR 130.7(b)) are listed as water quality limited waters. These waters are required to have a TMDL developed to bring them back into compliance with water quality standards. Table 2.1 outlines listed pollutants for each listed creek in this TMDL reach. A further discussion of the pollutant listings, available data, beneficial uses and evidence of non-compliance with standards is contained in the following sections.

Table 2.1 Dennett Creek, Hog Creek, Scott Creek and Warm Springs Creek §303(d) Listed Pollutants*

Segment	HUC – WQLS#	AU/WBID#	Idaho §303(d) Listed Pollutants	Data Source
Dennett Creek (headwaters to the Snake River)	17050201 - #2825	17050201 SW012_02	Flow alteration, temperature, sediment	305(b) list, Appendix D
Hog Creek (headwaters to the Snake River)	17050201 - #2829	17050201 SW008_02 SW008_03	Nutrients, sediment	305(b) list, Appendix D
Scott Creek (headwaters to the Snake River)	17050201 - #2830	17050201 SW006_02 SW006_03	Nutrients, sediment	305(b) list, Appendix D
Warm Springs Creek (headwaters to the Snake River)	17050201 - #2828	17050201 SW007_02 SW007_03	Nutrients, sediment	305(b) list, Appendix D

HUC = Hydrologic Unit Code, WQLS# = Water Quality Limited Segment number, AU/WBID# = Assessment Unit/Water Body Identification Number
* Jenkins Creek was delisted in 1998.

Some common water quality issues occur in more than one of these creeks. The following sections will outline these general issues by pollutant. More detailed and individually relevant discussions will be offered under the discussion of each stream segment. Those pollutants that only appear in a single segment are presented in the section for that individual segment. Discussion of general concerns below and in the segment specific sections that follow is not meant to indicate that all potential effects discussed in these sections occur within the listed segments. This is intended as general information only and should not be interpreted to imply that the full range of possible effects is currently occurring, or has ever occurred in these creeks.

Bacteria

Violations of the numeric criteria for bacteria in surface waters can result in health risks to individuals using the water for both primary and secondary contact recreation. Such activities carry the potential for ingestion of small quantities of water.

The most common source of bacteria applicable to these stream segments is wastes from warm-blooded animals (domestic animals, humans and wildlife). Wastes may enter the system directly, be carried in through tributary or agricultural inflows, or may be the result of improper disposal of fishing or camping wastes. Septic system wastes may be present but are most likely not present not in the densities required to generate the bacteria concentrations observed.

Nutrients

Violations of the narrative criteria for nutrients in surface waters can result in nuisance aquatic growth (both algae and rooted plants) which can adversely affect aquatic life, agricultural water supply and recreational water uses. In addition to the direct effects of excessive algae growth, when algae die, they sink slowly through the water column, eventually collecting on the bottom sediments. The biochemical processes that occur as the algae decompose remove oxygen from the surrounding water. Low dissolved oxygen in these areas can lead to decreased fish habitat and even fish kills if there are not other areas of water with sufficient dissolved oxygen available where the fish can take refuge. Both living and dead (decomposing) algae also can affect the pH of the water due to the release of various acid and base compounds during respiration and photosynthesis. Additionally, low dissolved oxygen levels caused by decomposing organic matter can lead to changes in water chemistry and release of sorbed phosphorus to the water column at the water/sediment interface.

There are many sources and conditions that contribute to phosphorus in the environment. Anthropogenic (man-made) causes of excess nutrients including applied fertilizers in farming or landscaping, livestock grazing, the creation of artificial waterways and water levels through agricultural practices and the presence of septic waste (treated and untreated) in the surface, subsurface and ground water of a region. Natural sources of nutrients in the form of geologic deposits (mineral constituents of certain rock types) are also known to occur within the Snake River Basin.

Sediment

Both suspended and bedload sediment can have negative effects on aquatic life. Many fish species are adapted to high suspended sediment levels for short periods of time as such events commonly occur during natural spring runoff. However, longer duration exposure to high levels of suspended sediment can interfere with feeding behavior, damage gills, reduce available food, reduce growth rates, smother eggs and fry in the substrate, damage habitat and in extreme cases eventually lead to death. Eggs, fry and juveniles are particularly sensitive to suspended sediment, although at high concentrations adult fish are affected as well.

Newcombe and Jensen (1996) reported the effects of suspended sediment on fish; summarizing 80 published reports on suspended sediments in streams and estuaries. For rainbow trout, lethal effects, which include reduced growth rate, begin to be observed at concentrations of 50 to 100 mg/L when those concentrations are maintained for 14 to 60 days. Similar effects were observed for other species. Adverse effects on habitat, especially spawning and rearing habitat, were noted at similar concentrations.

Bedload sediment (sediment particles too large or heavy to be suspended, but still transported by flowing water), can also adversely affect aquatic species. As sand and silt wash downstream, they can cover spawning gravels. This increases cobble embeddedness in the streambed. If it occurs during incubation or while small fry are using the spawning gravels, this sediment covering can reduce intergravel dissolved oxygen (DO) levels and smother eggs or juvenile fish. Accumulation of sand and silt on stream bottoms can also directly limit the availability of spawning gravels, thus reducing habitat for salmonid and other bed spawning species. Organic suspended sediments can also settle to the bottom and, due to their high carbon content, can lead to low intergravel dissolved oxygen.

Common sources of sediment within the creeks are predominantly erosion-based as well as from instream biological productivity. Sediment may originate from natural causes such as landslides, forest or brush fires or high flow events; or from anthropogenic sources such as erosion from roadways, agricultural lands, urban/suburban stormwater runoff and construction sites. Sediment loads within the system are highest in the spring when high flow volumes and velocities result from snowmelt in higher elevations. Sediment transport and delivery is directly associated with increased flow volumes and high flow velocities.

2.2 Applicable Water Quality Standards

Water quality standards under the CWA consist of three main components: designated beneficial uses, water quality criteria that are established to protect designated beneficial uses and antidegradation policies and procedures. Water quality criteria can be either numeric limits for individual pollutants and conditions, or narrative descriptions of desired conditions.

Surface water beneficial use classifications are intended to protect surface water uses. DEQ designates beneficial uses for selected waterbodies as outlined in ISDAPA 58.01.02.140. All surface waters within the state are designated for agricultural and industrial water supply, wildlife habitat and aesthetics. Waters without specific beneficial use designations are defined as undesignated waters.

Idaho Code states: "…undesignated waters shall be protected for beneficial uses, which includes all recreational use in and on the water and the protection and propagation of fish, shellfish and wildlife wherever attainable." (IDAPA 58.01.02.101.01). Therefore, in the case where waters are undesignated, DEQ presumes that most waters in Idaho will support cold water aquatic life and, depending on the characteristics of the water body, primary or secondary contact recreation (IDAPA 58.01.02.101.01a). Cold water aquatic life use support determination procedures, apply to undesignated, perennial waters to protect these presumptive uses. If an undesignated surface water body is intermittent (i.e. has zero flow at some time during most years), then aquatic community indexes cannot be applied; however, numeric criteria do apply to intermittent waters during periods of optimal flow (IDAPA 58.01.02.003.51, IDAPA 58.01.02.070.07).

Additionally, under the CWA, any uses that existed or were presumed to exist in a waterbody in November 1975 are required to be protected as existing uses. The designation of existing uses for protection generally applies to segments where beneficial uses are not formally designated.

While the statewide designations of agricultural and industrial water supply, wildlife habitat and aesthetics apply, no specific use designations have been made for Dennett, Hog, Scott, and Warm Springs Creeks. These streams are all undesignated waters and are therefore presumed to support cold water aquatic life, propagation of fish, shellfish and wildlife and primary or secondary contact recreation. Jenkins Creek is designated for cold water aquatic life and primary contact recreation.

Table 2.2 gives a complete listing of all presumed and statewide beneficial uses for each listed segment.

Table 2.2 Dennett Creek, Hog Creek, Scott Creek and Warm Springs Creek Beneficial Uses

Segment	Beneficial Uses
Dennett Creek (headwaters to the Snake River)	*Undesignated segment:* presumed to support cold water aquatic life and secondary contact recreation *State-wide:* agricultural and industrial water supply, wildlife habitat and aesthetics
Hog Creek (headwaters to the Snake River)	*Undesignated segment:* presumed to support cold water aquatic life and secondary contact recreation *State-wide:* agricultural and industrial water supply, wildlife habitat and aesthetics
Scott Creek (headwaters to the Snake River)	*Undesignated segment:* presumed to support cold water aquatic life and secondary contact recreation *State-wide:* agricultural and industrial water supply, wildlife habitat and aesthetics
Warm Springs Creek (headwaters to the Snake River)	*Undesignated segment:* presumed to support cold water aquatic life and secondary contact recreation *State-wide:* agricultural and industrial water supply, wildlife habitat and aesthetics
Jenkins Creek (headwaters to the Snake River)	*Designated*: cold water aquatic life and primary contact recreation *State-wide*: agricultural and industrial water supply, wildlife habitat and aesthetics

Table 2.3 summarizes the Idaho water quality criteria specific to this TMDL effort and lists specific citations where the full code language can be found. Detailed citations of Idaho State Standards can be found in Appendix B.

Table 2.3 Idaho Water Quality Standards and Criteria Summary		
Parameter	**Idaho Water Quality Standard**	**Idaho Administrative Code**
Temperature Cold Water Aquatic life	22 °C or less **AND** no greater than 19 °C maximum daily average	250.02.b
Dissolved Oxygen (DO) Cold Water Aquatic Life	Greater than 6.0 mg DO/L; except in hypolimnion of stratified lakes and reservoirs and the bottom 7 meters in lakes and reservoirs with greater than 35 meters depth	250.02.a
pH	6.5 to 9.5 standard units	250.01.a
Bacteria	Less than 126 *E. coli* organisms/100 mL as a 30 day log mean with a minimum of 5 samples **AND** no sample greater than 576 *E. coli* organisms/100 mL (Secondary contact recreation)	251.01.a & b
Nuisance Algae	Surface waters shall be free from floating, suspended or submerged matter of any kind in concentrations causing nuisance or objectionable conditions or that impair designated beneficial uses and be free from oxygen-demanding materials in concentrations that would result in an anaerobic water condition	200.05 & 07
Nutrients	Surface waters shall be free from excess nutrients that can cause visible slime growths or other nuisance aquatic growths impairing designated beneficial uses	200.06
Turbidity	Sediment shall not exceed quantities specified for aquatic life or water supply designations, or, in the absence of specific sediment criteria, quantities which impair designated beneficial uses Turbidity requirements for aquatic life uses shall be less than 50 NTU above background for any given sample **OR** Less than 25 NTU for more than 10 consecutive days (below any applicable mixing zone set by the DEQ)	200.08 250.02.d

Bacteria

State of Idaho water quality criteria require waterbodies where primary contact recreation occurs to contain less than 126 *E. coli* organisms/100 mL water (see Tables 2.3 and 2.4 for details). For secondary contact recreation the standard is less than 576 *E. coli* organisms/100 mL of water. Because of the low water levels observed in these stream segments during the summer season, primary contact recreation is not likely to occur, therefore, secondary contact recreation criteria apply.

Nutrients

Hog, Scott and Warm Springs Creek are listed for nutrients on the 1998 state §303(d) list. The water quality standards and guidance values identified for excess nutrients and sediment are narrative criteria that require a numeric interpretation based on local conditions.

A narrative standard for nutrients is appropriate given that the associated problems (excessive growth, low dissolved oxygen, etc.) can occur under a range of concentrations and are related to system characteristics such as flow, temperature, water column mixing, light penetration and water depth. Interpretation of the narrative standard on a site-specific basis is necessary to identify targets that will be protective of beneficial uses within the listed segment as well as those downstream uses that may be degraded by nutrient or sediment loading carried by inflowing surface waters.

The beneficial uses determined to be most at risk from excess nutrients were those associated with recreation and aquatic life. Dennett Creek discharges into the Brownlee Reservoir segment of the SR-HC TMDL reach. Hog Creek, Scott Creek, Warm Springs Creek and Jenkins Creek discharge into the Upstream Snake River segment of the SR-HC TMDL reach (Snake River mile 409 to 335).

The numeric target for nutrients (total phosphorus) that is applied in this TMDL was identified to protect and support designated beneficial uses in the SR-HC TMDL reach. This target has been calculated to be protective of cold water aquatic life, secondary contact recreation, agricultural and industrial water supply, wildlife habitat and aesthetics.

An instream nutrient target of 0.07 mg/L total phosphorus was identified through correlations of total phosphorus and algae concentrations, using chlorophyll *a* as a surrogate measure of algae biomass (DEQ, 2002). This information was further linked to the public's assessment of water quality specific to recreational and aesthetic use as interpreted from algae concentrations in surface waters. Using literature values for the nutrient concentrations at which discoloration occurred (10 ug/L to 30 ug/L chlorophyll *a*) and alga slimes were observed to occur, (greater than 30 ug/L chlorophyll *a*), along with data provided from similar determinations completed in other states (chlorophyll *a* threshold concentrations identified in Colorado, New Hampshire, Minnesota, South Carolina, North Dakota and New Mexico range from less than 50 ug/L to less than 15 ug/L), an estimate was made of the highest level of algae concentration that was acceptable to the general public without curtailing recreational and aesthetic water quality perceptions. This limit was then correlated to total phosphorus concentrations that would result in algal concentrations below this level. This information and the methodology used is discussed in detail in the SR-HC TMDL (DEQ, 2002).

The critical period for application of this target is from May through September. It is projected that attainment of this and other applicable water quality targets will result in support of beneficial uses within the listed stream segments and will contribute to attainment of beneficial use support in the SR-HC TMDL reach.

Due to the findings from the SR-HC TMDL (DEQ, 2002), total phosphorus has been defined as the nutrient of concern for these creeks. However, as further data are collected, the effects of existing nitrogen concentrations on these streams will be assessed. If nitrogen management is warranted, appropriate load allocations will be identified at that time and incorporated into the implementation planning for management of these tributary streams.

For detailed information on how the nutrient targets were identified, please refer to the SR-HC TMDL, Sections 3.2 and 3.5 (DEQ, 2002).

Sediment

Hog, Scott and Warm Springs Creeks are listed for sediment on the 1998 state §303(d) list. The water quality standards and guidance values identified for excess nutrients and sediment are narrative criteria that require a numeric interpretation based on local conditions. The sediment criteria is linked to turbidity and states that turbidity should be less than 50 nephelometric turbidity units (NTU) above background for any given sample and less than 25 NTU for any ten consecutive days. This latter criterion was originally developed to address point sources and incorporates mixing zones in the evaluation of violations.

A narrative standard for sediment is appropriate given that wide ranges of nutrient and sediment concentration and duration occur in surface waters. Interpretation of the narrative standard on a site-specific basis is necessary to identify targets that will protect beneficial uses within the listed segment as well as those downstream uses that may be degraded by nutrient or sediment loading carried by inflowing surface waters.

The designated beneficial uses within the SR-HC TMDL reach determined to be most at risk from excess sediment were those associated with aquatic life. Because sediment includes both organic and inorganic materials, direct and indirect impacts to aquatic life are possible. Dennett Creek discharges into the Brownlee Reservoir segment of the SR-HC TMDL reach. Hog Creek, Scott Creek, Warm Springs Creek and Jenkins Creek discharge into the Upstream Snake River segment of the SR-HC TMDL reach (Snake River mile 409 to 335).

The numeric targets for sediment that are applied in this TMDL were identified to protect and support designated beneficial uses in the SR-HC TMDL reach. They have been calculated to be protective of cold water aquatic life, secondary contact recreation, agricultural and industrial water supply, wildlife habitat and aesthetics.

Sediment targets were identified using studies authored for the Mid-Snake (DEQ, 1997c) and Lower Boise River TMDLs (DEQ, 1998a). The targets identified by the SR-HC TMDL (DEQ, 2002) of no greater than 50 mg/L total suspended solids (TSS) as a monthly average and no greater than 80 mg/L total suspended solids for events lasting less than 14 days, were shown to be protective of fish and other aquatic life while allowing for natural events that commonly produce elevated sediment concentrations for a limited duration.

For detailed information on how the sediment targets were identified, please refer to the SR-HC TMDL, Sections 3.2 and 3.5 (DEQ, 2002). Table 2.4 summarizes the water quality targets that will be applied as part of this TMDL effort.

2.3 Summary and Analysis of Existing Water Quality Data

The TMDL program is charged with using available data to assess the condition of §303(d) listed stream segments and determining what measures should be taken to bring waterbodies back into compliance. Available data for Dennett Creek, Hog Creek, Scott Creek, Warm Springs Creek and Jenkins Creek include data collected by the ISDA, US Bureau of Land Management (BLM) data, IDFG data and DEQ BURP data. The majority of the data were

Table 2.4 Pollutant Sources and Target Concentrations for Brownlee Reservoir (Weiser Flat) Subbasin § 303 (d) Listed Streams
Pollutant Target Concentrations
Bacteria: Less than 126 *E. coli* organisms/100 mL as a 30 day log mean with a minimum of 5 samples and no sample greater than 576 *E. coli* organisms/100 mL (IDAPA 58.01.02.251.01. a and b)
Nutrients: No greater than 0.07 mg/L total phosphorus from May through September (IDAPA 58.01.02.200.06 [narrative] and target from the SR-HC TMDL [numeric] DEQ, 2002)
Sediment: No greater than 50 mg/L total suspended solids as a monthly average and no greater than 80 mg/L total suspended solids for events lasting less than 14 days (IDAPA 58.01.02.200.08 [narrative] and targets from the SR-HC TMDL [numeric] DEQ, 2002)
Temperature: 22 ^{o}C or less instantaneous temperature and no greater than 19 ^{o}C maximum daily average (IDAPA 58.01.02.250.02.b)

collected between 1999 and 2001. The locations of DEQ BURP monitoring sites and the locations of ISDA monitoring sites are identified in Figures 1.5 through 1.9.

Information available from BLM and IDFG, including stream functioning assessments and on-site surveys, was used to evaluate Dennett Creek. Data from Dennett Creek were generally collected biweekly April through October 2000 and once a month from November 2000 to March 2001. Hog Creek, Scott Creek, Warm Springs Creek and Jenkins Creek were monitored by ISDA from 1999 through 2001. Nutrient, sediment, dissolved oxygen, pH, temperature, flow and bacteria data were collected. Generally, both upstream and downstream sites were selected in each stream segment. Upstream sites were located above areas of row crop. Downstream sites were located below areas with row crops. This monitoring strategy allowed delineation of pollutant loading from the nonpoint source categories (agriculture, domestic and wildlife grazing and roads).

DEQ BURP data, collected in 1995 and 1996, are available for all listed segments. DEQ BURP data, collected in 1998 are available for Warm Springs Creek. This monitoring employs multi-index scoring including the stream macroinvertabrate index (SMI), the stream fish index (SFI) and the stream habitat index (SHI) to help determine whether a stream is supporting its beneficial uses by integrating biological monitoring with physical habitat assessment to characterize stream integrity and water quality. The BURP information is primarily useful for assessing the middle range of the watershed for Hog, Scott and Warm Springs Creeks since BURP sites were located upstream of almost all agricultural activity and below the uppermost reaches. Monitoring locations are shown in Figures 1.5 through 1.9.

BURP data for Dennett Creek, Hog Creek, Scott Creek and Jenkins Creek were collected in 1995 and 1996 therefore; the status at the time of assessment may not reflect the current status. BURP data for Warm Springs Creek were collected in 1998 and is considered representative of current conditions for the purposes of this TMDL.

In the data sets available, variations between water years occur because of differences in crop rotation, irrigation management, domestic livestock grazing management, ambient temperatures and precipitation amounts/patterns. Water year 2000 to 2001 was a drier year than 1999 to 2000; crop rotations included less sugar beets and onions and more alfalfa and grain crops. The available data sets were not robust enough to normalize the water years so the inherent variation was addressed by averaging the data over the available water years. Water quality standards apply to intermittent waters during optimum flow periods, which are defined as less than or equal to 5 cfs for recreation and water supply uses less than or equal to 1 cfs for aquatic life.

No historical water quality data are available for these creeks. The ISDA study, BLM, IDFG and BURP data represent the data currently available.

Aquatic Beneficial Use Indicators

Beneficial use support was determined using BURP and ISDA data. Aquatic insects and worms, as a group called benthic macroinvertebrates, are good indicators of localized water quality and habitat conditions. Macroinvertebrates have complex lifecycles, often spanning a year or more. The life stages of pupae and larvae are more sensitive than the adult stage, making them excellent surrogates for detecting short term and long term environmental variations. In addition, macroinvertebrates as a community are composed of species spanning a broad range of trophic levels. Thus, they are good indicators of the cumulative effects of water quality pollution.

The BURP assessment process was developed by DEQ as a non-arbitrary, objective, water body assessment tool. Stream macroinvertebrate index (SMI) scores, stream fish index (SFI) scores and stream habitat index (SHI) scores were calculated using the current edition of the DEQ *Water Body Assessment Guidance* (Grafe *et al.*, 2002). Index scores are rated as follows:

SMI Score	SHI Score	SFI Score	Support Status
≥ 51	≥ 58	≥ 82	Condition Rating 3
43-50	55-57	62-81	Condition Rating 2
33-42	< 55	39-61	Condition Rating 1
< 33		< 39	Minimum Threshold

These scores were used to evaluate the support status of cold water aquatic life for Dennett Creek, Hog Creek, Scott Creek and Warm Springs Creek, however, BURP data for all but Warm Springs Creek were collected in 1995 and 1996 therefore, the status at the time of assessment may not reflect the current status.

Beneficial Uses

As four of the creeks that comprise this TMDL are undesignated (See Table 2.2), these streams must be maintained to support cold water aquatic life, propagation of fish, shellfish and wildlife and primary or secondary contact recreation. Due to the low water levels in the summer, primary contact recreation is not likely to occur in these creeks; therefore, only secondary contact recreation standards will be applied. These streams must also be maintained to support the statewide surface water use designations of agricultural and industrial water supply, wildlife habitat and aesthetics. Specific details pertinent to each beneficial use are discussed in the following sections. Jenkins Creek is designated for cold water aquatic life and primary contact recreation.

Cold Water Aquatic Life

Aquatic life classifications are for waterbodies that are suitable or are intended to be made suitable for protection and maintenance of viable aquatic life communities of aquatic organisms and populations of significant aquatic species. Aquatic life use for undesignated water bodies is presumed to be cold water aquatic life. Waters with cold water aquatic life beneficial use are required to exhibit appropriate levels of dissolved oxygen, temperature, pH, ammonia and turbidity for cold water aquatic life support (IDAPA 58.01.02.250.02).

Recreation

Recreation classifications are for waterbodies that are suitable or intended to be made suitable for primary and secondary contact recreation. Primary contact recreation refers to prolonged and intimate human contact with water where ingestion is likely to occur, such as swimming, water skiing and skin diving. Secondary contact recreation consists of recreational uses where raw water ingestion is not probable, such as wading and boating. However, low flows prevent the use of personal watercraft on all the creeks (IDAPA 58.01.02.251.02).

The criteria Idaho require waterbodies where primary contact recreation occurs to contain less than 126 *E. coli* organisms/100 mL water (as a geometric mean based on a minimum of five samples, see Table 2.2.1 for details), and an upper limit of less than 406 *E. coli* organisms/100 mL of water in any single sample. Waters with secondary contact recreation uses (all year) are not to contain *E. coli* bacteria significant to public health in concentrations exceeding: A single sample of five hundred and seventy six (576) *E. coli* per one hundred (100) ml; or a geometric mean of one hundred twenty six (126) *E. coli* organisms per one hundred ml based on a minimum of five (5) samples taken every three (3) to five (5) days over a thirty day period.

Agricultural Water Supply

Waters designated as agricultural water supply are required to be suitable for the irrigation of crops or as drinking water for livestock. Waters designated for agricultural water supply are required to meet general surface water quality criteria for toxic materials. These waters are also required to meet narrative criteria related to sediment and excessive nutrients (IDAPA 58.01.02.252.02).

Industrial Water Supply

Waters designated as industrial water supply are required to be suitable for industrial uses and are required to meet general surface water quality criteria (IDAPA 58.01.02.252.03).

Wildlife Habitat
Wildlife habitat waters are those which are suitable or are intended to be made suitable for wildlife habitat (IDAPA 58.01.02.253.01).

Aesthetics
Aesthetics are designated as a beneficial use for special resource waters or for aesthetic enjoyment of a waterway. This use includes those waters protected due to unique or outstanding aesthetic characteristics or where intensive protection of the water quality is necessary to maintain aesthetic enjoyment (IDAPA 58.01.02.253.02).

The following sections contain a discussion of available data and an assessment of what the data indicate about use support and water quality on a stream-segment specific basis for Dennett Creek, Hog Creek, Scott Creek, Warm Springs Creek and Jenkins Creek (delisted in 1998).

Dennett Creek

Segment Identifier:	PNRS# 825, WQLS# 2825, HUC #17050201
Segment Length:	6.46 miles (Headwaters to the Snake River)
Geomorphology:	Rosgen Type A (upper reach)
Beneficial Uses:	*Undesignated:* presumed uses include cold water aquatic life, propagation of fish and shellfish, secondary contact recreation *State-wide designations:* agricultural and industrial water supply, wildlife habitat, aesthetics
1998 §303(d) Listed Pollutants:	Sediment, temperature, flow alteration
Pollutants Proposed for De-listing:	Temperature
Indicators of Impairment:	Riparian vegetation in poor condition, low bank stability Exceedences of criteria for secondary contact recreation (bacteria)
Uses Affected:	Secondary contact recreation, downstream water quality Cold water aquatic life uses not fully supported (1996 data)
Known Sources:	Agricultural management (domestic livestock grazing [upper] and cropping [lower]), roadways, natural sources
TMDLs Written:	Sediment
SMI score:	32.02 (lower), rating = 0; 35.43 (middle), rating = 1; 1996 data
SHI score:	65 (lower), rating = 2; 63 (middle), rating = 2; 1996 data
SFI score:	Not available
Support status:	1.0 (lower), not full support; 1.5 (middle), not full support; 1996 data

Continuous flow monitoring data are not available for Dennett Creek. However, due to the observed low flow regime in the summer, primary contact recreation is not considered to be an existing use.

DEQ BURP data collected in 1996 in Dennett Creek showed SMI scores at the lower and middle sites of 32.02 and 35.43 respectively, SHI scores of 65 and 63 at the lower and middle sites respectively. These scores translate to support status ratings of 1.0 and 1.5 at the lower and middle sites respectively indicating that at the time of this assessment (1996), the reach described by these sites was not fully supporting cold water aquatic life uses. These sites will be revisited in the future as part of the statewide BURP process. If appropriate, status calls will be updated at that time. SFI scores were not available. Salmonid spawning was not evaluated. There are no fisheries data available for Dennett Creek.

Nutrients

POLLUTANT SOURCES

Sources of nutrients in the Dennett Creek subwatershed include domestic livestock grazing, roads, natural erosion and native wildlife. Nutrient loading from these sources has not been quantified.

AVAILABLE DATA

No historical water quality data are available for Dennett Creek. Existing information from BLM and IDFG was used to assess Dennett Creek. Stream functioning condition was evaluated by both BLM and IDFG. Low level (1 to 5000 scale) aerial color infrared photographs were taken in 1999. These photos were analyzed by BLM specialists in order to determine stream functioning condition. Follow-up site surveys were conducted in the summer of 2000.

Sediment

POLLUTANT SOURCES

Sources of sediment in the Dennett Creek subwatershed include domestic livestock grazing, roads, natural erosion and native wildlife. Sediment loading from these sources has not been quantified.

AVAILABLE DATA

No sediment data exist for Dennett Creek. Channel stability and riparian PFC information is available.

Most of Dennett Creek's main stem and forks are A4 and A5 Rosgen streams (Rosgen, 1996). According to Rosgen (1996), these channels have high sediment supply and transport rates and are typically unstable with steep banks that contribute large quantities of sediment through fluvial erosion, bank collapse, freeze/thaw cycles and lateral scour form debris flow. In 1998 there was evidence of a natural blowout that scoured out sections of the middle fork. The blowout itself originated on a relatively stable, undisturbed slope. Down-cutting was evident throughout the middle fork reach. Large woody debris in Dennett Creek creates dams that collect large quantities of sediment in step pools. Rosgen (1996) states that type A4/A5 streams are extremely sensitive to grazing-induced soil disturbance and have poor recovery potential.

Domestic livestock grazing in the watershed tends to be moderate to heavy by the stream because the steep terrain renders the upper watershed inaccessible. BLM surveys in 2000 found that the mid to upper slopes and ridgetops in the watershed are functioning properly relative to soil type, vegetation, climate and landform. Mancuso (1995) noted in his study of the North and Middle Forks of Dennett Creek, that livestock grazing had adversely impacted readily accessible areas near streams and roads as well as the plant communities throughout the study area. In 2001, DEQ field staff found stock-watering ponds located away from the creek, reducing pressure on the riparian area.

However, Mancuso and Murphy (1999) found that the riparian area was generally in PFC. The riparian area typically had mid to late seral shrubs, trees and sedge/rushes with deep binding root masses; thus these banks were generally not as vulnerable to bank erosion and better able to filter runoff. In 2000, BLM surveys found that upper Dennett Creek and the main stem of Dennett Creek were in PFC, but that the Middle Fork of Dennett Creek was in at-risk stable condition (BLM, 2001 a and b). Data available from the IDFG Conservation Data Center surveys show that 90 percent of the sampled segments of the mainstem (4.2 miles total) were in PFC.

Although percent fines data are available from BLM, IDFG and DEQ BURP surveys, the percent fines determined by BLM and IDFG used different size classes than the DEQ BURP data. This resulted in small subsets of data that were not easily comparable. The range for gravel used by IDFG encompassed the higher end of the percent fines for BURP as well as the lower end of cobble size. Percent fines can therefore only be used as a descriptive indicator of water quality status since for each type of percent fines measurement there was correlation to upstream disturbance. The percent fines measured in BURP surveys are above the 25 percent levels found to be protective of salmonids in watersheds of this particular geology. However, this elevated level may not be due exclusively to land use or management as Rosgen (1996) indicates that percent fines of greater than 40 percent are typically seen in A4 streams.

The middle fork of Dennett Creek, which appears to have had the most domestic livestock grazing disturbance, also demonstrated the highest level of percent fines and most unstable banks. DEQ BURP data collected in 1996 showed a percent fines level of 50.3 percent. BLM and IDFG data showed low percent fines in the uppermost part of the mainstem of Dennett Creek. IDFG data showed low percent fines in the north fork of Dennett Creek and high percent fines in the middle fork of Dennett Creek.

The north fork of Dennett Creek was observed to have the greatest channel stability of the three reaches. The middle fork of Dennett Creek has undergone severe down-cutting and lateral recession as a result of a 1998 blowout and, when the stream surveys were conducted in 1999, had not shown much recovery (BLM, 2001 a and b). The main fork of Dennett Creek was observed to have moderate channel stability (BLM, 2001 a and b).

Temperature

General Concerns

Temperature is a water quality factor that is key to fish and aquatic habitat. It is used to determine if water will support warm or cold water aquatic species. High temperatures can be harmful to fish at all life stages, especially if high temperatures occur in combination with other habitat limitations such as low dissolved oxygen or poor food supply. Temperature as a stressor to adult fish can result in lower body weight, poor oxygen exchange and reduced reproductive capacity. Extreme high temperatures can result in death if they persist for an extended length of time. Juvenile fish are more sensitive to temperature variations and duration than adult fish and can experience negative impacts at a lower threshold value than the adults. Acceptable temperature ranges vary for different species of fish, with warm water species being the most tolerant of high water temperatures.

Criteria have been established for the aquatic life needs of the important cold and warm water species that must be protected. The temperature criteria are usually built around a maximum allowable value that relates to critical life stage requirements. The temperature standard and violation criteria can be based on daily maximum or other temperature relationships identified to be critical to the species being protected.

Because Dennett Creek provides habitat for fish (including salmonids) and other aquatic life, it is important that the temperature levels be appropriate to support them. The targets applied (22 ^{o}C or less instantaneous temperature and no greater than 19 ^{o}C maximum daily average) are protective of cold water aquatic species, the presumed existing use.

POLLUTANT SOURCES

In the Snake River Basin, elevated surface water temperatures are potentially the result of a combination of natural and anthropogenic sources. Anthropogenic temperature influences may stem from human influenced practices such as domestic livestock grazing and close proximity of roads to the riparian zone. The process of natural heat exchange through high air temperatures and direct solar radiation effects on the water surface may also influence summer water temperatures.

AVAILABLE DATA

Temperature logger data gathered by both DEQ and BLM in the main fork of Dennett Creek are displayed in Figures 2.1 and 2.2. No water temperatures greater than the 22 ^{o}C instantaneous water temperature standard were observed in the available data set. Healthy canopy cover, trees and other vegetation near the stream that act to shade surface waters, often results in cooler water temperatures. BLM stream surveys indicated that canopy cover was over 90 percent in the upper reach of the main fork of Dennett Creek and 80 percent in the lower reach of the main fork (BLM, 2001 a and b).

Flow Alteration

Although flow alteration can adversely affect beneficial uses, there are no Idaho water quality standards or criteria that address it. Flow alteration is not suitable for estimation of load capacity or load allocation and it is the policy of DEQ that TMDLs will not be written to address it. Therefore, although Dennett Creek is listed for flow alteration, a TMDL for flow alteration will not be written at this time.

Segment Status

No bacteria data are available to this effort; therefore, no support status can be identified for secondary contact recreation within Dennett Creek. Dennett Creek discharges into the Brownlee Reservoir segment of the Snake River. The SR-HC TMDL (DEQ, 2002) in place in this section of the Snake River has set load allocations for nutrients (total phosphorus) and sediment to meet water quality targets designed to protect designated beneficial uses and restore water quality within this reach of the Snake River. As a tributary to the Snake River,

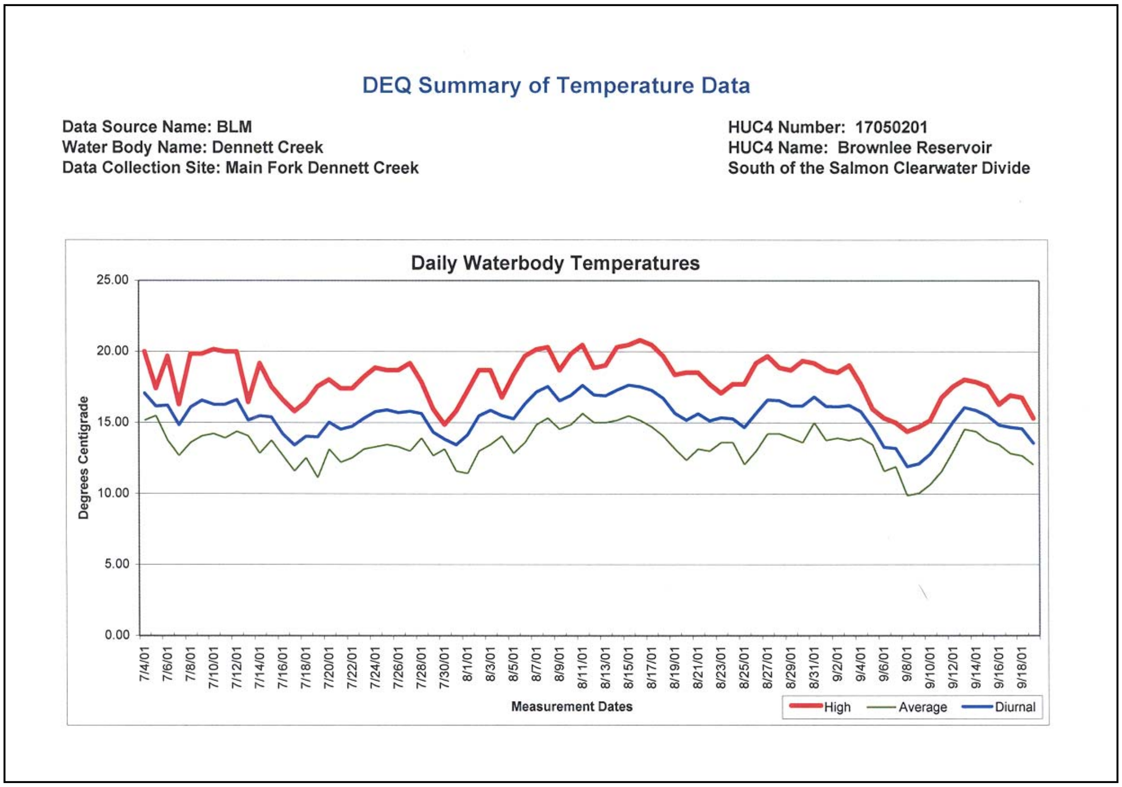

Figure 2.1 Instream temperatures measured in Dennett Creek. (Data collection by the Bureau of Land Management, 2001).

nutrient and sediment targets (Table 2.4) from the SR-HC TMDL (DEQ, 2002) will be applied to Dennett Creek to protect downstream waters. These targets will also be protective of uses within Dennett Creek. Water temperatures within Dennett Creek were not observed to violate cold water aquatic life temperature criteria throughout the monitoring period (2001). Surface water temperatures are therefore judged to be supportive of cold water aquatic life uses within this segment.

Conclusions

There is no indication that the statewide designated beneficial uses of agricultural and industrial water supply, wildlife habitat and aesthetics are impaired.

No bacteria data exist for this segment so the support status of the presumed secondary contact recreation use is unknown. This will be included in the listing of data gaps for this TMDL.

A sediment TMDL has been written for Dennett Creek. Sediment targets applied are protective of both instream and downstream beneficial uses. No further action (beyond attainment of the identified targets) is judged necessary at this time.

The data available show no temperature impairment during the hottest months of the year. The majority of the riparian area in the watershed is in proper functioning condition with the

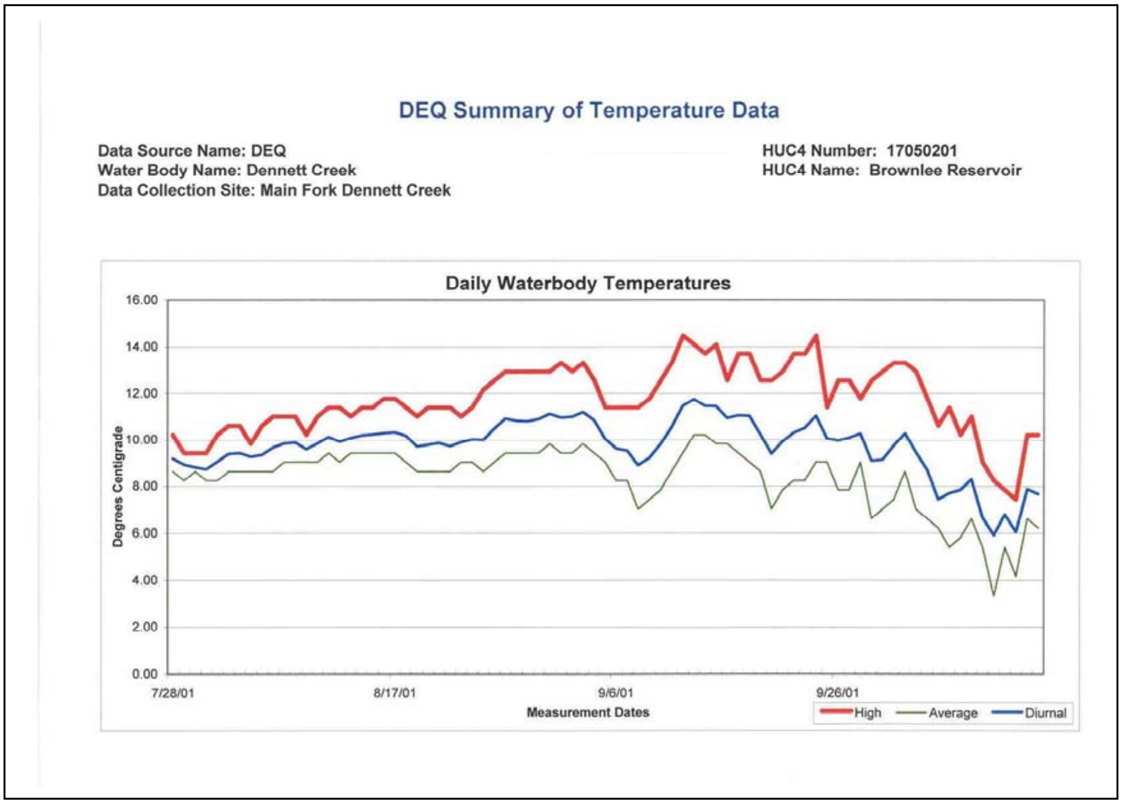

Figure 2.2 Instream temperatures measured in Dennett Creek. (Data collection by the Idaho Department of Environmental Quality, 2001).

exception of the middle fork of Dennett Creek. The riparian area provides shade that is vital to preventing warming in the exposed terrain and arid climate of this watershed.

Given the fact that the available data set was collected during a low water year representing critical conditions for surface water temperatures and shows no violations of the applicable cold water aquatic life temperature criteria (no greater than 22 °C instantaneous water temperature and no greater than 19 °C maximum daily average water temperature standards), and the fact that BURP surveys of Dennett Creek identified cold water indicators present, this assessment process finds that this segment is not impaired due to temperature limitations and recommends that Dennett Creek (WQLS# 2825, headwaters to the Snake River) be delisted for temperature by the State of Idaho as part of the first §303(d) list submitted by the State of Idaho subsequent to the currently approved 1998 listing.

Hog Creek

Segment Identifier:	PNRS# 829, WQLS# 2829, HUC #17050201
Segment Length:	9.94 miles (Headwaters to the Snake River)
Geomorphology:	Rosgen Type B (upper reach)
Beneficial Uses:	*Undesignated:* presumed uses include cold water aquatic life, propagation of fish and shellfish, secondary contact recreation *State-wide designations:* agricultural and industrial water supply, wildlife habitat, aesthetics
1998 §303(d) Listed Pollutants:	Nutrients, sediment
Pollutants Proposed for Listing:	Bacteria
Indicators of Impairment:	Riparian vegetation in poor condition, low bank stability exceedences of criteria for secondary contact recreation (bacteria)
Uses Affected:	Secondary contact recreation, downstream water quality Cold water aquatic life uses not fully supported (1995 data)
Known Sources:	Agricultural management (domestic livestock grazing [upper] and cropping [lower]), roadways, natural sources
TMDLs Written:	Nutrients
SMI score:	21.39, rating = 0; 18.63, rating = 0; 1995 data
SHI score:	42, rating = 1; 46, rating = 1; 1995 data
SFI score:	Not available
Support status:	0.5, not full support; 0.5, not full support; 1995 data

Hog Creek is §303(d) listed for nutrients and sediment. There were no observed violations of the surface water quality criteria for dissolved oxygen, pH or temperature (as based on instantaneous temperature data) during the two water years sampled. In addition to the criteria specific to the pollutants of concern, cold water aquatic life and recreation beneficial uses were also evaluated using macroinvertebrate and bacteria data.

Figure 2.3 illustrates the available flow data for Hog Creek. Observed flow is seasonally intermittent in some areas and, due to the low flow regime in the summer, primary contact recreation is not considered to be an existing use.

DEQ BURP data collected in 1995 in Hog Creek showed SMI scores of 21.39 and 18.63 and SHI scores of 42 and 46 at the two sites assessed. These scores translate to support status ratings of 0.5 and 0.5, indicating that at the time of this assessment (1995) the reach described by these sites was not fully supporting cold water aquatic life uses. BURP sites were located upstream of almost all agricultural activity and below the uppermost reaches. These sites will be revisited in the future as part of the statewide BURP process. If appropriate, status calls will be updated at that time. SFI scores were not available. Salmonid spawning was not evaluated. There are no fisheries data available for Hog Creek.

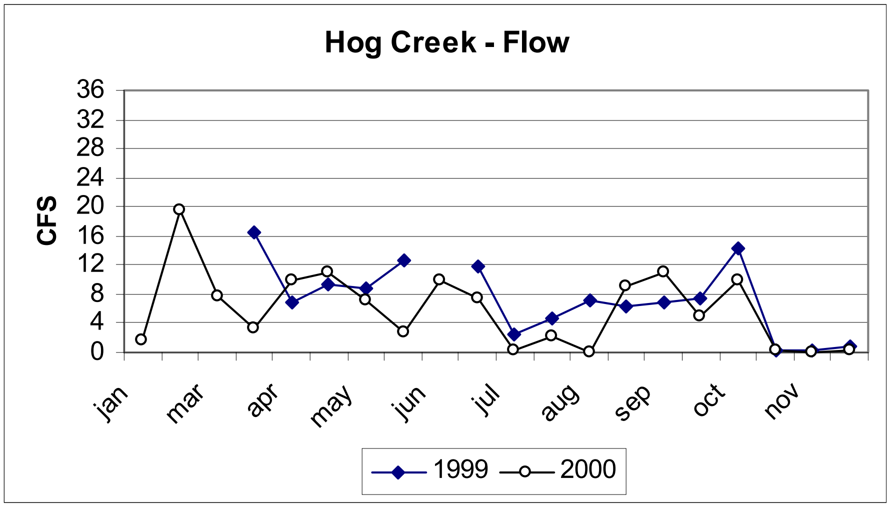

Figure 2.3 Flow data collected for the Hog Creek subwatershed during 1999 and 2000. (Data collection by the Idaho State Department of Agriculture, K. Campbell, 1999-2000.)

Bacteria

POLLUTANT SOURCES

Potential bacteria sources in Hog Creek include roadway usage, recreational usage and grazing in the upper reach. Livestock (domestic cattle), and native wildlife (elk, deer and waterfowl) may also be sources of bacteria. A cattle wintering area of about 150 head exists in the area, but it is fenced off from the creek. There is also a feedlot with 300 head capacity but the potential runoff to the creek is small due to the installation of waste lagoons.

AVAILABLE DATA

Bacteria levels in Hog Creek were monitored by ISDA between 1999 and 2001. The data are displayed in Figure 2.4.

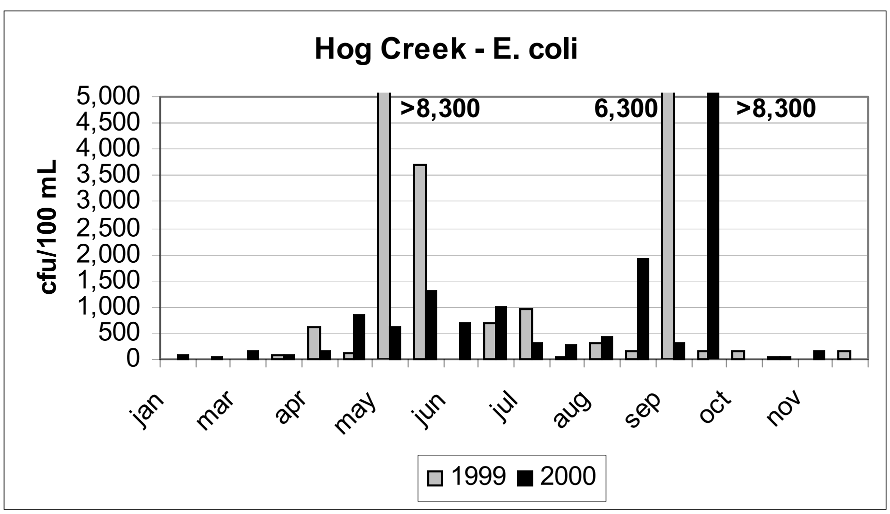

Figure 2.4 Bacteria (*E. coli)* data collected in the lower section of Hog Creek during 1999 and 2000. (Data collection by the Idaho State Department of Agriculture, K. Campbell, 1999-2000.)

Observed *E. coli* concentrations exceeded the secondary contact recreation concentration of 576 colony forming units (CFU) per 100 ml of water April through July, September and October. Six downstream samples from May through September 2000 (11 samples total) exceeded the secondary contact recreation *E. coli* standard of 576 CFUs. Taking an average of the two years of data from the period April 15 through September 15, the average (arithmetic mean) *E. coli* concentrations at the downstream site was 1,411 CFU/100 mL.

Nutrients

POLLUTANT SOURCES

Potential nutrient sources in the Hog Creek subwatershed include dirt roads and grazing in the upper reach and intensive agricultural activity in the lower reach. Nutrient sources include both domestic animals (cattle) and wildlife (deer, elk and waterfowl). Henley Basin road contributes total phosphorus loads to Hog Creek during rainfall events and spring runoff (BLM, 2001 a and b). A beef cattle wintering area of about 150 head exists in the area, but it is fenced off from the creek so potential for nutrient transport is considered minimal. There is also a feedlot with 300 head capacity (cattle) but the potential runoff to the creek is small due to the installation of waste lagoons.

AVAILABLE DATA

No historical water quality data are available for Hog Creek. Data collected as part of studies by ISDA represent currently available data.

Data specific to nutrient concentrations are displayed in Figure 2.5. Total phosphorus concentrations are elevated above those observed in the mainstem Snake River above river mile 409 (listed for nutrients on the §303(d) list). The highest total phosphorus concentrations observed occur during the May through October growing/irrigation season.

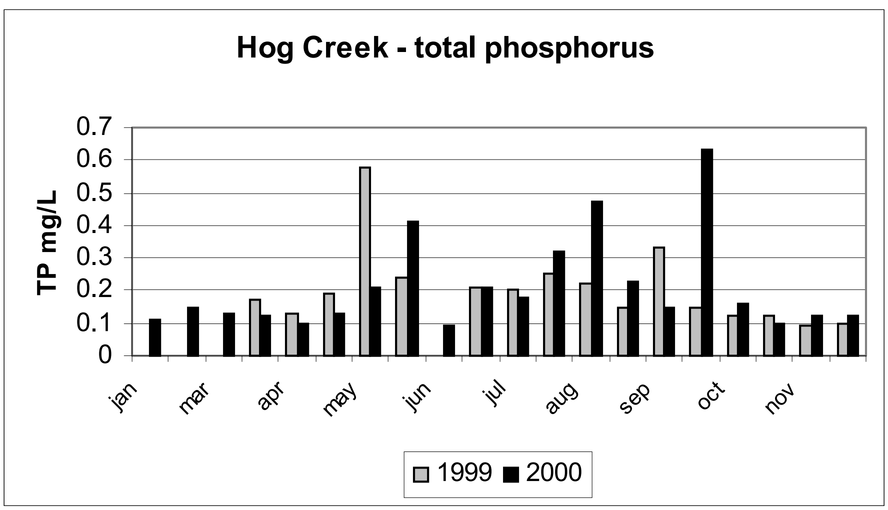

Figure 2.5 Total phosphorus concentration data collected in the lower section of Hog Creek in 1999 and 2000. (Data collection by the Idaho State Department of Agriculture, K. Campbell, 1999-2000.)

Data collected concurrently on ortho-phosphate concentrations showed that the total phosphorus concentrations recorded in Figure 2.5 are between 62 percent and 64 percent ortho-phosphate, indicating a high potential for dissolution and ready uptake by algae and other plant materials in the water column. Monitoring of background concentrations when Hog Creek did not contain substantial diversion water (November through March) showed calculated mean total phosphorus concentrations at 0.11 mg/L in the upper watershed.

Table 2.5 summarizes general information related to total phosphorus concentrations in the Hog Creek subwatershed. An increase in the total phosphorus concentration is observed in the downstream section.

Table 2.5 Average Seasonal Total Phosphorus Concentrations Measured in Hog Creek (1999 through 2000)

Waterbody	SR-HC TMDL total phosphorus target (mg/L) at mouth	Total phosphorus (mg/L) average instream concentration in the upstream segment	Total phosphorus (mg/L) average concentration near confluence with Snake River
Hog Creek	0.07	0.17	0.26

SR-HC TMDL = Snake River – Hells Canyon Total Maximum Daily Load. Seasonal refers to May through September.

Sediment

POLLUTANT SOURCES

Potential sources of sediment in the Hog Creek subwatershed are the same as those described for nutrient sources in the previous section.

AVAILABLE DATA

No historical water quality data are available for Hog Creek. Data collected as part of studies by ISDA, BLM, IDFG and DEQ BURP assessments represent currently available data.

As observed in Figure 2.6, instantaneous measurements of sediment concentrations in Hog Creek did not often exceed the monthly average target of 50 mg/L and were never observed to exceed the 80 mg/L concentration identified as a target for events lasting fewer than 14 days (calculated mean total suspended solids was 33.16 mg/L in the upper segment and 23.07 mg/L in the lower segment). Monitoring of background concentrations when Hog Creek did not contain substantial diversion water (November through March) showed calculated mean total suspended solids at 3.54 mg/L in the upper watershed. While duration-based information would be helpful in making a conclusive assessment, these data are a good indication that sediment concentrations in Hog Creek are not impairing cold water aquatic life uses.

In addition to the information displayed in Figure 2.6, data on the volatile component of the suspended solids was collected. This information was used to estimate the proportion of algae and organic material associated with the total suspended solids measurement.

On an annual basis, volatile suspended solids represented approximately 28 percent of the total. Therefore, roughly one third (8 to 10 mg/L) of the total suspended solids concentration

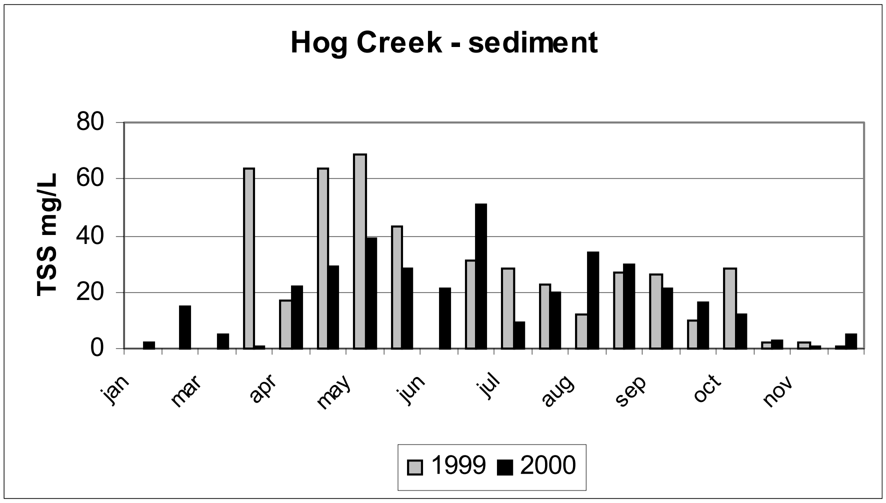

Figure 2.6 Sediment data collected in the lower section of Hog Creek from 1999 and 2000. (Data collection by the Idaho State Department of Agriculture, K. Campbell, 1999-2000.)

measured can be attributed to algae or other organic growth. This is similar to the proportions observed for the mainstem Snake River and slightly higher than the proportions observed in larger tributaries to the Snake River (averaging ~20 percent), the majority of which are listed for nutrients on the §303(d) list.

Table 2.6 summarizes general information related to sediment concentrations in the Hog Creek subwatershed. A reduction in sediment concentration is observed at the downstream site.

Table 2.6 Average Annual Total Suspended Solids (TSS) Concentrations Measured for Hog Creek (1999 through 2000)

Waterbody	TSS target concentration	TSS (mg/L) average instream concentration in the upstream segment	TSS (mg/L) average concentration near confluence with Snake River
Hog Creek	50 mg/L monthly average	33.16	23.07

In the BLM allotment, BLM staff surveyed the riparian condition of one mile of stream. Approximately half of the surveyed stream was determined to be degraded and in a downward trend. The other half, on an intermittent stream segment, was classified as non-functioning.

In some areas, the banks have been observed to have been trampled by livestock, which may include both cattle and elk and riparian species are limited. Spike and Baltic rush were generally the only riparian species observed to be present. Heavy historic and current domestic and wildlife grazing practices probably eliminated more palatable sedge, shrub and rush species that would otherwise naturally occur. Willows are hedged with little recruitment of woody species except for black hawthorne. Subsequently, bank stability was observed to be low and excessive width/depth ratios are present due to cantilever failures and bank slumpage (BLM, 2001 a and b).

These evaluations indicate that the cumulative effects of sediment from bank erosion may be impairing other, habitat-related aspects of the watershed and that implementation measures should be identified to target those areas identified as degraded or non-functioning in order to reduce the potential for future impacts to cold water aquatic life within the watershed.

Temperature

AVAILABLE DATA

No historical water quality data are available for Hog Creek. Data collected by ISDA represent currently available data.

Instantaneous temperature measurements for the Hog Creek subwatershed are displayed in Figure 2.7. Although the existing data set does not include continuous monitoring information, instream temperatures were measured during an extreme low water year when water temperatures would be expected to exhibit a "worst case scenario" condition.

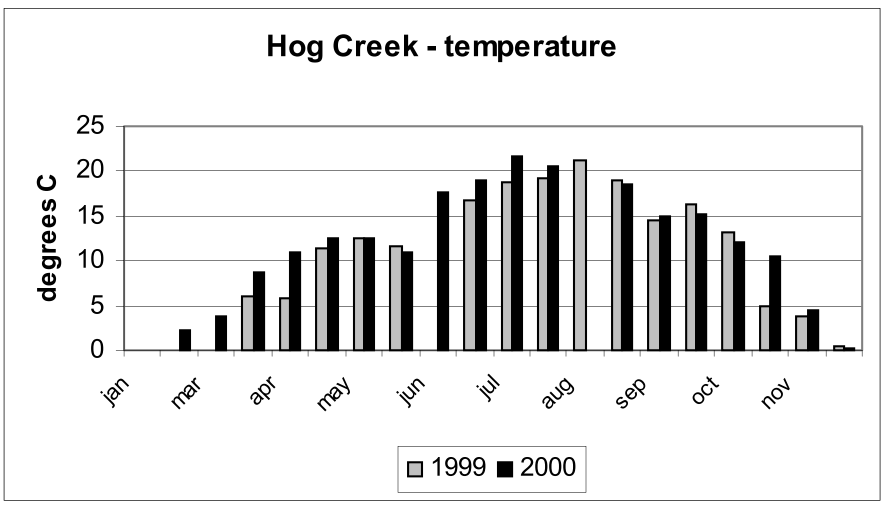

Figure 2.7 Instantaneous water temperature data collected in the lower section of Hog Creek during 1999 and 2000. (Data collection by the Idaho State Department of Agriculture, K. Campbell, 1999-2000.)

The available data show that there is no observed temperature impairment during the hottest months of the year. No violations of the applicable cold water aquatic life temperature criteria (no greater than 22 ^{o}C instantaneous water temperature) were observed.

Segment Status

Bacteria levels monitored in Hog Creek exceed the state standard for secondary contact recreation, indicating that the presumed secondary contact recreation use is not supported.

Hog Creek discharges into the Upstream Snake River segment of the SR-HC TMDL (DEQ, 2002) (between Snake River mile 409 and 335). A nutrient TMDL has been completed for

Hog Creek. As a tributary to the Snake River, nutrient targets (Table 2.4) from the SR-HC TMDL (DEQ, 2002) will be applied to Hog Creek to protect downstream waters. These targets will also be protective of uses within Hog Creek.

Water temperatures within Hog Creek were not observed to violate cold water aquatic life temperature criteria throughout the monitoring period (2001). Surface water temperatures are therefore judged to be supportive of cold water aquatic life uses within this segment.

Conclusions

There is no indication that the statewide designated beneficial uses of agricultural and industrial water supply, wildlife habitat and aesthetics are impaired.

The beneficial use of secondary contact recreation is not being supported due to violations of the bacteria standard and a TMDL is recommended for bacteria. Bacteria is proposed to be listed as a §303(d) pollutant as part of the first §303(d) list submitted by the State of Idaho subsequent to the approval of this TMDL. Scheduling for the bacteria TMDL will be identified at the time of listing.

The downstream section of Hog Creek appears to attenuate sediment inputs and instantaneous monitoring data do not indicate that the monthly average or 14 day maximum targets for the SR-HC TMDL (DEQ, 2002) are exceeded by this tributary inflow. Therefore, while SR-HC sediment targets will be applied to this segment, they will function as a concentration cap and are not projected to result in sediment reductions at this time.

Total phosphorus concentrations are substantially greater than the target value for the SR-HC TMDL (DEQ, 2002); therefore, total phosphorus reductions are projected to be required with the application of the total phosphorus target to this segment.

Although the existing data set is small, the available data show that there is no temperature impairment during the hottest months of the year. Further, instream temperatures were measured during an extreme low water year when higher water temperatures were expected. This assessment process finds that this segment is not impaired due to surface water temperature limitations.

Scott Creek

Segment Identifier:	PNRS# 830, WQLS# 2830, HUC #17050201
Segment Length:	18.3 miles (Headwaters to the Snake River)
Geomorphology:	Rosgen Type B (upper reach)
Beneficial Uses:	*Undesignated:* presumed uses include cold water aquatic life, propagation of fish and shellfish, secondary contact recreation *State-wide designations:* agricultural and industrial water supply, wildlife habitat, aesthetics
1998 §303(d) Listed Pollutants:	Nutrients, Sediment
Pollutants Proposed for Listing:	Bacteria
Indicators of Impairment:	Riparian vegetation in poor condition, low bank stability exceedences of criteria for secondary contact recreation (bacteria)
Uses Affected:	Secondary contact recreation, downstream water quality Cold water aquatic life uses not supported (1995 data)
Known Sources:	Agricultural management (domestic livestock grazing [upper] and cropping [lower]), roadways, natural sources
TMDLs Written:	Nutrients, sediment
SMI score:	14.97, rating = 0; 1995 data
SHI score:	50, rating = 1; 1995 data
SFI score:	Not available
Support status:	0.5, not full support; 1995 data

Scott Creek is §303(d) listed for nutrients and sediment. There were no observed violations of the surface water quality criteria for dissolved oxygen, pH or temperature (as based on instantaneous temperature data) during the two water years sampled. In addition to the criteria specific to the pollutants of concern, cold water aquatic life and recreation beneficial uses were also evaluated using macroinvertebrate and bacteria data.

Figure 2.8 illustrates the available flow data for Scott Creek. Observed flow is seasonally intermittent in some areas and, due to the low flow regime in the summer, primary contact recreation is not considered to be an existing use.

The upstream ISDA Scott Creek site was moved in 2000 through 2001 because during 1999 through 2000 there was agricultural activity upstream of that site. To eliminate bias, only the second year data from Scott Creek upstream were used in showing instream averages and loading calculations.

DEQ BURP data collected in 1995 in Scott Creek showed an SMI score of 14.97 and an SHI score of 50 at the site assessed. These scores translate to a support status rating of 0.5, indicating that at the time of this assessment (1995) the reach described by this site was not fully supporting cold water aquatic life uses. These sites will be revisited in the future as part of the statewide BURP process. If appropriate, status calls will be updated at that time. SFI scores were not available. Salmonid spawning was not evaluated. There are no fisheries data available for Scott Creek.

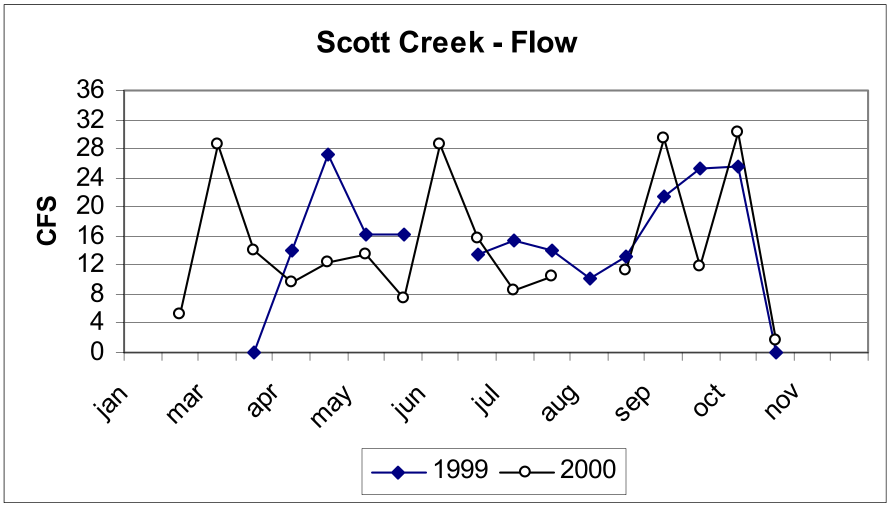

Figure 2.8 Flow data collected for the Scott Creek subwatershed during 1999 and 2000. (Data collection by the Idaho State Department of Agriculture, K. Campbell, 1999-2000.)

Bacteria

POLLUTANT SOURCES

Potential bacteria sources in Scott Creek include roadway usage, recreational usage and grazing in the upper reach. Livestock (domestic cattle) and wildlife (elk, deer and waterfowl) are potential sources of bacteria in this subwatershed. Utilization pattern mapping on the BLM allotment showed that most of the land received light use with moderate use along Scott Creek (BLM, 2001 a and b).

AVAILABLE DATA

Bacteria levels in Scott Creek were monitored by ISDA between 1999 and 2001. The data are displayed in Figure 2.9. Nine downstream samples from May through September 2000 (out of 11 samples total) exceeded secondary contact recreation *E. coli* standard of 576 CFUs in 2000. Taking an average of the two years of data from the period April 15 through September 15, the average (arithmetic mean) *E. coli* concentrations at the downstream site was 754 CFU/100 mL.

Nutrients

POLLUTANT SOURCES

Potential nutrient sources in the Scott Creek subwatershed include dirt roads and grazing in the upper reach and intensive agricultural activity in the lower reach. Nutrient sources include both domestic animals (cattle) and wildlife (deer, elk and waterfowl). Utilization pattern mapping on the BLM allotment showed that most of the land received light use with moderate use along Scott Creek (BLM, 2001 a and b).

AVAILABLE DATA

No historical water quality data are available for Scott Creek. Data collected as part of studies by ISDA represent currently available data.

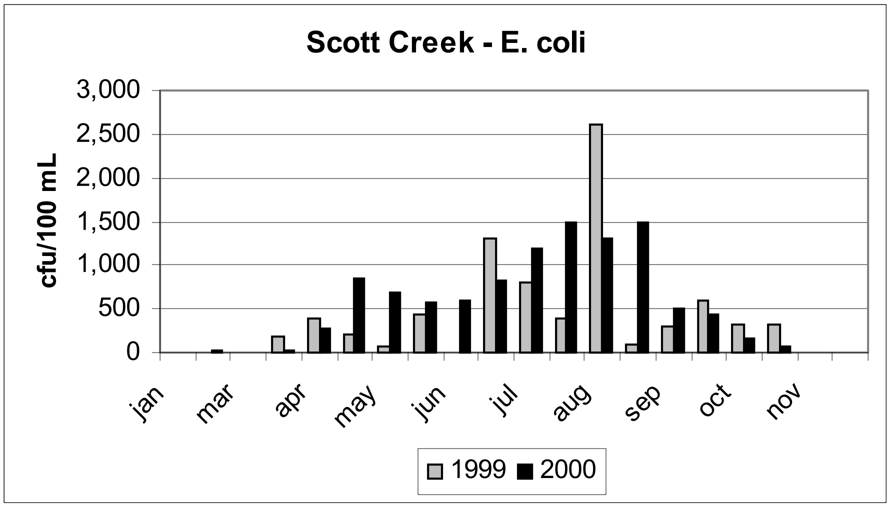

Figure 2.9 Bacteria (*E. coli*) data collected for the Scott Creek subwatershed in 1999 and 2000. (Data collection by the Idaho State Department of Agriculture, K. Campbell, 1999-2000.)

Data specific to nutrient concentrations are displayed in Figure 2.10. Nutrient data used in this assessment are from the year 2000 monitoring only, as the monitoring site in 2000 was located farther upstream in the watershed and therefore is likely to more accurately represent background conditions than the data collected in 1999. The precipitation levels for 2000 were reasonably close to average, approximately 78% of the 30-year average for the Weiser area.

Total phosphorus concentrations are elevated substantially above those observed in the mainstem Snake River above river mile 409 (listed for nutrients on the §303(d) list). The highest total phosphorus concentrations observed occurred during the May through October growing/irrigation season with a slight decrease observed during the month of July.

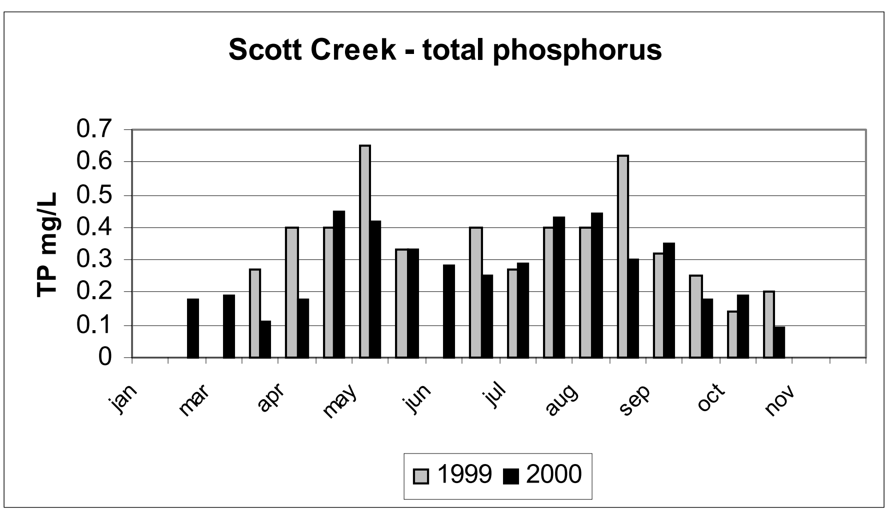

Figure 2.10 Total phosphorus concentrations measured in the Scott Creek subwatershed in 1999 and 2000. (Data collection by the Idaho State Department of Agriculture, K. Campbell, 1999-2000.)

Data collected concurrently on ortho-phosphate concentrations showed that the total phosphorus concentrations recorded in Figure 2.10 are between 39 percent and 43 percent ortho-phosphate, indicating a moderate potential for dissolution and ready uptake by algae and other plant materials in the water column.

Table 2.7 summarizes general information related to total phosphorus concentrations in the Scott Creek subwatershed. An increase in the total phosphorus concentration is observed to occur in the downstream section.

Table 2.7 Average Seasonal Total Phosphorus Concentrations Measured in Scott Creek (1999 through 2000)

Waterbody	**SR-HC TMDL total phosphorus target (mg/L) at mouth**	**Total phosphorus (mg/L) average instream concentration in the upstream segment**	**Total phosphorus (mg/L) average concentration near confluence with Snake River**
Scott Creek	0.07	0.09	0.37

SR-HC TMDL = Snake River – Hells Canyon Total Maximum Daily Load. Seasonal refers to May through September.

Sediment

Pollutant Sources

The potential sediment sources in the Scott Creek subwatershed are the same as those described for nutrients in the preceding section.

Available Data

No historical water quality data are available for Scott Creek. Data collected by ISDA represent currently available data.

Sediment data used in this assessment are from the year 2000 monitoring only, as the monitoring site in 2000 was located farther upstream in the watershed and therefore is likely to more accurately represent background conditions than the data collected in 1999. The precipitation levels for 2000 were reasonably close to average, approximately 78% of the 30-year average for the Weiser area.

As observed in Figure 2.11, instantaneous measurements of sediment concentrations in the lower segment of Scott Creek consistently exceed the monthly average target of 50 mg/L and the 80 mg/L concentration identified as a target for events lasting fewer than 14 days. The calculated mean sediment concentration in the upper segment was 30.51 mg/L and 107.13 mg/L in the lower segment. While duration information would be helpful in making a conclusive assessment, these data are a good indication that suspended sediment concentrations in Scott Creek may be impairing cold water aquatic life uses.

In addition to the information displayed in Figure 2.11, data on the volatile component of the suspended solids was collected. This information was used to estimate the proportion of algae and organic material associated with the total suspended solids measurement. On an annual basis, volatile suspended solids represented approximately 10 percent of the total. Therefore, roughly 11 mg/L of the total suspended solids concentration measured can be

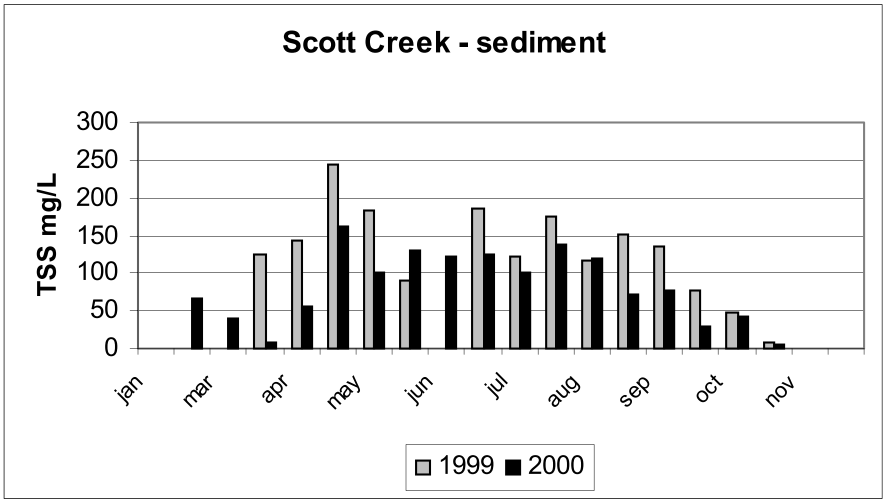

Figure 2.11 Sediment concentrations measured in the Scott Creek subwatershed in 1999 and 2000. (Data collection by the Idaho State Department of Agriculture, K. Campbell, 1999-2000.)

attributed to algae or other organic growth. This is less than the proportions observed for the mainstem Snake River and the proportions observed in larger tributaries to the Snake River (averaging ~20 percent).

A riparian survey on BLM land in the Scott Creek subwatershed showed that all of the 4.4 miles surveyed were in PFC. A LANDSAT inventory for range condition showed that 61 percent of the allotment was in fair condition, 0 percent in excellent condition, 19 percent in poor condition, 13 percent in good condition and 7 percent in seeding condition.

Sediment data are shown in Table 2.8. Scott Creek exceeds the instream targets for sediment. Further up in the watershed, above the agricultural area, Scott Creek meets the instream targets for sediment. Lower in the watershed, below the area of agricultural activity, sediment concentrations measured in Scott Creek are triple those measured in the upstream segment, substantially exceeding the targets for sediment established by the SR-HC TMDL (DEQ, 2002).

Table 2.8 Average Annual Total Suspended Solids (TSS) Concentrations Measured for Scott Creek (1999 through 2000)

Waterbody	**TSS target concentration**	**TSS (mg/L) average instream concentration in the upstream segment**	**TSS (mg/L) average concentration near confluence with Snake River**
Scott Creek	50 mg/L monthly average	11.60	107.13

Wolman pebble counts done by DEQ BURP crews showed 20 percent fines in the middle part of the watershed (BURP, 1996). Rhodes *et al.,* (1994) concluded that survival to emergence for salmonids in the Snake River Basin is substantially reduced when fine sediment concentration exceed 20 percent. The level found by BURP surveys shows that surface fines are at a level that supports cold water aquatic life. Further downstream, total suspended sediment at the ISDA site was well above the instream target level. The majority of sediment appears to be delivered in the lower part of the watershed.

Temperature

AVAILABLE DATA

No historical water quality data are available for Scott Creek. Data collected by ISDA represent currently available data.

Instantaneous temperature measurements for the Scott Creek subwatershed are displayed in Figure 2.12. Although the existing data set does not include continuous monitoring information, instream temperatures were measured during an extreme low water year when water temperatures would be expected to exhibit a "worst case scenario" condition.

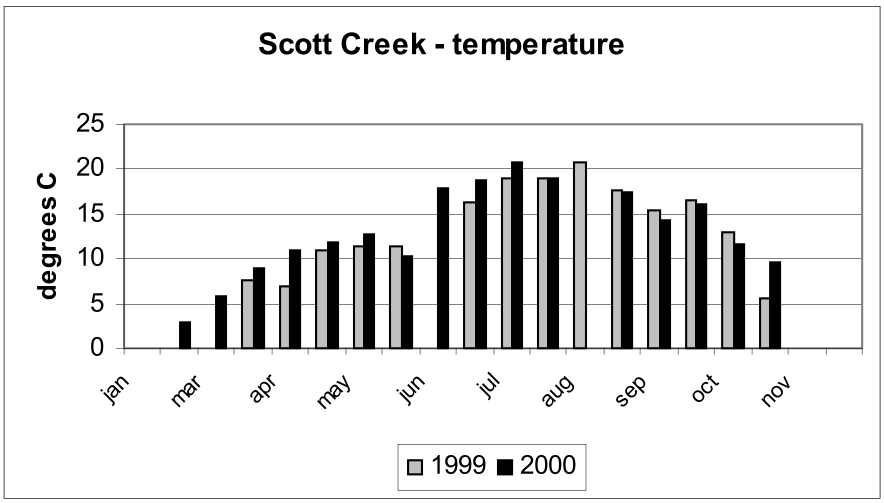

Figure 2.12 Instantaneous temperature data collected for the Scott Creek subwatershed during 1999 and 2000. (Data collection by the Idaho State Department of Agriculture, K. Campbell, 1999-2000.)

The available data show that there is no observed temperature impairment during the hottest months of the year. No violations of the applicable cold water aquatic life temperature criteria (no greater than 22 ^{o}C instantaneous water temperature) were observed.

Segment Status

Bacteria levels monitored in Scott Creek exceed the state standard for secondary contact recreation, indicating that the presumed secondary contact recreation use is not supported.

Scott Creek discharges into the Upstream Snake River segment of the SR-HC TMDL (DEQ, 2002) (between Snake River mile 409 and 335). The SR-HC TMDL (DEQ, 2002) has set load allocations for nutrients (total phosphorus) and sediment to meet water quality targets designed to protect designated beneficial uses and restore water quality within this reach of the Snake River. As a tributary to the Snake River, nutrient and sediment targets (Table 2.4) from the SR-HC TMDL (DEQ, 2002) will be applied to Scott Creek to protect downstream waters. These targets will also be protective of uses within Scott Creek.

Water temperatures within Scott Creek were not observed to violate cold water aquatic life temperature criteria throughout the monitoring period (2001). Surface water temperatures are therefore judged to be supportive of cold water aquatic life uses within this segment.

Conclusions

There is no indication that the statewide designated beneficial uses of agricultural and industrial water supply, wildlife habitat and aesthetics are impaired.

The beneficial use of secondary contact recreation is not being supported due to violations of the bacteria standard and a TMDL is recommended for bacteria. Bacteria is proposed to be listed as a §303(d) pollutant as part of the first §303(d) list submitted by the State of Idaho subsequent to the approval of this TMDL. Scheduling for the bacteria TMDL will be identified at the time of listing.

A sediment TMDL has been completed for Scott Creek. Sediment concentrations in the upstream section of Scott Creek are not projected to exceed the monthly average target of 50 mg/L, or the 80 mg/L target for events lasting less than 14 days. Sediment concentrations in the downstream section of Scott Creek are projected to exceed these targets. Therefore, sediment reductions will be necessary for this segment.

A nutrient TMDL has been completed for Scott Creek. Total phosphorus concentrations are substantially greater than the target value for the SR-HC TMDL (DEQ, 2002); therefore, total phosphorus reductions are required for this segment in order to protect water quality downstream.

Although the existing data set is small, the available data show that there is no temperature impairment during the hottest months of the year. Further, instream temperatures were measured during an extreme low water year when higher water temperatures were expected. This assessment process finds that this segment is not impaired due to surface water temperature limitations.

Warm Springs Creek

Segment Identifier:	PNRS# 828, WQLS# 2828, HUC #17050201
Segment Length:	12.64 miles (Headwaters to the Snake River)
Geomorphology:	Rosgen Type F (upper reach)
Beneficial Uses:	*Undesignated:* presumed uses include cold water aquatic life, propagation of fish and shellfish, secondary contact recreation *State-wide designations:* agricultural and industrial water supply, wildlife habitat, aesthetics
1998 §303(d) Listed Pollutants:	Nutrients, sediment
Pollutants Proposed for Listing:	Bacteria
Indicators of Impairment:	Riparian vegetation in poor condition, low bank stability exceedences of criteria for secondary contact recreation (bacteria)
Uses Affected:	Secondary contact recreation, downstream water quality Cold water aquatic life not fully supported in the lower reach
Known Sources:	Agricultural management (domestic livestock grazing [upper] and cropping [lower]), roadways, natural sources
TMDLs Written:	Nutrients, sediment
SMI score:	21.7 (lower), rating = 0; 43.98 (upper), rating = 2; 1998 data
SHI score:	53 (lower), rating = 1; 61 (upper), rating = 3; 1998 data
SFI score:	Not available
Support status:	0.5 (lower), not full support; 2.5 (upper), full support; 1998 data

Warm Springs Creek is §303(d) listed for nutrients and sediment. There were no observed violations of the surface water quality criteria for dissolved oxygen, pH or temperature (as based on instantaneous temperature data) during the two water years sampled. In addition to the criteria specific to the pollutants of concern, cold water aquatic life and recreation beneficial uses were also evaluated using macroinvertebrate and bacteria data.

Figure 2.13 illustrates the available flow data for Warm Springs Creek. Observed flow is seasonally intermittent in some areas and, due to the low flow regime in the summer, primary contact recreation is not considered to be an existing use.

DEQ BURP data collected in 1998 in Warm Springs Creek showed SMI scores of 21.7 and 43.98 at the lower and upper sites respectively and SHI scores of 53 and 61 at the lower and upper sites respectively. These scores translate to support status ratings of 0.5 for the lower site and 2.5 for the upper site, indicating that the lower reach is not fully supporting cold water aquatic life uses and the upper reach is fully supporting cold water aquatic life uses. SFI scores were not available. Salmonid spawning was not evaluated. There are no fisheries data available for Warm Springs Creek.

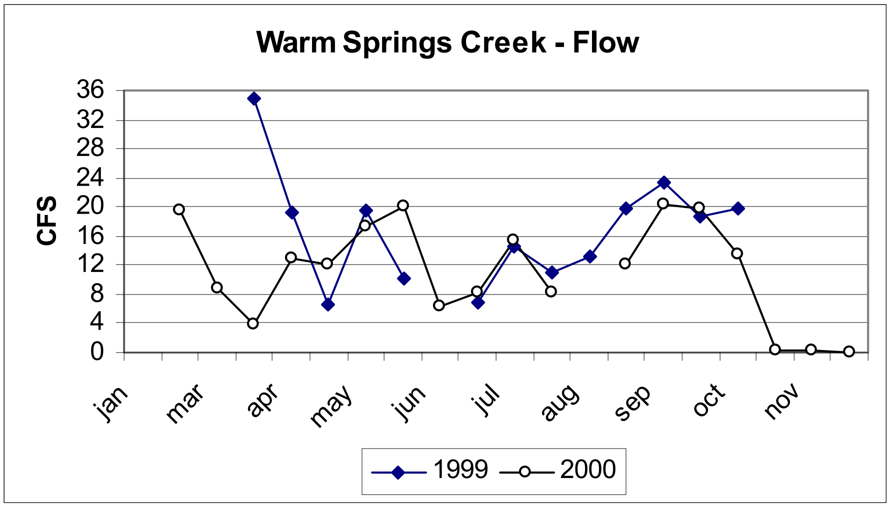

Figure 2.13 Flow data collected for the Warm Springs Creek subwatershed during 1999 and 2000. (Data collection by the Idaho State Department of Agriculture, K. Campbell, 1999-2000.)

Bacteria

POLLUTANT SOURCES

Potential bacteria sources in Warm Springs Creek include roadway usage, recreational usage and grazing in the upper reach. Livestock (domestic cattle) and wildlife (elk, deer and waterfowl) are potential sources of bacteria in this subwatershed.

AVAILABLE DATA

Bacteria levels in Warm Springs Creek were monitored by ISDA between 1999 and 2001. The data are displayed in Figure 2.14. No historical water quality data are available for Warm Springs Creek. Data collected by ISDA represent currently available data.

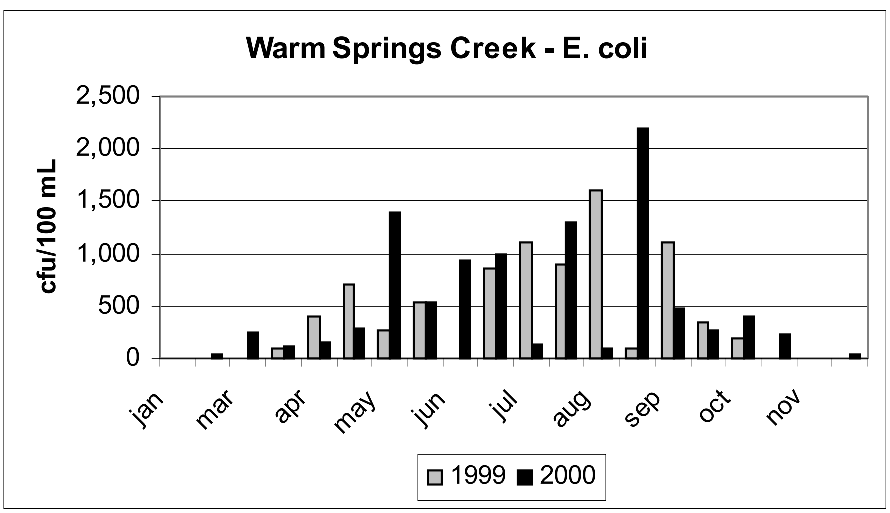

Figure 2.14 Bacteria (*E. coli*) data collected in the Warm Springs Creek subwatershed during 1999 and 2000. (Data collection by the Idaho State Department of Agriculture, K. Campbell, 1999-2000.)

Warm Springs Creek had violations of the secondary contact recreation standards at both the upstream and downstream sites. Five downstream samples collected between May through September 2000 (11 samples total) exceeded the secondary contact recreation *E. coli* standard of 576 CFUs in 2000. Taking an average of the two years of data from the period April 15 through September 15, the average (arithmetic mean) *E. coli* concentrations at the downstream site was 764 CFU/100 mL.

Nutrients

POLLUTANT SOURCES

Potential nutrient sources in the Warm Springs Creek subwatershed include dirt roads and grazing in the upper reach and intensive agricultural activity in the lower reach. Nutrient sources include both domestic animals (cattle) and wildlife (deer, elk and waterfowl).

AVAILABLE DATA

No historical water quality data are available for Warm Springs Creek. Data collected as part of studies by ISDA represent currently available data.

Data specific to nutrient concentrations are displayed in Figure 2.15. Total phosphorus concentrations are elevated substantially above those observed in the mainstem Snake River above RM 409 (listed for nutrients on the §303(d) list). The highest total phosphorus concentrations observed occur during the May through October growing/irrigation season.

Data collected concurrently on ortho-phosphate concentrations showed that the total phosphorus concentrations recorded in Figure 2.15 are between 47 percent and 51 percent ortho-phosphate, indicating a moderate potential for dissolution and ready uptake by algae and other plant materials in the water column.

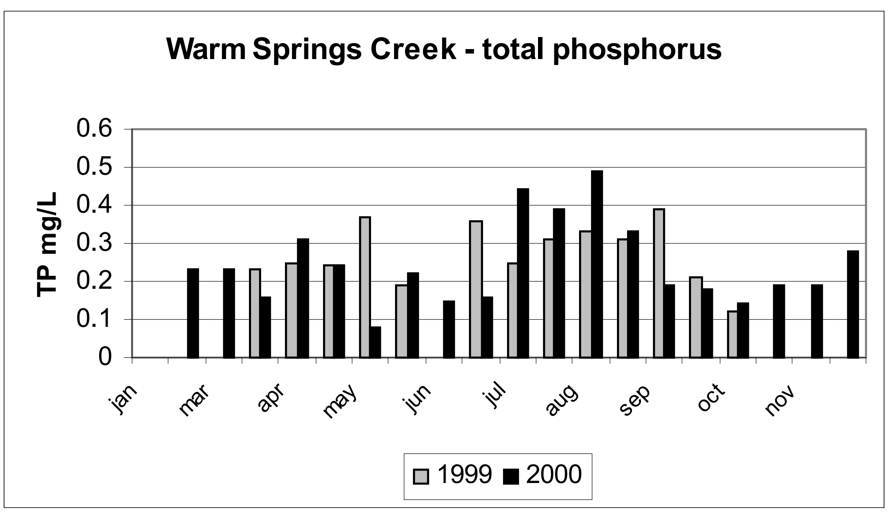

Figure 2.15 Total phosphorus data collected for the Warm Springs Creek subwatershed during 1999 and 2000. (Data collection by the Idaho State Department of Agriculture, K. Campbell, 1999-2000.)

Table 2.9 summarizes general information related to total phosphorus concentrations in the Warm Springs Creek subwatershed. An increase in the total phosphorus concentration is observed to occur in the downstream section.

Table 2.9 Average Seasonal Total Phosphorus Concentrations Measured in Warm Springs Creek (1999 through 2000)

Waterbody	SR-HC TMDL total phosphorus target (mg/L) at mouth	Total phosphorus (mg/L) average instream concentration in the upstream segment	Total phosphorus (mg/L) average concentration near confluence with Snake River
Warm Springs Creek	0.07	0.18	0.28

SR-HC TMDL = Snake River – Hells Canyon Total Maximum Daily Load. Seasonal refers to May through September.

Sediment

Pollutant Sources

Potential sediment sources in the Warm Springs Creek subwatershed are the same as those described for nutrients in the preceding section.

Available Data

No historical water quality data are available for Warm Springs Creek. Data collected by ISDA represent currently available data.

As observed in Figure 2.16, instantaneous measurements of sediment concentrations in Warm Springs Creek consistently exceed the monthly average target of 50 mg/L and the 80 mg/L concentration identified as a target for events lasting fewer than 14 days (the calculated mean sediment concentration in the upper segment was 4.22 mg/L and 88.12 mg/L in the lower segment). While duration information would be helpful in making a conclusive assessment, these data are a good indication that suspended sediment concentrations in Warm Springs Creek may be impairing cold water aquatic life uses.

In addition to the information displayed in Figure 2.16, data on the volatile component of the suspended solids was collected. This information was used to estimate the proportion of algae and organic material associated with the total suspended solids measurement. On an annual basis, volatile suspended solids represented approximately 17 percent of the total. Therefore, roughly 15 mg/L of the total suspended solids concentration measured in the lower segment can be attributed to algae or other organic growth. This is similar to the proportions observed for the mainstem Snake River and the proportions observed in larger tributaries to the Snake River (averaging ~20 percent).

Sediment data are shown in Table 2.10. Warm Springs Creek exceeds the instream targets for sediment. Further up in the watershed, above the agricultural area, Warm Springs Creek meets the instream targets for sediment. Lower in the watershed, below the area of agricultural activity, sediment concentrations measured in Warm Springs Creek are ten times greater than those measured in the upstream reach, nearly double the targets for sediment established by the SR-HC TMDL (DEQ, 2002).

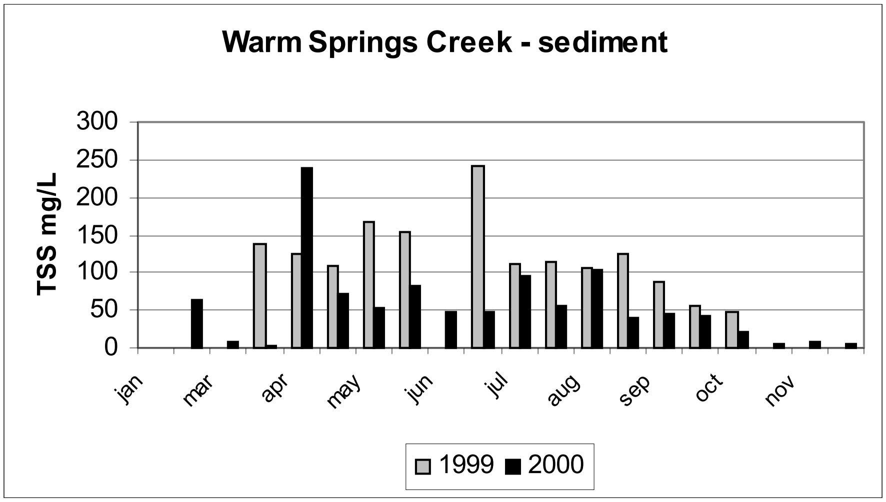

Figure 2.16 Sediment data collected for the Warm Springs Creek subwatershed during 1999 and 2000. (Data collection by the Idaho State Department of Agriculture, K. Campbell, 1999-2000.)

Table 2.10 Average Annual Total Suspended Solids (TSS) Concentrations Measured for Warm Springs Creek (1999 through 2000)

Waterbody	**TSS target concentration**	**TSS (mg/L) average instream concentration in the upstream segment**	**TSS (mg/L) average concentration near confluence with Snake River**
Warm Springs Creek	50 mg/L monthly average	4.22	88.12

Wolman pebble counts done by DEQ BURP crews in 1998 showed 16 percent fines at the upper site and 25 percent fines at the lower site. Rhodes *et al.,* (1994) concluded that survival to emergence for salmonids in the Snake River Basin is substantially reduced when fine sediment concentration exceed 20 percent. The level found by BURP surveys shows that surface fines exceed the level that supports cold water aquatic life at the lower site. In the downstream site sediment concentrations were well above the instream target level. The majority of sediment appears to be delivered in the lower part of the watershed.

Temperature

AVAILABLE DATA

No historical water quality data are available for Warm Springs Creek. Data collected by ISDA represent currently available data. Instantaneous temperature measurements for the Warm Springs Creek subwatershed are displayed in Figure 2.17.

Although the existing data set does not include continuous monitoring information, instream temperatures were measured during an extreme low water year when water temperatures would be expected to exhibit a “worst case scenario” condition. The available data show that there is no observed temperature impairment during the hottest months of the year. No violations of the applicable cold water aquatic life temperature criteria (no greater than 22 ^{o}C instantaneous water temperature) were observed.

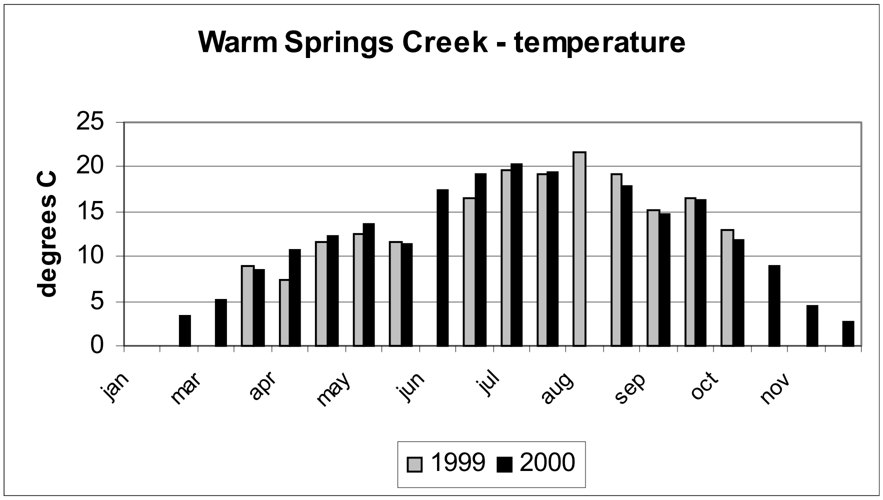

Figure 2.17 Instantaneous water temperature data collected for the Warm Springs Creek subwatershed during 1999 and 2000. (Data collection by the Idaho State Department of Agriculture, K. Campbell, 1999-2000.)

Segment Status

Bacteria levels monitored in Warm Springs Creek exceed the state standard for secondary contact recreation, indicating that the presumed secondary contact recreation use is not supported.

Warm Springs Creek discharges into the Upstream Snake River segment of the SR-HC TMDL (DEQ, 2002) (between Snake River mile 409 and 335). The SR-HC TMDL (DEQ, 2002) has set load allocations for nutrients (total phosphorus) and sediment to meet water quality targets designed to protect designated beneficial uses and restore water quality within this reach of the Snake River. As a tributary to the Snake River, nutrient and sediment targets (Table 2.4) from the SR-HC TMDL (DEQ, 2002) will be applied to Warm Springs Creek to protect downstream waters. These targets will also be protective of uses within Warm Springs Creek.

Water temperatures within Warm Springs Creek were not observed to violate cold water aquatic life temperature criteria throughout the monitoring period (2001). Surface water temperatures are therefore judged to be supportive of cold water aquatic life uses.

Conclusions

There is no indication that the statewide designated beneficial uses of agricultural and industrial water supply, wildlife habitat and aesthetics are impaired.

The beneficial use of secondary contact recreation is not being supported due to violations of the bacteria standard and a TMDL is recommended for bacteria. Bacteria is proposed to be listed as a §303(d) pollutant as part of the first §303(d) list submitted by the State of Idaho subsequent to the approval of this TMDL. Scheduling for the bacteria TMDL will be identified at the time of listing.

A sediment TMDL was completed for Warm Springs Creek. Sediment concentrations in the upstream section of Warm Springs Creek are not projected to exceed the monthly average target of 50 mg/L, or the 80 mg/L target for events lasting less than 14 days. Sediment concentrations in the downstream section of Warm Springs Creek are projected to exceed these targets. Therefore, sediment reductions will be necessary for this segment.

A nutrient TMDL was completed for Warm Springs Creek. Total phosphorus concentrations are substantially greater than the target value for the SR-HC TMDL (DEQ, 2002); therefore, total phosphorus reductions are required for this segment in order to protect water quality downstream.

Although the existing data set is small, the available data show that there is no temperature impairment during the hottest months of the year. Further, instream temperatures were measured during an extreme low water year when higher water temperatures were expected. This assessment process finds that this segment is not impaired due to surface water temperature limitations.

Jenkins Creek

Segment Identifier:	WQLS# 2831, HUC #17050201
Segment Length:	13.02 miles (Headwaters to the Snake River)
Geomorphology:	Rosgen Type B (upper reach)
Beneficial Uses:	*Designated:* cold water aquatic life, primary contact recreation *State-wide designations:* agricultural and industrial water supply, wildlife habitat, aesthetics
1998 §303(d) Listed Pollutants:	Previously listed for sediment, flow alteration; delisted in 1998
Pollutants Proposed for Listing:	Nutrients, sediment, bacteria
Indicators of Impairment:	Riparian vegetation in poor condition, low bank stability exceedences of criteria for secondary contact recreation (bacteria)
Uses Affected:	Secondary contact recreation, downstream water quality Cold water aquatic life status needs verification
Known Sources:	Agricultural management (domestic livestock grazing (upper) and cropping (lower)), roadways, natural sources
TMDLs Written:	Nutrients, sediment
SMI score	37.19, rating = 1; 1995 data
SHI score	63, rating = 3; 1995 data
SFI score	Not available
Support status	2.0, full support; 1995 data

Jenkins Creek was delisted from the Idaho §303(d) list in 1998 based on DEQ BURP information collected in 1995. The DEQ BURP site was located in the upper portion of the stream segment, above the majority of the anthropogenic activity and therefore does not reflect conditions in the lower portion of the stream. Recent monitoring data from ISDA (collected in 1999 and 2000) show that the stream violated water quality standards for bacteria and had elevated levels of nutrients and sediment. There were no observed violations of the surface water quality criteria for dissolved oxygen, pH or temperature (as based on instantaneous temperature data) during the two water years Jenkins Creek was monitored.

Jenkins Creek will be proposed for listing for bacteria in first §303(d) list submitted by the State of Idaho subsequent to the approval of this TMDL. TMDLs for nutrients and sediment for Jenkins Creek were written as part of this document. Appendix C contains the monitoring data collected by ISDA for Jenkins Creek. Figure 2.18 illustrates the available flow data for Jenkins Creek. Observed flow is seasonally intermittent in some areas.

There are no fisheries data available for Jenkins Creek. Monitoring carried out by ISDA indicates the stream segment may not be supporting designated cold water aquatic life beneficial uses due to elevated nutrient and sediment loading (discussed in greater detail in the following sections). DEQ BURP data are available for one site on Jenkins Creek from 1995.

DEQ BURP data collected in 1995 in Jenkins Creek showed an SMI score of 37.19 and an SHI score of 63 at the site assessed. These scores translate to a support status rating of 2.0,

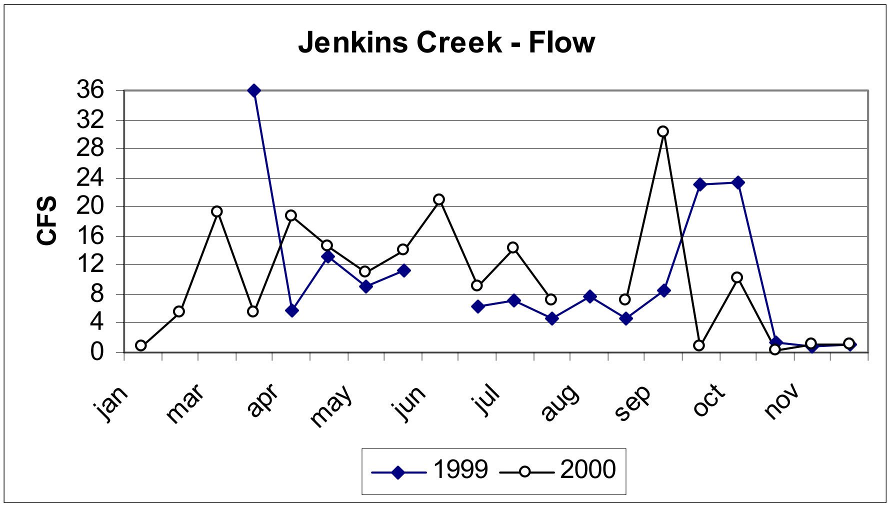

Figure 2.18 Flow data collected for the Jenkins Creek subwatershed during 1999 and 2000. (Data collection by the Idaho State Department of Agriculture, K. Campbell, 1999-2000.)

indicating that at the time of this assessment (1995) the reach described by this site was fully supporting cold water aquatic life uses. The BURP site identified was located upstream of almost all agricultural activity however, and therefore, in the light of more recent water quality data collected in the lower reach of Jenkins Creek, cannot be assumed to be representative of conditions in the lower reach. Additional BURP data should be collected at both the original (upstream) site, and a lower (downstream) site in order to verify that this support call represents current conditions. SFI scores were not available. Salmonid spawning was not evaluated.

Bacteria

POLLUTANT SOURCES

Potential bacteria sources in Jenkins Creek include roadway usage, recreational usage and grazing in the upper reach. Livestock (domestic cattle) and wildlife (elk, deer and waterfowl) are potential sources of bacteria in this subwatershed.

AVAILABLE DATA

Bacteria levels at two different sites (upsteam and downstream) in Jenkins Creek were monitored by ISDA between 1999 and 2001. Data are displayed in Figure 2.19. No historical water quality data are available for Jenkins Creek. The data collected by ISDA represent currently available data.

Jenkins Creek had violations of the secondary contact recreation standards at both the upstream and downstream sites. Seven downstream samples from May through September 2000 (11 samples total) exceeded secondary contact recreation *E. coli* standard of 576 CFUs in 2000. Taking an average of the two years of data from the period April 15 through September 15, the average (arithmetic mean) *E. coli* concentration at the downstream site was 1,465 CFU/100 mL.

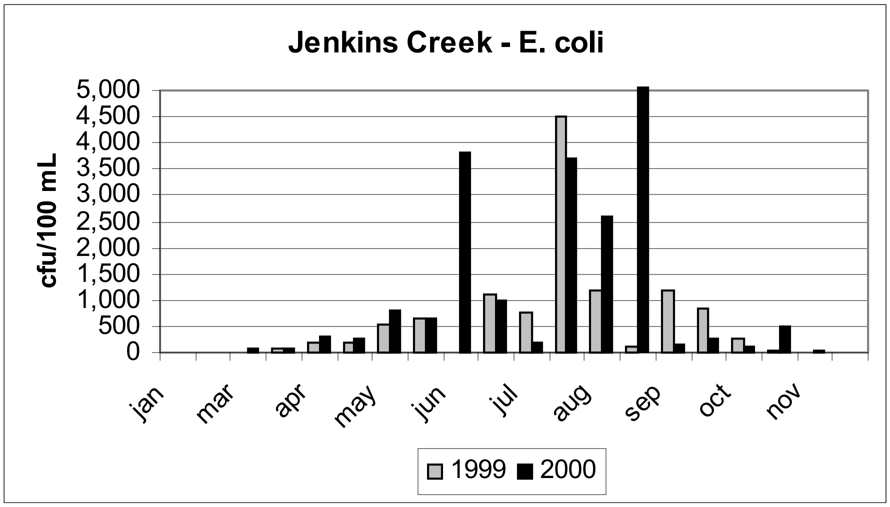

Figure 2.19 Bacteria (*E coli*) data collected for the Jenkins Creek subwatershed during 1999 and 2000. (Data collection by the Idaho State Department of Agriculture, K. Campbell, 1999-2000.)

Nutrients

POLLUTANT SOURCES

Potential nutrient sources in the Jenkins Creek subwatershed include dirt roads and grazing in the upper reach and intensive agricultural activity in the lower reach. Nutrient sources include both domestic animals (cattle) and wildlife (deer, elk and waterfowl).

AVAILABLE DATA

No historical water quality data are available for Jenkins Creek. Data collected as part of studies by ISDA represent currently available data.

Data specific to nutrient concentrations are displayed in Figure 2.20. Total phosphorus

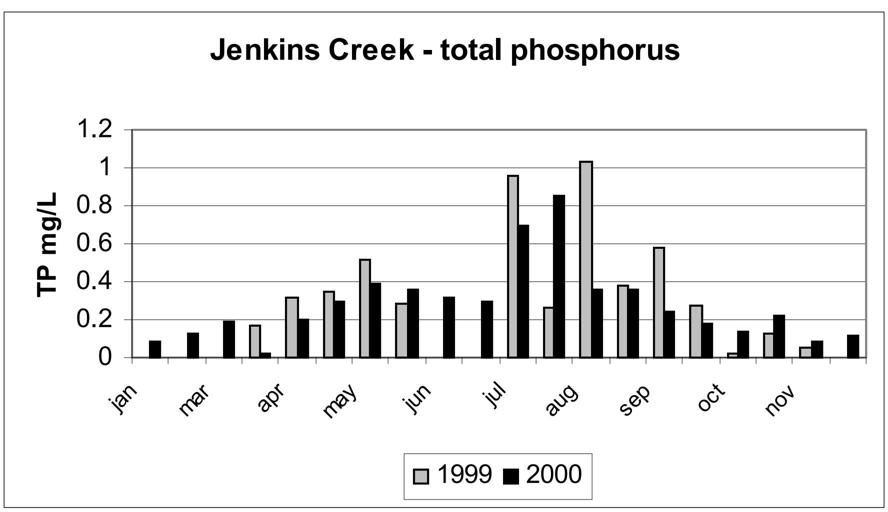

Figure 2.20 Total phosphorus data collected for the Jenkins Creek subwatershed during 1999 and 2000. (Data collection by the Idaho State Department of Agriculture, K. Campbell, 1999-2000.)

concentrations are elevated substantially above those observed in the mainstem Snake River above RM 409 (listed for nutrients on the §303(d) list). The highest total phosphorus concentrations observed occur during the May through October growing/irrigation season. Data collected concurrently on ortho-phosphate concentrations showed that the total phosphorus concentrations recorded in Figure 2.20 are between 40 percent and 52 percent ortho-phosphate, indicating a moderate potential for dissolution and ready uptake by algae and other plant materials in the water column.

Table 2.11 summarizes general information related to total phosphorus concentrations in the Jenkins Creek subwatershed. An increase in the total phosphorus concentration is observed to occur in the downstream section.

Table 2.11 Average Seasonal Total Phosphorus Concentrations Measured in Jenkins Creek (1999 through 2000)

Waterbody	SR-HC TMDL total phosphorus target (mg/L) at mouth	Total phosphorus (mg/L) average instream concentration in the upstream segment	Total phosphorus (mg/L) average concentration near confluence with Snake River
Jenkins Creek	0.07	0.13	0.63

SR-HC TMDL = Snake River – Hells Canyon Total Maximum Daily Load. Seasonal refers to May through September.

Sediment

POLLUTANT SOURCES

Potential sediment sources in the Jenkins Creek subwatershed are the same as those described for nutrients in the preceding section.

AVAILABLE DATA

No historical water quality data are available for Jenkins Creek. Data collected by ISDA represent currently available data.

As observed in Figure 2.21, instantaneous measurements of sediment concentrations in Jenkins Creek consistently exceed the monthly average target of 50 mg/L and the 80 mg/L concentration identified as a target for events lasting fewer than 14 days (the calculated mean sediment concentration was 5.77 mg/L in the upper segment and 162.54 mg/L in the lower segment). While duration information would be helpful in making a conclusive assessment, these data are a good indication that suspended sediment concentrations in Jenkins Creek may be impairing cold water aquatic life uses.

In addition to the information displayed in Figure 2.21, data on the volatile component of the suspended solids was collected. This information was used to estimate the proportion of algae and organic material associated with the total suspended solids measurement. On an annual basis, volatile suspended solids represented approximately 17 percent of the total. Therefore, roughly 28 mg/L of the total suspended solids concentration measured in the lower segment can be attributed to algae or other organic growth. This is similar to the proportions observed for the mainstem Snake River and the proportions observed in larger tributaries to the Snake River (averaging ~20 percent).

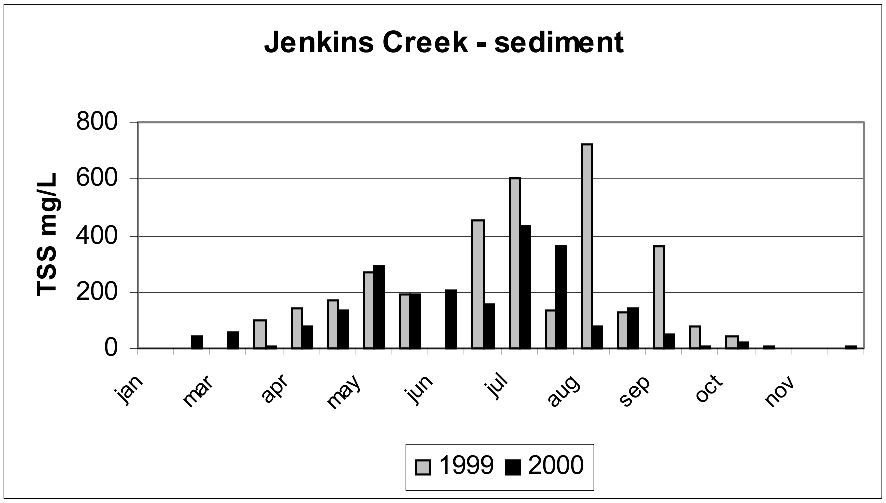

Figure 2.21 Sediment data collected for the Jenkins Creek subwatershed during 1999 and 2000. (Data collection by the Idaho State Department of Agriculture, K. Campbell, 1999-2000.)

Sediment data are shown in Table 2.12. Jenkins Creek exceeds the instream targets for sediment. Further up in the watershed, above the agricultural area, Jenkins Creek meets the instream targets for sediment. Lower in the watershed, below the area of agricultural activity, sediment concentrations measured in Jenkins Creek are more than twenty-five times greater than those measured in the upstream reach, triple the targets for sediment established by the SR-HC TMDL (DEQ, 2002).

Table 2.12 Average Annual Total Suspended Solids (TSS) Concentrations Measured for Jenkins Creek (1999 through 2000)

Waterbody	**TSS target concentration**	**TSS (mg/L) average instream concentration in the upstream segment**	**TSS (mg/L) average concentration near confluence with Snake River**
Jenkins Creek	50 mg/L monthly average	5.77	162.54

Wolman pebble counts done by DEQ BURP crews in 1995 showed 16 percent fines at the upper site and 25 percent fines at the lower site. Rhodes *et al.,* (1994) concluded that survival to emergence for salmonids in the Snake River Basin is substantially reduced when fine sediment concentration exceed 20 percent. The level found by BURP surveys shows that surface fines exceed the level that supports cold water aquatic life at the lower site. In the downstream site, sediment concentrations were well above the instream target level. The majority of sediment appears to be delivered in the lower part of the watershed.

Temperature

AVAILABLE DATA

No historical water quality data are available for Jenkins Creek. Data collected by ISDA represent the currently available data.

Instantaneous temperature measurements for the Jenkins Creek subwatershed are displayed in Figure 2.22. Although the existing data set does not include continuous monitoring information, instream temperatures were measured during an extreme low water year when water temperatures would be expected to exhibit a “worst case scenario” condition.

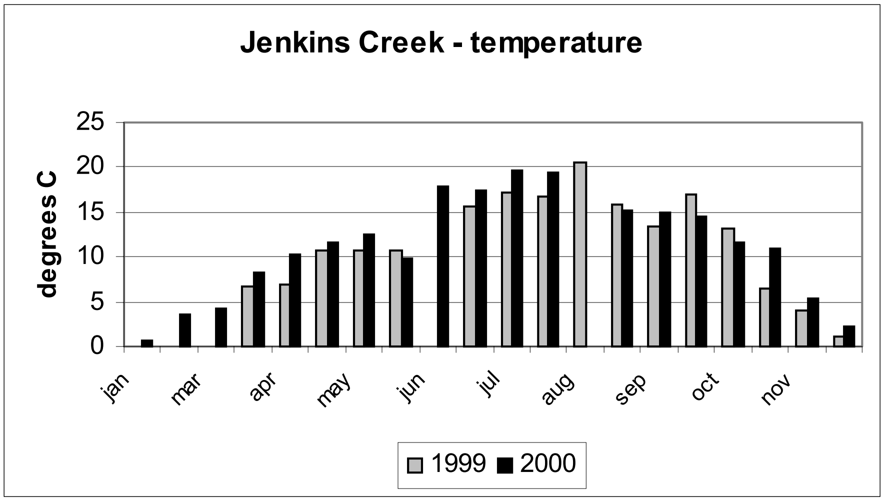

Figure 2.22 Instantaneous temperature data collected for the Jenkins Creek subwatershed during 1999 and 2000. (Data collection by the Idaho State Department of Agriculture, K. Campbell, 1999-2000.)

The available data show that there is no observed temperature impairment during the hottest months of the year. No violations of the applicable cold water aquatic life temperature criteria (no greater than 22 ^{o}C instantaneous water temperature) were observed.

Segment Status

Bacteria levels monitored in Jenkins Creek exceed the state standard for secondary contact recreation, indicating that the presumed secondary contact recreation use is not supported. Jenkins Creek discharges into the Upstream Snake River segment of the SR-HC TMDL (DEQ, 2002) (between Snake River mile 409 and 335). The SR-HC TMDL (DEQ, 2002) has set load allocations for nutrients (total phosphorus) and sediment to meet water quality targets designed to protect designated beneficial uses and restore water quality within this reach of the Snake River. As a tributary to the Snake River, nutrient and sediment targets (Table 2.4) from the SR-HC TMDL (DEQ, 2002) will be applied to Jenkins Creek to protect downstream waters. These targets will also be protective of uses within Jenkins Creek.

Water temperatures within Jenkins Creek were not observed to violate cold water aquatic life temperature criteria throughout the monitoring period (2001). Surface water temperatures are therefore judged to be supportive of cold water aquatic life uses within this segment.

Conclusions

There is no indication that the statewide designated beneficial uses of agricultural and industrial water supply, wildlife habitat and aesthetics are impaired.

The beneficial use of secondary contact recreation is not being supported due to violations of the bacteria standard and a TMDL is recommended for bacteria. Bacteria is proposed to be listed as a §303(d) pollutant as part of the first §303(d) list submitted by the State of Idaho subsequent to the approval of this TMDL. Scheduling for the bacteria TMDL will be identified at the time of listing.

A sediment TMDL was completed for Jenkins Creek. Sediment concentrations in the upstream section of Jenkins Creek are not projected to exceed the monthly average target of 50 mg/L, or the 80 mg/L target for events lasting less than 14 days. Sediment concentrations in the downstream section of Jenkins Creek are projected to exceed these targets. Therefore, sediment reductions will be necessary for this segment.

A nutrient TMDL was completed for Jenkins Creek. Total phosphorus concentrations are substantially greater than the target value for the SR-HC TMDL (DEQ, 2002), therefore, total phosphorus reductions are required for this segment in order to protect water quality downstream.

Although the existing data set is small, the available data show that there is no temperature impairment during the hottest months of the year. Further, instream temperatures were measured during an extreme low water year when higher water temperatures were expected. This assessment process finds that this segment is not impaired due to surface water temperature limitations.

2.4 Data Gaps

It is the responsibility of the state of Idaho to write TMDLs using available data. It is the state's discretion to accept or reject data. TMDLs are to use best available data and to include margins of safety to account for unknown factors. The current TMDL schedules for the state of Idaho do not directly address the amount of available data. The States are charged to write TMDLs using the best available data. The fact that more data could be collected is not a viable basis for delaying a TMDL.

Available data has been used in making the initial assessment of support status for the TMDL and implementation targets for the creeks. The phased implementation process discussed in Section 5.4 is in part intended to allow data to be collected for those constituents for which additional data would be helpful. If these additional data show that initial water quality targets should be refined, the appropriate changes will be undertaken.

This assessment has identified several areas in which additional data would be helpful in refining the current assessment of the affects of listed pollutants on beneficial uses.

Point Sources

There are no NPDES permitted point sources in any of the subwatersheds within this TMDL.

Nonpoint Sources

- Duration data for total suspended solids: The current database only includes total suspended solids data that only allow identification of instantaneous concentrations. Duration data would be helpful in determining direct sediment effects on aquatic life.
- Total suspended solids data for Dennett Creek: Currently there is only limited percent fines information.
- Channel erosion inventories in Dennett Creek. This information would be helpful in determining erosion rates and correlating the rates to 80 percent bank stability.

The information identified above could be used to revise the effected portions of the TMDL and determine and adjust appropriate implementation measures and control efforts. If changes to the TMDL are deemed appropriate, they are not expected to result in the production of a new TMDL document. Minor changes could potentially be handled through a letter amending the existing document(s). More extensive changes may require supplementary documentation or replacement of existing chapters or appendices. The goal will be to build upon rather than replace the original work wherever practical. The schedule and targets for reviewing new data will be addressed in the implementation plan. The opportunity to potentially revise the TMDL and necessary control measures is consistent with current and recently developed TMDL guidance, which emphasizes an iterative approach to TMDL development and implementation. However, any additional effort on the part of the DEQ to revise the TMDL or implementation plan and control efforts will most likely be addressed on a case by case basis.

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3. Subbasin Assessment – Pollutant Source Inventory

In all five creeks (Dennett Creek, Hog Creek, Scott Creek, Warm Springs Creek and Jenkins Creek) anthropogenic activities have adversely impacted water quality through increased bacteria, nutrient and sediment loading to the Snake River system. The degradation of water quality in the tributaries is caused to some degree by pollutant sources related to agricultural activities, domestic and wildlife grazing and dirt roads among others.

3.1 Sources of Pollutants of Concern

Point Sources

There are no point sources in the watershed.

Nonpoint Sources

Anthropogenic nonpoint sources within the watersheds include agricultural land uses, including irrigated and non-irrigated croplands and irrigated and dryland pasture (domestic livestock grazing); urban/suburban land use including runoff from impervious surfaces and construction activities; recreational uses, including both land and water-based activities; and legacy mining activities. Associated pollutants include sediment, nutrients, pathogens, salts, toxic substances, petroleum products and pesticides, all of which contribute to some degree to surface and ground water quality degradation (EPA, 2000). Each nonpoint source category is discussed in greater detail in the following sections.

In the discussion of nonpoint pollutant sources listed below and in the segment-specific sections earlier, specific land use practices are identified as causing negative water quality impacts and increased pollutant loading. It should be kept in mind however that these land use practices, when managed in a responsible and conscientious fashion, do not result in decreased water quality. However, these land uses can lead to decreased water quality where poor management or inadequate controls are practiced.

For example, domestic livestock grazing is identified below as a potential source of bacteria, nutrient and sediment loading to the watershed. This should not be interpreted as implying that all domestic livestock grazing results in degraded water quality. Rather, poorly managed or improper domestic livestock grazing practices may result in increased pollutant loading. Proper management and location considerations in a domestic livestock grazing plan can be expected to result in minimal if any impact to water quality. Therefore, the discussion below should not be interpreted as an identification of land use practices in general as being detrimental to water quality. It should be noted that poor land use practices can be improved and direct, long term benefits to water quality can be realized.

Agricultural Management Sources
The primary pollutants associated with agricultural activities are sediment and nutrients (present in both dissolved and sediment-bound forms), as shown in Table 3.1. Related agricultural impacts are alteration of

Table 3.1 Potential Pollutant Loading from Agricultural Activities

Management Practices	Resulting Status of Sediment Loads	Resulting Status of Nutrient Loads	Resulting Status of Other Pollutants
Nonirrigated Cropland	Increased sediment load during winter snowmelt and spring rain, when soil is least protected by plant growth	Nutrient transport during storm events, correlated with sediment transport and fertilizer application Nitrogen transport in early winter	Increased bacterial levels from manured fields Potential transport of agricultural pesticides
Irrigated Cropland (sprinkler, furrow and flood irrigation techniques)	Irrigation induced erosion and sediment transport Increased sediment load during winter snowmelt and spring rain, when soil is least protected by growth	Nutrient transport during storm events, correlated with sediment transport and fertilizer application Nitrogen transport in early winter	Increased bacterial levels from manured fields Potential transport of agricultural pesticides
Riparian Grazing and Watering	Increased sediment load Increased erosion Vegetation reduction/removal Increased stream temperatures	Increased nutrients from animal waste deposition and transport within the channel Greater dissolution of nutrients at elevated temperatures	Increased bacterial levels
Over Utilization of Pasture	Increased erosion (sheet and rill) Increased transport of sediment Decreased stubble height Soil compaction leading to reduced water infiltration	Increased nutrient load from animal waste deposition Increased nutrient transport from overland flow caused by soil compaction and decreased stubble height	Increased bacterial levels
Flood Irrigation	Removal of soil fines from surface and subsurface Increased bank erosion from subsurface drainage and recharge Subsurface saturation, decreased permeability, and increased erosion from surface runoff	Prolonged saturation leads to anaerobic soil conditions and decreased capacity for phosphorus sorption Removal of soil fines decreases surface area of soils and decreases available capacity for phosphorus sorption	

stream flows and temperatures. Pesticides are also associated with agricultural land uses. The generation and transport of pollutants from agricultural nonpoint sources are influenced by the health of riparian areas through which water is transported to the mainstem Snake River, overland flow from runoff and snowmelt, irrigation practices, pasture and domestic livestock grazing management and fertilizer application (NRCS, 1995 a and b).

CROPPING

Impacts from cropping practices include direct and indirect effects related to sediment, nutrient and pesticide loading. The primary transport mechanisms for sediment and other associated pollutants are wind and water erosion. Previously, agricultural practices that left soil bare for extended periods of time often resulted in substantial erosion rates. Improved conservation tillage practices are reducing the impacts of erosion on surface waters.

In both irrigated and non-irrigated cropland, runoff containing sediment and other associated pollutants (most commonly nitrogen, phosphorus and pesticides) generally occurs during winter and spring snowmelt and spring rainfall events when the soil is least protected by plant growth. Irrigation induced erosion is the major contributor of sediment and associated pollutants to surface waters from irrigated croplands. The most serious irrigation induced erosion is caused by surface applied systems, primarily furrow irrigation. Erosion from sprinkler irrigation can also be significant if the rate of water application exceeds the soil infiltration capacity (IDH, 1993; USDA, 1996).

Tilled cropland is additionally susceptible to erosion during the spring when crops are newly planted and furrows are not well established. The majority of sediment transported by water movement in cropped land is fine particulate containing many adsorption sites for nutrients and other pollutants. Heavy or large particle sizes are not commonly transported off-site by moving water or wind. The preferential removal of fine particle size sediment from a cropped field can result in increased pollutant transport in surface water due to greater availability of adsorption sites in the small particles and decreased adsorption capacity in the field.

The small particle size soil fractions preferentially removed from the subsurface through irrigation practices are deposited within the flow channel after irrigation flows discharge to streams and tributaries. Material deposited in this fashion can function as a pollutant source to the overlying water column. Natural processes act to maintain equilibrium between pollutant concentrations in the bed sediments and the flowing water. Thus, if pollutant concentrations in the overlying water are less than concentrations occurring within the deposited sediments, sorbed pollutants will be more readily desorbed from the sediments and dissolved into the flowing water. This process acts to enrich tributary inflow concentrations to the mainstem Snake River system and to extend the peak input period to the mainstem Snake River system beyond the traditional irrigation season (Sonzongi *et al.*, 1982).

Additionally, improper timing or excessive application of fertilizers to cropped fields can result in nutrient transport to surface and ground waters. Similarly, agricultural pesticides may be transported to surface waters or leached to ground water if improperly applied. Best management practices and recommended application protocols for fertilizers and pesticides can reduce the potential for negative impacts to the environment (IDH, 1993; Olness *et al.*, 1975; Sharpley *et al.*, 1991; Sharpley *et al.*, 1992; Tisdale *et al.*, 1993; USDA, 1996)

GRAZING

Impacts from domestic and wildlife grazing practices include direct and indirect effects related to sediment and nutrient loading. Local streams represent the major source of water for livestock and a secondary source of forage. Access to streams is generally unrestricted. Cattle grazing along the streambanks and within the channel exacerbate erosion in two major ways. The shearing action of hooves on streambanks destabilizes the soil and increases the potential for significant erosion as loose sediments are rapidly removed by flowing water. Grazing cattle also remove or substantially reduce riparian vegetation (Armour *et al.*, 1991; Platts and Nelson, 1985 a and b; Platts 1983). Bank erosion is accelerated where riparian vegetation has been removed or heavily grazed. Streambank vegetation stabilizes bank sediments and reduces the erosive force of flowing water. It also serves as a depositional area for sediment already in the stream.

Water entering vegetated reaches slows down because of the resistance plant stems create within the flow path. As flow velocity decreases, sediment particles settle out within the riparian areas. Reduction or removal of riparian vegetation decreases bank stability through the loss of root mass within the soil profile and decreases settling and sedimentation at the edges of the stream channel. As a result, streambanks have become unstable in many stream reaches.

In addition to increased erosion and sediment transport effects, domestic and wildlife grazing practices also contribute to nutrient loading through the deposition and transport of animal wastes. A small portion of the available phosphorus in plant material is used in growing and maintaining bones and teeth, but grazing animals partition nearly all phosphorus intake into manure. Manure has a slower physical decomposition rate than plant material on the surface. This results in increased accumulation of soluble phosphorus in a physically unstable form within the pasture (Khaleel *et al.*, 1980; USDA, 1996). Such deposition is especially noticeable when correlated with the spatial distribution of animals in grazing and bedding routines.

Cattle within a grazed pasture rarely spread out and cover the entire acreage evenly. Rather, they tend to congregate around areas where water is readily available and forage is plentiful. Because greater numbers of livestock are concentrated in these areas, a greater proportion of the manure produced is deposited in or near stream channels and riparian areas. Manure concentration per unit of land is relatively small because the total grazed land area is commonly large however manure concentration correlates well with major water bodies, resulting in a greater potential for direct transport.

The phosphorus contained within manure is in a highly soluble, readily bioavailable form. Because of the high solubility, phosphorus loading and transport from a manured field can exceed those from a non-manured field by many times (Hedley *et al.*, 1995; Khaleel *et al.,* 1980; Olness *et al.,* 1975; Omernik *et al.,* 1981; Reddell *et al.*, 1971; Sharpley *et al.,* 1992). Erosive processes occurring within an ungrazed or forested watershed would require a significantly greater amount of time and transport to produce the same effect on bioavailable phosphorus loading as a direct deposition of phosphorus-rich animal wastes into the channel or floodplain of a stream.

A related impact is increased water temperatures in the streams due to removal of streamside vegetation, which allows greater dissolution of adsorbed phosphorus and other nutrients from sediment-bound forms. Monitoring performed above and below grazed land in other watersheds has shown higher levels of bacterial loading in waters below the grazed area than in those above (Lappin and Clark, 1986; USDA, 1996; Zimmer, 1983). This is most probably due to deposition of manure in and around streams and overland transport of manure through storm events and spring runoff.

Erosion from storm events, combined with reduced vegetation from improper domestic livestock grazing management also result in increased sediment transport to stream channels. In a related fashion, over utilization of pasture land can result in subsurface compaction of soils as hoof action combined with animal weight create a pressure wave that compresses the soil profile, resulting in the formation of a dense layer of low permeability 12 to 15 inches below the soil horizon (Gilley *et al.*, 1996; Mapfumo *et al.*, 1999; Orodho *et al.*, 1990; Weltz *et al.*, 1989). In storm events and spring snowmelt, water cannot penetrate this compacted layer and the volume and velocity of overland flows increase, as do the total suspended sediment and nutrient loads. Vegetation in over-utilized pasture areas is commonly insufficient to retain sediment carried by overland flow and deposited manure is easily transported directly into or downstream within natural stream and/or irrigation channels (NRCE, 1996).

It should be noted that the domestic livestock grazing impacts identified above commonly associated with poor management of domesticated livestock can also occur as a result of the management of wild game such as deer and elk if populations are manipulated to levels greater than those that would occur without human intervention. For example, elk herds can trample vegetation in a manner similar to cattle and have been known to destroy newly established riparian vegetation in the upstream sections of tributaries to the Snake River (IDFG, 2000).

Feeding Operations

Feeding operations result in large numbers of cattle in a small area. Subsequently, runoff is high in nutrients and bacteria. Feeding operations often install lagoons to prevent runoff from draining directly into a stream. Nutrient management plans are required by ISDA for feedlots by July 2005.

Irrigation

Furrow and flood irrigation, commonly used to irrigate agricultural land, also impact sediment and nutrient loading. Water diverted from natural streams is applied to pasture land through a series of canals and ditches. These canals are filled and water is allowed to saturate the surrounding soil, creating an artificially high water table. Practices like flood irrigation that substantially alter the water table can lead to changes in the mobility of phosphorus within the shallow subsurface. Phosphorus has been observed to move more easily through soils that are consistently waterlogged because the majority of the iron present in these soils is no longer in the chemical form (Fe^{+3}) required for greatest sorption potential. As a result, adsorption occurs less efficiently or at greatly reduced rates within the soil profile (Sharpley *et al.*, 1995).

In addition, movement of water in subsurface layers results in the preferential loss and transport of small particle-size soil fractions which represent the primary source of phosphorus sorption sites in the soil. These particles carry a significant amount of sorbed phosphorus with them when they are removed and leave the remaining soil deficient in sorption sites. Therefore, not only is the subsurface water enriched directly through the sorbed phosphorus on the particulate, but further runoff from the original soils will be enriched due to the decrease in phosphorus sorption capacity (Hedley *et al.*, 1995). In addition, phosphorus sorption-desorption characteristics, buffer capacity and the sorption index of the transported sediments are altered and the equilibrium phosphorus content of the runoff waters is usually enriched (Sharpley *et al.*, 1995).

The small particle-size soil fractions preferentially removed from the subsurface through flood irrigation practices are deposited within the flow channel after irrigation flows discharge to streams and tributaries. Material deposited in this fashion can function as a nutrient source to the overlying water column. Natural processes act to maintain equilibrium between nutrient concentrations in the bed sediments and the flowing water. Thus, if nutrient concentrations in overlying water are less than nutrient concentrations occurring within the deposited sediments, sorbed nutrients will be more readily desorbed from the sediments and dissolved into the flowing water. This process acts to enrich tributary inflow concentrations to the mainstem Snake River system and to extend the peak nutrient input period to the mainstem Snake River system beyond the traditional irrigation season (Sonzongi *et al.*, 1982).

Irrigation recharge and surface runoff created by furrow and flood irrigation practices are diverted to local streams or returns as shallow subsurface recharge. These waters generally contain high concentrations of phosphorus and nitrogen as compared to ambient concentrations in local streams (Klahr, 1988; Omernik *et al.,* 1981; Shewmaker, 1997). These same irrigation systems funnel and accelerate delivery of runoff from snowmelt during spring thaw. In addition, inefficient irrigation water management practices can reduce stream flows unnecessarily, resulting in increased water temperatures.

In many areas of the Snake River watershed furrow and flood irrigation return flows are discharged into streams and rivers both as surface and subsurface flows. While it has the potential to be enriched in nutrients, subsurface recharge can also increase instream flows, resulting in lower temperatures and improved fish habitat in some areas (IDFG, 2000; DEQ, 1998b). In addition, this subsurface flow has resulted in the formation of wetland areas in many pasturelands (DEQ, 1998b). Similarly, when irrigation practices occur in proximity to natural or manmade surface water systems, subsurface recharge can result in the extension of riparian zones and improved bank stabilization by increased riparian vegetation. Irrigation flows commonly act to extend the health of such riparian or “created” wetlands into the late summer months. Without these surface and subsurface flows, this vegetation would normally only be present in the spring and early summer months.

Recreational Sources

Potential impacts from recreational uses are mainly related to increased erosion potential caused by irresponsible off-road vehicle use. Pollutants of concern generated by recreational use in the watershed include, but are not limited to, bacterial and nutrient contamination from human and animal waste (improper sanitary disposal) and organic material from fish cleaning (Table 3.2). Sediments are also contributed by heavy use of native-surface roads, particularly during the wet season.

Table 3.2 Potential Pollutant Loading from Recreational Activities

Management Practice	Resulting Status of Sediment Loads	Resulting Status of Nutrient Loads	Resulting Status of Other Pollutants
Recreation	Increased sediment from off-road and irresponsible camping vehicle use	Increased nutrient load from improperly disposed wastes	Increased bacterial levels from improperly disposed human, fishing and hunting wastes

Urban/Suburban Sources

There are three primary components to urban/suburban land use in the watersheds: low intensity residential land use, suburban/recreational residential land use and transportation corridors (roads and highways). Pollutant sources of concern associated with urban/suburban land use include (but are not limited to) stormwater and other impervious surface runoff, improperly functioning septic systems and construction-based loading concerns. Potential impacts from urban/suburban activities are listed in Table 3.3.

Table 3.3 Potential Pollutant Loading from Urban/Suburban Activities

Management Practices	Resulting Status of Sediment Loads	Resulting Status of Nutrient Loads	Resulting Status of Other Pollutants
Stormwater Runoff	Increased sediment from snow management and construction practices	Increased sediment-bound nutrients from runoff and construction	Increased amounts of petroleum products and home/ lawn care chemicals
Ranchettes and other suburban development	Increased sediment transport from high road and livestock density	Increased nutrient loads from increased animal waste deposition and transport	Increased bacterial levels Increased storm- water pollutants
Failing Septic Systems	Increased sediment from construction (nominal)	Increased nutrient load in highly bioavailable form	Increased bacterial levels
Road and Highway Management	Increased sediment from snow management and construction practices and runoff from rain events	Increased sediment-bound nutrients from runoff and construction	Petroleum products, vehicle wastes and snow/ice management chemicals

STORMWATER RUNOFF

Stormwater runoff, occurring when precipitation and runoff events result in excess water movement through urban/suburban systems, roadways, road repair and construction and other major construction projects can result in a substantial impact to water quality if not properly treated. These event-driven flows often remove pollutants from impervious surfaces and transport pollutant loads through road swales and drainage ditches to surface and ground water systems. In most rural residential areas the quantity and quality of stormwater runoff is unknown.

Pollutant sources of concern associated with urban stormwater and other impervious surface runoff include nutrients from lawn fertilizers and improperly disposed of animal wastes; sediment from erosion of conveyance systems, private properties and ditches; oils; pesticides and bacteria. Certain municipal, industrial and construction sources of stormwater runoff are considered point sources and are regulated by national pollution discharge elimination system (NPDES) permits, either general or site specific. Most stormwater permits require pollution prevention plans.

FAILING SEPTIC SYSTEMS

Many rural residential and recreational housing developments rely on septic systems for the treatment of household and human wastes. Septic systems, if improperly constructed or located, can act as sources of nutrients and pathogens to surface and ground water systems due to inadequate retention time and treatment of septic tank effluent. Improper construction of septic systems may be due to age (construction prior to current regulations) or inappropriate capacity or materials (tanks sized too small for usage, tank materials not appropriate for location characteristics, or tanks not sealed properly). Tanks may be improperly placed in areas with high ground water tables, existing ground water contamination and/or high septic tank density (DEQ, 1997; Postma *et al.*, 1992; Alhajjer *et al.*, 1989).

Nutrient and pathogen contributions from septic tank effluent can also be the result of soil characteristics that are inappropriate for septic systems (Reckhow and Simpson, 1980; DEQ, 1997) or how well the soil matrix functions in binding and reducing the transport of phosphorus through shallow ground water. The most important soil mechanisms responsible for immobilizing phosphorus are the formation of insoluble iron and aluminum phosphate compounds and the adsorption of phosphate ions onto clay particles (Tilstra *et al.*, 1972). Seasonal high ground water tables may also increase the mobilization of phosphorus, ultimately transporting all phosphorus from septic tank effluent to surface and ground water systems.

Recreational or seasonal housing that depends on septic systems may represent a nutrient and pathogen source to surface and ground water systems even if the septic tank and drainfield are properly constructed and located because inconsistent or intermittent usage does not result in the adequate formation of treatment mats within the drainfield (Postma *et al.*, 1992). These mats are formed of organic material and stationary bacterial growth that treats outflowing water. In intermittently used systems these mats do not form to the same degree as in continually used systems. Treatment of septic effluent is therefore less effective overall in intermittently used septic systems.

Legacy Mining Activities

Legacy mining activities in the Dennett Creek watershed have left eroding hillsides, tailing piles and dirt roads all of which contribute sediment to the creek.

Ground water

Ground water within the SR-HC watershed can be divided into two major categories: ground water and subsurface recharge. Within this document, ground water refers to ground water that is present due to geological and non-anthropogenic hydrological processes. It occurs at a variety of subsurface levels, but is predominantly located from 40 to 500 feet below the ground surface. Subsurface recharge refers to subsurface water present due to anthropogenic practices such as furrow and flood irrigation. The water applied in such practices is often "perched" between the soil surface and one of several existing clay layers known as "hard-pan" or "clay-pan." These layers occur within the watershed at depths ranging from 2 to 10 or more feet below the surface. Because of their relative impermeability they prohibit infiltration of the water to lower levels and promote an artificially raised water table.

This water moves under hydraulic pressure toward low lying areas, discharging into existing stream channels through outlets in the streambanks and eventually into the mainstem river system and tributaries.

Ground water (especially shallow ground water) within the Weiser Flat area is of poor quality due to an increasing occurrence of nitrate and, to a lesser extent, pesticide contamination. Nutrient concentrations in ground water in Idaho commonly average less than 0.75 mg/L nitrate (USGS, 1996; Seitz and Norvitch, 1979; Yee and Souza, 1984). Data from the ground water in the Weiser Flat area show average concentrations of 9.9 mg/L. Of the 25 areas determined to be nitrate priority areas, the Weiser priority area is ranked first in terms of the severity of the problem (DEQ Ground Water Quality Plan). In infants under six months of age, nitrate levels higher than 10 mg/L can have toxic effects as nitrate in the bloodstream interferes with the blood's ability to carry oxygen to the body tissues.

Land use practices over the last 100 years have contributed to elevated nitrate and pesticide concentrations in ground water. With continued irrigation, some of this loading may leach into surface waters.

Nutrient concentrations in subsurface recharge within the Snake River watershed were higher than those in unimpacted ground water, averaging 0.5 mg/L total phosphorus and 2.25 mg/L nitrate in Idaho (USGS, 1996). Sediment loading from natural ground water is minimal for all but the smallest particle sizes due to the sieving effect of transport through the soil matrix.

Background and Natural Loading

Background Loading

For the purpose of this document, background loading is the load delivered to a segment by inflowing upstream waters. Background loads can contain pollutants originating from both natural and anthropogenic sources. In general, TMDL processes move toward reductions in the anthropogenically induced fraction of background loading. In this manner, background load reductions can be assessed and achieved in most systems.

Information on instream concentrations of pollutants is only from the lower watershed. There is no information on instream concentrations of these pollutants in the upper watershed. Thus, DEQ is using SR-HC natural background loading information to determine what part of the loading is attributable to natural background conditions. The SR-HC targets are derived from information from similar subwatersheds in the surrounding SR-HC watershed.

Natural Loading

For the purpose of this document, natural loading is defined as the loading within a water system that originates solely from natural, non-anthropogenic sources. In general, TMDL processes move toward the attainment of natural loading levels rather than requiring the reduction of natural loads. Natural loading to the creeks as discussed in this TMDL comes from a variety of different sources. Sources differ substantially from pollutant to pollutant and to a lesser degree from reach to reach.

Natural sources of bacteria and other pathogens include indigenous wildlife and wildfowl that utilize the watershed. While wildlife and wildfowl populations are relatively stable throughout much of the year, substantial increases in some populations were observed with spring and fall migration patterns. Fluctuations in the levels of bacteria from waterfowl are especially noticeable as migration effects are directly correlated with surface water areas and wetland areas within the watershed.

Increased nutrient loading is often associated with increases in algal mass and chlorophyll *a*, decreases in dissolved oxygen levels and changes in pH that commonly occur following a major bloom. Natural sources of nutrient loading that may trigger such occurrences include elevated levels of nutrients from natural ground water inflows or springs, correlated with high solar radiation and low flow velocities associated with low water levels during the dry summer season. Additional sources of natural nutrient loading include runoff and sediment/erosion associated with natural soils and geologic features, landslides and high velocity flows.

Natural sources of sediment include streambank erosion, commonly most significant during high flow and spring runoff conditions (December through June); naturally induced landslides and debris flows that deposit material in the stream channel; and erosion induced by other natural occurrences such as forest fires where native vegetation is removed leaving exposed soils more susceptible to extreme precipitation and runoff events (Beaty, 1994; Saa *et al.*, 1994). All of the sources listed are highly variable in nature and difficult to predict accurately. Sediment transport within a water system is directly related to increased flow volumes and velocities.

Natural sources of increased temperature are predominantly the result of the hot, dry climate. In addition, native vegetation in much of the watershed is relatively low growing and sparse, providing little shading to some tributary waters.

Pollutant Transport

Flows within the Weiser Flat watershed are strongly seasonal. Early in the year the majority of in-stream flow is a result of snowmelt and runoff from those areas of the watershed where precipitation falls mostly as snow. While the total volume and timing of surface runoff is highly variable from year to year, natural flows decrease markedly in the late spring and early summer and some of the upper segments alternate between reaches with and without water later in the year.

In the lower segments of these streams, irrigation recharge represents the vast majority of the flow during the summer and early fall. Much of this recharge is in the form of ground water and results in lower summertime temperatures for these systems than observed in other surface waters in the same general area.

In the upstream drainage areas of the perennial streams, ground water discharge occurs in a generally constant fashion throughout the year, but varies somewhat from year to year depending on the relative level of annual precipitation and the duration and timing of the snowmelt.

As evidenced by the plots of pollutant concentrations in Section 2, pollutant loading is strongly seasonal and the lower watershed's hydrology is largely governed by irrigation activity in summer. The majority of loading observed correlates with the irrigation season (May through October), followed by snowmelt induced loading that occurs in the spring (February through April).

In addition to the peak in loading that occurs during summer months, monitoring data in the Snake River downstream show that this is also the critical period for excessive algae growth and thus, should be the main focus of pollutant reductions.

Total phosphorus loads for the Weiser Flat streams were calculated using flow and water quality concentration data from May through September. This seasonal average is specific to the target value, represents the time of year when a significant portion of anthropogenic loading occurs and is the time when management practices have the greatest efficacy. Sediment loads were calculated using flow and water quality concentration data from year round monitoring.

There is no loading in the upper watershed when the streams are dry. In the Weiser Flat subwatersheds, nutrient pollutant loads are greatest during the irrigation season and spring runoff (roughly April 15 through September 15). Sediment loads are high during runoff events and throughout the irrigation season in the lower portion of the watershed.

Flow and sediment data are not available for Dennett Creek. Dennett Creek receives the majority of its sediment load through instream processes. While grazing contributes to sediment loading through degradation of riparian and upland areas, bank erosion and down-cutting result in greater sediment loading.

A full discussion of the relationship between pollutants and identified pollutant sources is available in the preceding sections and in Tables 3.1, 3.2 and 3.3.

Agriculture is the primary land use in the lower drainages (Table 1.3) and often occurs within close proximity of the stream channel. Those areas of these streams that flow through areas of intensive land use (primarily the lower stream reaches) are the most sensitive to impairment as flows are slower (less flushing occurs) and are very highly managed. In some cases (e.g. Hog Creek), the flows in the downstream segments are almost 100 percent agricultural recharge. These lower segments are therefore the most likely to reflect direct pollutant transport both to the stream segments themselves and to downstream waters.

3.2 Data Gaps

It is the responsibility of the state of Idaho to write TMDLs using available data. It is the states' discretion to accept or reject data. TMDLs are to use best available data and to include margins of safety to account for unknown factors. The current TMDL schedules for the State of Idaho do not directly address the amount of available data. The States are charged to write TMDLs using the best available data. The fact that more data could be collected is not a viable basis for delaying a TMDL.

Available data has been used in making the initial assessment of the TMDL and implementation targets for the systems. The phased implementation process discussed in Section 5.4 is in part intended to allow data to be collected for those constituents for which additional data would be helpful. If these additional data show that initial water quality targets should be refined, the appropriate changes will be undertaken.

This assessment has identified several areas in which additional data would be helpful in refining the current assessment of the affects of listed pollutants on beneficial uses.

Point Sources

There are no NPDES permitted point sources in any of the subwatersheds within this TMDL.

Nonpoint Sources

- Duration data for total suspended solids: The current database only includes total suspended solids data that only allow identification of instantaneous concentrations. Duration data would be helpful in determining direct sediment effects on aquatic life.
- Total suspended solids data for Dennett Creek: Currently there is only limited percent fines information.
- Channel erosion inventories in Dennett Creek. This information would be helpful in determining erosion rates and correlating the rates to 80 percent bank stability.

The information developed through these efforts may be used to revise the effected portions of the TMDL as described in Section 2.4.

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

4.1 Point Source Efforts

There are no NPDES permits in any of the watersheds.

4.2 Nonpoint Source Efforts

The Weiser River Soil and Water Conservation District conducted a preliminary investigation into surface and ground water quality problems in 2000. As part of this effort, they came up with 'potential alternative solutions' to the problems and determined unit cost per acre for these solutions. The current best management practices (BMPs) in place are listed below, but the district has embarked on an outreach and education program for implementation of other nutrient and sediment management projects. These projects include, but are not limited to, constructed wetlands, filter strips, polyacrylamide (PAM) application, drip and surge irrigation system and prescribed grazing (NRCS 2000).

A 50 percent reduction in domestic livestock grazing is scheduled for portions of the Dennett Creek watershed in the near future. This effort will reduce pressure on the riparian area in Middle Dennett Creek, resulting in greater canopy cover as woody species are able to reestablish. The improved canopy cover is projected to increase shading, resulting in lower overall surface water temperatures.

Table 4.1 outlines nonpoint source pollution control efforts currently in place or in progress within the watersheds addressed by this TMDL.

Table 4.1 Nonpoint Source Pollution Control Efforts

Watershed	Nonpoint Source Pollution Control Efforts
Dennett Creek	Joint Idaho Department of Fish and Game conservation easement / US Bureau of Land Management grazing allotment plan requiring 50 percent reduction on **both** private and public lands Stock watering ponds installed away from riparian areas to reduce impacts
Hog Creek	Gated pipes, concrete ditches, sprinkler systems
Scott Creek	Gated pipes, concrete ditches, sprinkler systems
Warm Springs Creek	Conservation reserve program lands, gated pipes, concrete ditches, sprinkler systems

The above improvements in management currently initiated and/or scheduled for the Dennett Creek watershed are projected to result in benefits to water quality that will, over time, meet the majority of the requirements of the TMDLs specific to this watershed, namely reductions in total phosphorus and sediment concentrations. It is recommended that an appropriate time frame be defined for the identified reduction in AMUs and streambank stabilization projects be completed and mature, to be followed by qualitative and quantitative monitoring to assess the magnitude of water quality improvement realized.

In addition to the improvements currently initiated and/or scheduled for the Dennett Creek watershed, treatment of Hog Creek agricultural drains that will address not only irrigation return waters but also stormwater from the City of Weiser is currently being implemented in the form of a series of created wetlands. These wetlands, located near the end of several major agricultural drains, will treat a majority of the irrigation return water in this watershed. In addition to irrigation return water, several Hog Creek drains also receive stormwater runoff from the City of Weiser. Treatment of stormwater runoff is difficult if not impossible in most areas where discharge to the drains occurs due to the lack of land surface and steep slope issues. Treatment of the combined flow through created wetlands was initiated on a moderate scale in early 2003 with expansion planned to include additional drain flows in late 2003 and 2004. These improvements in treatment currently initiated and scheduled for the Hog Creek watershed are projected to result in benefits to water quality that will, over time, meet the majority of the requirements of the TMDLs specific to the treated drains within this watershed, namely reductions in total phosphorus and sediment concentrations. As with the Dennett Creek watershed, it is recommended that an appropriate time frame be defined for the identified reduction in AMUs and streambank stabilization projects be completed and mature, to be followed by qualitative and quantitative monitoring to assess the magnitude of water quality improvement realized.

4.3 Potential for Achievement of Water Quality Standards with Present and Planned Activities

If the pollutant reduction measures identified perform at the expected efficiencies, water quality standards should be met and designated beneficial uses should be supported in the respective stream drainages for which TMDLs have been developed.

If the pollutant reduction measures identified perform at efficiencies below those expected, the iterative assessment processes present in the TMDL will be called upon to identify additional measures for reduction. In this manner, achievement of water quality standards and full support of designated beneficial uses will be realized, but through an extended time frame. The implementation of planned pollutant loading reduction activities is expected to benefit from the evaluation of reduction efficiencies in those measures already in place. Those measures observed to function efficiently, with consideration for both water quality benefits and cost per reduction, would be expected to be considered for more widespread implementation within the watershed.

4.4 Adequacy of Efforts to Date

To date, the pollutant control measures currently inplace have not resulted in attainment of water quality criteria for nutrients or sediment for those segments specifically listed for these pollutants. As a result, beneficial uses of fishing, recreation and cold water aquatic life within the watersheds have not been brought back into full support through these efforts. Additional efforts, both currently in the planning stages and those specific to the TMDL process are expected to be necessary to allow the reaches to meet water quality criteria and fully support their beneficial uses.

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5. Total Maximum Daily Loads

A TMDL prescribes an upper limit on discharge of a pollutant from all sources so as to assure water quality standards are met. It further allocates this load capacity (LC) among the various sources of the pollutant. Pollutant sources fall into two broad classes: point sources, each of which receives a waste load allocation (WLA); and nonpoint sources, which receive a load allocation (LA). Natural background (NB), when present, is considered part of the load allocation, but is often broken out on its own because it represents a part of the load not subject to control. Because of uncertainties regarding quantification of loads and the relation of specific loads to attainment of water quality standards, the rules regarding TMDLs (40 CFR § 130) require a margin of safety (MOS) be a part of the TMDL.

Practically, the MOS is a reduction in the load capacity that is available for allocation to pollutant sources. The natural background load is also effectively a reduction in the load capacity available for allocation to human made pollutant sources. This can be summarized symbolically as the equation: LC = MOS + NB + LA + WLA = TMDL. The equation is written in this order because it represents the logical order in which a loading analysis is conducted. First the LC is determined. Then the LC is broken down into its components: the necessary MOS is determined and subtracted; then NB, if relevant, is quantified and subtracted; and then the remainder is allocated among pollutant sources. When the breakdown and allocation are completed we have a TMDL, which must equal the LC.

Another step in a loading analysis is the quantification of current pollutant loads by source. This allows the specification of load reductions as percentages from current conditions, considers equities in load reduction responsibility and is necessary in order for pollutant trading to occur. Also a required part of the loading analysis is that the LC be based on critical conditions – the conditions when water quality standards are most likely to be violated. If protective under critical conditions, a TMDL will be more than protective under other conditions. Because both LC and pollutant source loads vary and not necessarily in concert, determination of critical conditions can be more complicated than it may appear on the surface.

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

5.1 Instream Water Quality Targets

Target Selection

In order to restore "full support of designated beneficial uses" (Idaho Code 39.3611, 3615), the targets listed in Table 5.1 were determined for nutrients and sediment based on criteria from the SR-HC TMDL (DEQ, 2002). A more in-depth discussion of how these targets were derived is included in Section 2.3 of this document and in Sections 3.2 and 3.5 of the SR-HC TMDL (DEQ, 2002).

Table 5.1 Water Quality Targets Specific to Dennett Creek, Hog Creek, Scott Creek, Warm Springs Creek and Jenkins Creek

Parameter	Selected Target
Nutrients	No greater than 0.07 mg/L total phosphorus from May through September
Sediment	No greater than 50 mg/L total suspended solids as a monthly average and no greater than 80 mg/L total suspended solids for events lasting less than 14 days

Total phosphorus was used as a target instead of the more biologically available ortho-phosphorus for the following reasons:

1. Total phosphorus is a more stable form of phosphorus: ortho-phosphorus rapidly converts between forms in the water column.
2. Total phosphorus represents the phosphorus that is currently available for growth as well as that which has the potential to become available over time.

Monitoring Points

The locations of DEQ BURP monitoring sites and the locations of ISDA monitoring sites are identified in Figures 1.5 through 1.9. The ISDA downstream monitoring site in each subwatershed was used to determine total loading into the Snake River. Load capacity was calculated by calculating monthly loading at each downstream site. The upstream site was used to determine the loading contribution from background and domestic livestock grazing and dirt roads. Seasonal loads were used to more accurately characterize the loading variations and allocate reductions accordingly. The lower watershed's hydrology is largely governed by irrigation activity in summer. The reverse situation also holds true at certain times of the year due to natural conditions. Data sources are described in Appendix C. Copies of the collected data are on file at the DEQ office.

Temperature data from Dennett Creek were collected during 1999 and 2000. For Hog Creek, Scott Creek, Warm Springs Creek and Jenkins Creek, monitoring data were collected biweekly during April through October 2000 and monthly from November 2000 to March 2001 by ISDA. Nutrient, sediment, dissolved oxygen, pH, temperature, flow and bacteria data were collected.

The Weiser Flat streams have intermittent sections and it is important to note that the lower segments of these streams could have flow when the upper segments are dry.

5.2 Load Capacity

Load capacity is the maximum load each water body can accommodate and still meet the water quality standards "with season variations and a margin of safety which takes into account any lack of knowledge..." (CWA §303(d)(C)). Likely sources of uncertainty include lack of knowledge of assimilative capacity, uncertain relation of selected target(s) to beneficial use(s) and variability in target measurement. Load capacity for these stream segments was determined by using the target criteria to identify loads/day.

In determining loads, DEQ accounts for natural loading and includes a margin of safety to address uncertainty that may result from a variety of sources. These loads are iterative, meaning that if further monitoring shows that targets need to be adjusted, then those adjustments will be made. Background loading will be evaluated on an ongoing basis to ensure adequate characterization.

For the Weiser Flat watersheds of Hog, Scott, Warm Springs and Jenkins Creeks bacteria targets for primary and secondary contact recreation apply throughout the year.

Total phosphorus targets apply from May through September only. Monitoring data show that this is the critical period of algae growth and pollutant loading and thus, should be the main focus of pollutant reductions. This seasonal target application should result in a reduction of the majority of anthropogenic loading. Sediment targets apply year round. Load capacities for total phosphorus and sediment are identified in Tables 5.2 and 5.3.

5.3 Estimates of Existing Pollutant Loads

Loading analyses were performed where adequate tributary water quality data were available. Regulations allow that loadings "...may range from reasonably accurate estimates to gross allotments, depending on the availability of data and appropriate techniques for predicting the loading," (40 CFR 130.2(I)).

All pollutant loading within these stream segments is from nonpoint or natural sources. For Hog, Scott, Warm Springs and Jenkins Creeks, nonpoint and natural/background source delineations were based on monitoring site locations. Monitoring and flow data are not available for Dennett Creek. Flows were estimated for Dennett Creek using the average flow/acre in the subbasin from measured stream flows in Hog, Scott and Warm Springs Creek.

To the extent possible, natural/background loads were distinguished from human-caused increases in nonpoint loads through the location of monitoring points (The locations of DEQ BURP monitoring sites and the locations of ISDA monitoring sites are identified in Figures 1.5 through 1.9). However, grazing related sources are aggregated with natural/background sources in the upper watersheds because grazing occurs above the upper monitoring sites.

Table 5.2 Total Phosphorus Load Capacity for Stream Segments in the Brownlee Reservoir (Weiser Flat) Subbasin Based on Total Phosphorus Target of Less Than 0.07 mg/L.

Waterbody	Total phosphorus target concentration (mg/L) at mouth	Flow (cfs) summer season average	Load capacity (lbs/day)	Calculation method used
Dennett Creek	0.07	15.6	5.88	Estimated flow x target concentration
Hog Creek	0.07	6.7	2.53	Measured flow x target concentration
Scott Creek	0.07	13.1	4.95	Measured flow x target concentration
Warm Springs Creek	0.07	13.7	5.15	Measured flow x target concentration
Jenkins Creek	0.07	10.2	3.85	Measured flow x target concentration

Table 5.3 Sediment Load Capacity for Stream Segments in the Brownlee Reservoir (Weiser Flat) Subbasin Based on Total Suspended Sediment Targets of Less Than 50 mg/L as a Monthly Average.

Waterbody	Sediment target concentration (mg/L monthly average)	Flow (cfs) annual average	Load capacity (lbs/day)	Calculation method used
Dennett Creek	50	18.8	5,060	Estimated flow x target concentration
Hog Creek	50	7.6	2,046	Measured flow x target concentration
Scott Creek	50	16.4	4,414	Measured flow x target concentration
Warm Springs Creek	50	16.4	4,414	Measured flow x target concentration
Jenkins Creek	50	10.0	2,692	Measured flow x target concentration

Therefore, upstream anthropogenic loading and natural/background loading cannot be fully differentiated in these subwatersheds.

The hydrology and land use patterns of the Weiser Flat subwatersheds have been correlated with monitoring locations to the extent possible. Sources located above the upstream monitoring sites were generally roads, domestic livestock grazing and natural loading.

The natural/background and domestic livestock grazing load was calculated using the upper watershed flow data. Total phosphorus loads were calculated using flow and water quality concentration data from May through September. This seasonal average is specific to the target value, represents the time of year when a significant portion of anthropogenic loading occurs and the time when management practices have the greatest efficacy. Sediment loads were calculated using flow and water quality concentration data from year round monitoring.

While septic systems in the Weiser Flat watersheds may contribute nutrient loads, the fraction of the total load is minimal and it has been included with other sources in the nonpoint source load allocation.

There is no loading in the upper watershed when the streams are dry. In the Weiser Flat subwatersheds, nutrient pollutant loads are greatest during irrigation season and spring runoff (roughly April 15 through September 15). Sediment loads are high during runoff events and throughout irrigation season in the lower portion of the watershed.

Flow and sediment data are not available for Dennett Creek. Dennett Creek receives the majority of its sediment load through watershed-wide sources including both natural and anthropogenic loading. While grazing contributes to sediment loading through degradation of riparian and upland areas, bank erosion and down-cutting result in greater sediment loading. Additional data will be collected following approval of the TMDL to allow better quantitative identification of appropriate load allocations. Current pollutant loads for total phosphorus and sediment are identified in Tables 5.4 and 5.5. The locations of DEQ BURP monitoring sites and the locations of ISDA monitoring sites are identified in Figures 1.5 through 1.9.

Table 5.4 Current Total Phosphorus Pollutant Loads Measured for Stream Segments in the Brownlee Reservoir (Weiser Flat) Subbasin.

Waterbody	Load type/location	Total phosphorus loading (lbs/day)	Calculation method used
Dennett Creek		Cannot be calculated due to lack of concentration data	N/A
Hog Creek	Rangeland above upstream site	4.68	Measured flow x concentration with differentiation by site location
	Agricultural land below upstream site	4.55	
	Natural + Background	0.15	
	Total	9.38	
Scott Creek	Rangeland above upstream site	0.13	Measured flow x concentration with differentiation by site location
	Agricultural land below upstream site	25.9	
	Natural + Background	0.06	
	Total	26.09	
Warm Springs Creek	Rangeland above upstream site	0.11	Measured flow x concentration with differentiation by site location
	Agricultural land below upstream site	20.52	
	Natural + Background	0.02	
	Total	20.65	
Jenkins Creek	Rangeland above upstream site	0.13	Measured flow x concentration with differentiation by site location
	Agricultural land below upstream site	34.32	
	Natural + Background	0.14	
	Total	34.59	

Table 5.5 Current Sediment Pollutant Loads Measured for Stream Segments in the Brownlee Reservoir (Weiser Flat) Subbasin.

Waterbody	Load type/location	Sediment loading (lbs/day)	Calculation method used
Dennett Creek		Cannot be calculated due to lack of concentration data	N/A
Hog Creek	Rangeland above upstream site	856	Measured flow x concentration with differentiation by site location
	Agricultural land below upstream site	944	
	Natural + Background	271	
	Total	944*	
Scott Creek	Rangeland above upstream site	1,504	Measured flow x concentration with differentiation by site location
	Agricultural land below upstream site	7,479	
	Natural + Background	475	
	Total	9,458	
Warm Springs Creek	Rangeland above upstream site	47	Measured flow x concentration with differentiation by site location
	Agricultural land below upstream site	7,718	
	Natural + Background	15	
	Total	7,779	
Jenkins Creek	Rangeland above upstream site	68	Measured flow x concentration with differentiation by site location
	Agricultural land below upstream site	8,660	
	Natural + Background	22	
	Total	8,750	

* Hog Creek exhibits sediment attenuation below the upstream site

5.4 Load Allocation

Using the existing data in concert with target concentrations, load allocations were determined for each watershed. Stream segment-specific load allocations were developed through the calculation of load delivered within a specific stream segment as compared to the natural and background loading. The cumulative value of the stream segment-specific total phosphorus load allocations is equal to the calculated load capacity as shown in Table 5.2. The cumulative value of the stream segment-specific total suspended solids load allocations is equal to the calculated load capacity as shown in Table 5.3 minus a 10% margin of safety (discussed in the following section).

Margin of Safety

Although the best available techniques and information are applied, uncertainty arises in the selection of water quality targets, load capacity and estimates of existing loads; and can be attributed to a number of sources including incomplete knowledge or understanding of the system and incomplete or variable data. The margin of safety is essentially a reduction in loading capacity that is identified prior to allocation to any sources.

There are several areas of uncertainty that are addressed by applying a margin of safety. In this TMDL, storm events may not be captured in the existing data set since it consists of biweekly and monthly measurements. Pollutant loads vary with cropping patterns as well as climactic conditions and this variability may not be adequately assessed with only two years of monitoring data.

The US Geological Survey (USGS) determined that discrete flow measurements present 10 to 25 percent degree of error depending on whether grab sampling or depth/width integrated sampling methodologies were utilized. Analytical error accounts for another 3 to 5 percent of uncertainty. Using best professional judgement and the above ranges, 13 percent has been applied as a MOS for this determination. This MOS has been incorporated into the identification of the total phosphorus targets for this TMDL; therefore, it is not necessary to include any further margin of safety in the total phosphorus load allocations.

An implicit margin of safety is incorporated into the SR-HC TMDL sediment targets, as all parameters used to identify these targets were conservative in nature. An additional explicit margin of safety of 10 percent has been used in calculation of the sediment load allocations.

Seasonal Variation

Seasonal variation within these streams and their respective drainage basins is primarily driven by flow. Snowmelt and spring runoff flows represent the highest flow regimes, late fall and winter flows represent the lowest flow regimes. Pollutant delivery is associated primarily with snowmelt and spring runoff flows (sediment) and irrigation season flows (sediment and nutrients). Irrigation flows generally start in April or early May and continue through October. Therefore, seasonal variation and critical conditions were considered in development of the TMDLs.

Reasonable Assurance

The load reductions for these watersheds rely on nonpoint source reductions to achieve desired water quality and restore beneficial uses. To ensure that these nonpoint source mechanisms are operating effectively and also to calculate reduction efficiency, monitoring will be conducted. Monitoring in the Weiser Flat watersheds of Hog, Scott and Warm Springs Creek will continue at the same locations as the past ISDA monitoring and will allow quantification of reductions from agricultural areas and rangeland.

If instream monitoring indicates that improvement is not occurring then BMPs or other efforts will be modified as necessary to ensure that protection of beneficial uses.

Dennett Creek will be monitored on a triennial basis using the NRCS erosion inventory that will allow identification of vulnerable stream areas as well as assessment of channel stability improvements. The BMPs can then be adjusted accordingly.

The state of Idaho uses a voluntary approach to control agricultural nonpoint sources.

However, regulatory authority can be found in the state water quality standards (IDAPA 58.01.02350.01 through 58.01.02350.03). IDAPA 58.01.02054.07 refers to the Idaho Agricultural Pollution Abatement Plan (IAPAP) which provides direction to the agricultural community for approved BMPs. A portion of the IAPAP outlines responsible agencies or elected groups that will take the lead if nonpoint pollution problems need addressing. It assigns the local SCDs to assist the landowner/operator to develop and implement 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 provide injunctive relief for those situations that may be determined imminent and of substantial danger to public health or the environment (IDAPA 58.01.02350.02(a)).

If a nonpoint pollutant is determined to be impacting beneficial uses and the activity already has inplace referenced BMPs or knowledgeable and reasonable practices, the state may request that the BMPs be evaluated and/or modified to determine appropriate actions. If evaluations and/or modifications do not occur injunctive relief may be requested (IDAPA 58.01.02350.2. ii (1)).

It is recognized that the implementation of recommended practices within these tributary watersheds will most likely be undertaken as part of the implementation plan for the Weiser River TMDL. Therefore, the targets established here for these creeks will be revisited with the completion of the Weiser River TMDL and the most appropriate management targets will be identified at that time. If necessary, changes may be made to these TMDLs in order to make correlation with the Weiser River TMDL implementation process.

It is expected that a voluntary approach will be sufficient to achieve the load allocations needed. The local agricultural/ranching community has demonstrated a willingness to implement BMPs and protect water quality. In the past, costshare programs have provided the agricultural community the technical assistance, information and education and cost share incentives to implement BMPs. These cost share programs are generally administered through the local SCD and usually involve contracts specifying that BMPs be implemented for ten years. The continued funding of these programs is critical for the load allocations set out in this TMDL.

Since no point sources are present within the subbasin, reasonable assurances are not required. However, a discussion on nonpoint source reductions has been provided.

Background

In addition to the margin of safety, the natural/background load represents a further reduction in loading capacity available for allocation. Background/natural sources are those identified to stem from non-anthropogenic sources and as such, no reductions are required specific to these loads.

Background levels of total phosphorus and sediment were not available for Dennett, Hog, Scott, Warm Springs and Jenkins Creeks. Because of this lack of data, DEQ used the background levels of these pollutants determined for the SR-HC TMDL (DEQ, 2002), namely natural total phosphorus loading was estimated at 0.02 mg/L, natural total suspended solids loading was estimated as being 24 percent of the total spring runoff load from the upper watershed. These estimates are described in detail in the SR-HC TMDL (DEQ, 2002). Where appropriate, background level monitoring will take place in 2002 to verify natural background level allocation. The allocation for background will be adjusted if necessary based on these results.

Reserve

Identified sources and land uses are predominantly agricultural, with some minor influence from roadways. With the identified trend of conversion from agricultural land uses to urban/suburban or rural development land uses, agricultural sources of pollutants are likely to remain stable or decrease within the implementation lifetime of this TMDL. For this reason, no future pollutant source load allocations (reserve capacity) were calculated.

Remaining Available Load

After the natural/background loading is subtracted form the load capacity, the remaining available load represents that amount that can be allocated to nonpoint sources within the subwatersheds in the form of load allocations. No waste load allocations will be assigned as there are no point sources in the watershed.

The load allocations identified by this TMDL are outlined in Tables 5.6 and 5.7.

Implementation Considerations

It is recognized that the TMDL addresses a complex system that includes a combination of diverse natural and nonpoint pollutant sources. Limited data are available to this TMDL effort for the evaluation of water quality violations.

As identified in the DEQ TMDL guidance (1999) “A phased approach is typically needed when nonpoint sources are a large part of the pollutant load, information is limited, or narrative criteria are being interpreted.” This TMDL has therefore adopted a phased approach to implementation that will identify interim, measurable milestones for determining whether management measures or other action controls are being implemented and a process for implementing stronger and more effective management measures if necessary.

It is expected that this phased approach to implementation, where implementation activities are scheduled over a period of time will result in some sources achieving load allocations prior to other sources, provided that progress is being made in achieving water quality standards in accordance with the schedule established by the TMDL.

The implementation of the TMDL will consist of and support practices and policies that lead towards sustainable and responsible land use and development. Regional cooperation in developing long-term environmental, economic and community sustainability plans will be of critical importance to this effort. The site specific implementation plans that follow the completion of the TMDL will be encouraged to focus on strategies that promote sustainable options. Soil, water and energy conservation programs will be emphasized. Waste minimization and pollution prevention are central to the success of the TMDL.

Table 5.6 Total Phosphorus Load Allocations for Stream Segments in the Brownlee Reservoir (Weiser Flat) Subbasin Based on Total Phosphorus Target of Less Than 0.07 mg/L.

Waterbody	Load type/location	Total phosphorus load allocations (lbs/day)	Reductions required (lbs/day)	Time frame to meet load allocations*
Dennett Creek		No nutrient TMDL written		
Hog Creek	Rangeland above upstream site	1.21		11.5 years from approval of this TMDL
	Agricultural land below upstream site	1.17		
	Natural + Background	0.15		
	Total	2.53	6.85 (73%)	
Scott Creek	Rangeland above upstream site	0.07		11.5 years from approval of this TMDL
	Agricultural land below upstream site	4.82		
	Natural + Background	0.06		
	Total	4.95	21.14 (81%)	
Warm Springs Creek	Rangeland above upstream site	0.04		11.5 years from approval of this TMDL
	Agricultural land below upstream site	5.09		
	Natural + Background	0.02		
	Total	5.15	15.50 (75%)	
Jenkins Creek	Rangeland above upstream site	0.07		11.5 years from approval of this TMDL
	Agricultural land below upstream site	3.64		
	Natural + Background	0.14		
	Total	3.85	30.74 (89%)	

* Implementation plans will be completed 18 months after approval of the TMDL. Implementation is expected to be completed within 10 years after the implementation plans are finalized.

It is also expected that information will continue to be collected to fill existing data gaps and allow a more accurate determination of the status of beneficial uses within the reach and the impact of pollutants delivered to and processed by the system. In recently formulated guidance on TMDLs, EPA recognized that additional information regarding the actual performance of management measures may lead to questions concerning the appropriateness of the water quality standards. In some cases, states, territories and authorized tribes may initiate use attainability analyses to determine the appropriate use and possibly revise the use on the basis of the information gathered during the implementation phase of the TMDL.

5.5 Conclusions

There is no indication that the statewide designated beneficial uses of agricultural and industrial water supply, wildlife habitat and aesthetics are impaired in Dennett, Hog, Scott, Warm Springs or Jenkins Creeks.

Table 5.7 Sediment Load Allocations for Stream Segments in the Brownlee Reservoir (Weiser Flat) Subbasin Based on Total Suspended Sediment Targets of Less Than 50 mg/L as a Monthly Average and a 10 Percent Margin of Safety.

Waterbody	Load type/location	Sediment load allocations (lbs/day)	Reductions required (lbs/day)	Time frame to meet load allocations*
Dennett Creek		4,554	Cannot be calculated	11.5 years from approval of this TMDL
Hog Creek		No sediment TMDL written		
Scott Creek	Rangeland above upstream site	1,053		11.5 years from approval of this TMDL
	Agricultural land below upstream site	2,445		
	Natural + Background	475		
	Total	3,973	5,485 (58%)	
Warm Springs Creek	Rangeland above upstream site	47		11.5 years from approval of this TMDL
	Agricultural land below upstream site	3,911		
	Natural + Background	15		
	Total	3,973	3,806 (49%)	
Jenkins Creek	Rangeland above upstream site	68		11.5 years from approval of this TMDL
	Agricultural land below upstream site	2,333		
	Natural + Background	22		
	Total	2,423	6,327 (72%)	

* Implementation plans will be completed 18 months after approval of the TMDL. Implementation is expected to be completed within 10 years after the implementation plans are finalized.

The beneficial use of secondary contact recreation is not being supported in Hog, Scott, Warm Springs and Jenkins Creeks due to water quality standards violations for bacteria. A TMDL is recommended for these segments. Bacteria is proposed to be listed as a §303(d) pollutant as part of the first §303(d) list submitted by the State of Idaho subsequent to the approval of this TMDL. Scheduling for the bacteria TMDLs will be identified at the time of listing.

Total phosphorus concentrations in Hog, Scott, Warm Springs and Jenkins Creeks are substantially greater than the target value for the SR-HC TMDL (DEQ, 2002), therefore, total phosphorus reductions are projected to be required for these streams in order to protect water quality downstream. Nutrient TMDLs have been completed for these streams.

Sediment concentrations in the downstream segments of Scott, Warm Springs and Jenkins Creeks are projected to exceed sediment targets. Therefore, sediment reductions will be necessary for these streams. Sediment TMDLs have been completed for these streams.

Dennett Creek is listed for temperature on the 1998 Idaho §303(d) list. Temperature was evaluated to the extent possible for Dennett, Hog, Scott, Warm Springs and Jenkins Creeks. Instream temperatures were measured during an extreme low water year when higher water temperatures were expected. Available data show that there is no exceedance of cold water aquatic life temperature criteria during the hottest months of the year for any of these streams. Since the assessment process found that this segment is not impaired due to surface water temperature limitations, delisting is recommended for Dennett Creek for temperature on the first §303(d) list submitted by the State of Idaho subsequent to the approval of this TMDL.

Listing is proposed for Jenkins Creek for bacteria, nutrients and sediment as part of the first §303(d) list submitted by the State of Idaho subsequent to the approval of this TMDL. Scheduling for these TMDLs will be identified at the time of listing.

In all streams, continued monitoring is necessary to ensure that the characterization of these watersheds is complete, ensure that appropriate BMPs are used and also to quantify BMP efficiency as reductions are made. The TMDL process is iterative to ensure that refinements can be made as needed.

The reductions determined in this TMDL in concert with the implementation process will ensure that these waterbodies can support recreation and cold water aquatic life. The BMPs for agriculture and domestic livestock grazing that are already underway and in the planning stages as well as additional BMPs implemented as part of this effort, will have long reaching effects in terms of wildlife habitat, recreation and aesthetic improvements.

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.

Time Frame

The expected time frame for meeting assigned load allocations is identified in Tables 5.6 and 5.7 as 11.5 years. This time frame is based on the requirement that implementation plans for each TMDL will be completed 18 months after approval of the TMDL; and the assumption that implementation of each TMDL will be completed within 10 years after the implementation plans are finalized. As the load allocations are based on water quality targets formulated to meet water quality standards and support designated beneficial uses; and as there is essentially no retention in any of these watersheds that would result in long-term internal processing of pollutant loads, the time frame for meeting load allocations is expected to parallel that required to meet water quality standards and full support of support designated beneficial uses. In this manner, achievement of water quality standards and full support of designated beneficial uses will be realized, but through an extended time frame.

Approach

The Brownlee Reservoir (Weiser Flat) TMDL will rely on nonpoint source reductions to meet the load allocations to achieve desired water quality and to restore designated beneficial uses. There are no identified point sources discharging to the Weiser Flat streams at this time.

The state of Idaho uses a voluntary approach to control agricultural nonpoint sources. It is expected that a voluntary approach will be sufficient to achieve the load allocations needed as the local agricultural/ranching community has demonstrated a willingness to implement BMPs and protect water quality.

Specific measures to be implemented to meet load allocations will be identified in the TMDL implementation plans to be prepared within 18 months of the approval of these TMDLs.

Responsible Parties

State of Idaho water-quality standards refer to other programs whose mission is to control nonpoint pollution sources. Some of these programs and responsible agencies are listed in Table 5.8.

Table 5.8 Identification of the Federal, State, and Local Governments, Individuals, or Entities that will be Involved in or Responsible for Implementing the TMDL

Citation	IDAPA Citation	Responsible Agency
Rules governing forest practices	16.01.02350.03(a)	Idaho Department of Lands
Rules governing solid waste management	16.01.02350.03(b)	Idaho Department of Health and Welfare
Rules governing subsurface and individual sewage disposal systems	16.01.02350.03(c)	Idaho Department of Health
Rules and standards for stream channel alteration	16.01.02350.03(d)	Idaho Department of Water Resources
Rules governing exploration and surface mining operations in Idaho	16.01.02350.03(e)	Idaho Department of Lands
Rules governing placer and dredge mining in Idaho	16.01.02350.03(f)	Idaho Department of Lands
Rules governing dairy waste	16.01.02350.03(g) or IDAPA 02.04.14	Idaho State Department of Agriculture

In addition to the state agencies identified in the preceeding table, federal and local entities have participated in administration and oversight of TMDL implementation measures in the past in the form of costshare programs. Costshare programs have provided the agricultural community the technical assistance, information and education and cost share incentives to implement BMPs. These cost share programs are generally administered through the NRCS, ISDA or local SCDs and usually involve contracts specifying that BMPs be implemented for ten years. The continued funding of these programs is critical for the load allocations set out in this TMDL.

Monitoring Strategy

A monitoring plan that is appropriate in scope will be prepared as part of the site-specific implementation plans completed 18 months following the approval of the Brownlee Reservoir (Weiser Flat) TMDL. DEQ has an acknowledged role in construction of this plan and oversight of the monitoring activities. In other TMDLs in the State of Idaho, DEQ monitoring has played a prominent role in progress evaluation. Other entities, such as state and federal agencies have also often been partners in providing monitoring support for TMDL implementation. It is expected that the monitoring accomplished on the Brownlee Reservoir (Weiser Flat) TMDL will follow a similar pattern of participation. DEQ has committed to participate to the fullest extent possible contingent on available resources.

While detailed plans cannot be accurately identified at this time, the monitoring effort on the Brownlee Reservoir (Weiser Flat) TMDL is expected to include both monitoring to fill data gaps and routine progress monitoring. This will include both qualitative and quantitative monitoring techniques for both BMP effectiveness and ambient water quality trends.

These projected goals of the Brownlee Reservoir (Weiser Flat) TMDL monitoring plan will be a joint effort on the part of many government and private participants. Specific responsibility will be identified as the implementation planning process proceeds.

To ensure that nonpoint source reduction mechanisms are operating effectively, and to give some quantitative indication of the reduction efficiency for in-place BMPs, BMP monitoring will be conducted. This monitoring will not be carried out on a site specific basis for each implemented BMP, but rather as a suite of indicator analyses may be monitored at the inflow and outflow of the segments within the Brownlee Reservoir (Weiser Flat) TMDL reach and at other appropriate locations such as the inflow of tributaries. For example, a decrease in total phosphorus over time as monitored at the Hog Creek inflow to the SR-HC TMDL reach would serve as an indicator that BMPs employed within the Hog Creek watershed were acting to reduce total phosphorus levels within the tributary water column. This data will be further utilized, in conjunction with flow measurements, to evaluate the overall decrease in total pollutant mass being delivered to the Brownlee Reservoir (Weiser Flat) TMDL reach.

Concurrent monitoring of mainstem water quality will be undertaken to determine the direct effects of the monitored inflowing concentration trends on mainstem water quality.

6. Additional TMDL Process Information

6.1 Public Involvement

Throughout this TMDL process, local experience and participation have been and will continue to be invaluable in the identification of water quality issues and reduction strategies appropriate on a local scale. Because of the impact of the TMDL process on the local community and the dependence of any implementation plan on local participation, public involvement is critical during the entire TMDL process. Within the Weiser River subbasin, a structured public involvement program has been established that includes both local stakeholder interests and technical, agency personnel as outlined by Idaho Code 39-360, 39-3615, 39-3616. This program was established by the State of Idaho so members of the local communities could provide direction and leadership in developing and implementing TMDLs.

The public committee created for the Weiser River subbasin is known as the Weiser River Watershed Advisory Group (WAG) and Technical Advisory Group (TAG). Because the creeks evaluated in this TMDL are in close proximity to the Weiser River and many of the land owners associated with the Weiser River TMDL process are also associated with the management of lands within or adjacent to these creeks, the Weiser River WAG and TAG have been involved in the review and assessment of this TMDL document. To a lessor extent, the Snake River – Hells Canyon Public Advisory Team (SR-HC PAT) has taken an ancillary role in this TMDL through review and comment on water quality targets and land management issues associated with that segment of the Snake River to which Dennett Creek, Hog Creek, Scott Creek and Warm Springs Creek discharge.

In late 1999, Weiser River watershed residents formed the Weiser River WAG for the Weiser River TMDL (due 2003). The WAG formed relatively early in the TMDL process in order to allow time for the members to gain a better understanding of the watershed. Nominations for potential representatives for each of the interest categories were solicited from the general public through letters to local governments, organizations, stakeholder interest groups, individuals etc. The interest categories were approved by the Southwest Basin Advisory Group (BAG) as outlined Idaho Code 39-3614, 39-3615.

As stated previously, the Weiser River WAG represents the local stakeholder interests for the Weiser River watershed and, due to the geographic proximity of the tributaries, for Dennett Creek, Hog Creek, Scott Creek, Warm Springs Creek and Jenkins Creek. The Weiser River WAG is coordinated by the Weiser River Soil and Water Conservation District. An alphabetical listing of the stakeholder interests represented within the Weiser River WAG follows:

- Agricultural Interests
- City of Council
- City of Weiser
- County Commissioners
- Public at Large
- Sporting or Recreational Interests
- Timber/Forestry Interests

The Weiser River TAG was formed in December 1999. The TAG is comprised of agency representatives from:

- Idaho Department of Environmental Quality
- US Department of Agriculture
- US Forest Service
- Natural Resource Conservation Service
- US Bureau of Land Management
- Idaho State Department of Agriculture
- Idaho Soil Conservation Commission
- City of Weiser
- City of Council
- Adams Soil Conservation District
- Weiser River Soil Conservation District

The efforts of this focus on the Weiser River and nearby watersheds. The Weiser River TAG will assist with review in this TMDL process and with proposed implementation plans.

Similar information on the stakeholder interests represented in the SR-HC PAT are available in the SR-HC TMDL (DEQ, 2002).

The Weiser River WAG and TAG and the SR-HC PAT provide an opportunity for a group of concerned citizens to see the TMDL process through from start to finish. These groups, though advisory in nature, have the potential to shape the final outcome of the TMDLs for Dennett Creek, Hog Creek, Scott Creek, Warm Springs Creek and Jenkins Creek. Weiser River WAG and SR-HC PAT representatives are members of local communities that can provide direction and experience in local problems and locally-based solutions to DEQ. Their leadership and experience is invaluable to the process of developing and implementing the TMDL. Additionally, Weiser River WAG and SR-HC PAT members represent a critical mechanism in disseminating information to their respective interest groups and relaying concerns and advice from these interest groups to DEQ.

The public comment period on the draft Weiser Flat TMDL was opened on April 15, 2003, and closed on May 30, 2003. An informational meeting to present background on the TMDL and answer questions was provided preceding the public comment period. A public information meeting was held on Thursday, May 15, 2003 from 7 to 9 PM at the Vendome located at 309 State Street in Weiser, Idaho. DEQ did not receive any public comments during the public comment period. DEQ received comments on the draft TMDLs from two individuals representing the Idaho Association of Soil and Water Conservation Districts and the Idaho State Department of Agriculture, and comments from the Weiser River WAG and TAG prior to the public comment period. These comments were incorporated into the document to the extent possible. The DEQ also received comments from USEPA during the public comment period and these comments were also incorporated into the document to the extent possible. The Response to Comments document, included in Appendix H, summarizes the issues raised, and DEQ’s prepared responses and revisions to the TMDLs.

Interested citizens not involved directly through these groups can get involved in the TMDL process through attending public comment and informational meetings, as well as Weiser River WAG and SR-HC PAT meetings.

6.2 Enforcement Authorities

The DEQ's regulatory and enforcement authorities are set forth in the Idaho Environmental Health and Protection Act (1972), as amended (Idaho Code §39-101 *et seq.*), Idaho Code §39-3601 *et seq.* and Section 350 of the *Idaho Water Quality Standards and Wastewater Treatment Requirements*. DEQ will rely on existing authorities to achieve the goals and objectives of the TMDL. The goals and objectives of this TMDL will be used by the DEQ as guidelines to document compliance with state water quality standards with consideration for the physical reality of the existing system and compliance with other applicable laws. Attainment of water quality standards will require a significant long-term coordinated effort from the managers of all pollutant sources throughout the watershed.

For nonpoint sources, a feedback loop will be used to achieve water quality goals. If monitoring indicates a violation of standards despite use of approved BMPs or knowledgeable and reasonable efforts, then BMPs for the nonpoint source activity must be modified by the appropriate agency to ensure protection of beneficial uses (Idaho Water Quality Standards and Wastewater Treatment Requirements, IDAPA 58.01.350.02.b.ii). Currently, there are no enforceable BMPs for agricultural activities. Therefore, agricultural activities must use knowledgeable and reasonable efforts to achieve water quality standards. DEQ encourages the use of recommended BMP component practices developed by the NRCS, which when selected for a specific site can become an approved BMP. DEQ, in cooperation with other agencies, will participate in efforts to evaluate the effectiveness of site specific BMPs and other restoration projects in reducing pollutant loading. If the BMPs prove ineffective they will be modified to ensure effectiveness of existing and future projects. Modifications to forestry BMPs required by the Idaho Forest Practices Act (IFPA) will be subject to state rule-making requirements.

In the event that BMPs for nonpoint sources are not implemented adequately using a voluntary approach, DEQ will use existing regulatory authorities to seek water quality improvements. Adequate implementation requires that enough reduction measures be installed to achieve load reduction goals (or that all feasible steps will be taken towards achieving the highest quality water attainable) and that the BMPs be properly maintained. In general, DEQ will incorporate pollution prevention into enforcement actions, since pollution prevention is the ultimate goal for protecting human health and the environment. In addition, DEQ will work closely with the SR-HC public advisory team, resource agencies and affected parties to review existing authorities and determine if additional regulatory requirements are necessary to achieve the goals of the TMDL.

6.3 Adaptive Management

The goal of the CWA and associated administrative rules for Idaho is that water quality standards shall be met or that all feasible steps will be taken towards achieving the highest quality water attainable. This is a long-term goal in many watersheds, particularly where nonpoint sources are the main concern. To achieve this goal, implementation must commence as soon as possible.

TMDLs are numerical loadings that are set to limit pollutant levels such that in-stream water quality standards are met and designated beneficial uses are supported. DEQ recognizes that TMDLs are values calculated from mathematical models and other analytical techniques designed to simulate and/or predict very complex physical, chemical and biological processes. Models and some other analytical techniques are simplifications of these complex processes and, while they are useful in interpreting data and in predicting trends in water quality, they are unlikely to produce an exact prediction of how streams and other waterbodies will respond to the application of various management measures. It is for this reason that the TMDL has been established with a margin of safety.

For the purposes of the this TMDL, an Implementation Plan will be written and submitted to EPA within 18 months of the approval of this TMDL. Appropriate agencies and/or entities as designated by the states will assist in the development and oversight of the implementation plan. This implementation plan will be designed to reduce pollutant loads to meet the TMDLs established for listed pollutants.

For nonpoint sources, DEQ expects that the implementation plan will be implemented as soon as practicable. DEQ recognizes however, that it may take some period of time, from several years to several decades, to fully develop and implement effective management practices. DEQ also recognizes that it may take additional time after implementation has been accomplished before the management practices identified in the implementation plan become fully effective in reducing and controlling pollution. In addition, DEQ recognizes that technology for controlling nonpoint source pollution is, in many cases, in the development stages and will likely take one or more iterations to develop effective techniques.

The adaptive management process for implementation provides the flexibility necessary to identify and evaluate management practices and, accordingly, modify implementation plans to reflect revised or new management practices. It is possible that after application of all reasonable best management practices, some TMDLs or their associated targets and surrogates cannot be achieved as originally established. Nevertheless, it is the expectation of DEQ that nonpoint sources make a good faith effort to achieving their respective load allocations in the shortest practicable time.

DEQ recognizes that expedited implementation of TMDLs will be socially and economically challenging. Further, there is a desire to minimize economic impacts as much as possible consistent with protecting water quality and designated beneficial uses.

DEQ further recognizes that, despite the best and most sincere efforts, natural events beyond the control of humans may interfere with or delay attainment of the TMDL and/or its associated targets and surrogates. Such events could be, but are not limited to floods, fire, insect infestations, and drought.

It is also recognized that full attainment of pollutant surrogates (system potential vegetation, for example) at all locations may not be feasible due to physical, legal or other regulatory constraints. To the extent possible, the specific implementation plans should identify potential constraints, but should also provide the ability to mitigate those constraints should the opportunity arise. For instance, at this time, the existing location of a road or highway may preclude attainment of system potential vegetation due to safety considerations. In the future, however, should the road be expanded or upgraded, consideration should be given to designs that comply with TMDL load allocations and pollutant surrogates such as system potential vegetation.

If a nonpoint source that is covered by the TMDLs complies with its finalized implementation plan or applicable forest practice rules, it will be considered in compliance with the TMDL.

DEQ intends to regularly review progress of the implementation plan to achieve TMDLs. If and when DEQ determines the implementation plan has been fully implemented, that all feasible management practices have reached maximum expected effectiveness, and a TMDL or its interim targets have not been achieved, DEQ shall reopen the TMDL and adjust it or its interim targets and the associated water quality standard(s) as necessary.

The implementation of TMDLs and the associated plans is enforceable under the applicable provisions of the water quality standards for point and nonpoint sources by DEQ and other state agencies and local governments in Idaho. However, it is envisioned that sufficient initiative exists on the part of local stakeholders to achieve water quality goals with minimal enforcement. Should the need for additional effort emerge, it is expected that the responsible agency will work with land managers to overcome impediments to progress through education, technical support or enforcement. Also, DEQ will assist stakeholders in seeking grant funds and support stakeholder's requests for grants from federal, state and private agencies (as appropriate), to fund data collection and evaluation efforts, and implementation testing or evaluation of point source and nonpoint source controls.

Enforcement may be necessary in instances of insufficient action towards progress. This could occur first through direct intervention from state or local land management agencies, and secondarily through DEQ. The latter may be based on departmental orders to implement management goals leading to water quality standards.

If a source is not given a load allocation, it does not necessarily mean that the source is prohibited from discharging any wastes. A source may be permitted to discharge if the holder can adequately demonstrate that the discharge will not have a significant impact on water quality over that achieved by a zero allocation. For instance, a permit applicant may be able to demonstrate that a proposed thermal discharge would not have a measurable detrimental impact on projected stream temperatures when site temperature is achieved. Alternatively, in the case where a TMDL is set based upon attainment of a specific pollutant concentration, a source may be permitted to discharge at that concentration and still be considered as meeting a zero allocation.

Subject to available resources, DEQ intends to review the progress of the TMDLs and the associated implementation plan, on a five-year basis. In conducting this review, DEQ will evaluate progress towards achieving the TMDLs (and water quality standards) and the success of implementing the implementation plan.

DEQ expects that designated agencies will also monitor and document their progress in implementing the provisions of the specific implementation plans for those pollutant sources for which they are responsible. This information will be provided to DEQ respectively for use in reviewing the TMDL. DEQ expects that designated agencies will identify benchmarks for the attainment of TMDL targets and surrogates as part of the specific implementation plans being developed. As implementation of the implementation plan proceeds, these established benchmarks will be used to measure progress toward the goals outlined in the TMDLs.

Where implementation of the implementation plan or effectiveness of management techniques are found to be inadequate, DEQ expects designated agencies to revise the components of their implementation plan to address these deficiencies.

DEQ will review aspects of the TMDL including water quality targets, loading analysis, and management measures. It is expected that the results of this review and any proposed changes will be discussed to the extent possible with both the Weiser WAG and TAG and appropriate stakeholder groups.

If DEQ, in consultation with the designated agencies, conclude that all feasible steps have been taken to meet the TMDL and its associated targets and surrogates, and that the TMDL, or the associated targets and surrogates are not practicable, the TMDL may be reopened and revised as appropriate. DEQ would also consider reopening the TMDL should new information become available indicating that the TMDL or its associated targets and/or surrogates should be modified.

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Glossary of Terms

305(b)
Refers to section 305 subsection "b" of the Clean Water Act. 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.

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.

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. 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 (Armantrout 1998, EPA 1996).

Anadromous Fish, such as salmon and sea-run trout, that live part or the majority of their lives in the salt water 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 58.01.02.003.56).

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).
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 biota, 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 (Public Law 92-50, commonly known as the Clean Water Act), as last reauthorized by the Water Quality Act of 1987 (Public Law 100-4), 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).

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/cm 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. EPA 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 mm depending on the observer and methodology used. The depth sampled varies but is typically about one foot (30 cm).

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. Their presence is often indicative of fecal contamination.

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 Geologic 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).

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.,* 2000).

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 (EPA 1997).

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 Indian 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.
Knickpoint	Any interruption or break of slope.
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.

Loading 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 500 micron 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; and 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, 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 A condition indistinguishable from that without human-caused disruptions.

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.,* 2000).

Not Fully Supporting Cold Water At least one biological assemblage has been significantly modified beyond the natural range of its reference condition (EPA 1997).

Nuisance Anything which 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 which consume oxygen during decomposition.
Parameter	A variable, measurable property whose value is a determinant of the characteristics of a system; e.g., 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	Disease-producing organisms (e.g., bacteria, viruses, parasites).
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, waste load 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 terms "physical/chemical" and "physicochemical."

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. The goal of QA is to assure the data provided are of the quality needed and claimed (Rand 1995, 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. QC is implemented at the field or bench level (Rand 1995, 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 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 An Idaho 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 4th 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 mm 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 loading 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. TMDL = Loading Capacity = Load Allocation + Waste Load Allocation + Margin of Safety. 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 (Greenborg, Clescevi and Eaton 1995) 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.

Waste Load Allocation (WLA)	The portion of receiving water's loading capacity that is allocated to one of its existing or future point sources of pollution. Waste load 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 EPA-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 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.

Appendix A. Unit Conversion Chart

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Table A-1. Metric - English Unit Conversions.

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

[1] 1 ft^3/sec = 0.65 million gallons per day; 1 million gallons per day is equal to 1.55 ft^3/sec.
[2] The ratio of 1 ppm = 1 mg/L is approximate and is only accurate for water.

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Appendix B. State and Site-Specific Standards and Criteria

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Table B-1. State of Idaho Water Quality Standards as Appropriate to the Brownlee Reservoir (Weiser Flat) Subbasin Assessment and TMDL

Parameter	Idaho Water Quality Standard[1]	Idaho Admin. Code (IDAPA 58.01.02)
Bacteria	Less than 126 *E. coli* organisms/100 ml as a 30 day log mean with a minimum of 5 samples **AND** no sample greater than 406 *E. coli* organisms/100 ml	251.01.a & b
Dissolved Oxygen (DO)		
Cold Water Aquatic Life	Greater than 6.0 mg dissolved oxygen/L; except in hypolimnion of stratified lakes and reservoirs and the bottom 7 meters in lakes and reservoirs with greater than 35 m depth	250.02.a
Salmonid Spawning	Water column dissolved oxygen of not less than 6.0 mg/L or 90% of saturation whichever is greater.	250.02.e.2.a
	Intergravel dissolved oxygen of not less than 5 mg/L (1 day min) **AND** not less than 6.0 mg/L (7 day avg. mean) during spawning and incubation period for species inhabiting the waters	250.02.e.1
Seasonal Cold	Greater than 6.0 mg dissolved oxygen/L; except in hypolimnion of stratified lakes and reservoirs and the bottom 7 meters in lakes and reservoirs with greater than 35 m depth, applicable during the time period from the summer solstice to the autumnal equinox	250.03.a.i-iii
Warm Water Aquatic Life	Greater than 5.0 mg dissolved oxygen/L; except in hypolimnion of stratified lakes and reservoirs and the bottom 7 meters in lakes and reservoirs with greater than 35 m depth	250.04.a

Parameter	Idaho Water Quality Standard[1]	Idaho Admin. Code (IDAPA 58.01.02)
Mercury	Surface waters of the state shall be free from toxic substances in concentrations that impair designated beneficial uses. Toxic substance criteria is set forth in CWA 40 CFR 131.36 (b)(1) (National Toxics Rule (NTR)). 0.012 ug/L water column concentration aquatic life chronic criterion	210
	0.14 ug/L water column concentration for ingestion of fish and drinking water	210 and Nat. Toxics Rule (CWA 40 CFR 131.36 (b)(1)
	1.0 mg/kg total mercury (NTR), less than 0.5 mg methylmercury /kg in fish tissue (wet weight) for human consumption	210 and Nat. Toxics Rule (CWA 40 CFR 131.36 (b)(1))
Nuisance Algae	Surface waters shall be free from floating, suspended or submerged matter of any kind in concentrations causing nuisance or objectionable conditions or that impair designated beneficial uses and be free from oxygen-demanding materials in concentrations that would result in an anaerobic water condition.	200.05 & 07
Nutrients	Surface waters shall be free from excess nutrients that can cause visible slime growths or other nuisance aquatic growths impairing designated beneficial uses.	200.06
Pesticides	Surface waters of the state shall be free from toxic substances in concentrations that impair designated beneficial uses. Toxic substance criteria is set forth in CWA 40 CFR 131.36 (b)(1) (National Toxics Rule).	
DDT	Less than 0.00059 ug/L water column concentration for ingestion of fish and drinking water	210 and Nat. Toxics Rule (CWA 40 CFR 131.36 (b)(1))
DDD	Less than 0.00083 ug/L water column concentration for ingestion of fish and drinking water	210 and Nat. Toxics Rule (CWA 40 CFR 131.36 (b)(1))
DDE	Less than 0.00059 ug/L water column concentration for ingestion of fish and drinking water	210 and Nat. Toxics Rule (CWA 40 CFR 131.36 (b)(1))
Dieldrin	Less than 0.00014 ug/L water column concentration for ingestion of fish and drinking water	210 and Nat. Toxics Rule (CWA 40 CFR 131.36 (b)(1))
pH	6.5-9.0 standard units	250.01.a

Parameter	Idaho Water Quality Standard[1]	Idaho Admin. Code (IDAPA 58.01.02)
Temperature		
Cold Water Aquatic Life	22 ^{o}C or less **AND** no greater than 19 ^{o}C maximum daily average	250.02.b
Salmonid Spawning (for the appropriate periods for the specific species)	13 ^{o}C or less **AND** no greater than 9 ^{o}C maximum daily average	250.02.e.ii
Seasonal Cold	27 ^{o}C or less as a daily maximum with a daily average of no greater than 24 ^{o}C, applicable during the time period from the summer solstice to the autumnal equinox	250.03.b
Warm Water Aquatic Life	33 ^{o}C or less **AND** no greater than 29 ^{o}C maximum daily average	250.04.b
Turbidity (Sediment)	Less than 50 NTU above background for any given sample **OR** Less than 25 NTU for more than ten consecutive days (below any applicable mixing zone set by the DEQ) applies to waters designated for cold water aquatic life	250.02.d
Sediment	Sediment shall not exceed quantities specified in general surface water quality criteria (IDAPA 58.01.02.250 or 252), or, in the absence of specific sediment criteria, quantities that impair designated beneficial uses.	200.08
Total Dissolved Gases	Less than 110%	250.01.b

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Appendix C. Data Sources

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Table C-1. Data sources for the Brownlee Reservoir (Weiser Flat) Subbasin Assessment and TMDL.

Water Body	Data Source	Type of Data	When Collected
Dennett Creek	DEQ BURP monitoring, Boise Regional Office, Boise, Idaho	Field data	1996
	BLM monitoring, Boise Regional Office, Boise, Idaho	Field data	2001
Hog Creek	Kirk Campbell, Idaho State Department of Agriculture, Boise, Idaho	Field and laboratory monitoring data	1999,2000
	DEQ BURP monitoring, Boise Regional Office, Boise, Idaho	Field data	1995
Scott Creek	Kirk Campbell, Idaho State Department of Agriculture, Boise, Idaho	Field and laboratory monitoring data	1999,2000
	DEQ BURP monitoring, Boise Regional Office, Boise, Idaho	Field data	1995
Warm Springs Creek	Kirk Campbell, Idaho State Department of Agriculture, Boise, Idaho	Field and laboratory monitoring data	1999,2000
	DEQ BURP monitoring, Boise Regional Office, Boise, Idaho	Field data	1998
Jenkins Creek	Kirk Campbell, Idaho State Department of Agriculture, Boise, Idaho	Field and laboratory monitoring data	1999,2000
	DEQ BURP monitoring, Boise Regional Office, Boise, Idaho	Field data	1995

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Appendix D. Topographic Map of the Weiser Flat Watershed

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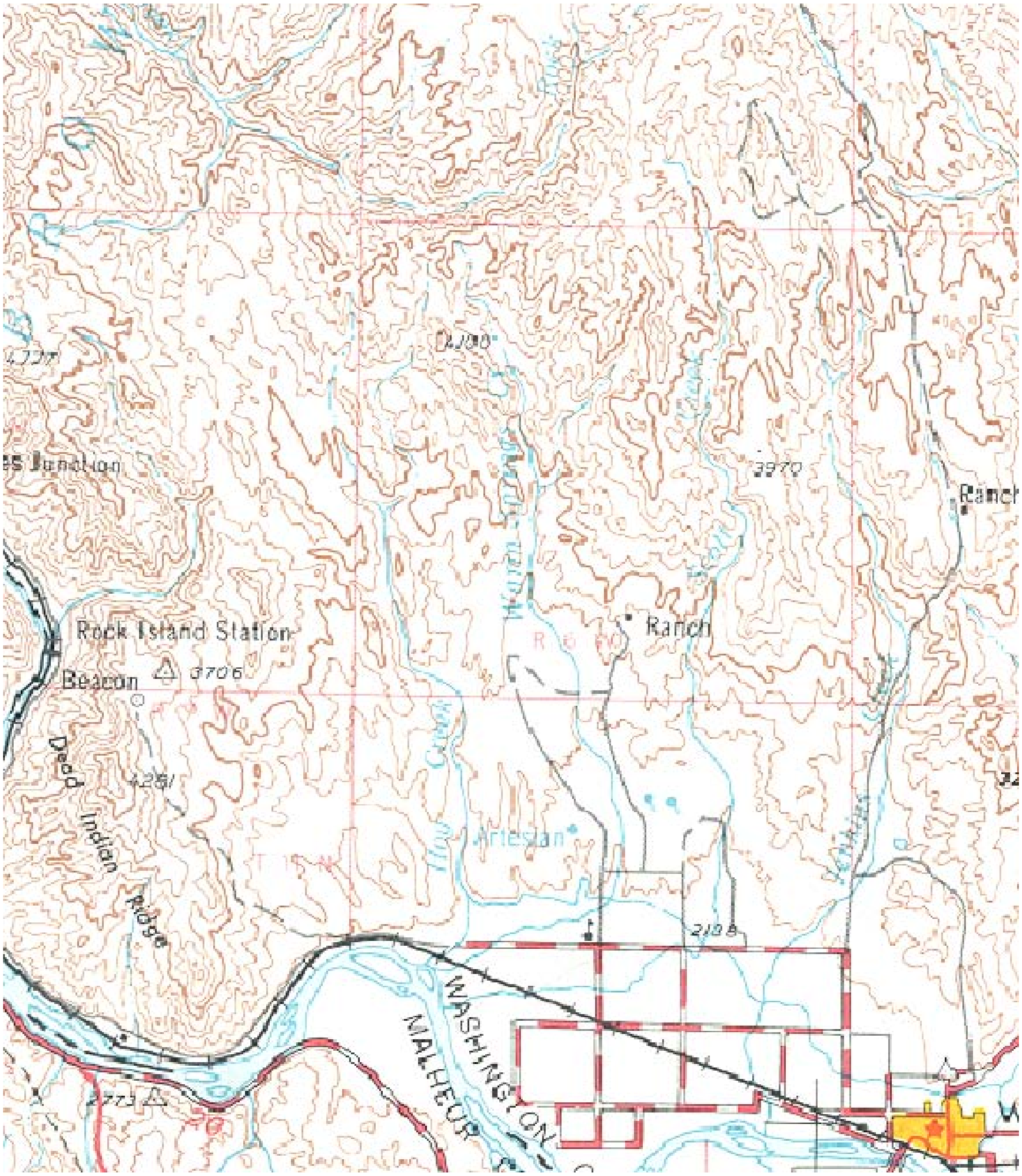

Figure D-1. Topographic map of the lower portion of the Brownlee Reservoir (Weiser Flat) Watershed, including the Hog Creek, Scott Creek, Warm Springs Creek and Jenkins Creek subwatersheds.

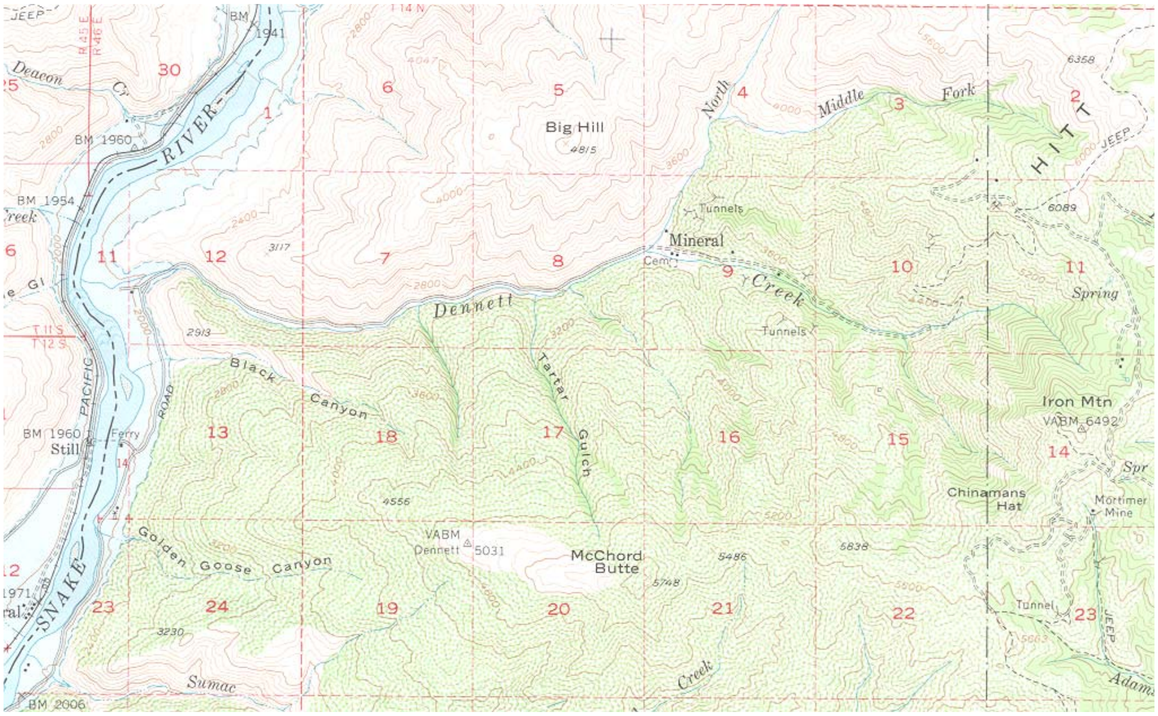

Figure D-2. Topographic map of the upper portion of the Brownlee Reservoir (Weiser Flat) Watershed, including the Dennett Creek subwatershed.

Appendix E. Example of a Field Form Used by the Idaho Department of Fish and Game Conservation Data Center

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Standard Checklist (Lotic)

Name of Riparian-Wetland Area: North Fork Dennett Cr

Date: 6-23-98 Area/Segment ID: 02

Location: Rocking M Map/Aerial Photo: Monroe Butte

ID Team Observers: Moseley Mancuso Murphy

Yes	No	N/A	HYDROLOGIC
X			1) Floodplain above bankfull inundated in "relatively frequent" events
Rationale			
		X	2) Where beaver dams are present they are active and stable
Rationale			
X			3) Sinuosity, width/depth ratio, and gradient are in balance with the landscape setting (i.e., landform, geology, and bioclimatic region)
Rationale			
X			4) Riparian-wetland area is widening or has achieved potential extent
Rationale			
X			5) Upland watershed is not contributing to riparian degradation
Rationale			

April 1998

Yes	No	N/A	VEGETATIVE
X			6) There is diverse age-class distribution of riparian-wetland vegetation (recruitment for maintenance/recovery)
Rationale			
X			7) There is diverse composition of riparian-wetland vegetation (for maintenance/recovery)
Rationale			
X			8) Species present indicate maintenance of riparian soil moisture characteristics
Rationale			
X			9) Streambank vegetation is comprised of those plants or plant communities that have root masses capable of withstanding high streamflow events
Rationale			
X			10) Riparian-wetland plants exhibit high vigor
Rationale			
X			11) Adequate riparian-wetland vegetative cover present to protect banks and dissipate energy during high flows
Rationale			
X			12) Plant Communities are an adequate source of coarse and/or large woody material (for maintenance/recovery)
Rationale			

Yes	No	N/A	SOILS-EROSION DEPOSITION
X			13) Flood plain and channel characteristics (i.e., rocks, overflow channels, coarse and/or large woody material) are adequate to dissipate energy
Rationale			
		X	14) Point bars are revegetating with riparian-wetland vegetation
Rationale			
X			15) Lateral stream movement is associated with natural sinuosity
Rationale			
X			16) System is vertically stable
Rationale			
X			17) Stream is in balance with the water and sediment being supplied by the watershed (i.e., no excessive erosion or deposition)
Rationale			

Remarks:

SUMMARY DETERMINATION

Functioning Rating

Proper Functioning Condition X

Functional--At Risk ____

Nonfunctional ____

Rationale: ____

Apparent Trend for Functional – At Risk

Upward ____

Downward ____

Not Apparent ____

Rationale: ____

Are factors contributing to unacceptable conditions outside the manager's control or management?

Yes ____ No ____ If yes, what are those factors?

____ Flow Regulation
____ Upstream channel conditions
____ Road encroachment
____ Recreational Activities
____ Other (specify) ____
____ Mining Activities
____ Channelization
____ Augmentation flows
____ Agricultural Activities

Remarks:

Segment Code NDEN01

RIPARIAN INVENTORY FIELD FORM

ADMINISTRATIVE INFORMATION

Project: Rocking M

Stream: N Fk Dennett Cr Observer(s): Moseley, Mancuso, Murphy

Date: 6.23.98 Segment Number: 01 Elevation (ft): 4440 to 5200

River Miles (channel length): 1.0 Quad Name: Monroe Butte

Air Photo Number:

SEGMENT DESCRIPTION

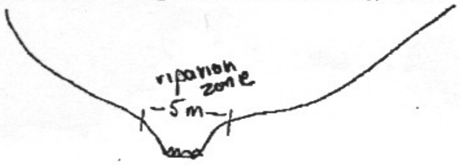
Steep gradient, small stream at headwaters of drainage. Relatively straight channel bordered by steep canyon walls. Stream has high cover of aspen and tall shrub understory. Streambanks are all well vegetated and stable. The understory of some flatter areas are dominated by Poa pratensis

VEGETATION SUMMARY

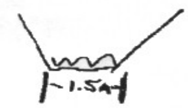
Community Types	Plot #	% of Segment	Successional Stage/Comments	Disturbance Induced (Y/N)
aspen	NDEN01A	100%	mid- to late seral	N

STREAM AND HYDROLOGIC INFORMATION

1a. Sketch the typical riparian-wetland cross section of the segment, showing relevant dimensions.



1b. Sketch the typical stream channel cross section, showing relevant dimensions.



2. Average non-vegetated stream channel width (m) 1
3. Average riparian- wetland zone width (m) 5
4. Riparian- wetland zone width range (m) 2 to 10
5. Primary Rosgen stream geomorphology classification and percent A4 / 100
6. Stream channel sinuosity (river miles/valley bottom miles) 1
7. Stream gradient (%) 14 8. Bankfull width/bankfull depth (m) 1 / 0.2
9. Entrenchment ratio (flood-prone width/bankfull width: A= <1.4, B= 1.4-2.2, C= >2.2) A
10. Channel bottom materials. Give the percent of each size; must total 100%.
    - 0 Bedrock
    - 25 >10 inches (boulders)
    - 60 2.5-10 inches (cobbles)
    - 15 0.08-2.5 inches (gravel)
    - 1 <0.08 inches (sand, silt clay)
11. Streambank materials. Give the percent of each size; must total 100%.
    - ____ Bedrock
    - not visible >10 inches (boulders)
    - ____ 2.5-10 inches (cobbles)
    - ____ 0.08-2.5 inches (gravel)
    - ____ <0.08 inches (sand, silt clay)
12. Other Rosgen classification types and percents observed within the Segment: 0 / ___ ___/___ ___/___ ___/___ ___/___
13. Percent of streambank which is accessible by livestock. 5
14. Percent of streambank which has been altered by human induced activities. 3
15. Percent of streambanks with deep binding root mass (A=<35%, B=35-64%, C=65-84%, D=>85%) C
16. Streambank stability: Percent of the total streambank length which is uncovered stable ____ covered stable 100 uncovered unstable ____ covered unstable ____

17a. Active lateral cutting of the stream? (Y/N/NA) N If Yes: 17b. Percent of stream within the segment that is undergoing active lateral cutting? ____

18a. Active downcutting of the stream? (Y/N/NA) N If Yes: 18b. Percent of the stream that is undergoing active downcutting of the stream? ____ 18c. Depth of downcutting ____

19a. Headcut(s) present: (Y/N) N If Yes: 19b. Number of headcuts ____
19c. Average height (ft) ____
19d. Location in segment of headcut(s) ____

20. Percent of the stream reach which is braided (has more than one active channel) 0
21. Indicate the best description of the incisement of the stream. (A,B,C, or D) A

22a. Human-induced channel modifications: [enter Y for appropriate response(s)] None ____
Road construction ____ Railroad construction X Dikes ____ Dams ____
Water diversion structures ____ Channelization ____ Rip-rap ____ Vegetation removal ____ Other(s) ____

22b. Location(s) within the segment: occasional throughout length; fill slope of road extends to creek - 3% of stream bank

22c. If human induced channel modifications are present, how stable are they? (Stable/Unstable) unstable

22d. What is the effect of the modifications on the immediate and downstream channel? not much

23. Stream temperature at the plot 7 °C
24. Photographic Record of Segment
Description of upstream photo none.
Description of downstream photo taken on road near plot
Description of general photo none.
Description of other photos 3 photos of plot

PROPER FUNCTIONING CONDITION ASSESSMENT

Enter proper code for function/health assessment for segment 1
(1) Proper functioning condition (2) Functional at risk (3) Nonfunctioning standard checklist attached.

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Appendix F. Jenkins Creek Water Quality Data (1999-2000)

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Jenkins Creek Water Quality Data (1999-2000)

Table F-1. Jenkins Creek Nutrient, Total Suspended Solids and Bacteria Results. (All results over water quality targets for this TMDL are highlighted.)

Date	TSS	Nitrate+N	Total-P	e-coli
4/14/99	98	0.52	0.17	60
4/28/99	144	5.09	0.32	180
5/12/99	173	1.61	0.35	180
5/26/99	268	2.97	0.52	530
6/9/99	188	2	0.28	630
6/24/99	455	2.37	3.93	1100
7/7/99	601	4.12	0.96	750
7/22/99	134	4.49	0.26	4500
8/3/99	722	1.5	1.03	1200
8/18/99	126	1.82	0.38	100
9/1/99	362	2.27	0.58	1200
9/22/99	77	0.27	0.27	850
10/6/99	42	0.16	0.025	260
10/21/99	6	4.99	0.13	40
11/16/99	2	6.74	0.05	<10
12/8/99	1	8.2	<0.05	<10
1/11/00	2	4.89	0.08	<10
2/9/00	40	1.26	0.13	10
3/15/00	54	1.42	0.19	80

Weiser Flats
Year 2

Date	TSS	Nitrate+N	Total-P	e-coli
4/5/00	4	0.26	<0.05	80
4/19/00	78	1.1	0.2	300
5/4/00	138	1.42	0.29	260
5/17/00	287	2.12	0.39	820
6/1/00	190	3.2	0.36	640
6/15/00	203	0.87	0.32	3800
6/26/00	157	2.43	0.29	1000
7/13/00	434	6.56	0.7	200
7/27/00	360	1.74	0.85	3700
8/8/00	76	2.29	0.36	2600
8/23/00	140	4.11	0.36	>8300
9/7/00	52	0.7	0.24	170
9/21/00	9	7.82	0.18	270
10/4/00	19	<0.02	0.14	130

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Appendix G. Distribution List

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Table G-1. List of Individuals and Entities that Received Copies of the Draft Weiser Flat Subbasin Assessment and TMDLs for Review and Comment as Part of the Public Process.

Name	Affiliation	Location
Adams County Commissioners	Adams County	Council, ID
ASWCD	Agricultural Interests	Council, ID
Crane Creek Reservoir	Weiser River WAG/TAG	Weiser, ID
Flood Control District #3Lost	Weiser River WAG/TAG	Cambridge, ID
Valley Reservoir Company	Irrigators	Fruitvale, ID
Water Master	Irrigators	Midvale, ID
Weiser River SCD	Agricultural Interests	Weiser, ID
Dale Allen	Idaho Department of Fish and Game	McCall, ID
Gary Bahr	Idaho Department of Agriculture	Boise, ID
Judy Bartlett	Common Sense Solutions	Midvale, ID
Jeff Batten	PHD3	Weiser, ID
Jack Biddle	Holladay Engineering	Payette, ID
Bosco Bossler	Concerned Citizen	Midvale, ID
LeVelle Braun	Grazing and Livestock	Weiser, ID
Ron Brooks	Idaho Association of Soil Conservation Districts	Payette, ID
Candace Brown	Weiser WAG	Cambridge, ID
Scott Brown	Idaho Conservation Commission	Boise, ID
Kirk Campbell	Idaho Department of Agriculture	Boise, ID
Mike Campbell	Cambridge City Council	Cambridge, ID
Art Correia	Weiser River WAG	Weiser, ID
Ferrel Crossley	Ada Soil and Water Conservation District	Council, ID
John Field	Concerned Citizen	Weiser, ID
Jerome Grandi	Concerned Citizen	Weiser, ID
Wendell Greenwald	Concerned Citizen	Walla Walla, WA
Scott Grunder	Idaho Department of Fish and Game	Nampa, ID
Ron Hasselstrom	Waste Water Treatment Plant	Council, ID
Jon Haupt	Bureau of Land Management	Boise, ID
Calvin Hickey	Agriculture/Row Crops	Weiser, ID
Mike Holladay	Holladay Engineering	Payette, ID
Harmon Horton	Weiser River Soil Conservation District	Midvale, ID
Mike Ingham	Idaho Department of Environmental Quality	Boise, ID
Gordon Keetch	University of Idaho	Council, ID
Scott Koberg	Idaho Association of Soil Conservation Districts	Caldwell, ID
Greg Lesch	US Forest Service	Weiser, ID
Marlene Lively	City of Council	Council, ID
Vern Lolley	Weiser River WAG	Weiser, ID
Herb Malany	Forestry Interests	Emmett, ID
Russ Manwaring	West Central Highlands RC&D	Emmett, ID
Roy Mink	Washington County Commissioner	Cambridge, ID
Russell Mink	Weiser River Soil Conservation District	Cambridge, ID
Ralph Myers	Idaho Power Company	Boise, ID
Paul Nichols	Concerned Citizen	Fruitvale, ID
Deb Parliman	US Geological Survey	Boise, ID
Joe Qualls	Weiser River WAG	Weiser, ID
Steve Reddy	Washington County Extension	Weiser, ID
Rob Ruth	Signal American News	Weiser, ID
Royce Schwenkfelder	Idaho Cattle Association	Cambridge, ID
Esther Smith	Concerned Citizen	Weiser, ID

Name	Affiliation	Location
Jeri Soulier	Concerned Citizen	Weiser, ID
Allen Tarter	Bureau of Land Management	Boise, ID
Diana Thomas	Washington County Commissioner	Weiser, ID
Kenneth Uhrig	Public at Large	Weiser, ID
Gail VanTassell	Concerned Citizen	Weiser, ID
John Westra	Idaho Department of Water Resources	Boise, ID
Jerry Williams	US Fish and Wildlife Service	Boise, ID
Dave Zimmer	US Bureau of Reclamation	Boise, ID

Appendix H. Public Comments

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Brownlee Reservoir (Weiser Flat)
Total Maximum Daily Load

Comment and Response Matrix

April 15, 2003 through May 30, 2003
Public Comment Period

No public comments were received during the formal public comment period. The comments in the following matrix were received from Idaho Department of Agriculture and the Idaho Association of Soil Conservation Districts immediately prior to the public comment period, and from USEPA during the public comment period.

Prepared by:
Idaho Department of Environmental Quality (DEQ)
Boise Regional Office

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No.	From	Comment	Response
1	K. Campbell (ISDA)	Table B-1 on page xx - note that the 576 E coli value is for secondary contact.	Changes have been made as suggested.
2	K. Campbell (ISDA)	Suggested that average total phosphorus, sediment and other pertinent values be reviewed for accuracy.	Values have been reviewed as suggested.
3	K. Campbell (ISDA)	Page 64 last paragraph, instead of Hog Creek replace with Jenkins Creek.	Changes have been made as suggested.
4	K. Campbell (ISDA)	Suggestion to check TSS calculation mechanism for consistency throughout TMDL document	Values and calculation mechanisms have been reviewed as suggested.
5	K. Campbell (ISDA)	Remove ISDA from the list of agencies that conducted monitoring on Dennett Creek in Table C-1.	Changes have been made as suggested.
6	S. Koberg (IASCD)	**Editorial comments**	Changes have been made as suggested.
7	S. Koberg (IASCD)	**Page xx:** Paragraph 4, second sentence includes *"...for bacteria and had elevated levels of sediment and nutrients."* **Suggestion:** Clarify *"elevated levels"*	An explanation has been added.
8	S. Koberg (IASCD)	**Suggestion:** In the pollutant discussions for each creek, include the data averages for each pollutant measured, not just those for sediment.	Changes have been made as suggested.
9	S. Koberg (IASCD)	Include discussion of proposed de-listing for sediment on Hog Creek. Table E For Hog Creek, sediment should be included as a de-list	Not proposing delisting because no duration data is available at this time.
10	S. Koberg (IASCD)	**Page xxix:** Paragraph 5, beginning "In the event that …" **Comment:** This sentence seems unduly harsh given the discussion in the following paragraph regarding BMP modification. While the process exists for potential regulatory authority, it does not seem necessary to mention the "stick" approach here. Maybe eliminate this sentence and focus on the "carrots".	Additional text has been added before the language in question to better acknowledge the demonstrated willingness on the part of the local agricultural/ranching community to implement BMPs and protect water quality.
11	S. Koberg (IASCD)	**Page 2: Paragraph** 2, eighth sentence reads *"TMDLs are not required for a water body impaired by pollution, but not specific pollutants."* Needs clarification	An explanation has been added.
12	S. Koberg (IASCD)	**Page 77: Paragraph** 4, last sentence reads *"Nutrient management plans are recommended for these operations."* **Suggestion:** Change to *"Nutrient management plans are required by ISDA for feedlots by July 2005."*	Change has been made as suggested.

No.	From	Comment	Response
13	S. Koberg (IASCD)	**Page 97:** Table 5.8 **Suggestion:** Currently there is no Table 5.8; include one for proposed bacteria reduction in accordance with proposed listing in next cycle	Reductions required within the bacteria TMDLs will be identified in the bacteria TMDL process. Insufficient information exists at this time to accurately identify the reductions to meet water quality criteria.
14	S. Koberg (IASCD)	**Page 100: Idaho** Soil Conservation Commission is not included in the representative list. **Suggestion:** Include Idaho Soil Conservation Commission in the list.	Change has been made as suggested.
15	S. Koberg (IASCD)	**Page 101: Paragraph** 2, second sentence reads *"Adequate implementation requires that enough reduction measures be installed and that they be properly maintained."* **Suggestion:** Clarify "enough reduction measures", i.e. "enough to achieve the load reduction goals"	Clarification has been added.
16	M. Fillipini (USEPA)	Section 5.1 Monitoring Points. It is unclear in the document for each of the streams where the 'upstream' sites are located. Please reference a map or provide a description in the text or a table as to where these monitoring points are located.	Monitoring points have been identified in the map in Figures 1.5 through 1.9 and are referenced in the text.
17	M. Fillipini (USEPA)	Section 5.1. It would be helpful to mention here that the data sources are described in Appendix C and that copies of the data are on file at the DEQ offices. The data used in the analyses should be available and retrievable for review in the future.	Change has been made as suggested.
18	M. Fillipini (USEPA)	**Section 5.3** This section as well as Table 5.4 also refer to the 'upstream' monitoring sites being used for determination of the natural/background loads. Per above, please provide a reference to these locations.	Monitoring points have been identified in the map in Figures 1.5 through 1.9 and are referenced in the text.
19	M. Fillipini (USEPA)	**Section 5.4** Margin of Safety. The second and third paragraphs are confusing in their discussions. The second paragraph mentions that the MOS was incorporated into the targets and no further MOS was added to the load allocations. However, the third paragraph mentions that an additional explicit MOS was added into the load allocations. Please clarify.	Text has been added to clarify this point.
20	M. Fillipini (USEPA)	**Section 5.4** Seasonal Variation. A statement should be included that; 'Therefore, seasonal variation and critical conditions were considered in development of the TMDLs.'	Change has been made as suggested.

No.	From	Comment	Response
21	M. Fillipini (USEPA)	**Section 5.4** Reasonable Assurances. For clarity it should be stated that, 'since no point sources are present within the subbasin, reasonable assurances are not required. However, a discussion on nonpoint source reductions has been provided.'	Change has been made as suggested.
22	M. Fillipini (USEPA)	Table 5.6. The derivation of 'Reductions Required' is unclear. In subtracting the load allocations from the 'Current Loads' presented in Table 5.4, with the exception of Hog Creek, none of the resulting reductions agree. If a current load other than those presented in Table 5.4 were used, please explain. For clarity, the 'current load', or whatever number used, should be presented in the table and the method for determining the reductions (the equation) should be explained in the text or table. If a margin of safety was added, it would be helpful to show that also.	Appropriate tables have been revised to clarify the concern identified.
23	M. Fillipini (USEPA)	Table 5.6. For Jenkins Creek, the 'Natural plus Background' numbers do not agree between Table 5.4 and 5.6, (0.14 vs. 0.10 lbs/day).	Error has been corrected.
24	M. Fillipini (USEPA)	Table 5.7. As with Table 5.6, the calculations in Table 5.7 also do not agree with the 'Current Loads' given in Table 5.5. In addition, none of the 'Natural plus Background' numbers agree with Table 5.5. Please explain or correct.	Appropriate tables have been revised to clarify the concern identified.
25	L. Woodruff (USEPA)	Page 90, last paragraph. The statement is made that septic system loads are minimal, therefore not incorporated into the allocations. It would be better to state that '...the fraction of the total load is minimal, and it has been included with the other sources in the nonpoint source allocation.' This way the load, though minimal, is officially accounted for in the allocations.	Change has been made as suggested.

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