Mid Snake River/Succor Creek Subbasin Assessment and Total Maximum Daily Load

April 2003

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Abbreviations, Acronyms, and Symbols

7Q2 The lowest flow that occurs in seven consecutive days within a two year period

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

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

AWS agricultural water supply

BAG Basin Advisory Group

BLM United States Bureau of Land Management

BMP best management practice

BOD biological oxygen demand

BOR United States Bureau of Reclamation

BURP Beneficial Use Reconnaissance Program

C Celsius

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

cfs cubic feet per second

CWA Clean Water Act

CWAL cold water aquatic life

DEQ Department of Environmental Quality

DO dissolved oxygen

DWS domestic water supply

EPA United States Environmental Protection Agency

F Fahrenheit

FWS U.S. Fish and Wildlife Service

GIS Geographical Information Systems

HUC Hydrologic Unit Code

IDAPA Refers to citations of Idaho administrative rules

IDFG Idaho Department of Fish and Game

IDL Idaho Department of Lands

IDWR Idaho Department of Water Resources

IRU Idaho Rivers United

km kilometer

km^2 square kilometer

LA load allocation

LC load capacity

m meter

mi mile

mi^2 square miles

mg/L milligrams per liter

MOS margin of safety

MWMT maximum weekly maximum temperature

n.a. not applicable

NA not assessed

NB natural background

nd no data (data not available)

NFS not fully supporting

NPDES National Pollutant Discharge Elimination System

NRCS Natural Resources Conservation Service

NTU nephlometric turbidity unit

ORW Outstanding Resource Water

PCR primary contact recreation

QA quality assurance

QC quality control

RFI DEQ's river fish index

RMI DEQ's river macroinvertebrate index

RPI DEQ's river physiochemical index

SAWQP state agricultural water quality project

SBA subbasin assessment

SCR secondary contact recreation

SFI DEQ's stream fish index

SHI DEQ's stream habitat index

SMI DEQ's stream macroinvertebrate index

SRP soluble reactive phosphorus

SS salmonid spawning

SSC suspended sediment concentration

SSOC stream segment of concern

TDG total dissolved gases

TDS total dissolved solids

TIN total inorganic nitrogen

TKN total Kjeldahl nitrogen

TMDL total maximum daily load

TP total phosphorus

TS total solids

TSS total suspended solids

t/y tons per year

U.S. United States

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

WET whole effluence toxicity

WLA wasteload allocation

WQLS water quality limited segment

WQS water quality standard

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 Mid Snake River/Succor Creek 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 Mid Snake River/Succor Creek Subbasin located 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. Twenty-one segments of the Mid Snake River/Succor Creek Subbasin were included on this list. 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.

The Mid Snake River/Succor Creek Watershed Advisory Group (WAG) and the designated agencies played a significant role in the TMDL development process. The WAG and the designated agencies were involved in developing the allocation processes and their continued participation will be critical while implementing the TMDL.

Subbasin at a Glance

Table A and Figure A show the §303(d) listed water bodies within the basin and the Mid Snake River/Succor Creek watershed boundaries.

Table A. 303(d)[1] Listed Segments in the Mid Snake River/Succor Creek Subbasin.

Water Body	Boundaries	WQLS & AU[3]	303(d) Pollutants
Snake River	CJ Strike Reservoir (below dam) to Castle Creek	WQLS: 2670 AU: 006_07	Sediment
Snake River	Castle Creek to Swan Falls	WQLS: 2669 AU: 006_07	Sediment
Snake River	Swan Falls to Boise River	WQLS: 2668 AU: 006_07, 001_07	Bacteria, dissolved oxygen, flow alteration, nutrients, pH, sediment
Birch Creek	HW to Snake River	WQLS: 2684 AU: 021_02, 03, 04	Sediment
Brown Creek	HW to Catherine Creek	WQLS: 2682 AU: 019_02, 03, 04	Sediment, temperature
Castle Creek	T5SR1ES28 to Snake River	WQLS: 2680 AU: 014_03, 04, 05	Temperature, sediment, flow alteration
Corder Creek	HW to Snake River	WQLS: 2685 AU: 025_02	Sediment
Cottonwood Creek	HW to Succor Creek	WQLS: none AU: 003_02	Temperature
Hardtrigger Creek	HW to Snake River	WQLS: 2675 AU: 008_02	Sediment
Jump Creek	Headwaters to Snake River	WQLS: 2673 AU: 005_02,03	Habitat alteration
McBride Creek	Headwaters to Oregon Line	WQLS: 2672 AU: 004_02,03	Flow alteration, sediment, temperature
North Fork Castle Creek	HW to Castle Creek	WQLS: 2680 AU: 014_02a	Temperature
Pickett Creek	T5SR1WS32 to Catherine Creek	WQLS: 2681 AU: 016_02, 03	Sediment
Pickett Creek	Headwaters to T5SR1WS32	WQLS: 6681 AU: 016_02	Flow alteration, sediment, temperature
Poison Creek[2]	Headwaters to Shoofly Creek	WQLS: 2687 AU: 006_02, 03	Sediment
Rabbit Creek	HW to Snake River	WQLS: 2677 AU: 026_02	Sediment
Reynolds Creek	Diversion to Snake River	WQLS: 2676 AU: 009_04	Sediment

Sinker Creek	Diamond Creek to Snake River	WQLS: 2679 AU: 006_03	Flow alteration, sediment, temperature
South Fork Castle Creek	HW to Castle Creek	WQLS: 2683 AU: 014_02	Bacteria
Squaw Creek	HW to Snake River	WQLS: 2674 AU: 007_02, 03	Temperature
Squaw Creek	Unnamed tributary 3.9 km upstream to Snake River	WQLS: 2674 AU: 007_03	Sediment
Succor Creek	Oregon line to Snake River	WQLS: 2671 AU: 002_04	Sediment
Succor Creek	HW to Oregon line	WQLS: 6671 AU: 002_02, 03	Flow alteration, sediment, temperature

[1]Refers to a list created by the State of Idaho (using monitoring data) in 1998 or water bodies in Idaho that did not fully support at least one beneficial use. This list is required under section 303subsection "d" of the Clean Water Act.
[2]Poison Creek appears on the 303(d) list under HUC 17050103. This is a mistake. The Poison Creek that is in HUC 17050103 is not 303(d) listed. However, Poison Creek is evaluated as part of this subbasin assessment
[3]Water Quality Limited Segment & Assessment Unit

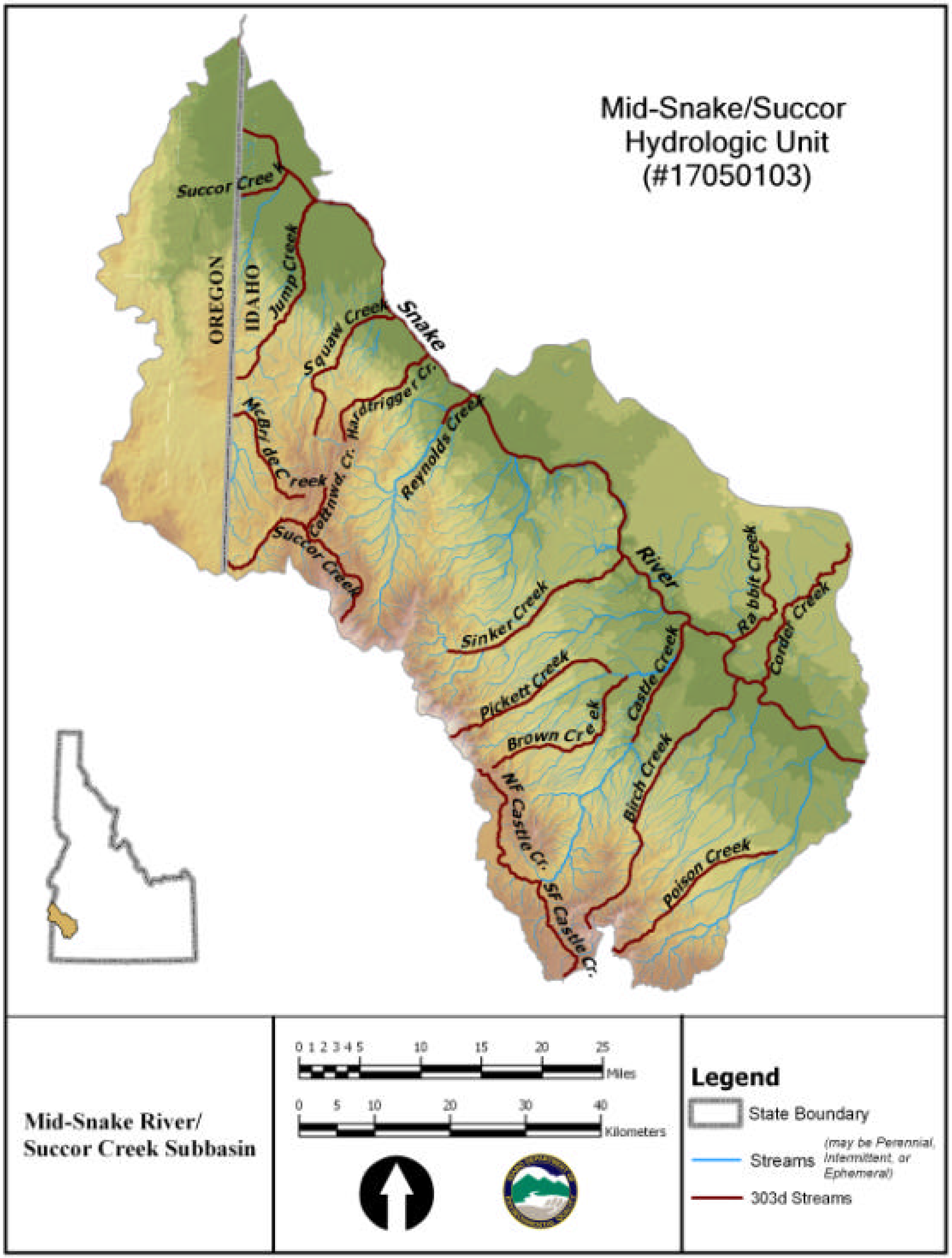

Figure A. Mid-Snake River/Succor Creek Subbasin

Key Findings

The Mid Snake River/Succor Creek watershed is an arid watershed characterized by hot summer temperatures. Tributaries are generally low volume rangeland streams that have a combination of high ambient temperatures, geography, poor shading, low flow volume, flow alteration, and naturally warm springs, which often leads to exceedances of the temperature standard. Even with maximum potential shade, some of the streams in the watershed cannot meet the cold water temperature standard. These streams were evaluated to determine the best achievable temperature based on the maximum potential shade.

Nutrient loading to the Snake River comes from the upstream segment of the Snake River, drains, tributaries, and point sources. The primary nutrient impairing beneficial uses is phosphorus. A total phosphorus target of 0.07 mg/L has been set for the Mid Snake River, based upon the work done in the draft Snake River Hells Canyon (SR-HC) TMDL (DEQ 2001). The critical period for target application is May-September.

Instream channel erosion is the primary source of sediment loading in Castle Creek, Sinker Creek, and Succor Creek. Land management practices contribute to unstable banks and this resultant instability leads to sediment delivery to the stream channel. Eighty-percent bank stability was selected as a surrogate target to achieve 28% depth fines in the creek.

Table B summarizes the outcomes of the subbasin assessment and TMDL. Table C shows the specific stream segments for which TMDLs were set.

Table B. Summary of subbasin assessment and TMDL outcomes.

Water Body	Boundary	Listed Pollutants	Proposed Action
Snake River WQLS: 2670 AU: 006_07	CJ Strike Reservoir (below dam) to Castle Creek	Sediment	De-list sediment List TDG
Snake River WQLS: 2669 AU: 006_07	Castle Creek to Swan Falls	Sediment	De-list sediment
Snake River WQLS: 2668 AU: 006_07, 001_07	Swan Falls to Boise River	Bacteria, dissolved oxygen, nutrients, sediment, pH, flow alteration	De-list bacteria, sediment, pH TMDL for nutrients Dissolved oxygen will be addressed by the nutrient TMDL No action for flow alteration List temperature

Water Body	Boundary	Listed Pollutants	Proposed Action
Birch Creek WQLS: 2684 AU: 021_02, 03, 04	Headwaters to Snake River	Sediment	De-list sediment
Brown Creek WQLS: 2682 AU: 019_02, 03, 04	Headwaters to Catherine Creek	Sediment, Temperature	De-list sediment, temperature
Castle Creek WQLS: 2680 AU: 014_03, 04, 05	T5SR1ES28 to Snake River	Temperature, sediment, flow alteration	TMDL for sediment, Delay TMDL for temperature to collect additional data No action for flow alteration
Corder Creek WQLS: 2685 AU: 025_02	Headwaters to Snake River	Sediment	De-list sediment
Cottonwood Creek WQLS: none AU: 003_02	Headwaters to Succor Creek	Temperature	De-list temperature
Hardtrigger Creek WQLS: 2675 AU: 008_02	Headwaters to Snake River	Sediment	De-list sediment
Jump Creek WQLS: 2673 AU: 005_02,03	Headwaters to Snake River	Habitat Alteration	TMDL for sediment No action for habitat alteration
McBride Creek WQLS: 2672 AU: 004_02,03	Headwaters to Oregon Line	Temperature, sediment, flow alteration	De-list temperature, sediment No action for flow alteration
North Fork Castle Creek WQLS: 2680 AU: 014_02a	Headwaters to Castle Creek	Temperature	Delay TMDL for temperature to collect additional data
Pickett Creek WQLS: 2681 AU: 016_02, 03	T5SR1WS32 to Catherine Creek	Sediment	De-list sediment

Water Body	Boundary	Listed Pollutants	Proposed Action
Pickett Creek WQLS: 6681 AU: 016_02	Headwaters to T5SR1WS32	Temperature, sediment, flow alteration	De-list temperature, sediment No action for flow alteration
Poison Creek WQLS: 2687 AU: 006_02, 03	Headwaters to Shoofly Creek	Not Listed, See Chapter 1	No Action
Rabbit Creek WQLS: 2677 AU: 026_02	Headwaters to Snake River	Sediment	De-list sediment
Reynolds Creek WQLS: 2676 AU: 009_04	Diversion to Snake River	Sediment	De-list sediment
Sinker Creek WQLS: 2679 AU: 006_03	Diamond Creek to Snake River	Temperature, sediment, flow alteration	TMDL for temperature, sediment No action for flow alteration
South Fork Castle Creek WQLS: 2683 AU: 014_02	Headwaters to Castle Creek	Bacteria	Delay bacteria TMDL to collect additional data
Squaw Creek WQLS: 2674 AU: 007_02, 03	HW to Snake River	Temperature	De-list temperature
Squaw Creek WQLS: 2674 AU: 007_03	Unnamed tributary 3.9 km upstream to Snake River	Sediment	De-list sediment
Succor Creek WQLS: 2671 AU: 002_04	Oregon line to Snake River	Sediment, flow alteration	TMDL for sediment, bacteria No action for flow alteration
Succor Creek WQLS: 6671 AU: 002_02, 03	Headwaters to Oregon line	Temperature, sediment	TMDL for sediment Delay TMDL for temperature to collect additional data

Table C. Streams and pollutants for which TMDLs[1] were developed.

Stream	Pollutants
Snake River (Swan Falls to Oregon Line)	Nutrients, Dissolved Oxygen (as part of nutrient TMDL)
Castle Creek	Sediment
Jump Creek (Mule Creek to Snake River)	Sediment
Sinker Creek	Sediment, Temperature
Succor Creek (Headwaters to Oregon line)	Sediment, Temperature
Succor Creek (Oregon line to Snake River)	Sediment, Bacteria

[1]Total Maximum Daily Loads

1. Subbasin Assessment – Watershed Characterization

The federal Clean Water Act (CWA) requires that states maintain the chemical, physical, and biological integrity of the nation's waters (33 USC § 1251.101). States, 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 to identify and prioritize water bodies that are water quality limited (i.e. water bodies that do not meet water quality standards). States must periodically publish a priority list of impaired waters, currently every two years. For waters identified on this list, states 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 Mid Snake River/Succor Creek 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 Mid Snake River/Succor Creek 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 – 4). This information will then be used to develop a TMDL for each pollutant exceeding the water quality standards in the Mid Snake River/Succor Creek Subbasin (Chapter 5).

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 "swimmable 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 country. The 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 should help define appropriate controls to restore water quality and allow the water bodies to meet their designated 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 pollutant loading for water bodies on the 303(d) list. The *Mid Snake River/Succor Creek Subbasin Assessment and Total Maximum Daily Load* provides this summary for the currently listed waters in the Mid Snake River/Succor Creek Subbasin.

The subbasin assessment section of this report (Chapters 1 – 4) includes an evaluation and summary of the current water quality status, pollutant sources, and control actions in the Mid Snake River/Succor Creek 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 point and nonpoint sources discharging the pollutant as well as a margin of safety (MOS) to account for uncertainty in pollutant measurement and dynamics. 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 specific pollutants as "pollution." TMDLs are not required for water bodies impaired by pollution, but by specific pollutants. In other words, if flow alteration was determined to be the only factor impairing a stream, then a TMDL would not be required since flow alteration is not a pollutant.

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.

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 anti-degradation 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, mining, commercial
- 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 and primary contact recreation are presumed to be the designated uses when the water body is 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 designated 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

The Mid Snake River/Succor Creek Subbasin is a 2,002 square mile semi-arid watershed that lies in the Snake River Basin. To the north of the Snake River, the terrain is primarily a gently rolling basaltic plain occasionally studded by gently sloped buttes. To the south lies a dissected lowland plateau of valleys, canyons, and mesas that increases in elevation as they rise to meet the Owyhee Mountains. The tributaries to the Snake River are primarily low volume rangeland streams that run through sagebrush steppe country. While the Mid Snake River/Succor Creek watershed extends into Oregon, this subbasin assessment concentrates on those water bodies located in Idaho. Figure 1.0 shows the subwatersheds that comprise the Mid Snake River/Succor Creek watershed in Idaho.

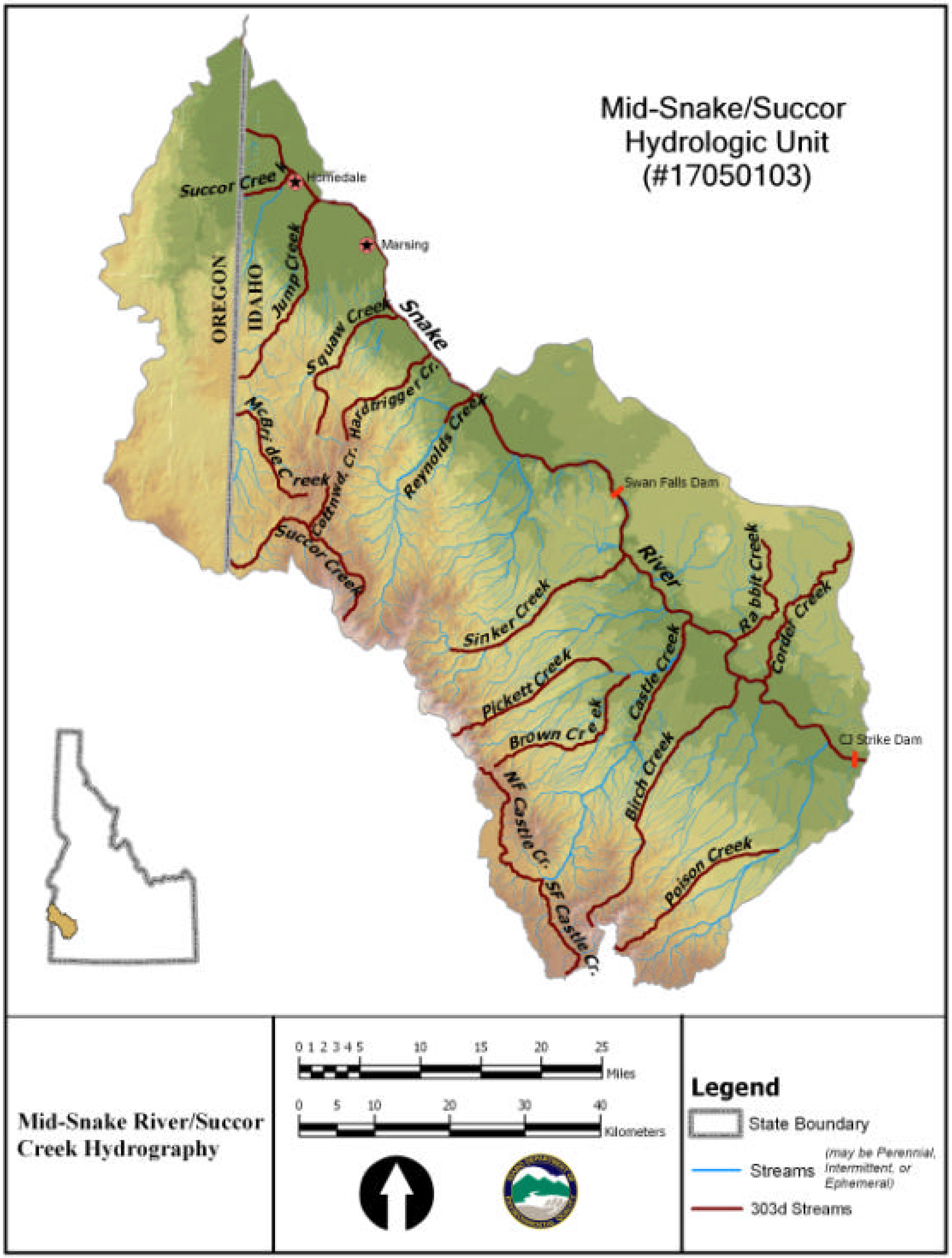

Figure 1.0 Mid-Snake/Succor Hydrography

Climate

The climate in an area is defined by several environmental variables, including its proximity to the ocean, the movement of air masses across pressure ridges and the angle of the sun at certain times of the year. Areas that share geographic similaries share similar climates. However, it should be noted that within climatic regions, weather patterns can differ drastically. As and example, the Boise Front and the Owyhee Mountains have similiar climatic characteristics, but often have different weather patterns.

The Mid Snake River/Succor Creek watershed is characterized by a semi-arid climate: hot and dry in the summer and cold and dry in the winter. Grand View is located along the Snake River, approximately 8 miles downstream of CJ Strike Dam. July is generally the hottest month with the greatest evaporation, while January is the coldest and has the least evaporation. Precipitation is bi-modal with intense, short duration summer storms and milder, longer duration winter storms. More than half of the precipitation falls November through January.

The Owyhee Mountains receive an average of 30 inches of snow per year in the higher elevations, while the lower elevations along the Snake River receive an average snowfall of under 6 inches. Figures 1.1 and 1.2 show the temperature and precipitation regimes in the lower elevations of the watershed. The differences in precipitation due to topography are shown in Figure 1.3 (Western Regional Climate Center 2002).

The closest climate station that yields percent possible sunshine per month is located in Boise, Idaho which is in an adjoining watershed. The climate in Boise is also semi-arid and thus, relatively similar. Table 1 shows the percent possible sunshine per month for the Boise area. Corresponding to the months of the hottest temperatures, the months with the highest percent sunshine are July and August.

Table 1. Percent possible sunshine per month.

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Avg
Boise	40	51	62	68	70	75	87	85	82	69	43	38	64%

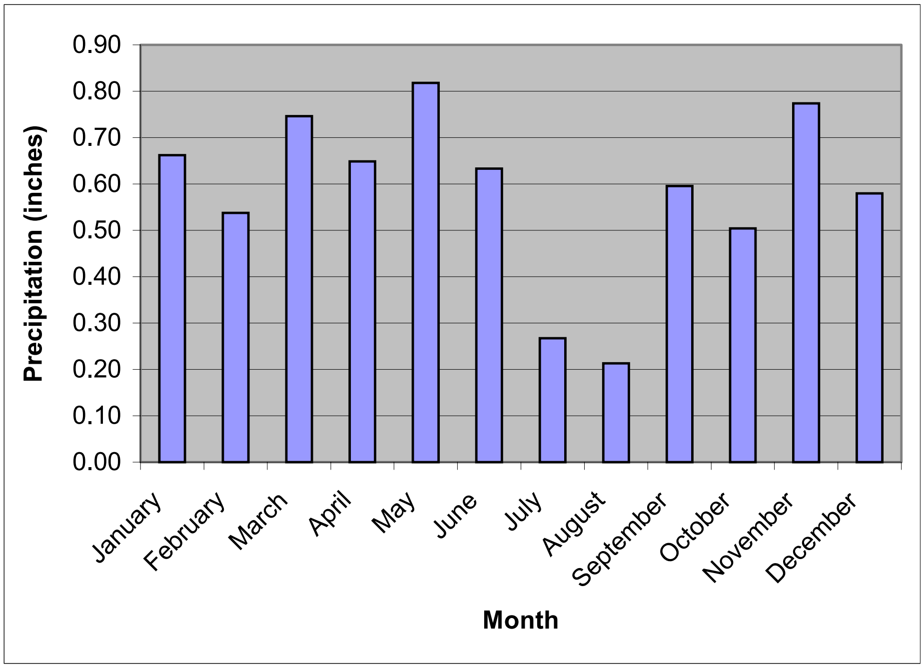

Figure 1.1 Average Monthly Precipitation for Grand View, Idaho

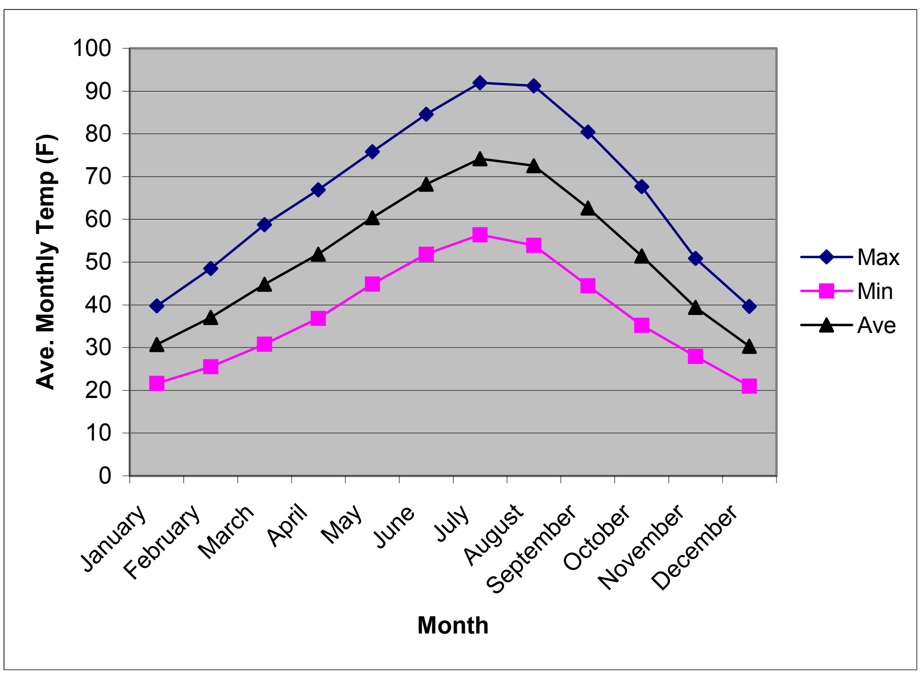

Figure 1.2 Average Monthly Temperatures for Grand View, Idaho

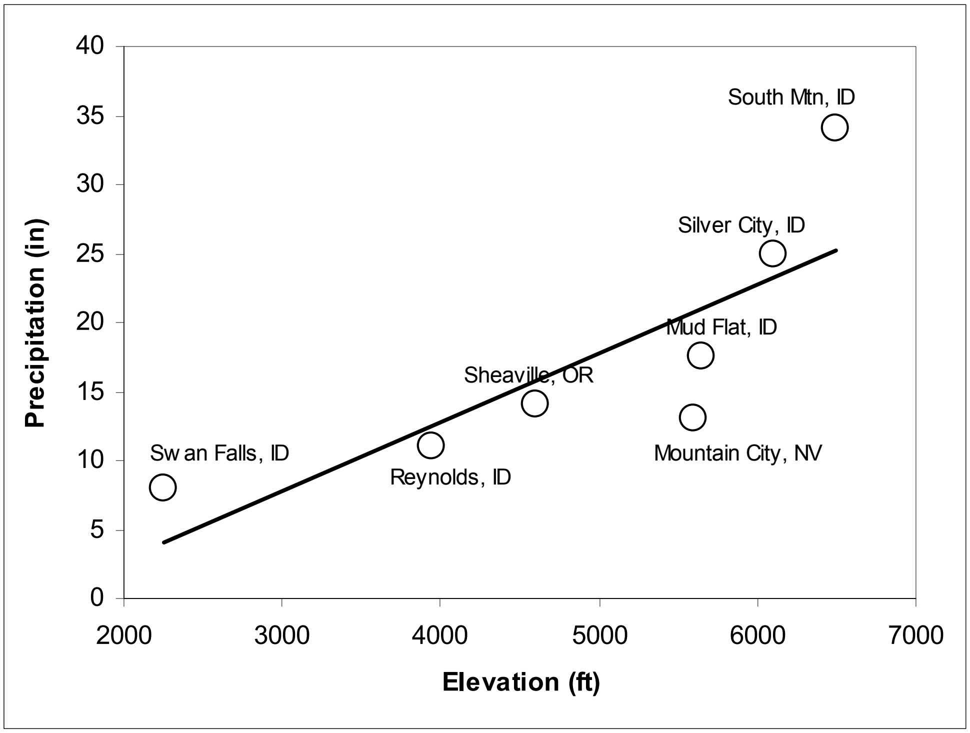

Figure 1.3 Increase in Precipitation with Increase in Elevation for Owyhee Mountains (Mountain City, NV; Sheaville, OR; and South Mountain, Owyhee Range, but not in Mid Snake River/Succor Creek Watershed)

Subbasin Characteristics

This section describes provides a cursory description of the Mid Snake River/Succor Creek watershed from a vegetative, geologic, climatic and hydrologic standpoint. More detail on each subbasin is also provided.

Vegetation

The Mid Snake River/Succor Creek watershed lies entirely in the Snake River Plain eco-region and is characterized primarily by sagebrush steppe vegetation (Omernik and Gallant 1986). Sagebrush directly influences the soil microclimate by accumulating vegetative litter to a much greater depth than adjacent grasses and by insulating the soils via its plant canopy. The combination of insulation from litter and canopy shade has a significant effect on the soil-water potential (the amount of water the soil can absorb). In the Snake River canyon as well as in the foothills to the south of the Snake River, saltbush greasewood vegetation is predominant. Cheatgrass, a non-native, invasive species, occurs in areas that have been disturbed. In the higher elevations, junipers are often present. The decreased frequency of fire (a significant mortality factor for junipers) in the higher elevations due to historic grazing practices has resulted in juniper encroachment into lower elevations. This encroachment is believed to have started occurring in the 1860's.

The Mid Snake River/Succor Creek watershed shows a vertical succession of plant associations from the lowest to highest elevations. The elevations at which various plant associations occur depend on characteristics such as latitude, exposure, soil, and moisture, while the width of the belts depends on the steepness of the slope (UDNR-DWR 1975).

Streamside vegetation often provides more important wildlife habitat due to the richer growth of plants than does the surrounding upland areas. At the lower elevations within the watershed, vegetation includes cottonwood trees and numerous shrubs such as sagebrush, greasewood, willows, wild rose, and dogwood. Wetlands and marshes found in the watershed offer good conditions for waterfowl. There are 159 islands in the Snake River (recently transferred from the U.S. Fish and Wildlife Service's (USFWS) Deer Flat National Refuge to the state of Idaho) and these are of great importance to waterfowl. Higher in the mountain canyons, the streams are lined with willow, dogwood, and other riparian shrubs. Cropland and irrigated pastures provide habitat for a number of animals such as pheasants, quail, and rabbits. They also provide feed for resident and migrating waterfowl.

Wildlife

This discussion focuses on the wildlife in the Mid-Snake River/Succor Creek watershed that could have a measurable effect on stream health. The watershed, in addition to being susceptible to the effects of livestock grazing, is also potentially susceptible to the effects of large mammals such as elk, deer and wild horses. The BLM has wild horse management areas throughout the watershed. The BLM's objective is to keep wild and free-roaming horses at appropriate management levels within a thriving natural ecological balance. To reach this objective, the BLM has established forage allocation (AUMs) by herd management area. Where there has been development of water sources for livestock in wildhorse management areas, there is the potential for riparian damage as the horses no longer roam as far to get to water and may yard up. In general, however, wild horses exhibit seasonal grazing patterns, following the green up to higher elevations and thus, do not stress one particular area for an extended period of time.

Deer and elk may have an impact on riparian areas at certain times of the year, particularly if large numbers of animals are in an area for an extended period of time. Like wild horses, deer and elk generally follow the green up exhibiting seasonal as opposed to season long grazing activity.

While in general beavers are beneficial to riparian areas, certain instances have occurred where populations rapidly expanded and riparian degradation took place.

Fisheries

Snake River

The stretch of the Snake River between CJ Strike Dam and the Oregon line is characterized by a dominance of game fish. In 1995, the Idaho Department of Fish and Game (IDFG) conducted an electrofishing study on the Snake River. From Swan Falls Dam to Walter's Ferry, 73% of the fish captured were game fish and smallmouth bass was the dominant species. From below CJ Strike Dam to Swan Falls Reservoir, carp were the dominant species. Other species that occur in this area of the Snake River include rainbow trout, largemouth bass, channel and flathead catfish, black crappie, yellow perch, and sunfish as well as other non-game species (Anglin 1992). White sturgeon are considered a sensitive species by the state of Idaho and are also found in this reach, mainly below Swan Falls Dam. More information on fisheries in the Snake River is located in Section 2.3.

Tributaries
In the tributaries, the only salmonid generally present is redband trout. Redband trout are a strain of rainbow trout and are typically associated with desert watersheds. Based upon the distribution of redband trout they appear to have developed a tolerance for the higher water temperatures (higher then the salmonid spawning criteria) found in the Owyhee desert. That is, redband trout that inhabit many of the Owyhee Mountain streams appear to have successfully propagated despite exceedances in the salmonid spawning temperature criteria. However, even though redband trout can live in naturally higher water temperatures, there is little flexibility regarding further degradation of substrate and temperature conditions in the streams.

The loss of desert riparian habitat that cools stream temperatures and filters surface runoff is a factor in determining the population dynamics of the redband trout. Loss of riparian habitat occurs due to both human caused (i.e. grazing, recreation) and natural factors (i.e. extreme flood or fire). The degree of riparian loss is directly related to the severity of the human or natural activities. Higher densities of redbands are found in the upper reaches of the tributaries where temperatures are cooler and riffles and pools are more prevalent. Fisheries data for the tributaries are found in Table 2.

The IDFG has determined that the lower sections of the listed tributaries, the response reaches, generally do not provide salmonid spawning habitat and have probably historically served primarily as migratory corridors (see Appendix F). Seasonal migration to the Snake River may be limited due to barriers caused by irrigation diversions. The potential to improve salmonid spawning habitat in these reaches is low due to the low gradient, habitat alteration, flow diversion and associated high temperatures. Salmonid spawning does occur in the upper reaches of many subwatersheds where better habitat conditions and higher gradients exist.

Table 2. Listed segments for which fish information exists

Water Body	Year Assessed	Fish Present[1]
Brown Creek	NA	No data
Birch Creek	NA	No data
Castle Creek	1994	Redband trout, dace sp., bridgelip sucker
Jump Creek	1994	Redband trout

McBride Creek	1996	No fish observed, no historical redband habitat (BLM 1997)
Pickett Creek (T5SR1WS32 to Catherine Creek)	NA	No data
Pickett Creek (headwaters to T5SR1WS32)	1996	Redband trout
Poison Creek	NA	No data
Reynolds Creek	NA	Redband trout, dace sp., bridgelip sucker, redside shiner
Sinker Creek	1995	Redband trout
South Fork Castle Creek	1993	Redband trout
Squaw Creek	1997	Bridgelip sucker, dace sp.
Succor Creek (Headwaters to .92 miles above Succor Creek Reservoir	2002	Redband trout, dace sp., bridgelip sucker, redside shiner

[1]All data collected using a backpack electrofisher

Geology

The Mid Snake River/Succor Creek watershed is part of the Snake River Plain, which is characterized by numerous buttes and basalt canyons formed by ancient lava flows. The western plain of the Snake River extends from near King Hill to Weiser. The plain is a fault-bounded shallow depression underlain by a mix of Quaternary and Tertiary sedimentary and volcanic rock. The western Snake River Plain is underlain by a section of sedimentary material that may be in excess of 5,000 feet thick in the central portion of the basin. The generally fine-grained nature of the sedimentary material does not allow ground water to move as freely as it does in the eastern Snake River Plain (Newton 1978). Faults typically trend in a westerly or northwesterly direction. Relatively few faults can be detected from the surface.

Both black basalt and light colored rhyolite are found throughout the watershed. Most of the volcanic rock in the watershed dates to the Pliocene era and was likely associated with the North American tectonic plate moving over a hot spot beneath the Columbia Plateau Province, resulting in basalt flows and explosions of rhyolite.

Fourteen thousand years ago, the Bonneville Flood had a significant effect on the topography of the Snake River canyon today. The Snake River canyon already existed, but the magnitude and velocity of the flood waters, estimated at 33 million cubic feet per second (cfs), resulted in substantial downcutting as well as the creation of box canyons along cliffs where eddies formed. Not only were the canyons a result of the flood, but places such as Wees Bar were formed due to enormous eddies that deposited sediment and huge boulders. The “melon” boulders, polished smooth by the tumbling action of the high velocity flood, that are found at Wees Bar and Celebration Park were later used by Native Americans for petroglyphs. Figure 1.4.1 shows the geologic formations that make up the watershed. Figure 1.4.2, the legend for figure 1.4.1, is found on the following page.

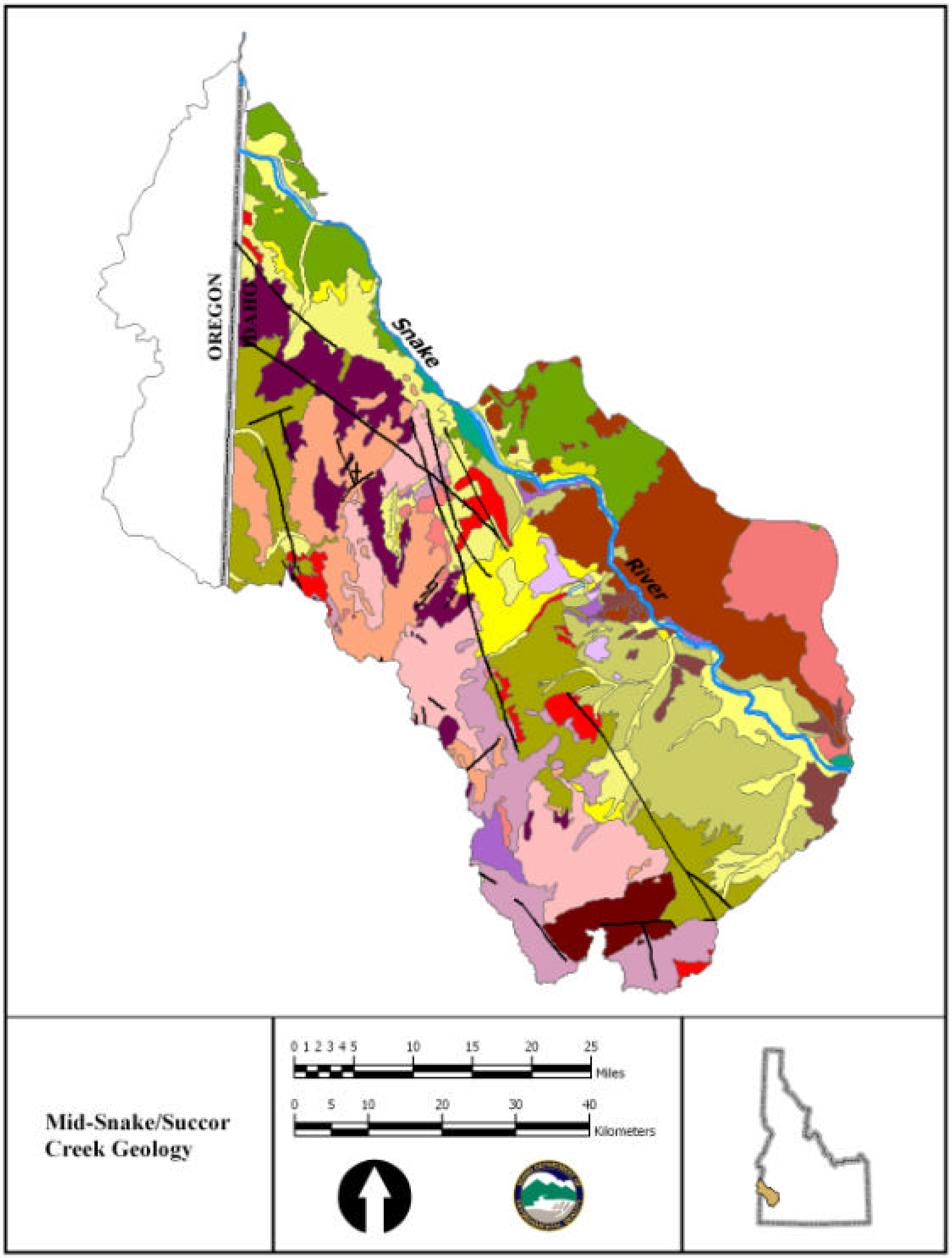

Figure 1.4.1 Mid Snake/Succor Geology

Figure 1.4.2 Mid-Snake/Succor Geology Legend

Soils

The Snake River Basin is characterized by aridisols and aridic mollisol soils. Aridisols are mineral soils, typically found in arid regions, light colored, and low in organic matter. They often have surface accumulations of soluble salts and lime. The lower the precipitation, the more frequently these accumulations are found on the surface. In the Mid Snake River/Succor Creek watershed there are both orthids (aridisols that have accumulations of calcium carbonate or other salts but no clay accumulations in the horizons) and argids (aridisols with a clay horizon).

The ardisols and mollisol soils are composed of loess (calcareous silt transported by wind deposits), residuum (soil produced from weathering of rock directly beneath it), colluvium (loose deposits at the foot of a slope brought there by gravity), and alluvium (deposits of silt or silty clay deposited as a result of flooding).

Mollisols are well-drained soils with organic-rich surface horizons and that are rich in basic cations such as calcium (Ca ++), magnesium (Mg ++), potassium (K +), and sodium (Na +). Xerolls are the most common suborder of the Mollisol soils within this reach. These soils develop in moist winter/dry summer climates, and are continually dry for long periods of time. These soils dominate the steppe and shrub-steppe vegetation areas in the reach and when kept moist (i.e., through irrigation) are important for grain and forage (Oregon State University, 1993).

Figure 1.5 shows the erodibility, or K factors for the soils in the watershed. The soils are predominantly moderately erodible soils. The K factor is an erosion susceptibility factor that shows how easily soil will detach and transport when subjected to rainfall and runoff.

Figure 1.6 shows the erosion potential in the watershed. This potential was developed using an analysis of the K factor, wind erodibility group, and slope. Areas of high erosion potential are typically steep sloped, high K factor sites. Slope plays a more significant factor in this determination than the K factor or wind erodibility group.

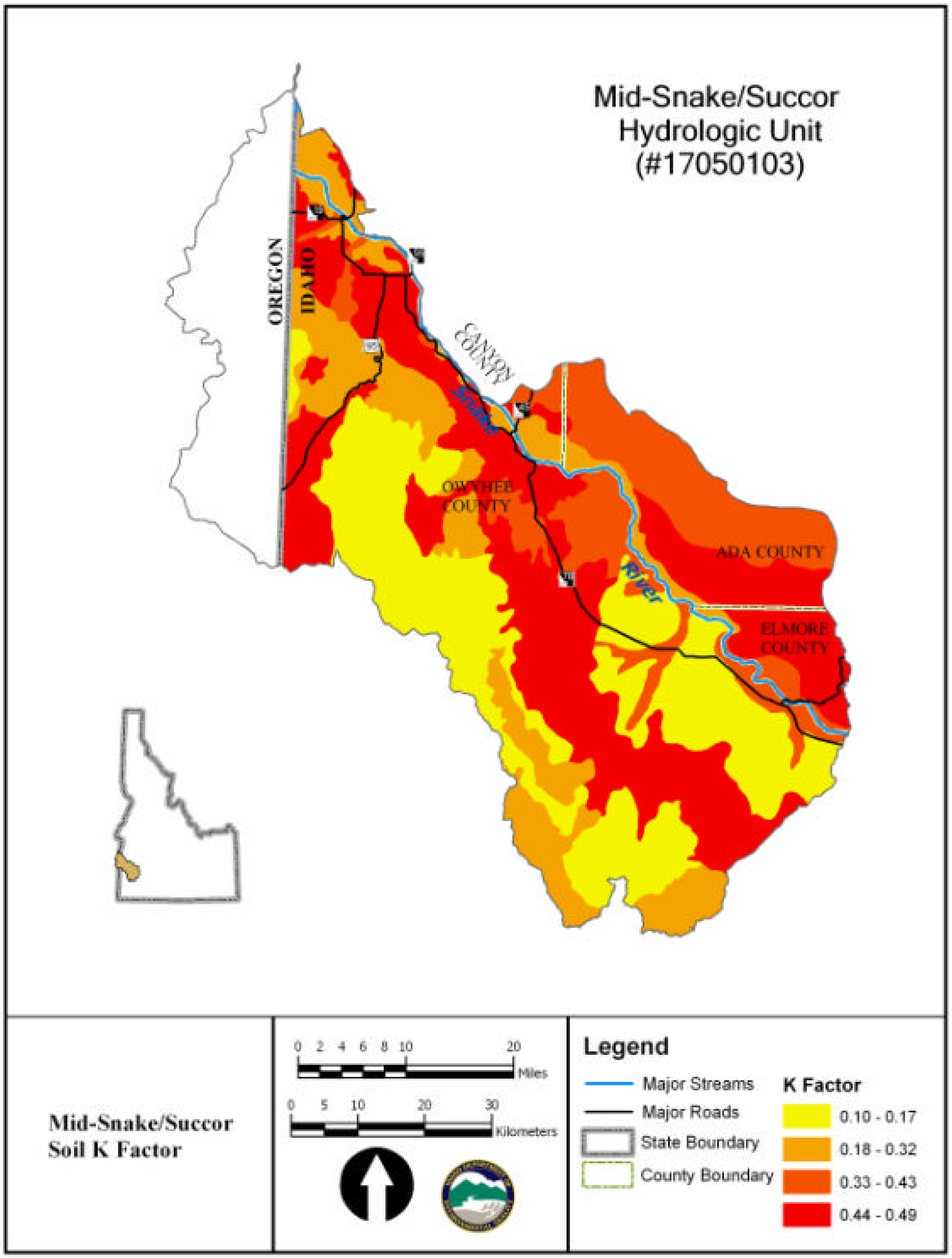

Figure 1.5 Mid-Snake/Succor Soil K Factor

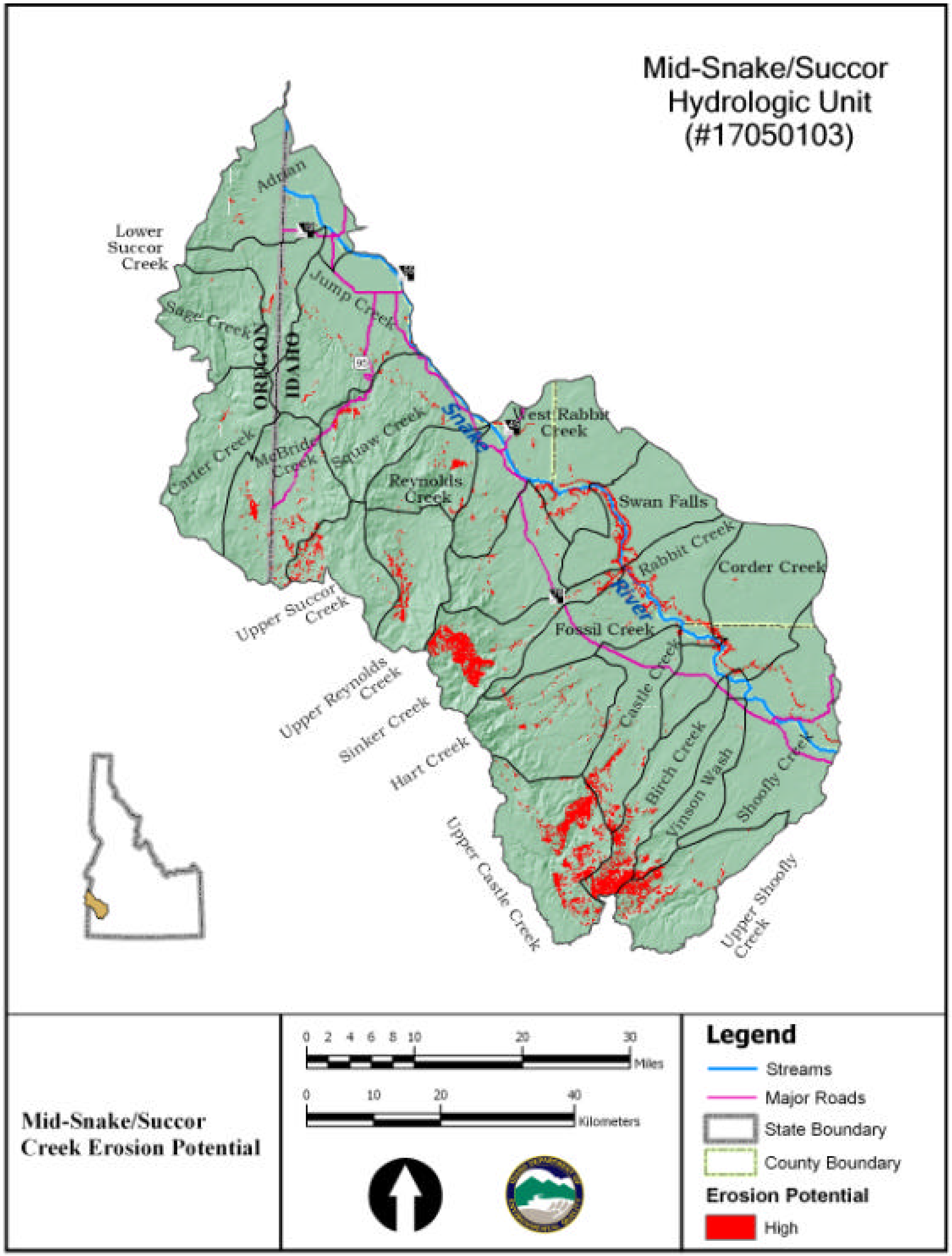

Figure 1.6 Mid-Snake/Succor Erosion Potential

Topography

Characterized by basalt canyons and buttes, the predominant aspect of the Mid-Snake River/Succor Creek watershed is southeasterly. Elevations are highest in the southern part of the watershed. In this area, streams flow out of the front range of the Owyhee mountains, coursing through canyons and sagebrush covered hills, before flattening out in the valleys that surround the mainstem Snake River, as shown in Figure 1.7.

The mean elevation in the watershed is 2,487 feet. The highest elevations are over 8,000 feet and are found in the Silver City Range bounding the southern edge of the watershed. The lowest elevation of 2,168 feet is found at the most downstream point of the Snake River on the eastern edge of the watershed.

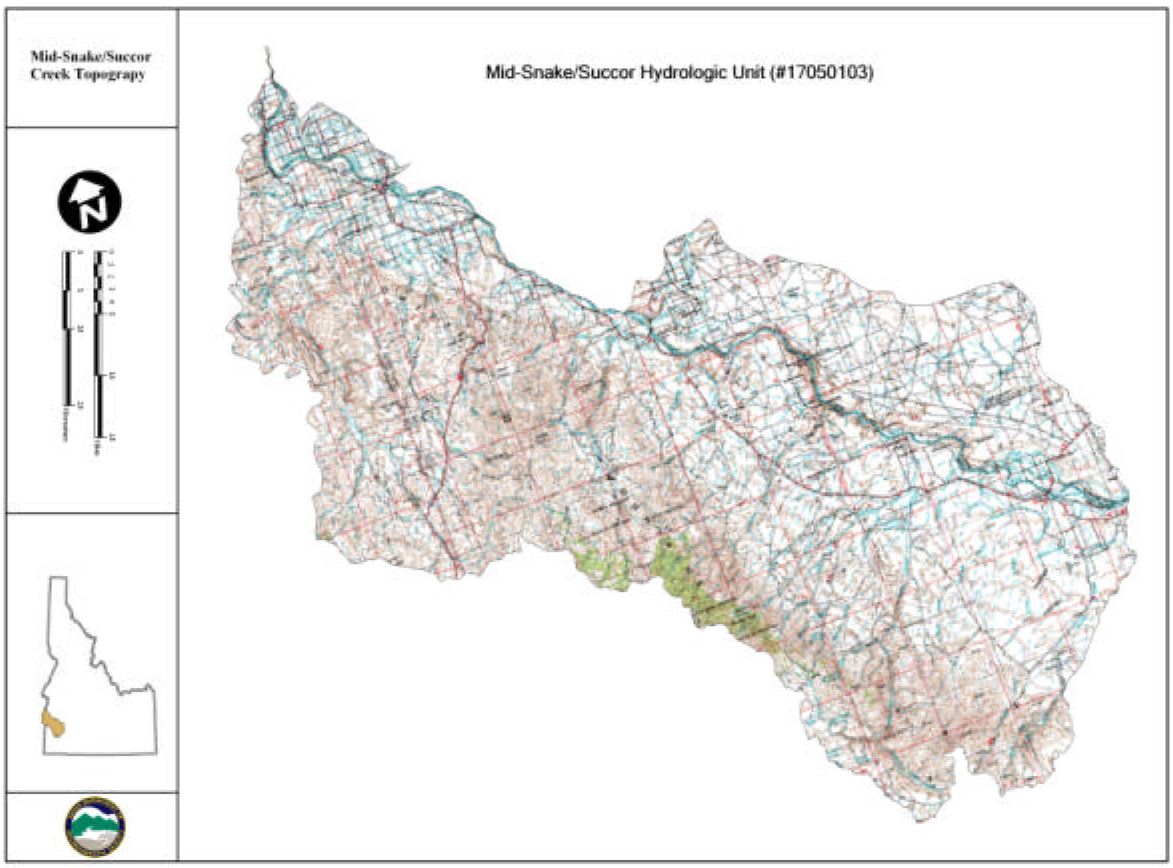

Figure 1.7 Mid-Snake/Succor Topography

Ground Water

The western plain of the Snake River extends from near King Hill to near Weiser. The plain is a fault-bounded depression underlain by a mix of Quaternary and Tertiary sedimentary and volcanic rock. While relatively few faults can be detected from the surface, they have an impact on the dynamics of vertical and horizontal ground water movement. Ground water in the watershed is typically deep (>100 feet) except in the areas near Grand View and Homedale, where levels may be in the tens of feet. Ground water in these areas and near Murphy has been found to have elevated levels of nitrates. The high levels in the Grand View area have been attributed to fertilizer use. Shallow ground water (subsurface recharge) has also been found to contain high concentrations of phosphorus (DEQ 1991). Agricultural chemicals can reach ground water in significant quantities under conditions of high soil permeability, chemical mobility, and water application practices. With appropriate placement, management, and control programs in place, effects from these nonpoint sources can be minimized or removed in many cases (USBR 1998).

The Grand View area is a ground water management area where state permission is required to drill additional wells. This classification is in place due to water level declines attributable to extensive ground water development.

Ground water in the region is present in two stratums. Water can be found under artesian conditions (confined) or under water table conditions (unconfined). Water in the shallow, unconfined alluvium is generally cold, while the deeply confined water is a mix of cold and hot water. Artesian wells occur south of the Snake River at elevations of 2,700 feet or less and usually produce free flowing geothermal water. This mix of cold/hot conditions is typically found along fault zones or through conveyances that penetrate more than one geologic profile. Some thermal water may leak upward into overlying cold-water aquifers and discharge to the Snake River as part of those sources (Lindholm 1988).

The Banbury Basalt aquifer is the most productive aquifer in the westerly plain. Other aquifers include the Poison Creek Formation, Glens Ferry Formation, and Tertiary Silicic volcanics. In general, aquifers are made up of sand, gravel, and to a lesser extent, basalt. The aquifers in northern Owyhee County, adjacent to the Snake River are typically unconsolidated and fine-grained. Hydrogen sulfide and methane emissions occur in some wells due to organic debris in the fine-grained deposits. Thus, some communities actually obtain their water from wells north of the river in Canyon County where unconsolidated-deposit aquifers are more permeable (Norvitch et al. 1969).

The movement of ground water through the profile trends with the hydrologic gradient. Water on the north side of the Snake River moves in a southwesterly direction to the river and water on the south side moves in a northwesterly direction to the river. The rate of water movement is dependent on hydraulic head, which varies throughout the watershed.

Water storage, particularly on the south side of the river, has generally decreased since 1972 (Kjelstrom 1995), although in the past there have been periods of increased recharge and storage. Recharge and storage rates are linked to climatic events, domestic water supply demand, and agricultural/irrigation water supply demand. In the uplands, recharge rates are closely linked to infiltration from precipitation. In the lowlands, recharge rates are linked to inter-aquifer flow, infiltration from perennial and intermittent streams and ditches, and precipitation, among other things.

Within the Snake River Basin, surface and ground water systems are interconnected. Changes in ground water recharge or discharge have been observed to affect surface water flows (Goodell 1988). Similarly, infiltrating water from irrigation systems and stream flows represent a significant portion of the ground water budget (USBR 2001). At many places in the basin, the Snake River channel is above the regional water table and instead of the aquifer discharging to the river, the river recharges the underlying aquifer (USBR 1998). In low-water years, pumping and diversions can remove more water from the Snake River than is contributed by some of the inflowing tributaries. Irrigation recharge during periods of low tributary input represents a significant source of in-river flow (as much as 52%) (IDWR and ODWR water supply data). Throughout the entire Snake River Plain millions of acre-feet of surface water are diverted annually for irrigation purposes. This increased application of water for surface irrigation has also artificially raised the water table by tens of feet throughout the plain (Lindholm 1996).

The aquifers found in the Snake River drainage areas provide ground water for use within the individual drainage areas. These also provide varying amounts of recharge, in the form of subsurface ground water inflow. While shallow ground water (subsurface recharge) in the watershed is more easily influenced by agricultural and storm water pollutants, deep ground water in the watershed is commonly of higher quality, suitable for drinking, agriculture, and industrial uses. Deep ground water quality is often better than that required to meet national drinking water standards.

River Characteristics

The Snake River originates at 9,500 feet along the continental divide in Wyoming and flows 1,038 miles to the confluence with the Columbia River in Pasco, Washington. The Mid Snake River/Succor Creek reach begins at river mile 494. The Snake River is a large volume river that is one of the most important water resources in the state. The Mid Snake River/Succor Creek reach is an important agricultural, recreational, and wildlife resource as well as a hydroelectric power source. Flowing in a northwesterly direction, the Mid Snake River/Succor Creek reach is 90.73 miles long, from below CJ Strike Dam to the Oregon line. In this reach, the river flows through basalt canyons, rangeland, and agricultural land. The channel shape varies from confined in the canyons to wide single channel areas with extensive floodplains and meandering channels with island complexes. Swan Falls Dam and Reservoir (a run of the river reservoir) are also located within the watershed. In the Mid Snake River/Succor Creek watershed, the tributaries to the Snake River generally only contribute substantial flow for a few days in winter or early spring due to run-off events.

The §303(d) listed segment originates below the CJ Strike Dam. CJ Strike Reservoir, which is not a part of this TMDL, impounds approximately 24 miles of the Snake River and almost 10 miles of the Bruneau River. The reservoir has a storage capacity of 240,000 acre-feet and a surface area of approximately 7,500 acres. The resulting effect downstream of fluctuating dam releases is elevational changes of up to 3 feet during a typical day. Ninety percent of the tailwater elevational changes are less than 1 foot.

Forty-nine of the 72 miles of the Snake River between CJ Strike and Swan Falls Dams supports wetland or riparian vegetation. A 1997 aerial photograph interpretation by DEQ indicates that riverbank and island vegetation was 20% forest, 40% shrub riparian habitat, 30% shore/bottomland wetland, and 10% emergent herbaceous vegetation. However, it is important to note that in this aerial photograph interpretation, russian olives and tamarisk are potentially included in this forest designation. Both of these are invasive, undesirable species considered noxious weeds by the state of Idaho. An instream flow incremental methodology study determined that the area of channel impact averages 4.1 feet on either side due to variable releases (i.e., 4.1 feet of shore might be vegetated if variable releases did not occur) (IPC 1998).

The reach from below CJ Strike Dam to Swan Falls Reservoir (river mile 468.6) initially runs through an extensive agricultural area before it enters a steep canyon in the lower section of that reach.

The river enters Swan Falls Reservoir at mile 480. Surrounded by steep cliffs, this run of the river, 6,800 acre-foot impoundment, stretches approximately 10 miles upstream to Big Foot Bar. Previous studies have shown that the average cross section in the reservoir is not much greater than that of a river section, and the volume of water in the reservoir is not much greater than an average river section of comparable length. Because of the hydrology of the reservoir, the retention time in the reservoir is short and the waters tend to remain well mixed. During summer, the retention time was estimated at 0.6 days, meaning that nutrients and phytoplankton would pass through the system before horizontal gradients could be established.

Sampling in 1993 by DEQ showed that temperatures were nearly isothermal during the summer and dissolved oxygen (DO) levels were also correspondingly orthograde with depth (DEQ 1993). Additional DO/temperature profiles taken by Idaho Power (IPC 2002) have shown similar results. Variations in inflow slightly altered the vertical stability of oxygen in the upstream section of the reservoir. A longitudinal gradient of oxygen was present, increasing in the downstream section of the reservoir with a corresponding increase in chlorophyll-a.

Both lentic and lotic habitat, due to the presence of Swan Falls Dam and the resultant Swan Falls Reservoir, characterize the Snake River. Behind Swan Falls Dam for about 10 river miles upstream to Big Foot Bar is a lentic habitat in the Swan Falls Reservoir. Warm water fish such as carp and sucker are found in this area as well as in the lotic habitat. Sturgeon, whitefish, and trout are found in the lotic habitat.

Below Swan Falls Dam, the river displays swift current, pools, rapids, and riffles. The Snake River downstream of CJ Strike Dam to Swan Falls Reservoir flows through extensive agricultural development before entering Swan Falls Reservoir. Shallow fast runs and simple island complexes characterize the river. There are few deep runs or pools in this stretch. Steep canyon walls are predominant in the Swan Falls Reservoir area, creating a run of the river reservoir.

From below Swan Falls Dam to Walters Ferry, the river channel is a high gradient reach (3.54 feet/mile) that passes through basalt cliffs and scattered boulder fields. The river in this section has a more diverse hydrology and habitat then the upstream sections. This reach has deep fast runs, multiple and single island complexes, rapid/riffle areas, and a few deep pools.

The Walters Ferry reach has the lowest gradient (1.27 feet /mile). There are multiple and single island complexes, mainly shallow runs, and a few deep runs or pools. Agricultural development is prevalent throughout this reach. There are several major pumping stations, many small individual pump stations, and numerous agricultural return drains throughout this reach.

Erosion and instream biological productivity provide most of the sediment in the Mid Snake River/Succor Creek reach of the Snake River. Sediment originates from natural (e.g., gully erosion, high flow events) and anthropogenic sources (road erosion, agricultural lands, urban/suburban storm water runoff, and construction sites). Sediment concentrations within the system are highest in spring in association with high flow volumes and velocities from snowmelt runoff. Since this reach is bounded on the upstream end by CJ Strike Dam, sediment inputs are limited to some degree by the controlled nature of the watershed. This control can reduce the amount of sediment delivered to this reach. Sediment transport and the transport and delivery of sediment bound pollutants are directly associated with increased flow volumes and high velocities.

Nutrient sources are both natural and anthropogenic, including nutrient loading from agricultural activities, grazing, and wastewater treatment plants. More information on nutrient sources can be found in Chapter 3.

Land Use

As shown in Figure 1.8, over 80% of the land in the watershed is rangeland. Land use is dominated by grazing and, to a lesser extent irrigated agriculture for all the watersheds. Fourteen percent of the land in the Mid Snake River/Succor Creek watershed is under cultivation (DEQ 2002a).

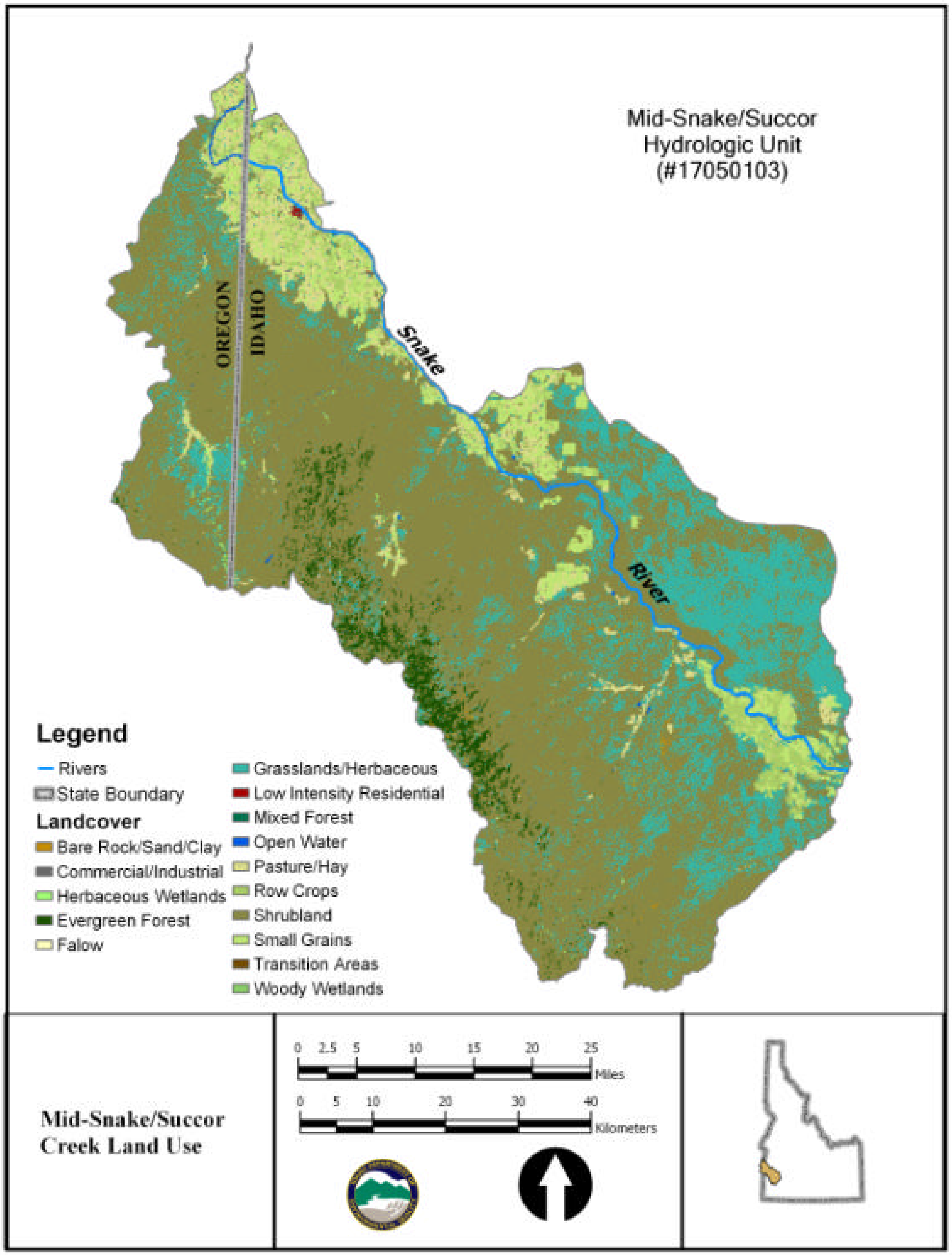

Figure 1.8 Mid Snake/Succor Land Use

Subwatershed Characteristics

Of all the streams and rivers in the watershed, almost 81% of the total stream lengths are classified as intermittent (Montana State University, 2002). Most of the tributaries exhibit similar characteristics: they start along the front range as higher gradient, lower sinuosity V-shaped channels (Rosgen B channels) before exiting to the plains area and becoming more sinuous, lower gradient, chisel-shaped channels. Rosgen B-type channels are sediment transport channels and are most common throughout the upper elevations of the subbasin. These channels have moderate gradients, sinuosity, width to depth ratios, and entrenchment ratios. They occur in narrow, moderately sloping valleys dominated by riffles with occasional pools. Rosgen B-type channels usually have stable bottom material and are more dependent on riparian vegetation and large woody debris for stability (Rosgen 1996).

Where the slope of the watershed changes to less than 7%, the channel types are typically Rosgen C-type channels (stream gradients of less than 2%), also called sediment response or sediment depositional reaches. These are low gradient channels located in gently sloping valleys with floodplains and terraces. These chisel-shaped channels are meandering and slightly entrenched with moderate width to depth ratios. One side of the channel is often shallow, while the opposite side is deep. Under natural conditions, the channels meander at a rate that allows for stream bank stability over 80%. By definition a stable stream bank is associated with a stream that can assimilate its sediment load (Rosgen 2002).

Under deteriorating conditions, width to depth ratios increase, eroded banks are evident, and streams can become severely entrenched. The surface water quality of the tributaries varies throughout the subbasin and is dependent on land uses, local geology, and discharge. Most surface water is of high quality near the source and in the upper reaches. Water quality in the lower reaches tends to decline. Water quality degradation occurs as sediments and other pollutants are deposited into the stream due to natural and anthropogenic processes. Primary anthropogenic sediment sources within the watershed are bank erosion, roads, and agriculture practices. Extreme flow events caused by rain on snow events or heavy precipitation can also cause significant sediment loading to these creeks. Natural erosion from sources such as gullies also contributes sediment to the stream. Surface waters are also affected by irrigation impoundment and diversion structures at lower elevation reaches, which preclude, in some cases, flow from reaching the mainstem Snake River.

Castle Creek

Castle Creek is a perennial stream that drains approximately 129,542 acres and generally flows in a northeasterly direction. The fourth order creek begins at close to 6,700 feet near Toy Mountain pass. Catherine, Browns, Bates, Hart and Pickett Creeks all flow into Castle Creek. After the creek exits the Owyhee front it flows through rangeland and pastures before emptying into the Snake River around 2,400 feet.

The 13-mile listed portion is a Rosgen C channel, a sediment depositing reach characterized by a U-shaped, sandy channel bottom. In swifter parts of the stream, the substrate is made up of partially embedded cobbles. This creek exhibits entrenchment and unstable banks in portions of the lower watershed. A portion of the downcutting is due to episodic rain on snow events and some of the downcutting is attributable to anthropogenic influences such as stream straightening. Where the riparian area has not been disturbed or the channel is not deeply downcut, the riparian area is thick with cottonwoods, willows, wild roses, and grasses.

There are geothermal sources of water in the Castle Creek subwatershed. Some of the warm water enters the creek due to the presence of flowing wells. Land management practices, including using the warm water for irrigation purposes, account for much of the warm water returning to the creek. The Castle Creek watershed has been settled for over 100 years and irrigation development can be traced back to the 1880s, although the greatest amount of irrigation development occurred in the 1950s and 1960s. Mining also occurred historically in the watershed.

Land Ownership and Land Use

The upper part of the Castle Creek watershed is primarily rangeland, while the lower reaches near the Snake River are a mix of irrigated agriculture and rangeland. Additionally, bentonite mining occurs in the watershed. Parts of the watershed are considered to have high mineral potential and sedimentary rock alongside the creek is being mined for industrial minerals (BLM 1999). Figure 1.9 shows the land use patterns within the watershed. While private lands exist in the upper part of the watershed, land is primarily federally owned. Most of the private holdings in the area are closest to the Snake River and around the township of Oreana (DEQ 2002a).

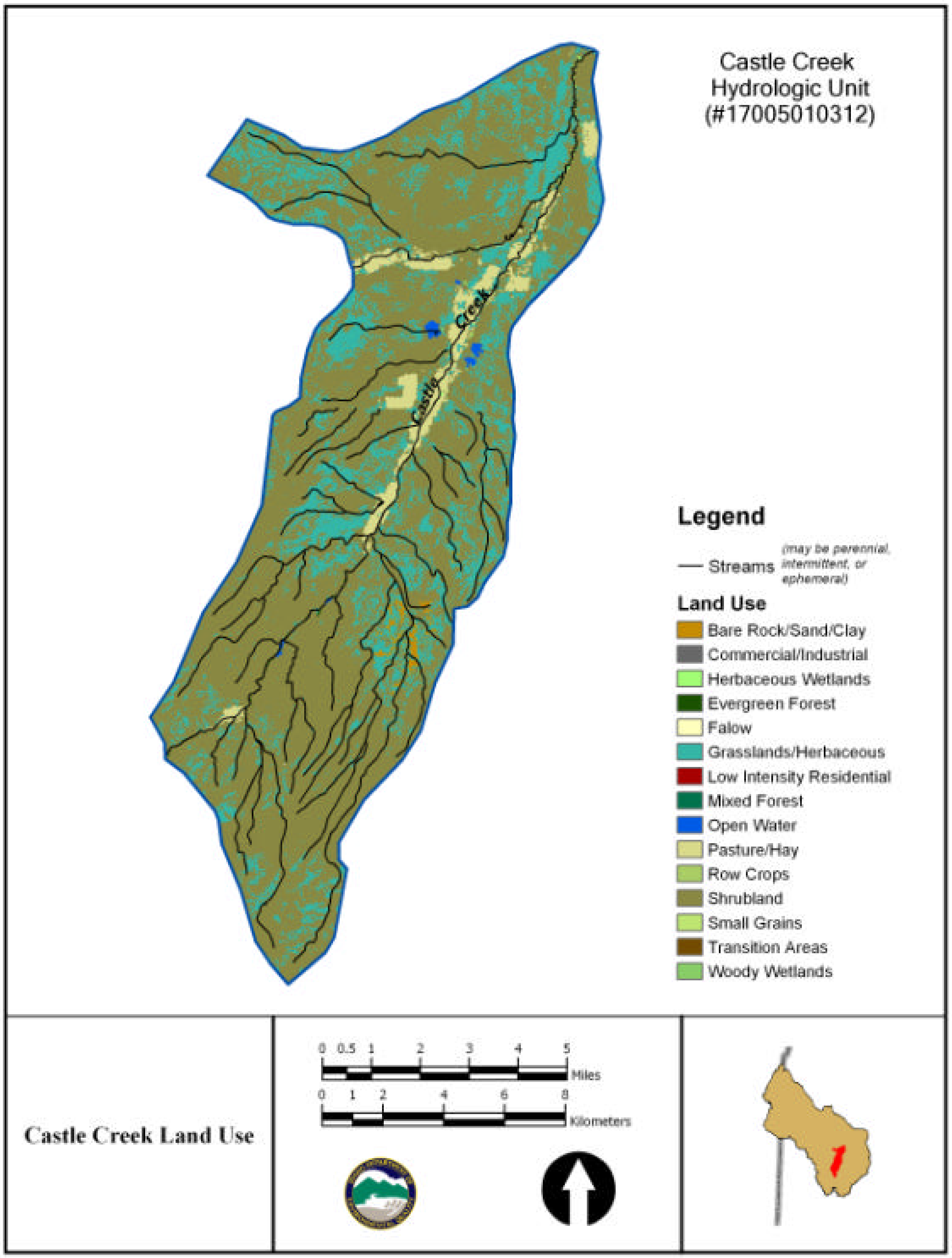

Figure 1.9 Castle Creek Land Use

Jump Creek

Jump Creek is a 25.6-mile long stream that drains a 170 square mile watershed. The elevation change in the watershed is 2,040 feet, with the elevation of the headwaters at 4,240 feet and mouth at 2,200 feet. The headwaters of Jump Creek are located just above the Sands Basin in the Owyhee Mountain Range. After flowing in a northeasterly direction through the Sands Basin, Jump Creek passes through a narrow canyon of sheer rhyolite cliffs. The canyon reaches depths of 600 feet and is often less than a quarter mile across. The rhyolitic tuffs and natural arches that bind Jump Creek as it flows through the canyon are primarily of Miocene volcanic origin. After exiting the canyon, Jump Creek opens up into the low gradient Snake River Plain where it flows in a northerly direction to the Snake River.

The Sands Basin portion of Jump Creek does not have year round flow although perennial pools occur in some years. Flow occurs as a direct result of spring snowmelt or flash flooding from cloudbursts. The flashiness of the stream discourages the growth of a shrub community. Instead, the riparian community consists mostly of tall forbs and mesic site grasses. About 2 miles down the canyon, a series of springs originate along a one-quarter mile stretch of the creek, marking the beginning of the perennial section. Below the springs, the quantity of water gradually increases as the stream mixes with other springs and small intermittent tributaries. Near the end of the canyon the 60-foot Jump Creek Falls occur (Figure 1.10). These falls effectively isolate the upper segment of stream from the lower segment. As the stream enters the Snake River Plain it begins to mix with a series of agricultural drains and small tributaries until it enters the Snake River.

Land Ownership and Land Use

The primary land use within the publicly held portion is rangeland grazing. Within the privately held portion the land uses are primarily agricultural related activities such as rangeland grazing and sprinkler and gravity irrigated cropland. The land uses in the segment being addressed for sediment (although it is not §303(d) listed for sediment) in this TMDL are primarily pasture grazing and irrigated cropland. Figure 1.10 shows the land use patterns within the Jump Creek watershed (DEQ 2002a).

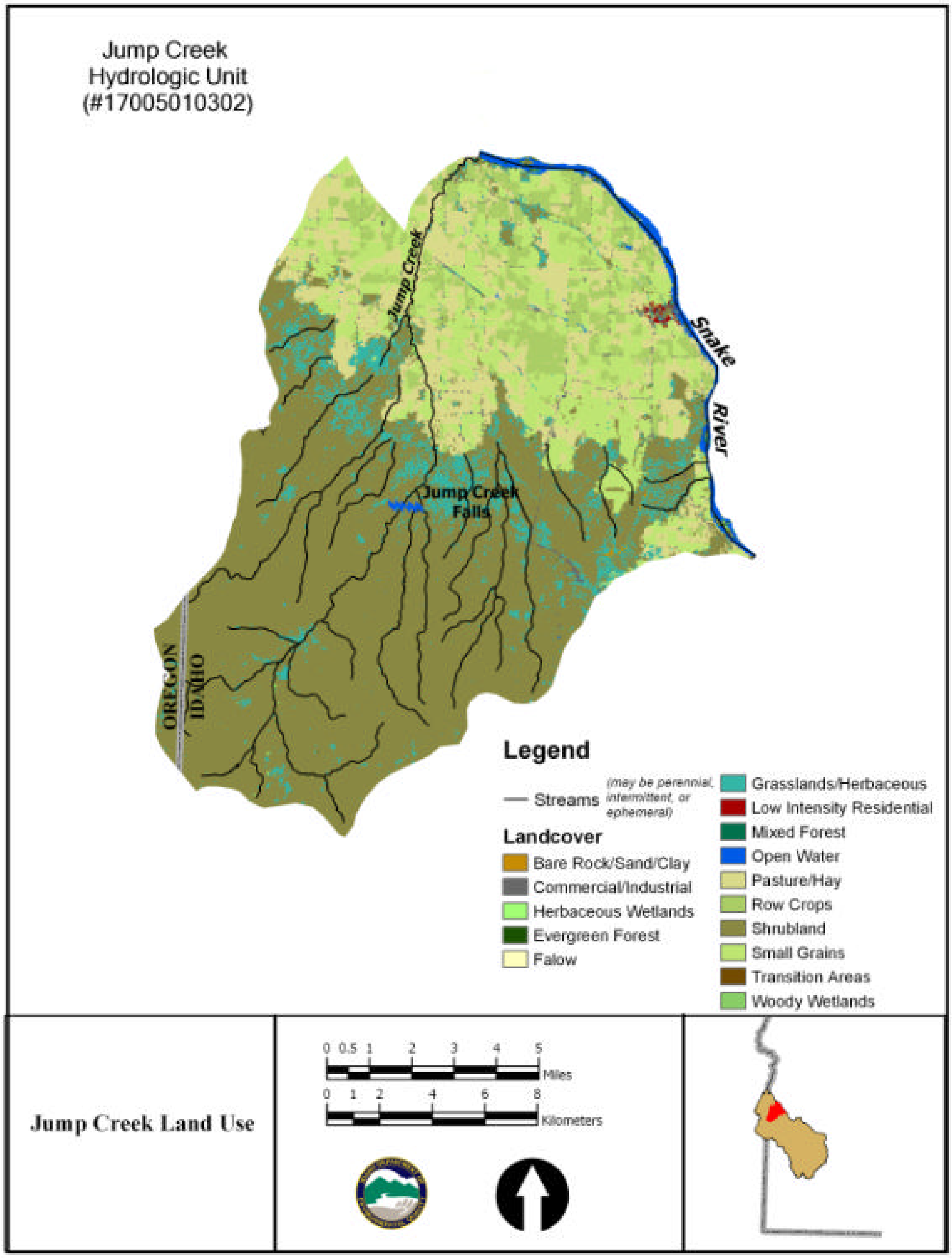

Figure 1.10 Jump Creek Land Use

Reynolds Creek

Reynolds Creek is a 24.5-mile long perennial stream that drains a 138 square mile watershed. The stream originates near Twin Peaks in the Owyhee Mountains and flows in a northerly direction to its confluence with Salmon Creek, where it begins to flow in a northeasterly direction to its confluence with the Snake River. The elevation change in the watershed is 4,520 feet, with the elevations of the headwaters at 6,760 feet and mouth at 2,240 feet. Reynolds Creek flows through four distinct topographic regions where the stream gradient changes distinctly (Figure 1.11 shows the slope of the watershed). From the headwaters to near its confluence with Sheep Creek, the stream flows through steep terrain and is often bounded by canyon walls. From Sheep Creek to near its confluence with Salmon Creek, the stream flows through a high mountain valley. The United States Department of Agriculture (USDA) Reynolds Creek Experimental Station (RCES) and the community of Reynolds are located in this valley. From the Salmon Creek confluence to where it enters the Snake River Plain, steep canyon walls bind the stream. From the canyon mouth to its confluence with the Snake River, the stream flows through a low gradient valley. The last region of the stream is where the §303(d) listed segment is located. Reynolds Creek is §303(d) listed for sediment from the Bernard Ditch to the Snake River. The Bernard Ditch is located approximately 1 stream mile below the mouth of the canyon and originates on private property.

Land Ownership and Land Use

The primary land use within the public land portion of the Reynolds Creek watershed is rangeland grazing, but there is a small amount of forested area near the headwaters. Within the privately held portion the land uses are primarily agricultural related activities such as rangeland grazing and sprinkler and gravity irrigated cropland. Land uses in the §303(d) segment, which is 100% privately held, are primarily pasture grazing and irrigated cropland. Figure 1.12 shows the land use patterns within Reynolds Creek watershed (DEQ 2002a).

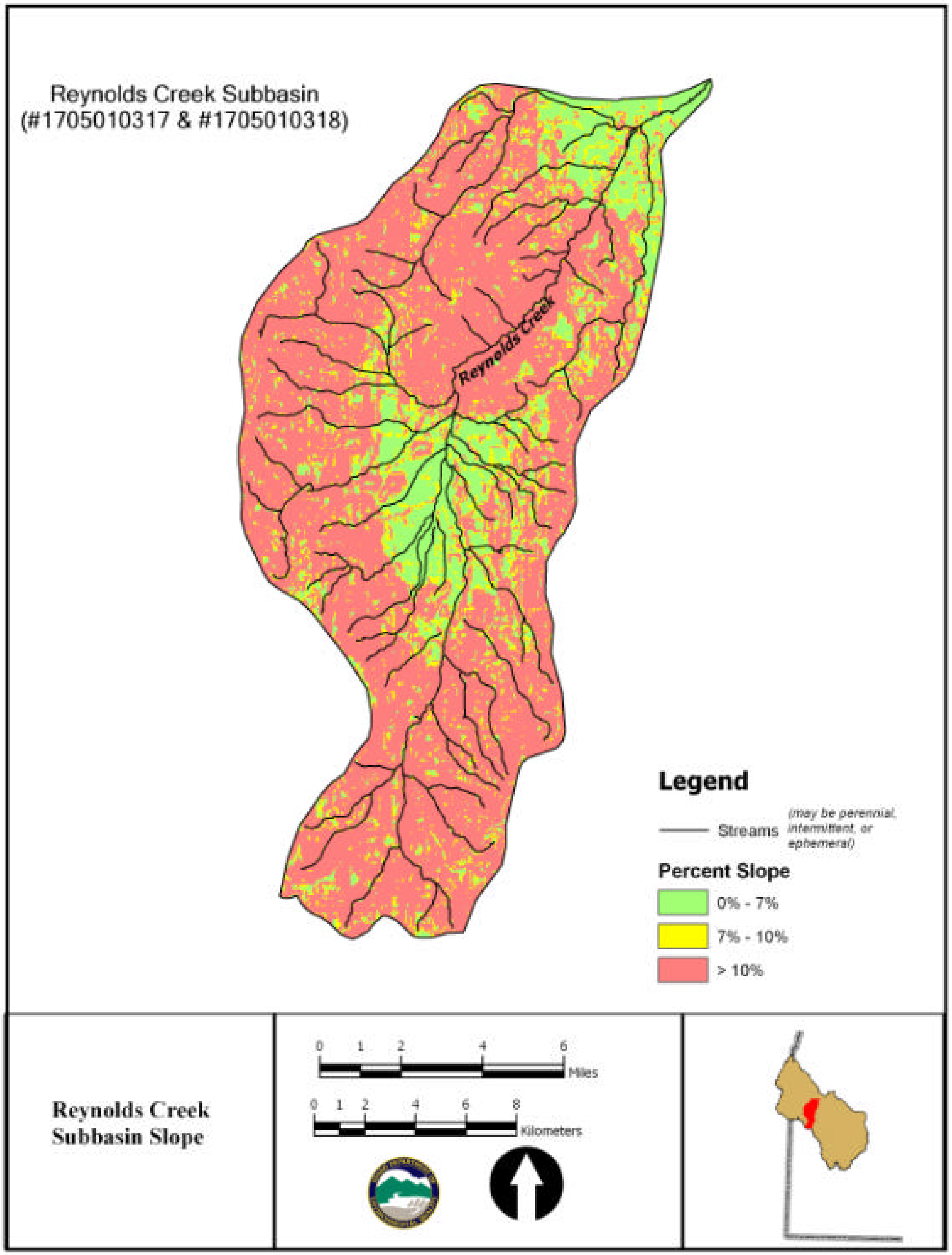

Figure 1.11 Reynolds Creek Subbasin Slope

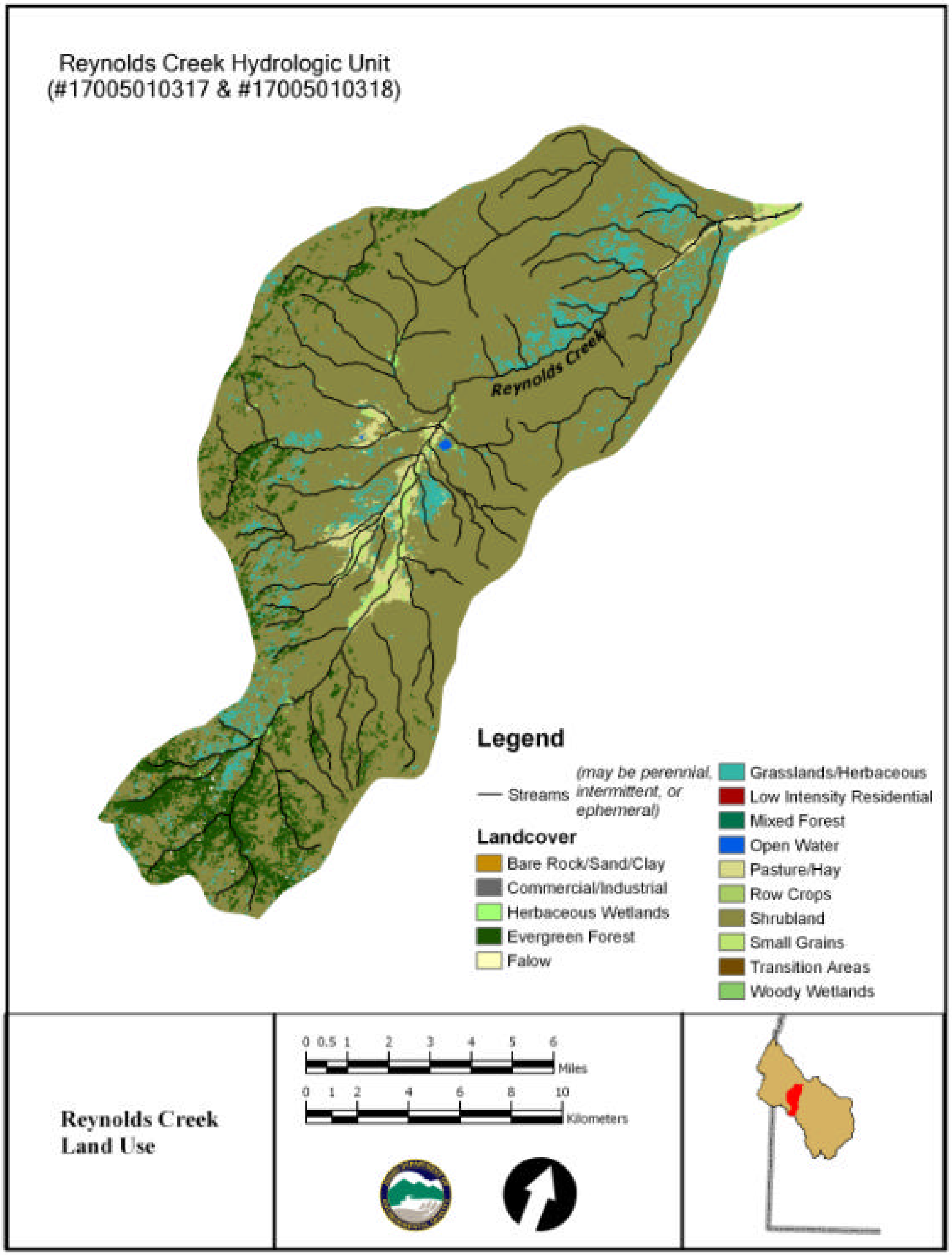

Figure 1.12 Reynolds Creek Land Use

Sinker Creek

As shown in Figure 1.13, Sinker Creek drains approximately 51,671 acres of primarily rangeland. A fourth order, low to moderately sinuous stream, Sinker Creek originates at over 8,000 feet in the Silver City Range of the Owyhee Mountains and flows in a northerly direction into the Snake River at 2,400 feet. Hulet Reservoir is located 12.9 miles upstream from the mouth of Sinker Creek.

Sinker Creek is perennial except in extreme drought years. However, the stream goes dry near the mouth due to flow diversions. Additionally, the nearby Nahas Reservoir is filled with water from Sinker Creek. Sinker Creek cuts through steep V-shaped basalt canyon in places and in others opens up into small low gradient valleys. In the lower sections, the channel is U-shaped.

Land Ownership and Land Use
The primary land use within the publicly held portion is rangeland grazing. Both irrigated agriculture and rangeland grazing occur in the privately owned portion. Figure 1.13 shows land use patterns in the watershed (DEQ 2002a).

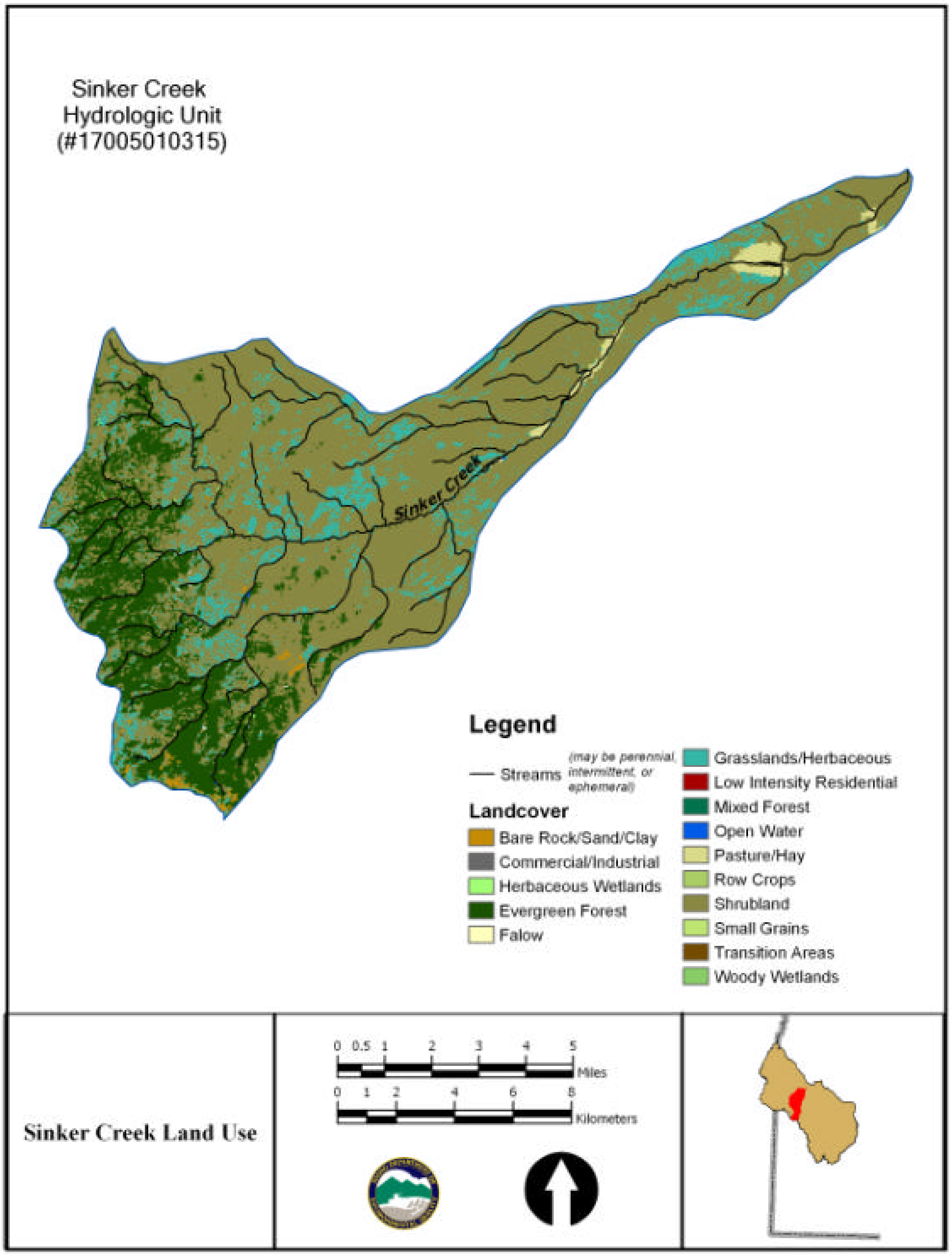

Figure 1.13 Sinker Creek Land Use

Squaw Creek

Squaw Creek drains approximately 83,286 acres of land, flowing mainly in a northeasterly direction. Squaw Creek is characterized by geologic formations of predominantly Miocene age volcanics, and the creek flows through a V-shaped canyon including two constrictions between vertical walls of rhyolite before it exits onto the Snake River Plain. The canyon contains nearly 600 feet of exposed rhyolitic welded tuffs and tuffaceous sediments. The upper watershed consists of steep, sagebrush-grassland slopes and several buttes.

The riparian community, often dense in the canyon sections, is composed of shrubs such as willow, alder, dogwood, chokecherry, currant, and rose.

The section of Squaw Creek exiting the canyon exhibits Rosgen Type B characteristics as it flows through grazing and agricultural land. This section of creek is largely intermittent due to both natural and anthropogenic conditions.

Land Ownership and Use

As shown in Figure 1.14, the upper watershed is primarily rangeland. The Bureau of Land Management (BLM) holds most of the land, although some private land is located in the lower gradient valleys. The lower portion of the watershed is used as rangeland and for irrigated agriculture (DEQ 2002a).

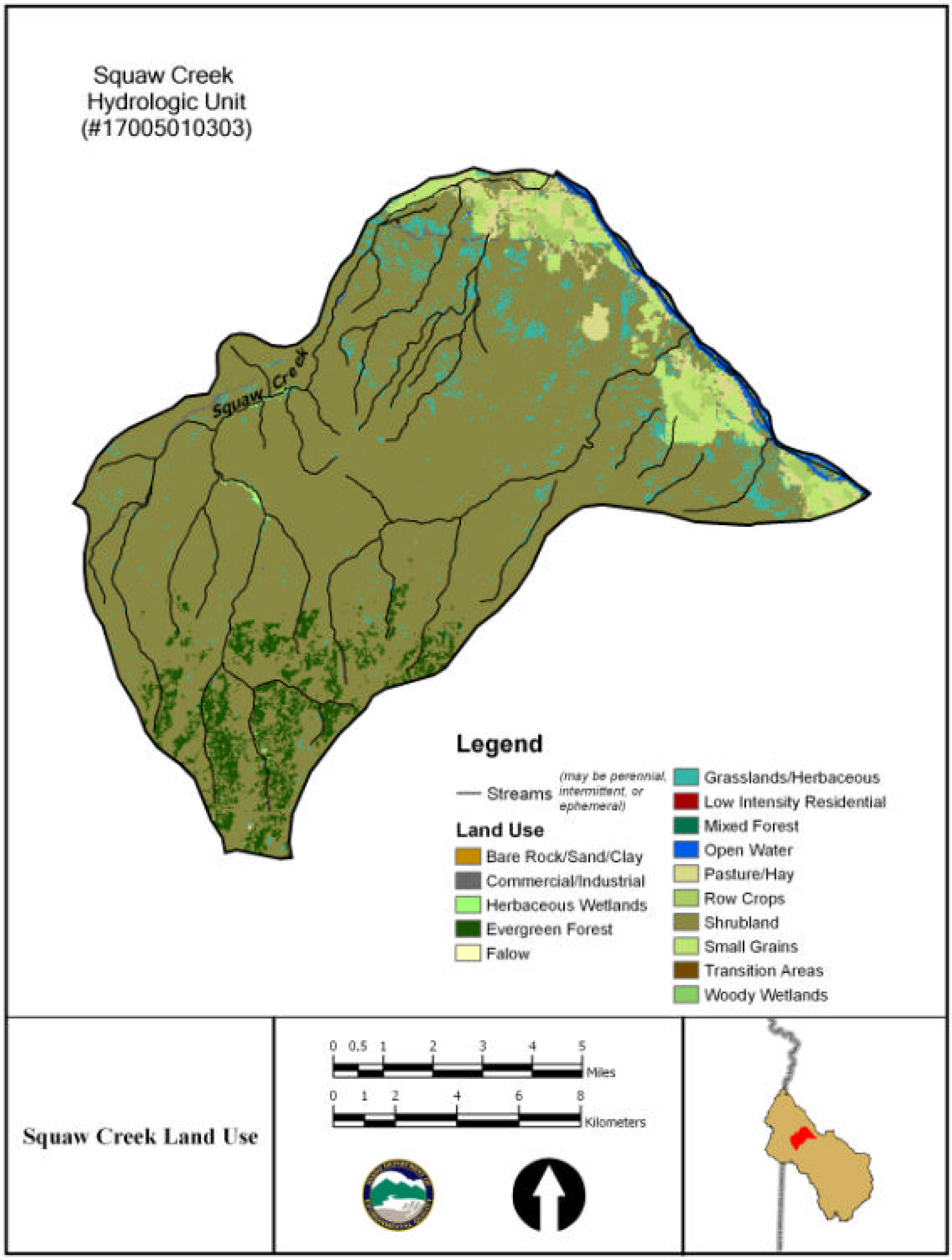

Figure 1.14 Squaw Creek Land Use

Succor Creek

Succor Creek is a 67.3-mile long stream located in the states of Idaho and Oregon. The elevation change in the watershed is 4,400 feet, with the elevation of the headwaters at 6,600 feet and mouth at 2,200 feet. The headwaters of Succor Creek are located approximately 6 miles north of DeLamar, near Johnson Lakes in Owyhee County, Idaho. After flowing in a northeasterly direction to near Rooster Comb Peak, Succor Creek turns to the northwest for approximately 5 miles. The stream then turns to the southwest and enters Succor Creek Reservoir. The reservoir was constructed in 1979 for agricultural storage. After exiting the reservoir, Succor Creek continues to flow in a southwesterly direction for another mile. It then turns to the northwest until it enters Oregon. This entire segment of Succor Creek will be referred to as upper Succor Creek in this subbasin assessment. In Oregon, Succor Creek travels primarily directly north. The stream flows through agricultural land, rangeland and Succor Creek State Park. Succor Creek exits Oregon 5.4 miles above Homedale, Idaho, and travels in a northeasterly direction to its confluence with the Snake River. This segment of Succor Creek (in Idaho) will be referred to as lower Succor Creek in this subbasin assessment. Only the portions of Succor Creek that are in Idaho are addressed in this subbasin assessment.

During most years the entirety of upper Succor Creek is classified as perennial due to the presence of scattered naturally perennial pools that support aquatic life. However, in most years there is no evident flow of water between the pools. Above the reservoir, flow occurs as a direct result of spring snowmelt and the subsequent bank storage. Below the reservoir to the Oregon Line, flow is largely affected by the discharge from Succor Creek Reservoir and the stream rarely is without water. In the lower segment near Homedale (Oregon Line to Snake River), the stream always contains flowing water.

Land Ownership and Land Use

The primary land use within the publicly held portion of the Succor Creek watershed is rangeland grazing, especially in the upper segment. Within the privately held portion the land uses are primarily agricultural related activities such as rangeland grazing and sprinkler and gravity irrigated cropland. Figure 1.15 shows the land use patterns within the Idaho portions of the Succor Creek watershed (DEQ 2002a).

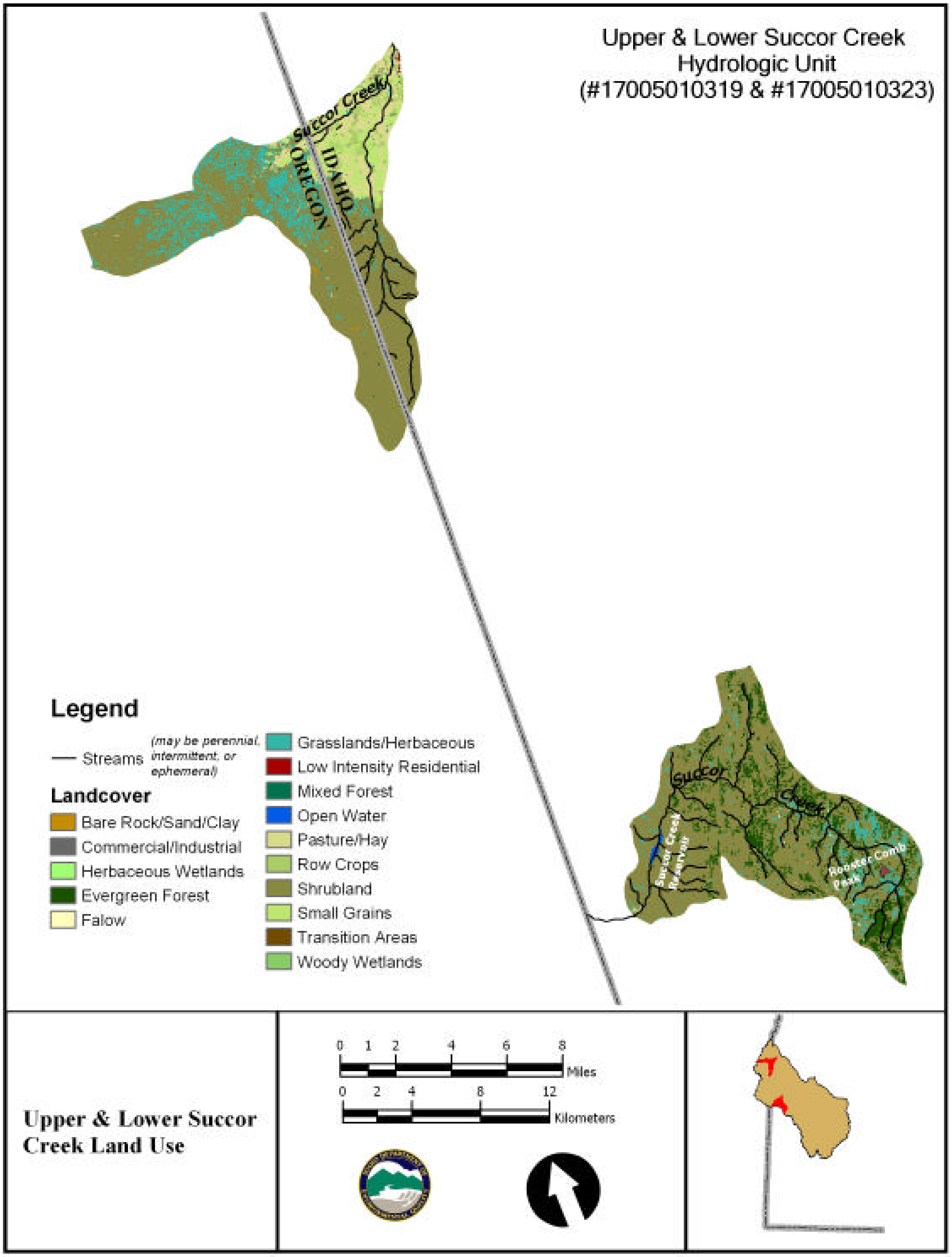

Figure 1.15 Upper and Lower Succor Creek Land Use

1.3 Cultural Characteristics

All watersheds contain aspects that are not directly linked to water quality. These include the history of the area, the past and current economic climate and the distribution of the population within the watershed. This section provides a brief description of these and other aspects of the culture in the Mid Snake River/Succor Creek watershed.

History and Economics

Evidence of human habitation in the Mid Snake River/Succor Creek watershed dates back at least 2,000 years. Remnants of buffalo jumps have been found in the drainage divide between the Mid Snake and Owyhee Rivers (Agenbroad 1976). Hunting and gathering camps have been found along the creeks and river. Petroglyphs can be found throughout the watershed.

The greatest amount of information on Native American settlement in the area is on the Shoshone Tribe. The Shoshone migrated in order to utilize seasonal resources including salmon runs on the Snake River. In the early 1800s the Shoshone started keeping large numbers of horses which they would graze on the bottomlands of the Snake River tributaries (IPC 1998). The Snake River canyon was used as an overwintering location due to abundant fish and game and places to store roots and dried meat. (Murphy 1993). In the fall, Native Americans traveled to the hills and tributary canyons for seed and berry harvesting.

Anglo-European beaver trappers first came to the area in the 1700s but their use of the area was transient and the watershed remained primarily the home of Native Americans. The establishment of the South Alternate Route of the Oregon Trail represented the next significant migration of people, but these were also transient populations. The greatest use of the route occurred in the late 1840s through the 1860s. While the route was shorter than the main trail, the road was harder to travel on and proved to be a more arduous journey (Owyhee County 2002).

In the early 1860s mineral deposits of gold and silver were discovered in the Owyhee Mountains and there was a tremendous migration into the area. At one point, Silver City was the eleventh largest town in Idaho. In general, most of the creeks discussed in this document ever yielded up silver or gold and most mining was in the form of tunneling as opposed to placer mining. Mining continued into the 1900’s and then steadily decreased. In response to gold prices, mines still come back into production. Many miners left the area; others found different forms of livelihood.

Cattle and sheep grazing developed in tandem with the mining industry. By 1869 there were several thousand head of cattle in Owyhee County (IPC 1998). In 1882 the number of cattle in Owyhee County numbered 24,559 and by 1889, the peak in cattle occurred with over 100,000 head in the county (Owyhee County, 1898). Thereafter, as the cattle numbers decreased, the sheep industry showed a corresponding increase (by 1898 there over 150,000 head of sheep in the county). In 1934, when overgrazing greatly threatened Western rangelands, Congress approved the Taylor Grazing Act, which for the first time regulated grazing on the public lands through the use of permits. The Taylor Grazing Act provided a way to regulate the occupancy and use of the public land, preserve the land from destruction or unnecessary injury, and provides for orderly use, improvement, and development.

Grazing has had long-term effects on stream hydrology and vegetation throughout the high desert areas of the intermountain west (Platts 1986, Yensen 1982). The introduction of cattle resulted in a decrease in the native perennial grasses and an increase in soil compaction because of trampling by concentrated numbers of livestock (IPC 1998, Yensen 1982, Rauzi et al. 1966, BLM 1999). The change in plant composition resulted in a change in the frequency of fires in the area. In some areas, the shift from seasonal to season long foraging resulted in fireproofing of the sagebrush steppe vegetation. While in other low elevation areas, the rapid spread of the non-native cheatgrass resulted in a floristic change in understory vegetation, which led to an increase in fire frequency due to the increased flammability of the vegetation. The cheatgrass and other mediterranean annuals outcompeted the native herbaceous vegetation (Burkhardt 1995). Current land management practices seek to address this increased fire frequency.

Irrigated agriculture in the Snake River basin dates back to the 1860s and long-term settlement of the area increased as canals and diversions were completed. These settlement patterns resulted in native vegetation (i.e., sagebrush steppe plants) being cleared for fields. The Guffey Railroad Bridge was completed in 1897, and the last train went across in 1948. In the 1920s, more sheep were shipped out of Murphy than anywhere else in North America. After the Walters Ferry Bridge was built in the late 1920s, connecting Owyhee County to roads to the north, use of the railroad steadily decreased.

Located between Kuna and Murphy, Idaho, at river mile 457.7, Swan Falls Dam was the first dam on the Snake River. It was built in 1901 by the Trade Dollar Mining Company to supply electricity to the Trade Dollar mine and excess power was distributed to the mining town of Silver City as well as other mines. The intent was to put in an electric rail since the steep grade to Silver City was hard on boiler engines, but the railroad was never constructed.

The 1900s generally continued the shift to agriculture and grazing that had started in the late 1800s. Today, the Mid Snake River/Succor Creek watershed is sparsely populated and primarily consists of farming and ranching operations.

Livestock production, dairies, farming, and related agricultural industries are the primary economic activities in the watershed. Crops that are farmed include alfalfa hay, grass hay, sugar beets, potatoes, onions, corn, pasture and mixed grain. Farmers depend upon irrigation to grow their crops (Owyhee County 2002).

Land Ownership, Cultural Features, and Population

Twenty five percent of the land in the Mid Snake River/Succor Creek watershed is privately owned. Seventy percent of the land is federally owned. As shown in Figure 1.16, almost all of the public land is managed by the BLM. A small percentage (5%) is state land. Both

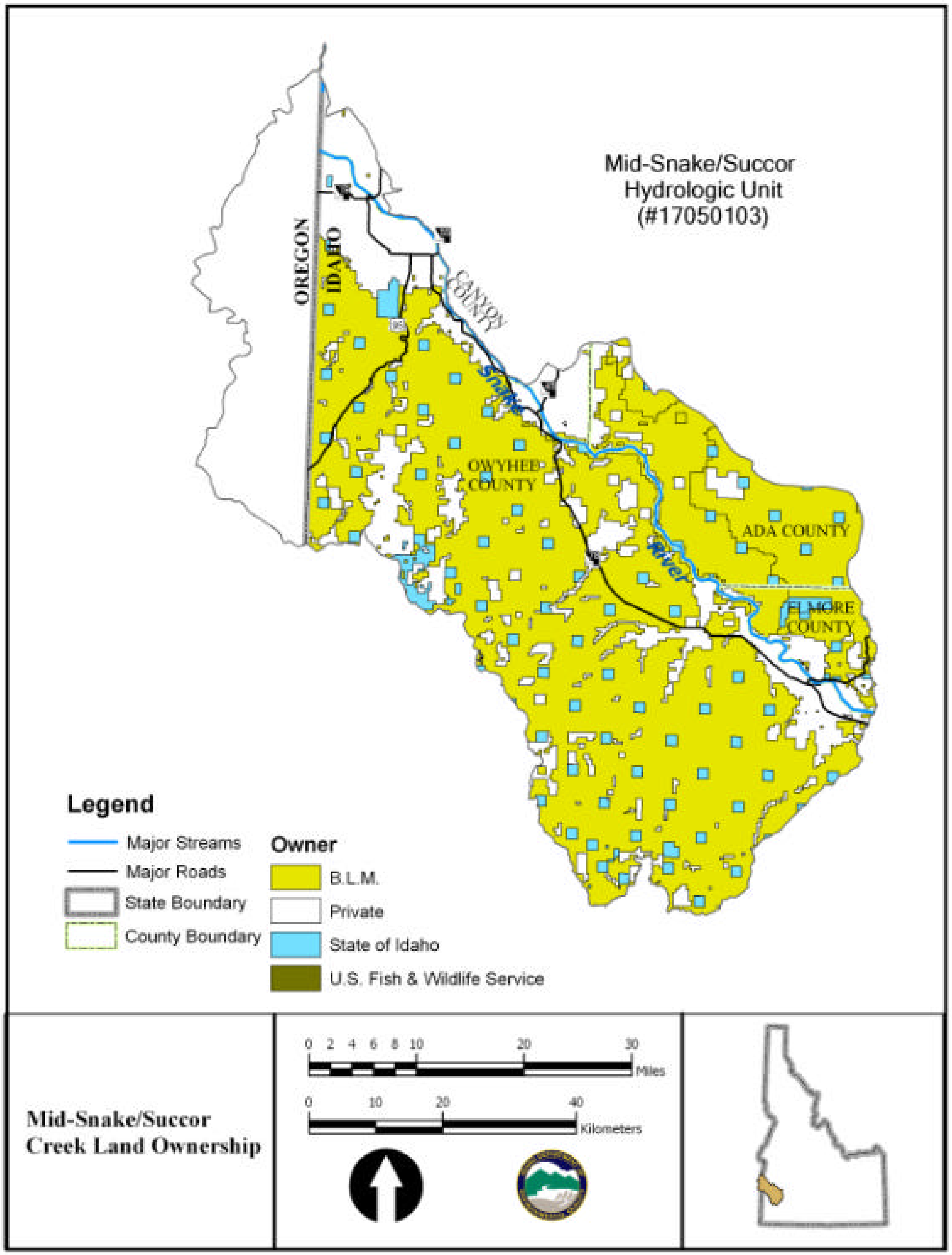

Figure 1.16 Mid Snake Succor Land Ownership

USFWS and the state of Idaho have ownership of the islands in the Snake River below Swan Falls Dam (DEQ 2002a). The sparsely populated Mid Snake River/Succor Creek watershed encompasses parts of Owyhee, Elmore, Ada, and Canyon counties. The agricultural activities in the watershed provide the economic base for the towns and communities in the watershed. Table 3 lists the major towns in the watershed and changes in population over the last 10 years (US Census 2002). While the population has dramatically increased over the past 10 years in some areas, the actual number of people living in the towns in these counties remains small.

Melba and Marsing have to a certain extent become bedroom communities for Nampa, Caldwell, and Boise. Half the population of Melba is estimated to commute to Nampa and Boise for work.

Table 3. Mid Snake River/Succor Creek Watershed Demographics

Town	County	Population (2000)	Population Increase from 1990-2000
Marsing	Owyhee	890	12%
Melba	Canyon	439	74%
Homedale	Owyhee	2528	29%
Grand View	Owyhee	470	42%
Murphy	Owyhee	77	N/A*

Water Resource Activities

Swan Falls Dam, the first dam constructed on the Snake River, is located between Kuna and Murphy, at river mile 457.7. The dam was built in 1901 and Idaho Power Company acquired the dam and power plant in 1916 when the company was formed. The original power plant had 10 generators with a total generating capacity of 10,400 kilowatts. In 1994, new generating units, called “pit turbines,” were installed which increased Swan Fall’s nameplate generating capacity to 25,000 kilowatts.

Two National Pollutant Discharge Elimination System (NPDES) permitted treatment plants exist within the watershed. The wastewater treatment facilities in Marsing and Homedale were first issued NPDES permits in the mid-1980s.

The Owyhee Natural Resources committee formed in 1992 to address a variety of natural resource issues facing watersheds in the Owyhee County area and the effects that management of the state and federal lands located within the county have on the custom, culture and economy of the county. Another group, The Owyhee Initiative, is made up of a diverse membership of ranchers, environmentalists, public officials, and growers who are working towards a management plan for certain federal lands located within Owyhee

County. Water quality issues are pertinent to streams that are on those lands. Local governments with a stake in water quality issues include Ada, Canyon, Owyhee, and Elmore Counties; the municipal governments of Homedale and Marsing; the Ada Soil and Water Conservation District; the Canyon Soil Conservation District; the Owyhee Soil Conservation District; the Bruneau River Soil Conservation District and the Elmore Soil and Water Conservation District.

Finally, the Snake River Basin Adjudication process affects water rights in this area and by association water quantity and quality. The process, which is slated to be done in the basin by 2005, includes the determination both surface and groundwater rights. This determination, done by the Snake River Basin Adjudication court, includes: ownership, source, quantity, priority date, point of diversion or beginning and ending points for instream flows, purpose of use, period of use, place of use, description of reservations, and applicable general provisions.

2. Subbasin Assessment – Water Quality Concerns and Status

2.1 Water Quality Limited Segments Occurring in the Subbasin

Section 303(d) of the CWA states that waters unable to support their designated beneficial uses and do not meet water quality standards must be listed as water quality limited waters. Subsequently, these waters are required to have a TMDL developed to bring them into compliance with water quality standards. Tables 4 and 5 show the pollutant listings and the designated beneficial uses for each §303(d) listed tributary in the basin. Not all of the water bodies will require a TMDL, as will be discussed later. However, a thorough investigation using the available data was performed before this conclusion was made. This investigation, along with a presentation of the evidence of non-compliance with standards for several other tributaries is contained in the following sections for each tributary.

Table 4. §303(d)[1] Listed Segments in the Mid Snake River/Succor Creek Basin.

Water Body	Segment ID and AU	Boundaries	Listing Basis[2]	Pollutants
Snake River	2670 006_07	CJ Strike Res. (below dam) to Castle Creek	305(b)	Sediment
Snake River	2669 006_07	Castle Creek to Swan Falls	305(b)	Sediment
Snake River	2668 006_07, 001_07	Swan Falls to Boise River	305(b)	Bacteria, dissolved oxygen, flow alteration, nutrients, pH, sediment
Birch Creek	2684 021_02, 03, 04	Headwaters to Snake River	305 (b) app. D	Sediment
Brown Creek	2682 019_02, 03, 04	Headwaters to Catherine Creek	BURP 305 (b) app. D	Sediment, temperature
Castle Creek	2680 014_03, 04, 05	T5SR1ES28 to Snake River	305 (b) app. D	Temperature, sediment, flow alteration
Corder Creek	2685 025_02	Headwaters to Snake River	305(b)	Sediment
Cottonwood Creek	None 003_02	Headwaters to Succor Creek	Public Comment DEQ Temp Study	Temperature
Hardtrigger Creek	2675 008_02	Headwaters to Snake River	305(b)	Sediment

Water Body	Segment ID and AU	Boundaries	Listing Basis[2]	Pollutants
Jump Creek	2673 005_02,03	Headwaters to Snake River	SSOC Basin Status Report	Habitat alteration
McBride Creek	2672 004_02,03	Headwaters to Oregon Line	305 (b) app. D	Flow alteration, sediment, temperature
North Fork Castle Creek	2680 014_02a	Headwaters to Castle Creek	Added by EPA	Temperature
Pickett Creek	26810 16_02, 03	T5SR1WS32 to Catherine Creek	305(b)	Sediment
Pickett Creek	6681 016_02	Headwaters to T5SR1WS32	305(b)	Flow alteration, sediment, temperature
Poison Creek[3]	2687 006_02, 03	Headwaters to Shoofly Creek	305(b)	Sediment
Rabbit Creek	2677 026_02	Headwaters to Snake River	Idaho Rivers United (IRU)	Sediment
Reynolds Creek	2676 009_04	Diversion to Snake River	IRU	Sediment
Sinker Creek	2679 006_03	Diamond Creek to Snake River	305(b)	Flow alteration, sediment, temperature
South Fork Castle Creek	2683 014_02	Headwaters to Castle Creek	305 (b) app. D BLM	Bacteria
Squaw Creek	2674 007_02, 03	Headwaters to Snake River	Added by EPA	Temperature
Squaw Creek	2674 007_03	Unnamed tributary 3.9 km upstream of river to Snake River	Public Comment DEQ Temp Study	Sediment, temperature
Succor Creek	2671 002_04	Oregon line to Snake River.	305(b)	Sediment
Succor Creek	6671 002_02, 03	Headwaters to Oregon line	305(b)	Flow alteration, sediment, temperature

[1]Refers to a list created by the State of Idaho in 1998. Monitoring data were used to identify water bodies in Idaho that did not fully support at least one beneficial use. This list is required under section 303subsection "d" of the Clean Water Act.

[2]These are the state, federal or private actions that resulted in the stream being placed on the 303(d) list.

[3]Poison Creek appears on the 303(d) list under HUC 17050103. This is a mistake. The Poison Creek that is in HUC 17050103 is not 303(d) listed. However, Poison Creek is evaluated as part of this subbasin assessment

2.2 Applicable Water Quality Standards

Idaho adopts both narrative and numeric water quality standards to protect public health and welfare, enhance the quality of water, and protect biological integrity. By designating the beneficial use or uses for water bodies, Idaho has created a mechanism for setting criteria necessary to protect those uses and prevent degradation of water quality through anti-degradation provisions. According to IDAPA 58.01.02.050 (02)a "wherever attainable, surface waters of the state shall be protected for beneficial uses which includes all recreational use in and on the water surface and the preservation and propagation of desirable species of aquatic biota." Beneficial use support is determined by DEQ through its water body assessment process. Table 5 contains a listing of the designated beneficial uses for each listed segment. Table 6 is a summary of the water quality standards associated with the beneficial uses. For streams with no designated beneficial uses, cold water aquatic life and recreation are presumed to be uses. The following discussion focuses on beneficial uses and the water quality criteria, both narrative and numeric, that apply to each of the listed water bodies. A more detailed explanation of the numeric water quality targets developed as an interpretation of the narrative standards for nutrients and sediment can be found in the Water Quality Targets section of this TMDL.

Table 5. Mid Snake River/Succor Creek Subbasin Designated Beneficial Uses

Water Body	Designated Uses[1]	1998 §303(d) List[2]
Snake River: CJ Strike Dam to Castle Creek	CW PCR, DWS, SRW[3]	Sediment
Snake River: Castle Creek to Swan Falls Dam	CW, PCR, DWS	Sediment
Snake River: Swan Falls Dam Idaho/Oregon Border	CW, PCR, DWS	Bacteria, dissolved oxygen, flow alteration, nutrients, pH, sediment
Birch Creek	No designated uses	Sediment
Brown Creek	No designated uses	Sediment, temperature
Castle Creek	CW, SS, PCR	Temperature, sediment, flow alteration
Corder Creek	No designated uses	Sediment
Cottonwood Creek	No designated uses	Temperature
Hardtrigger Creek	No designated uses	Sediment
Jump Creek	CW, PCR	Habitat alteration
McBride Creek	No designated uses	Flow alteration, sediment, temperature
North Fork Castle Creek	No designated uses	Temperature
Pickett Creek	No designated uses	Sediment
Pickett Creek	No designated uses	Flow alteration, sediment, temperature
Rabbit Creek	No designated uses	Sediment
Reynolds Creek	CW, SS, PCR	Sediment
Sinker Creek	CW,SS, PCR	Flow alteration, sediment, temperature

Water Body	Designated Uses[1]	1998 §303(d) List[2]
South Fork Castle Creek	No designated uses	Bacteria
Squaw Creek	No designated uses	Sediment, temperature
Succor Creek (lower)	CW, SS, PCR	Sediment
Succor Creek (upper)	CW, SS, PCR	Flow alteration, sediment, temperature

[1]CW – Cold Water, SS – Salmonid Spawning, PCR – Primary Contact Recreation, SCR – Secondary Contact Recreation, AWS – Agricultural Water Supply, DWS – Domestic Water Supply

[2]Refers to a list created by the State of Idaho in 1998. Monitoring data was used to identify water bodies in Idaho that did not fully support at least one beneficial use. This list is required under section 303 subsection "d" of the Clean Water Act.
[3]Special Resource Water. A waters designated as a special resource water meets at least one of the following criteria: 1) outstanding quality for recreation and aquatic life; 2) unique ecological significance; 3) outstanding recreational or aesthetic qualities; 4) protection is paramount to the interest of the people in Idaho; 5) within a wild and scenic river system, state or national park system or wildlife refuge; and 6) intensive protection is necessary to maintain an existing, but jeopardized beneficial use.

Table 6. Water Quality Standards Associated with Beneficial Uses

Pollutant & IDAPA Citation	Beneficial Use(s) to Which Standard Applies	Applicable Water Quality Standard
Temperature (58.01.02.250.02.b)	Cold Water Aquatic Life	No greater than 22 degrees Celsius AND no greater than 19 degrees Celsius maximum daily average
(58.01.02.250.02.e.ii)	Salmonid Spawning	During salmonid spawning periods: no greater than 13 degrees Celsius AND no greater than 9 degrees Celsius maximum daily average
Dissolved Oxygen (58.01.02.250.02.a)	Cold Water Aquatic Life Salmonid Spawning	Greater than 6.0 mg/L except in hypolimnion of stratified lakes and reservoirs
Sediment (58.01.02.200.08)	Cold Water Aquatic Life Salmonid Spawning	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 which impair designated beneficial uses
Turbidity (58.01.02.250.02.d)	Cold Water Aquatic Life	Less than 50 NTU[2] above background for any given sample or less than 25 NTU for more than 10 consecutive days (below any applicable mixing zone set by DEQ)
Bacteria (58.01.02.251.01.b,c)	Contact Recreation	Less than 126 *E. coli* organisms/100 mL as a 30 day geometric mean with a minimum of five samples AND no sample greater than 406 *E. coli* organisms/100 mL

Floating, Suspended, or Submerged Matter (Nuisance Algae) (58.01.02.200.05)	Contact Recreation	Surface waters shall be free from floating, suspended, or submerged matter of any kind in concentration 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
Excess Nutrients (58.01.02.200.06)	Cold Water Aquatic Life Contact Recreation	Surface waters shall be free from excess nutrients that can cause visible slime growths or other nuisance aquatic growths impairing designated beneficial uses
pH (58.01.02.250.01.a)	Cold Water Aquatic Life	Hydrogen ion concentration (pH) values within the range of 6.5 to 9.0

[1]NTU = nephlometric turbidity unit

It is DEQ's position that habitat modification and flow alteration, which may adversely affect beneficial uses, are not pollutants under Section 303(d) of the CWA. Idaho has no water quality standards for habitat or flow, nor are they suitable for estimation of load capacity or load allocations. Because of these practical limitations, TMDLs will not be developed to address habitat modification or flow alteration.

Additionally, the CWA states that "TMDLs are required to be established for water bodies impaired by a pollutant, but not by pollution." EPA goes on to say that "EPA does not believe that flow, or lack of flow, is a pollutant as defined by CWA Section 502(6)."

Beneficial Uses

Surface water beneficial use classifications are intended to protect the various uses of the state's surface waters. Idaho water bodies that have designated beneficial uses are listed in the *Idaho Water Quality Standards and Wastewater Treatment Requirements* (IDAPA 58.01.02). They are comprised of five categories: aquatic life, recreation, water supply, wildlife habitat, and aesthetics.

Aquatic life classifications are for water bodies that are suitable or intended to be made suitable for protection and maintenance of viable communities of aquatic organisms. Aquatic life beneficial uses include cold water, warm water, seasonal cold water, modified, and salmonid spawning.

Recreation classifications are for water bodies that are suitable or intended to be made suitable for primary and secondary contact recreation. Primary contact recreation is 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.

Water supply classifications are for water bodies that are suitable or intended to be made suitable for agriculture, domestic, and industrial uses. Industrial water supply applies to all waters of the state. Wildlife habitat waters are those that are suitable or intended to be made suitable for wildlife habitat. Aesthetics is a use that applies to all waters of the state.

IDAPA 58.01.02.140 designates beneficial uses for selected water bodies in the Southwest Idaho Basin. Undesignated water bodies are presumed to support cold water biota and primary or secondary contact recreation unless DEQ determines that other uses are appropriate. This is typically done by preparing a detailed evaluation of the attainability of uses in the stream.

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

Existing Uses

Existing uses under the CWA are "those uses actually attained in the water body on or after November 28, 1975, whether or not they are included in the water quality standards." The existing in-stream water uses and the level of water quality necessary to protect the uses shall be maintained and protected (IDAPA 58.01.02.003.35, .050.02, and 051.01 and .053). Existing uses include uses actually occurring, whether or not the level of quality to fully support the uses exists. Practical application of this concept would be when a water could support salmonid spawning, but salmonid spawning is not yet occurring.

Designated Uses

Designated uses under the CWA are "those uses specified in water quality standards for each water body or segment, whether or not they are being attained." Designated uses are simply uses officially recognized by the state. In Idaho these include things like aquatic life support, recreation in and on the water, domestic water supply, and agricultural use. Water quality must be sufficiently maintained to meet the most sensitive use. Designated uses may be added or removed using specific procedures provided for in state law, but the effect must not be to preclude protection of an existing higher quality use such as cold water aquatic life or salmonid spawning. Designated uses are specifically listed for water bodies in Idaho in tables in the Idaho water quality standards (see IDAPA 58.01.02.003.22 and .100, and IDAPA 58.01.02.109-160 in addition to citations for existing uses).

Presumed Uses

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

Pollutant Relationships to Beneficial Uses Support Status

This section describes the relationship between the pollutant(s) of concern and the aquatic life or contact recreational beneficial use support status.

Temperature

Temperature is a component of water quality integral to the life cycle of fish and other aquatic species. Different temperature regimes result in varying aquatic community compositions. Water temperature dictates whether a warm, cool, or coldwater aquatic community is present. Many factors, natural and anthropogenic, affect stream temperatures. Natural factors include but are not limited to altitude, aspect, climate, weather, geothermal sources, riparian vegetation (shade), and channel morphology (width and depth). Anthropogenic factors include heated discharges (such as those from point sources), riparian alteration, channel alteration, and flow alteration.

Elevated stream temperatures can be harmful to fish at all life stages, especially if they occur in combination with other habitat limitations such as low dissolved oxygen or poor food supply. Temperature as a chronic stressor to adult fish can result in reduced body weight, reduced oxygen exchange, increased susceptibility to disease, and reduced reproductive capacity. Acutely high temperatures can result in death if they persist for an extended length of time. If stream temperatures become too hot, fish die almost instantaneously due to denaturing of critical enzymes in their bodies (Hogan 1970). The ultimate instantaneous lethal limit occurs in high temperature ranges (> 90 °F). Juvenile fish are even more sensitive to temperature variations than adult fish, and can experience negative impacts at a lower threshold value than the adults, manifesting in retarded growth rates. High temperatures also affect embryonic development of fish before they even emerge from the substrate.

Table 7 shows the different modes of thermally induced mortality on coldwater fish. This data is based on a laboratory study that involved uniform heating of water. Streams, naturally, have varying temperatures and refugia available for fish. Thus, while a stream may have elevated temperatures, these temperatures are not necessarily representative of the entire stream. The redband trout in the Mid Snake River/Succor Creek watershed may be physiologically adapted to higher temperatures and thus, able to withstand higher temperature ranges.

Table 7. Modes of thermally induced coldwater fish mortality (Oregon DEQ 2002).

Modes of Thermally Induced Fish Mortality	Temperature Range
Instantaneous Lethal Limit – Denaturing of bodily enzyme systems	>90° F >32° C
Incipient Lethal Limit – Breakdown of physiological regulation of vital processes, namely respiration and circulation	70° - 77° F 21° - 25° C
Sub-Lethal Limit – Conditions that cause decreased or lack of metabolic energy for feeding, growth, or reproductive behavior; encourage increased exposure to pathogens, decreased food supply, and increased competition from warm water tolerant species	64° - 74° F 17.8° – 23° C

Acceptable temperature ranges vary for different species of fish, with warm water species being the most tolerant of high water temperatures. The salmonid species most commonly found in the Mid Snake River/Succor Creek basin are redband trout in the streams and whitefish in the river. The populations in the streams are generally resident fish and thus, the temperature criteria will be applied on a stream-by-stream basis in order to protect the coldwater aquatic life uses that are present.

The Mid Snake River/Succor Creek watershed has always been typified by high summer air temperatures, high solar radiation, and low stream flows. Heat generally enters the stream through solar radiation, although agricultural return water and artesian wells can also contribute heat to certain streams. Elevated temperatures are exacerbated by human-caused diminished riparian areas and certain management practices, such as flow diversion, but water temperatures may never have been cold during the hottest periods of the year. Native fish have either physiologically adapted to the high temperatures or have been able to find colder water refuge in deep pools and by springs during periods of overall high stream temperatures.

Dissolved Oxygen

Oxygen is necessary for the survival of most aquatic organisms and essential to stream purification. Dissolved oxygen is the concentration of free (not chemically combined) molecular oxygen (a gas) dissolved in water, usually expressed in milligrams per liter (mg/L), parts per million, or percent of saturation. While air contains approximately 20.9 percent oxygen gas by volume, the proportion of DO in air dissolved in water is about 35%, because nitrogen (the remainder) is less soluble in water. Oxygen is considered to be moderately soluble in water. A complex set of physical conditions that include atmospheric and hydrostatic pressure, turbulence, temperature, and salinity affect the solubility.

Dissolved oxygen levels of 6 mg/L and above are considered optimal for aquatic life. When DO levels fall below 6 mg/L, organisms are stressed, and if levels fall below 3 mg/L for a prolonged period, these organisms may die. Dissolved oxygen levels below 1 mg/L are often referred to as hypoxic; oxygen levels that remain below 1-2 mg/L for a few hours can result in large fish kills. Anoxic conditions refer to those situations where there is no measurable DO. Juvenile aquatic organisms are particularly susceptible to the effects of low DO due to their high metabolism and low mobility (they are less able to seek more oxygenated water).

Oxygen is produced during photosynthesis and consumed during plant and animal respiration and decomposition. Oxygen enters water from photosynthesis and from the atmosphere. Where water is more turbulent (i.e., riffles, cascades), the oxygen exchange is greater due to the greater surface area of water coming into contact with the oxygen. The process of oxygen entering the water is called reaeration.

Water bodies with significant aquatic plant communities can have significant DO fluctuations throughout the day. An oxygen sag will typically occur once photosynthesis stops at night and respiration/decomposition processes deplete DO concentrations in the water. Oxygen will start to increase again as photosynthesis resumes with the advent of daylight.

Temperature, flow, nutrient loading, and channel alteration all impact the amount of DO in the water. Colder waters hold more DO than warmer waters. As flows decrease, the amount of reaeration typically decreases and the instream temperature increases, resulting in decreased DO. Channels that have been altered to increase the effectiveness of conveying water often have less riffle or reaeration. Thus, these systems may show depressed levels of DO in comparison to levels before the alteration. Nutrient enriched waters can have a higher biochemical oxygen demand due to the amount of oxygen required for organic matter decomposition and other chemical reactions. This oxygen demand results in lower instream DO levels.

Sediment

Both suspended and bedload sediment (sediment particles too large or heavy to be suspended, but still transported by flowing water) can have negative effects on aquatic life communities. Many fish species can tolerate elevated suspended sediment levels for short periods of time, such as during natural spring runoff, but longer durations of exposure are detrimental. Elevated suspended sediment levels can interfere with feeding behavior (difficulty finding food due to visual impairment), damage gills, 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 especially sensitive to suspended sediment.

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, physiological stress, which includes reduced feeding rate, is evident at concentrations of 50 to 100 mg/L when those concentrations are maintained for 14 to 60 days. Similar effects are observed for other species, although the data set is less reliable. Adverse effects on habitat, especially spawning and rearing habitat, were noted at similar concentrations.

Bedload sediment also adversely affects aquatic species. As sand and silt wash downstream, they can cover spawning gravels, increasing embeddedness in the streambed. If this occurs during incubation periods or while small fry are using the spawning gravels to develop, it may eliminate those areas and result in death. Bedload can also reduce intergravel DO levels by decreasing the critical re-oxygenating flow through the intergravel matrix. Organic suspended sediments can also settle to the bottom and, due to their high carbon content, lead to low intergravel DO.

In addition to these direct effects on the habitat and spawning success of fish, detrimental food source changes may also occur. Aquatic insects, which serve as a primary food source for fish, are affected by excess sedimentation. Increased sedimentation leads to a macroinvertebrate community that is prone to burrowing, thereby making the macroinvertebrates less available to fish. Community structure, specifically diversity, of the aquatic macroinvertebrate community also diminishes due to the reduction of coarse substrate habitat.

Water column sediment levels in the Snake River, Reynolds Creek, Jump Creek, Succor Creek, and Birch Creek have been measured through the collection of total suspended solids (TSS) and/or suspended sediment concentration (SSC) samples. Suspended sediment concentration is determined by measuring the dry weight of all the sediment from a known volume of a water-sediment mixture. The terms SSC and TSS are often confused in the literature and are frequently used interchangeably. However, the results may be considerably different if a substantial amount of sand-sized material comprises the sample. Mid Snake River monitoring data collected in 2002 show a close correlation between TSS and SSC data (r^2=.94, N=32) both year round and during the irrigation season, meaning that the samples are not dominated by sand-sized particles.

Settleable solids are defined as the volume (milliliters [mL]) or weight (mg) of material that settles out of a liter of water in one hour (Standard Methods 1985). In the Snake River, settleable solids consist primarily of large silt, sand, and organic matter. Total suspended solids are defined as the material collected by filtration through a 0.45 µm (micrometer) filter (Standard Methods 1985). The primary forms of TSS in the Snake River are silt, clay, and phytoplankton. Settleable solids and TSS both contain nutrients that are essential for aquatic plant growth. Settleable solids are not as nutrient rich as the smaller TSS, but they do affect river depth and substrate nutrient availability for macrophytes. In low flow situations, settleable solids accumulate on the Snake River bottom, thus decreasing water depth. This increases the area of substrate that is exposed to light, facilitating additional macrophyte growth.

Sediments originating from the drainage basin are primarily inorganic, have a low carbon content, have high densities, and often increase in the water column during runoff events. Sediments originating instream (from primary production) are organic with a higher carbon content and lower density and often increase in association with algal blooms. The concentration of organic sediments can be underestimated because of their lower density.

Total suspended solids not only result in excess nutrients in the water column through nutrient spiraling, but also directly affect the turbidity of water. The potential to increase primary production as well as the direct effect on reducing cold water aquatic life habitat are the major concerns with sediment in aquatic systems in the Mid Snake River/Succor Creek watershed.

Bacteria
Coliform bacteria are unicellular organisms found in feces of warm-blooded animals such as humans, domestic pets, livestock, and wildlife. Coliform bacteria are commonly monitored as part of point source discharge permits (National Pollution Discharge Elimination System [NPDES] permits), but may also be monitored in nonpoint source arenas. The human health effects from pathogenic coliform bacteria range from nausea, vomiting, diarrhea, acute respiratory illness, meningitis, ulceration of the intestines, and even death. Coliform bacteria do not have a known effect on aquatic life.

Coliform bacteria from both point and nonpoint sources impact water bodies, although point sources are typically permitted and offer some level of bacteria-reducing treatment prior to discharge. Nonpoint sources of bacteria are diffuse and difficult to characterize. Unfortunately, nonpoint sources often have the greatest impact on bacteria concentrations in water bodies. This is particularly the case in urban stormwater, agricultural areas and where wildlife is abundant. Wildlife may account for a significant percentage of the bacteria in some water bodies, although the exact percentage is difficult to determine.

Floating, Suspended, or Submerged Matter (Nuisance Algae)
Algae are an important part of the aquatic food chain. However, when elevated levels of algae impact beneficial uses, those levels are considered nuisance aquatic growth. The excess growth of phytoplankton, periphyton, and/or macrophytes can adversely affect both aquatic life and recreational water uses. Algal blooms occur where adequate nutrients (nitrogen and/or phosphorus) are available to support growth. In addition to nutrient availability, flow-rates, velocities, water temperatures, and penetration of sunlight in the water column all affect algae (and macrophyte) growth. Low velocity conditions allow algal concentrations to increase because physical removal by scouring and abrasion does not readily occur. Increases in temperature and sunlight penetration also result in increased algal growth. When the aforementioned conditions are appropriate and nutrient concentrations exceed the quantities needed to support algal growth, excessive blooms may develop.

Algae blooms commonly appear as extensive layers or algal mats on the surface of the water. When present at excessive concentrations in the water column, blue-green algae often produce toxins that can result in skin irritation to swimmers, and illness or even death in organisms ingesting the water. The toxic effect of blue-green algae is worse when an abundance of organisms die and accumulate in a central area. Two canine deaths due to ingestion of blue-green algal toxins were confirmed in November 2000 and several others suspected in fall of 1999 below the Minidoka Dam along the Snake River between Rupert and Burley (Eyre 2001).

Algal blooms also often create objectionable odors and coloration in water used for domestic drinking water, and can produce intense coloration of both the water and shorelines as cells accumulate along the banks. In extreme cases, algal blooms can also result in impairment of agricultural water supplies due to toxicity. Water bodies with high nutrient concentrations that could potentially lead to a high level of algal growth are said to be eutrophic. The extent of the effect is dependent on both the type(s) of algae present and the size, extent, and timing of the bloom.

When algae die in low flow velocity areas, 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. Because most of the decomposition occurs within the lower levels of the water column, a large algal bloom can substantially deplete DO concentrations near the bottom. Low DO in these areas can lead to decreased fish habitat as fish will not frequent areas with low DO. Both living and dead (decomposing) algae can also affect the pH of the water due to the release of various acid and base compounds during respiration and photosynthesis. Additionally, low DO 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.

Excess nutrient loading can be a water quality problem due to the direct relationship of high total phosphorus (TP) concentrations on excess algal growth within the water column, combined with the direct effect of the algal life cycle on DO and pH within aquatic systems. Therefore, the reduction of TP inputs to the system can act as a mechanism for water quality improvements, particularly in surface-water systems dominated by blue-green algae, which can acquire nitrogen directly from the atmosphere and the water column. Phosphorus management within these systems can potentially result in improvement in the following water quality parameters: nutrients (phosphorus), nuisance algae, DO, and pH.

Excess Nutrients

This discussion on nutrients focuses on the dynamics of nutrients in the Snake River because it is the only water body listed for nutrients in the watershed. However, practically speaking, the discussion would also be applicable to nutrient-enriched tributaries.

The principle nutrients limiting aquatic plant growth in the Snake River are nitrogen and total phosphorus. While nutrients are a natural component of the aquatic ecosystem, natural cycles can be disrupted by increased nutrient inputs from anthropogenic activities. The excess nutrients result in accelerated plant growth and can result in a eutrophic or enriched system. The nuisance aquatic growth caused by this enrichment is discussed in the following section.

The first step in identifying a water body's response to nutrient flux is to define which of the critical nutrients is limiting. A limiting nutrient is one that normally is in short supply relative to biological needs. The relative quantity affects the rate of production of aquatic biomass. Either nutrient (phosphorus or nitrogen) may be the limiting factor for algal growth, although phosphorous is most commonly the limiting nutrient in Idaho waters.

Ecologically speaking, a resource is considered limiting if the addition of that resource increases growth (DEQ 1999).

The *Upper Snake Rock Subbasin Assessment and TMDL* (DEQ 2000) and the *Snake River-Hells Canyon TMDL* (DEQ 2001) determined that TP is the primary limiting nutrient in the free flowing areas of the Snake River. Total phosphorus is the measurement of all forms of phosphorus in a water sample, including all inorganic and organic particulate and soluble forms. In freshwater systems, typically greater than 90% of the TP present occurs in organic forms as cellular constituents in the biota or adsorbed to particulate materials (Wetzel 1983). The remainder of phosphorus is mainly soluble orthophosphate, a more biologically available form of phosphorus that consequently leads to a more rapid growth of algae than TP. Chapter 5 discusses the selection of TP as a water quality target over orthophosphate. In impaired systems, a larger percentage of the TP fraction is comprised of orthophosphate. The relative amount of each form measured can provide information on the potential for algal growth within the system.

Nitrogen may be a limiting factor at certain times if there is substantial depletion of nitrogen in sediments due to uptake by rooted macrophyte beds. In systems dominated by blue-green algae, nitrogen is not a limiting nutrient due to the algal ability to fix nitrogen at the water/air interface.

Total nitrogen to TP ratios (N:P) in the Mid Snake River/Succor Creek reach of the Snake River showed that phosphorus was the limiting nutrient the majority of the time (DEQ 1993, 2002). Nutrient data from the riverine sections of the Snake River Hells Canyon and the Mid Snake/Rock Creek watershed also show similar findings (DEQ 2001, 2000). Total nitrogen to TP ratios greater than seven are indicative of a phosphorus-limited system while those ratios less than seven are indicative of a nitrogen-limited system. Only biologically available forms of the nutrients are used in the ratios because these are the forms that are used by the immediate aquatic community.

Nutrients primarily cycle between the water column and sediment through nutrient spiraling. Aquatic plants rapidly assimilate dissolved nutrients, particularly orthophosphate. If sufficient nutrients are available in either the sediments or the water column, aquatic plants will store an abundance of such nutrients in excess of the plants' actual need, a chemical phenomenon known as luxury consumption. When a plant dies, the tissue decays in the water column and the nutrients stored within the plant biomass are either restored to the water column or the detritus becomes incorporated into the river sediment. As a result of this process, nutrients (including orthophosphate) that are initially released into the water column in a dissolved form will eventually become incorporated into the river bottom sediment. Once these nutrients are incorporated into the river sediment, they are available once again for uptake by yet another life cycle of rooted aquatic macrophytes and other aquatic plants. This cycle is known as nutrient spiraling.

Nutrient spiraling results in the availability of nutrients for later plant growth in higher concentrations downstream. Nutrient concentrations in the Snake River have caused nuisance aquatic growths impairing designated or protected beneficial uses. As a result, nutrient concentrations in the Snake River exceed the present assimilative capacity.

Sediment – Nutrient Relationship
The linkage between sediment and sediment-bound nutrients is important when dealing with nutrient enrichment problems in aquatic systems. Phosphorus is typically bound to particulate matter in aquatic systems and, thus, sediment can be a major source of phosphorus to rooted macrophytes and the water column. While most aquatic plants are able to absorb nutrients over the entire plant surface due to a thin cuticle (Denny 1980), bottom sediments serve as the primary nutrient source for most sub-stratum attached macrophytes. The USDA (1999) determined that other than harvesting and chemical treatment, the best and most efficient method of controlling growth is by reducing surface erosion and sedimentation.

Sediment acts as a nutrient sink under aerobic conditions. However, when conditions become anoxic, sediments can release phosphorous into the water column. Nitrogen can also be released, but the mechanism by which this happens is different. The exchange of nitrogen between sediment and the water column is for the most part a microbial process controlled by the amount of oxygen in the sediment. When conditions become anaerobic, the oxygenation of ammonia (nitrification) ceases and an abundance of ammonia is produced. This results in a reduction of nitrogen oxides (NO_x) being lost to the atmosphere.

Sediments can play an integral role in reducing the frequency and duration of phytoplankton blooms in standing waters and large rivers (Robertson 1999). In many cases there is an immediate response in phytoplankton biomass when external sources are reduced. In other cases, the response time is slower, often taking years. Nonetheless, the relationship is important and must be addressed in waters where phytoplankton is in excess.

2.3 Summary and Analysis of Existing Water Quality Data

The amount of available data varied substantially between subwatersheds. Types of available data also ranged widely, but typically represent biological, chemical, and physical parameters. Data pertinent to the water quality issues being addressed are presented for each listed stream in this section.

Data Assessment Methods

Several primary methods were used to evaluate the data for this subbasin assessment. A detailed description of the primary methods is located in Appendix G. A brief description of each method is located below.

DEQ-Water Body Assessment Guidance – Second Edition (Grafe et al. 2002)
The Water Body Assessment Guidance (WBAG) describes DEQ's methods used to consistently evaluate data and determine the beneficial use support status of Idaho water bodies. The WBAG is not used to determine pollutant-specific impairment. Rather, it utilizes a multi-index approach to determine overall stream support status. The methodology addresses many reporting requirements of state and federal rules, regulations, and policies.

For the most part, DEQ Beneficial Use Reconnaissance Program (BURP) data is used in the assessment. However, where available, other data is integrated into the assessment process.

An assessment entails analyzing and integrating multiple types of water body data such as biological, physical/chemical, and landscape data to address multiple objectives. The objectives are:

1. Determine beneficial use support status of the water body (i.e., fully supporting versus not fully supporting).
2. Determine biological integrity using biological information or other measures.
3. Compile descriptive information about the water body and data used in the assessment.

The multi-metric index approach measures biological, physiochemical, and physical habitat conditions within a stream. The indexes include several characteristics to gauge overall stream health. Three primary indexes are used, which include the Stream Macroinvertebrate Index (SMI), the Stream Fish Index (SFI) and the Stream Habitat Index (SHI). The SMI is a direct measure of cold water aquatic life health. The SFI is also a direct measure of cold water aquatic life health, but is specific to fish populations. The SHI is used to measure instream habitat suitability, although some of the measurements used to generate the SHI are linked to the riparian area.

Stream Segment Temperature Model (SSTEMP)
Changes in stream temperature as a result of riparian shading and channel shape are being assessed using SSTEMP (Bartholow 1999). These changes in stream temperature are linked to restoring cold water aquatic life beneficial uses, including salmonid spawning, which in many cases is impaired due to elevated stream temperatures.

The SSTEMP model is a one-dimensional steady-state stream temperature model that can be used to evaluate the effects of riparian shade, channel width, and stream flow on stream temperature in individual stream segments. The model calculates the heat gained or lost in a water body as it passes through a defined stream segment. The model is capable of predicting the decrease in instream temperature as a result of a specified increase in stream shade. The program predicts the minimum, mean, and maximum daily water temperatures at a specified distance downstream.

For streams listed for temperature, the pollutant is heat. The primary source of heat is solar radiation reaching the stream surface, although other sources (such as geothermal wells) are certainly considered. Streams that have increased width/depth ratios and decreased riparian shading are more susceptible to elevated stream temperatures.

To address the loading portion of the TMDL, heat (joules/m^2) is used to calculate loading capacities. Riparian shade, and to a lesser degree width/depth, are used as surrogates for excess solar radiation (heat). Thus, loading reductions are expressed in terms of heat, increased shading, and, to a lesser degree, decreased width/depth.

Stream Bank Erosion Inventory

The stream bank inventory was used to estimate background and existing stream bank and channel erosion. The inventory follows methods outlined in the proceedings from the National Resource Conservation Service (NRCS) Channel Evaluation Workshop (1983). The NRCS stream bank erosion inventory is a field-based method that measures bank and channel characteristics such as stability, length of eroding banks, and depth of eroding banks to calculate a long-term lateral recession rate. The recession rate is expressed in terms of the feet of stream bank lost due to erosion per year (ft/year). The lateral recession rate can then be combined with the volumetric mass of the bank material and the length of the segment to determine the sediment load from the stream banks.

The stream bank erosion inventories are linked to bank stability, which is used as a surrogate for instream channel particle size distributions. Previous TMDLs (DEQ 2001a, 2001b) have established a linkage between 80% streambank stability and less than 28% fine substrate material in riffles. This linkage allows for the restoration of beneficial uses to be assessed based on bank stability (i.e. streams with >80% bank stability will likely support cold water aquatic life beneficial uses). Of course, this linkage is based on sediment related use impairment only. If factors other than excess sediment are impairing uses, this method will not detect them and they must be addressed elsewhere.

For the Mid Snake River/Succor Creek TMDL, DEQ staff measured the stream bank erosion rates of areas where banks are greater than 80% stable. These areas are used as reference reaches for similar morphological channel types on the same stream where banks are eroding. The lateral recession rate from the reference reach becomes the benchmark for the remainder of the listed reach and thus, is the basis of load reductions.

Evaluations of Intermittence for Selected Streams

The state of Idaho defines an intermittent stream as one that has a period of zero flow for at least one week during most years or has a 7Q2 (a measure of the annual minimum 7-day mean stream flow, based on either a 2 year low) hydrologically based flow of less than 0.10 cfs (IDAPA 58.01.02.003.51). If a stream contains naturally perennial pools with significant aquatic life, it is not considered intermittent. Using this definition as guidance, DEQ identified eight §303(d) listed intermittent streams, as shown in Table 8. Appendix E provides a detailed analysis showing why each stream was determined to be intermittent. The implication of this determination is that a TMDL will not be performed for these streams because water is not present during the critical loading period (typically the irrigation season) or when aquatic life beneficial uses are absolutely expected to be fully supported (middle to late summer months). IDAPA 58.01.02.070.07 states that water quality standards shall only apply to intermittent waters during optimum flow periods sufficient enough to support the beneficial uses for which the water body has been designated. The optimum flow for contact recreation is equal to or greater than 5.0 cfs. The optimum flow for aquatic life is equal to or greater than 1.0 cfs.

Table 8. §303(d) listed intermittent streams in the Mid Snake River/Succor Creek Subbasin.

Water Body	§303(d) Listed Boundaries
McBride Creek	Headwaters to Oregon Line
Corder Creek	Headwaters to Snake River
Rabbit Creek	Headwaters to Snake River
Brown Creek	Headwaters to Catherine Creek
Hardtrigger Creek	Headwaters to Snake River
Birch Creek	Headwaters to Snake River
Pickett Creek	Headwaters to Catherine Creek
Poison Creek	Headwaters to Shoofly Creek

Evaluations of Spawning Conditions for Selected Streams

In comparing the §303(d) list for the Mid Snake River/Succor Creek watershed with the designated beneficial uses for each stream, DEQ has identified four stream segments that contain misleading salmonid spawning beneficial use designations. The stream segments are on the lower ends of Castle, Sinker, Reynolds, and Succor Creeks (but do not include the entire stream). The hydrologic regime, temperature regime, and gradient of each of these lower segments is such that they are most likely migration corridors for spawning activity that occurs further up in the stream.

While there is certainly a water quality component that must be addressed if necessary, the use of a stream by fish for spawning is also a local habitat issue. Fish rarely spawn throughout an entire stream. Rather, they choose locations that have ample spawning gravels, suitable water temperatures, and good habitat/cover for juvenile rearing. State-specific water quality criteria or targets for salmonid spawning will apply to those areas of the tributaries designated for salmonid spawning **and** where spawning actually occurs or could occur under restored conditions. Therefore, while it is critical to protect spawning habitat in the tributaries, and the designation will remain, it is not assumed to occur in the entire designated reach. Idaho Department of Fish and Game, in conjunction with DEQ, has closely examined the four stream segments listed above and has determined that while they are designated for spawning, in all likelihood it does not occur in those areas and should not be considered an achievable use in this assessment. Appendix F summarizes the position of DEQ and IDFG.

Snake River

This section describes the physical, chemical and biological data for the listed segments of the Snake River.

Hydrology
As illustrated in Figures 2.0-2.2, the Snake River is a large volume river (USGS 2002). Regulated by dams and irrigation withdrawals, the Snake River flows peak in late spring and then drop substantially in late June (Figure 2.1). In addition to receiving water from tributaries within the watershed, the Snake River also receives irrigation return water from the Owyhee Reservoir and the Boise Project. An important consideration in reviewing the water budget is that water in the drains is often partially derived from Snake River water that had been previously pumped out of the river. However, the tributaries and other agricultural related inputs represent only a small percentage of the river flow. In 1985 minimum flow requirements were implemented at Swan Falls Dam. The minimum flow requirement from April 1-October 31 is 3,900 cfs while from November 1- March 31, the minimum flow requirement is 5,600 cfs (Figure 2.2).

The greatest contribution of flow to this reach comes from the upstream stretch of the Snake River above CJ Strike Dam. Tributary and drain flow contributions vary from year to year but are generally 10% or less of the total measured volume. However, in terms of pollutant loading, the tributaries and drains can be significant sources of TP. The TP concentrations in the tributaries and drains are typically five to six times greater than the instream target of 0.07 mg/L. Ground water inflows appear to contribute an insignificant amount to instream volume (Idaho Power 1998, DEQ 1978).

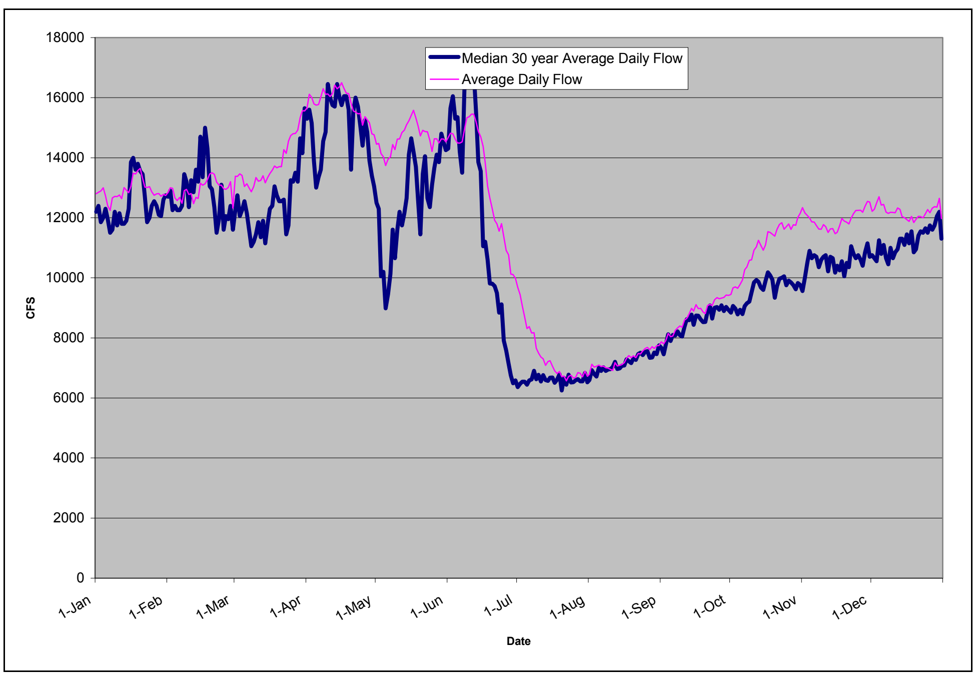

Figure 2.0 Snake River at Murphy 30 Year Average Flows

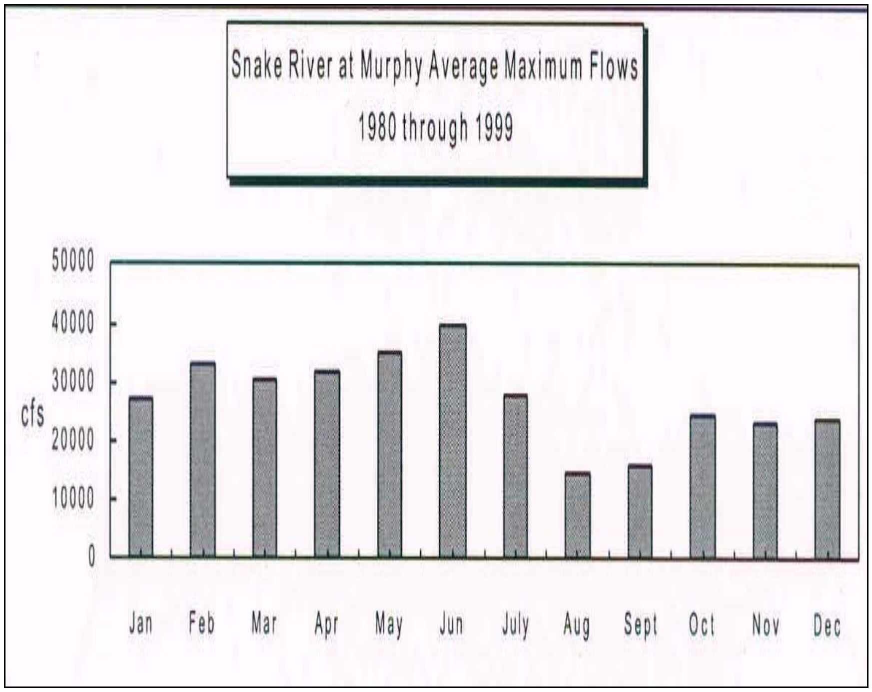

Figure 2.1 Snake River at Murphy Average Maximum Flows, 1980-1999

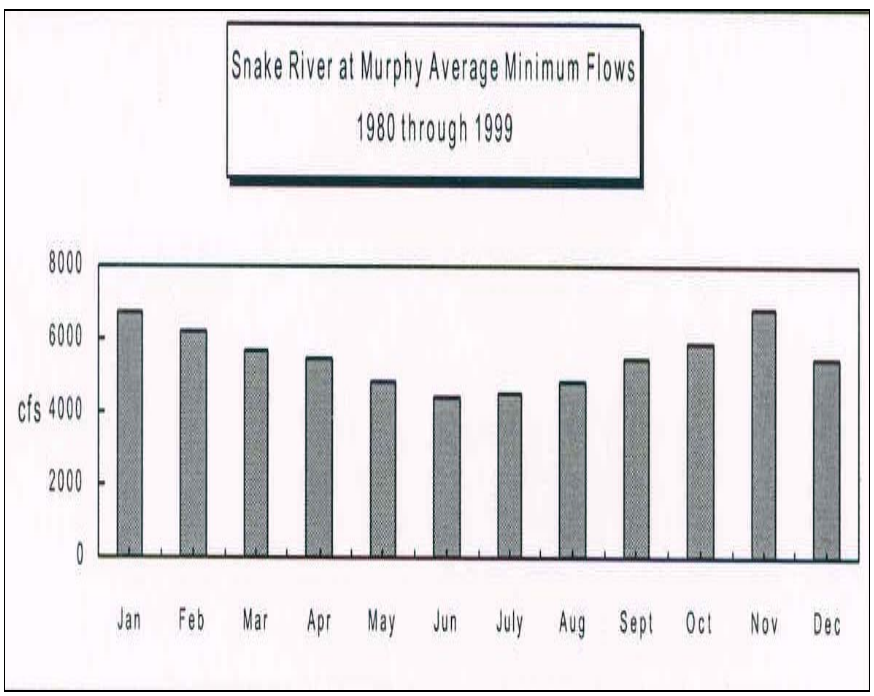

Figure 2.2 Snake River at Murphy Average Minimum Flows, 1980-1999

Bacteria

DEQ monitored *E. Coli* bacteria weekly in July and August 2002 in order to calculate a monthly geometric mean. Five samples were collected at least three days apart in a 30-day period and the geometric mean was then calculated. Samples were taken at the following locations: SR001, SR002, SR at Walters Ferry, SR004, and SR005, as shown in Figure 2.3. Samples were taken at recreational access points (i.e., boat ramps, docks) wherever possible. At SR002, samples were taken from a bridge. As shown in Table 9, none of the monitoring sites exceeded the geometric mean standard of 126 organisms/100mL for either primary or secondary contact recreation. Hence, the Snake River will be proposed for de-listing of bacteria.

Table 9. Geometric Mean of *E. coli* (counts/100 mL), summer 2002.

SR001[1]	SR002	SR at Walters Ferry	SR004	SR005
9.9	6.46	3.52	7.2	35.21

[1]See Figure 2.3 for the specific location of each monitoring location.

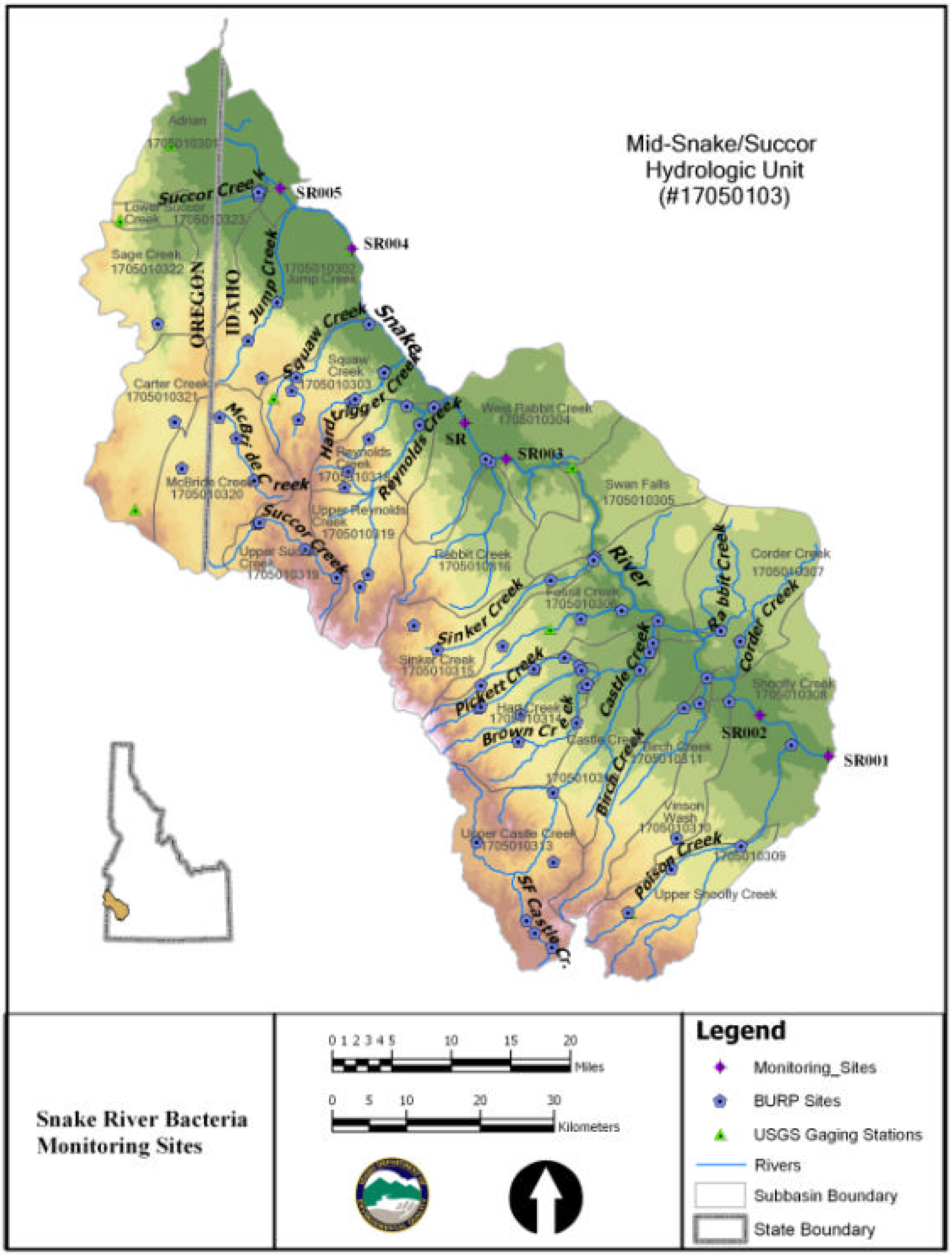

Figure 2.3 Snake River Bacteria Monitoring Sites

Temperature

The Snake River is designated for cold water aquatic life, but supports a primarily warm and cool water fishery. Elevated temperatures above the cold water aquatic life temperature standard are typically observed in July and August. The maximum weekly average temperature during the first week of August 1997 was 23 °C.

Figure 2.4 July 14, 2002: Fish kill on the Snake River at Walters Ferry

In 1992, a drought year, an instantaneous maximum of 29 °C was reached downstream of Swan Falls Dam. In early July 2002, following several days of extremely hot weather, instantaneous temperatures exceeded 26 °C below Swan Falls Dam. These temperatures resulted in a large fish kill of mountain whitefish (Figure 2.4). This event occurred after several days of extremely hot weather and water temperatures >26 degrees Celsius. This picture is not meant to imply that these fish kills occur on an annual basis, nor is it necessarily representative of conditions in the tributaries to the Snake River. Whitefish are subject to lethal effects at temperatures above 26 °C. An Idaho Power study on the habitat of the Snake River Plain states that whitefish kills are common in the Swan Falls area in the summer and are primarily due to elevated temperatures. (IPC 2002)

As shown in Figure 2.5, the Snake River exceeds the cold water maximum daily average temperature of 19 °C (USGS 2000). The Snake River is proposed for temperature listing on the §303(d) list. A TMDL is not being written at this time in order to allow time to adequately assess the thermal site potential of the river.

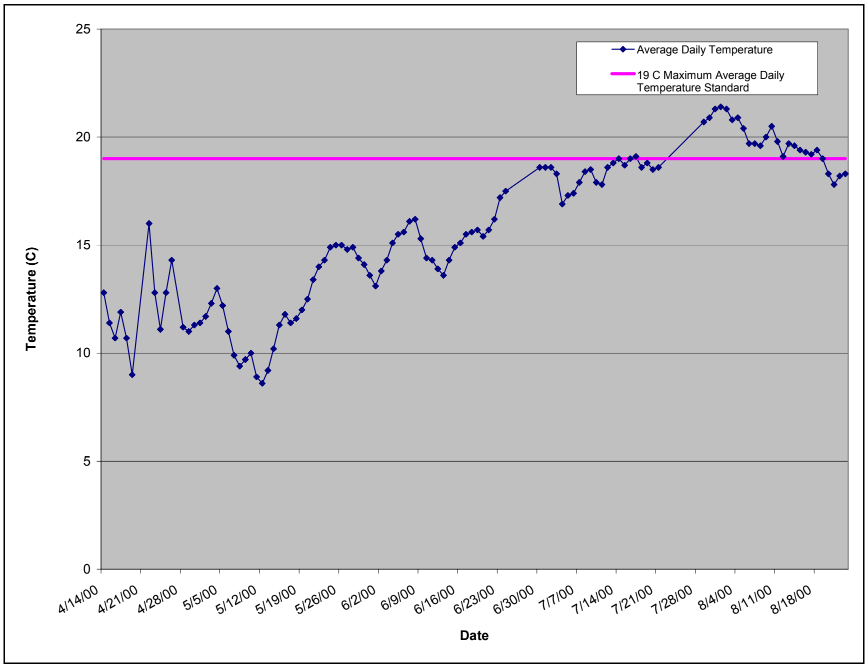

Figure 2.5 Snake River near Murphy Average Daily Temperature in 2000

pH

pH data collected from 1968 to 1974 showed pH levels between 7.7 and 8.5 slightly upstream from river mile 409 (near Marsing). These data were collected over a variety of seasons, but do not represent continuous monitoring (USEPA 1974,1975). Data collected from 1975 to 1991 show pH values from 7.5 to 8.9. Again, these data were collected over a variety of seasons, but do not represent continuous monitoring.

As shown in Figure 2.6, 1995 data from Idaho Power show pH values from 7.7 to 8.77. These values are similar to the data collected previously. These data are from sampling locations at Celebration Park, Marsing, and Homedale. Data collected from the CJ Strike Tailrace from 1993 to 1995 showed pH values ranging from 7.7 to 8.9 (IPC 1998).

The available data show that pH values remain within the standard range of 6.5 – 9. Thus, DEQ recommends that the mainstem Snake River from Swan Falls to the Idaho/Oregon border be delisted for pH. However, because pH values are often high in the summertime, corresponding to periods with algal blooms, further monitoring of pH should continue to be an integral part of the water quality monitoring regime. Decreases in nutrient loads should result in decreases in pH.

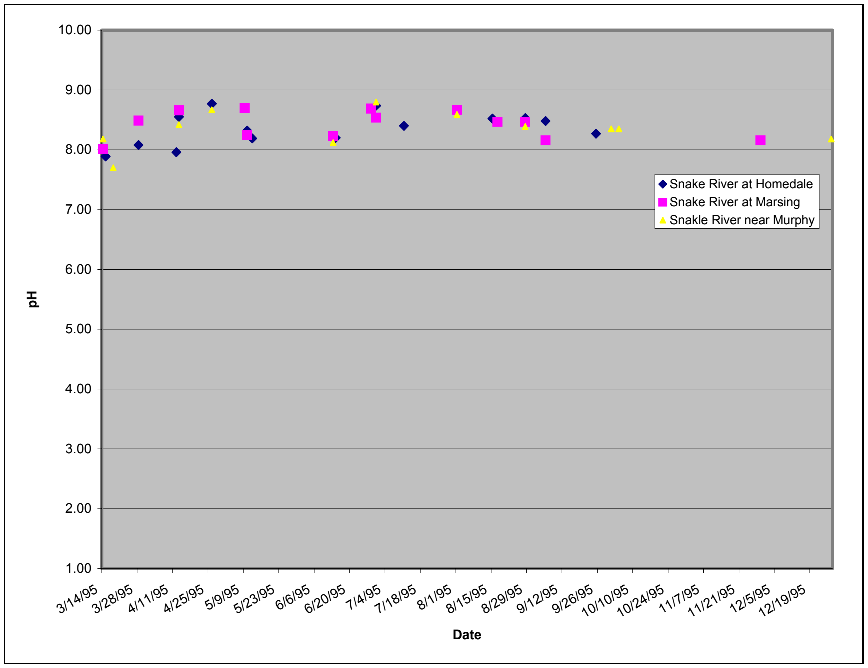

Figure 2.6. Mid Snake River pH Results

Sediment
Both TSS and SSC have been monitored in the Snake River. As shown in Figures 2.7 through 2.10 and Table 10, except during spring runoff, instream concentrations are generally below the 50 mg/L target set in the SR-HC TMDL.

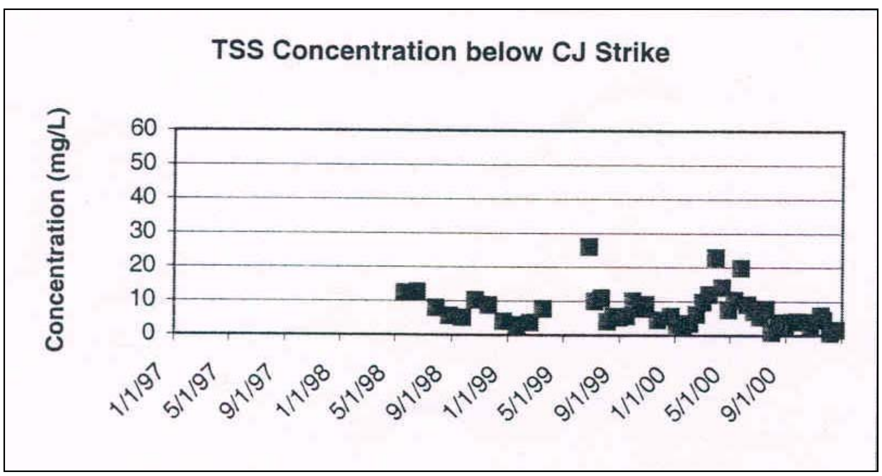

Figure 2.7 Total Suspended Solids Concentrations, Snake River below CJ Strike Dam (IPC 2002)

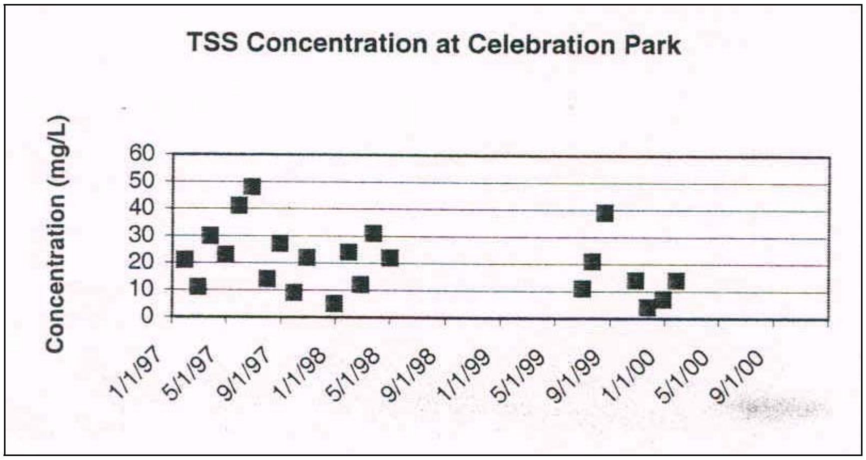

Figure 2.8 Total Suspended Solids Concentrations, Snake River at Celebration Park (IPC 2002)

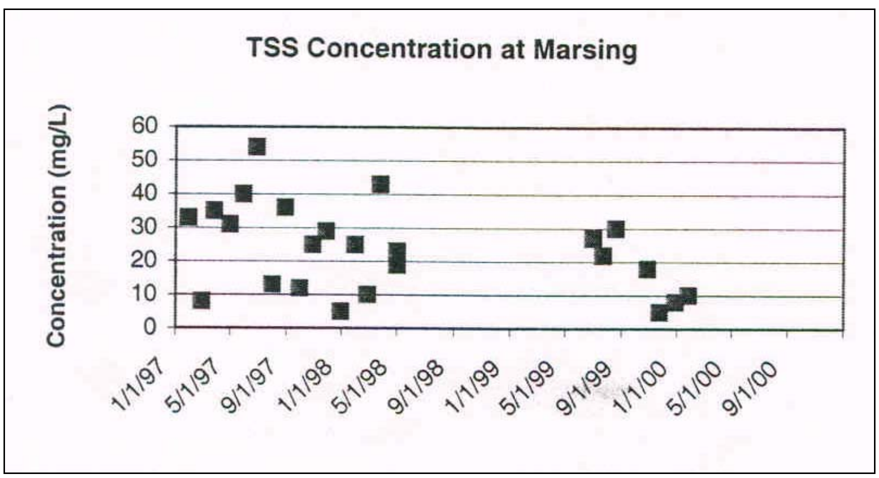

Figure 2.9 Total Suspended Solids Concentrations, Snake River at Marsing (IPC 2002)

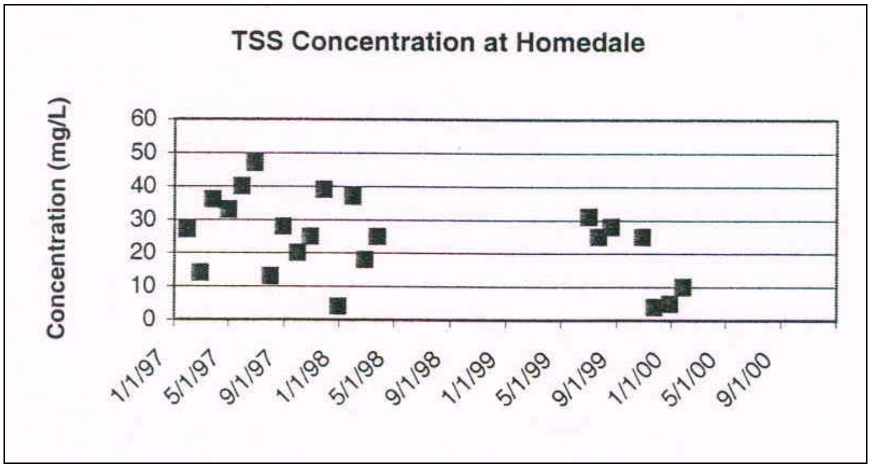

Figure 2.10 Total Suspended Solids Concentrations, Snake River at Homedale (IPC 2002)

Table 10. Snake River total suspended solids (TSS) sample average.

Sample Site	Number of Samples	Average TSS Concentration (mg/L)
Snake River at Marsing	88	21

DEQ monitored both SSC and TSS and found a .94 coefficient or determination (R^2) both annually and during the irrigation season. This finding suggests that the suspended sediment samples are made primarily of silt material and not dominated by sand-sized or larger particles. Thus, the 50 mg/L target for SSC can be applied to TSS data.

The sediment data outlined above indicate that water column sediment is not impairing beneficial uses. Thus, DEQ recommends that the mainstem Snake River from CJ Strike to the Idaho/Oregon border be delisted for sediment.

Total Dissolved Gas (TDG)
Elevated TDG levels above 110% saturation are known to have a detrimental effect on aquatic life. High concentrations of gas in the water can result in gas bubble trauma. This condition occurs when air bubbles form in the circulatory systems of fish. The mechanism for formation is when the dissolved gas pressure exceeds the compensating pressures of blood, tissue, water surface, and hydrostatic head tension.

Idaho has numeric water quality standards for TDG. The concentration of TDG relative to atmospheric pressure at the point of sample collection shall not exceed 110% saturation except when stream flow exceeds the ten-year, seven-day average flood. The target concentration for this TMDL is 110% saturation or less.

As shown in Figure 2.11, when water is spilling at a rate greater than 600 cfs at CJ Strike Dam, total dissolved gas (TDG) levels exceed 110% saturation (IPC 2002). Total dissolved gases at Swan Falls Dam also exceed the standard when water is spilled over the spillway, as shown in Figure 2.12.

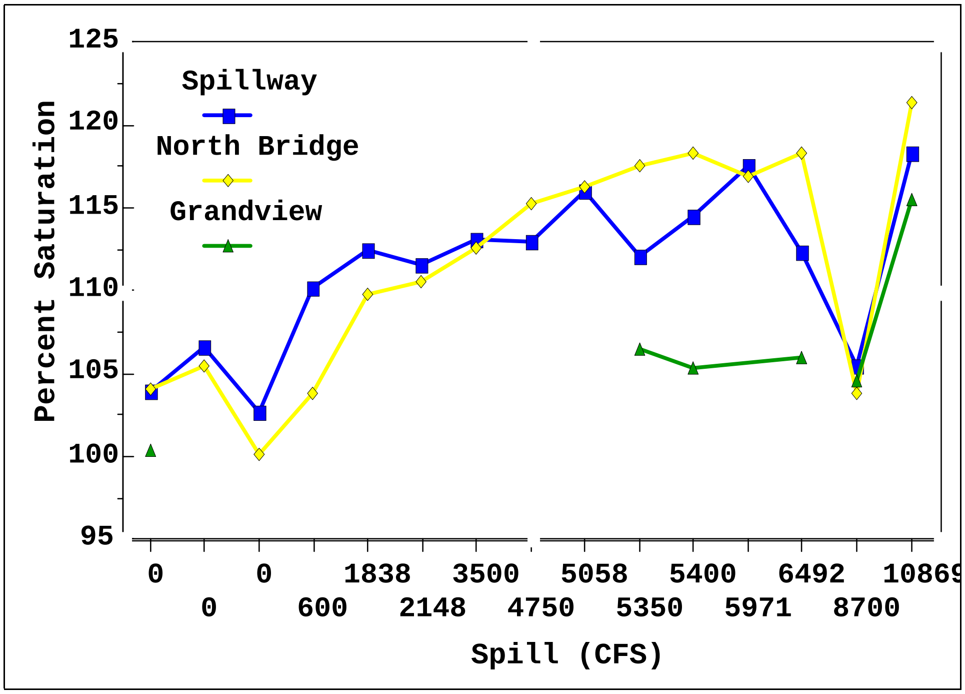

Figure 2.11 Total Dissolved Gasses at CJ Strike Dam

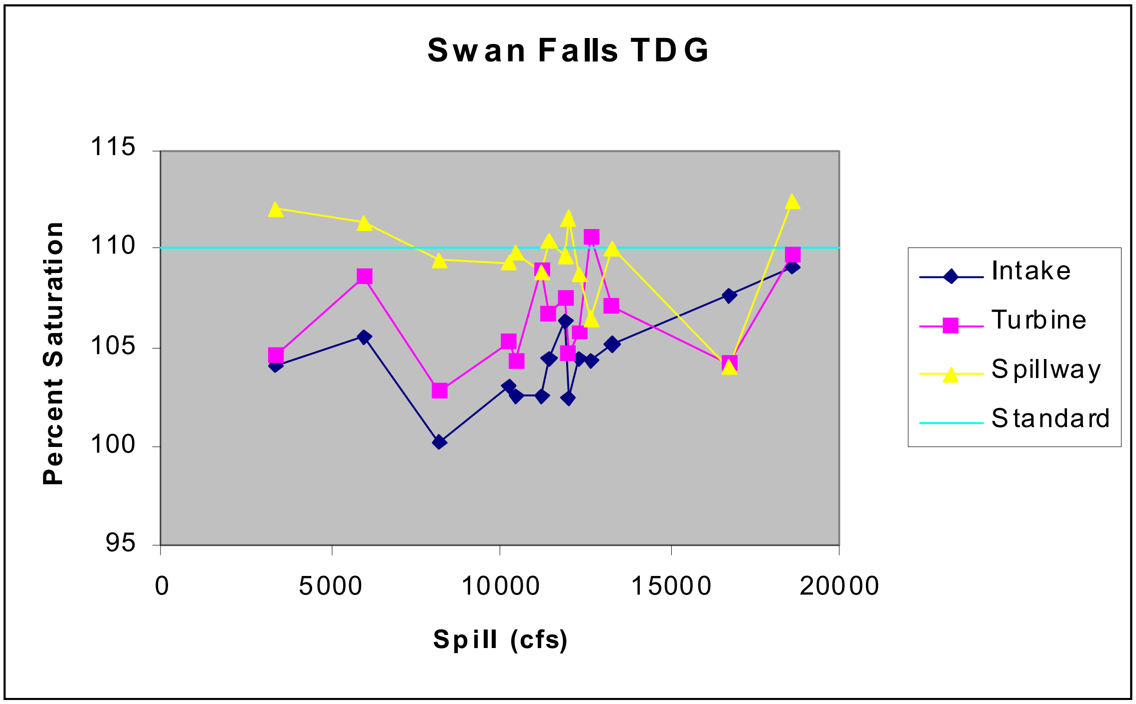

Figure 2.12 Total Dissolved Gases Below Swan Falls Dam

The TDG data outlined above show that TDG is frequently greater than 110% saturation when water is spilled above 1838 cfs at CJ Strike dam. As a result of these data, DEQ recommends listing TDG during the next §303(d) listing cycle.

Dissolved Oxygen

Insufficient DO data prevents a conclusive analysis of DO conditions at this time. However the available data do show that dissolved oxygen concentrations in the river are closely linked to nutrient and organic matter concentrations. Low DO is often the result of high nutrient, organic, or algal loading to a surface water system. Excessive nutrients can lead to algal growth. The algae, in turn, consume oxygen from the water column during periods when respiration is the dominant process and in the aerobic decomposition of the dead algae and other detritus (non-living organic material). Improvements in DO are ultimately tied to reductions in phosphorus through the corresponding reductions in algae growth. DEQ does not recommend an explicit DO TMDL at this time. Rather, DO conditions will be monitored as part of the nutrient TMDL to determine if additional actions (beyond the nutrient TMDL) are necessary.

Nutrients

The Snake River from Swan Falls Dam to the Oregon border is listed for nutrients. The 1999 and 2000 data sets used for calculation of the daily load did not show nutrient levels over the target concentration upstream of Swan Falls Dam. However, due to complaints about macrophytes in the Swan Falls Reservoir area, as well as total phosphorus levels slightly above the target concentration (0.071 mg/L) coming out of CJ Strike Dam, nutrient monitoring will continue in the upstream segment.

The designated beneficial uses determined to be most at risk from excess nutrients were those associated with aesthetics, recreation, and aquatic life. A 0.07 mg/L TP target is used for this TMDL (target selection is discussed in detail in Chapter 5) based on beneficial use support.

As shown in Figures 2.13-2.17, TP concentrations were near or above the 0.07 mg/L target in every year monitored. Raw data was provided by Idaho Power Company (IPC 2002) and USGS (USGS 2000). Differences in concentration levels are attributable to differences in water volume, cropping patterns, etc. Instream phosphorus concentrations increase in a downstream direction, as shown in Figures 2.13-2.17.

In the SR-HC TMDL, chlorophyll-a levels and total phosphorus concentrations were linked to show impairment of recreational beneficial uses in relation to nutrient/chlorophyll levels. Chlorophyll-a is an indirect measurement of the amount of algal productivity in a water body or in basic terms, how green the water is. At levels above 30 micrograms per liter (ug/L), recreationalists no longer find recreating desirable (DEQ 2001). A target of 14 ug/L chlorophyll-a (mean growing season concentration) and a nuisance threshold of between 25 and 30 ug/L of chlorophyll-a have been established as the chlorophyll-a targets for this TMDL. These targets were adopted from the SR-HC TMDL. Figure 2.20 shows the annual maximum concentrations monitored. This data is from routine monitoring, not monitoring of peak algal blooms. Typically, in mid-summer the margins of the river from Walters Ferry downstream have algal mats and macrophytes present in thick quantities forming 10-foot wide ribbons down either side of the river. Nuisance macrophyte growth has been reported upstream of Swan Falls Dam in the reservoir area. DEQ has also received complaint calls regarding the condition of the Snake River segment, particularly in the area below Marsing, concerning aesthetics and the odor from the algal mats. Downstream of Marsing is also where the highest concentrations of instream TP are found.

Direct effects associated with recreational uses include decreased utilization of the river due to unfavorable water color, low water clarity, and unpleasant odor. Indirect effects associated with aquatic life uses include low DO levels deep in the water column due to the decomposition of algae and other aquatic plant materials and high in the water column due to diurnal effects associated with substantial algae blooms. Excessively low DO levels result in reduced fitness of fish and eventually, increased mortality incidence.

As aesthetic water quality and public perception are difficult to measure directly, those characteristics of water that are generally considered unappealing were evaluated. Dominant factors in the perception of water quality are coloration, odor, and level of aquatic growth. Because it is correlated with all of these factors, algae were identified as a good indicator of aesthetic water quality. As discussed previously, a surrogate measure of algal growth is chlorophyll-a. This was used as a surrogate measure of aesthetic water quality for the purposes of this assessment.

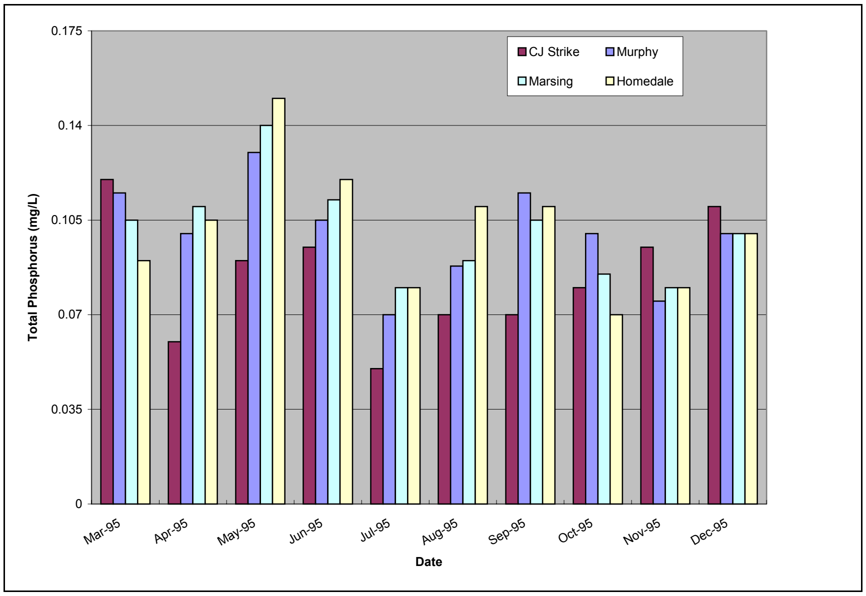

Figure 2.13 1995 Total Phosphorus Concentrations in the Snake River below CJ Strike Dam and at Celebration Park (Murphy), Marsing, and Homedale

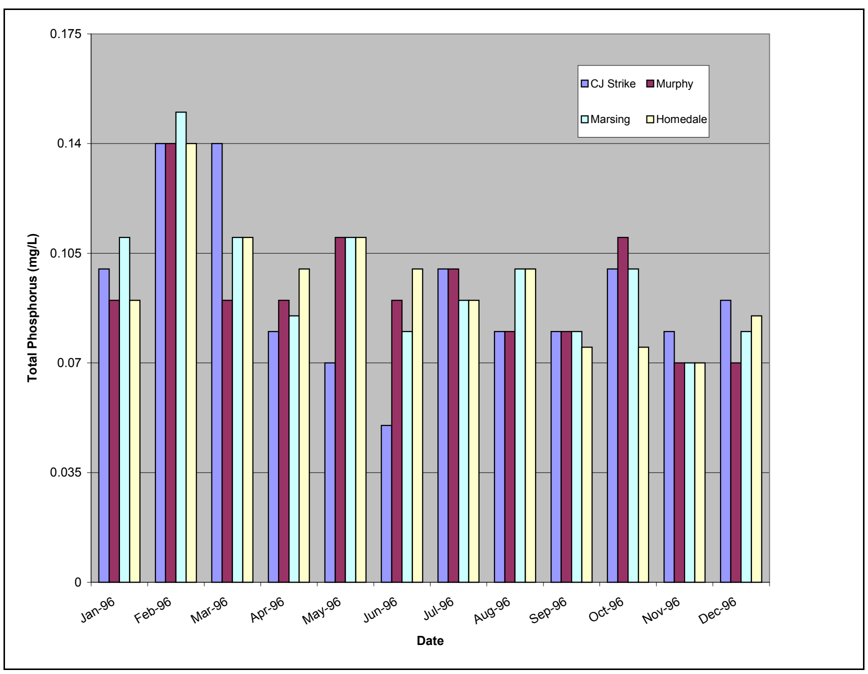

Figure 2.14 1996 Total Phosphorus Concentrations in the Snake River below CJ Strike Dam, and at Celebration Park (Murphy), Marsing, and Homedale

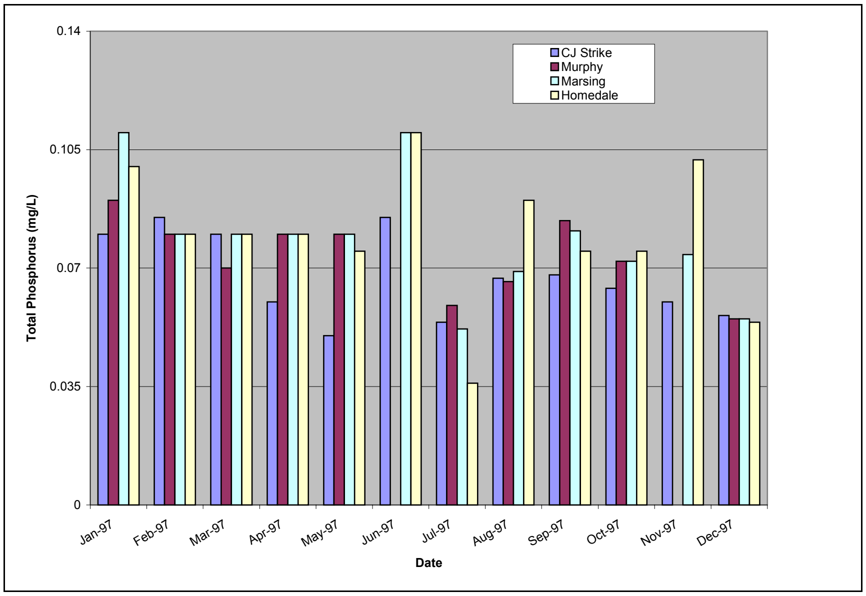

Figure 2.15 1997 Total Phosphorus Concentrations in the Snake River below CJ Strike Dam, and at Celebration Park (Murphy), Marsing, and Homedale

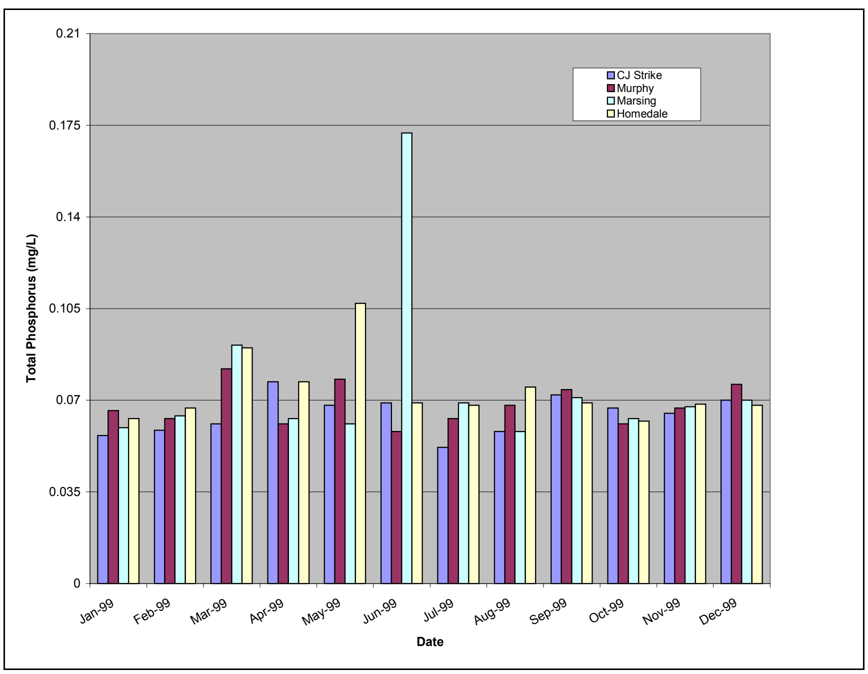

Figure 2.16 1999 Total Phosphorus Concentrations in the Snake River below CJ Strike Dam, and at Celebration Park (Murphy), Marsing, and Homedale

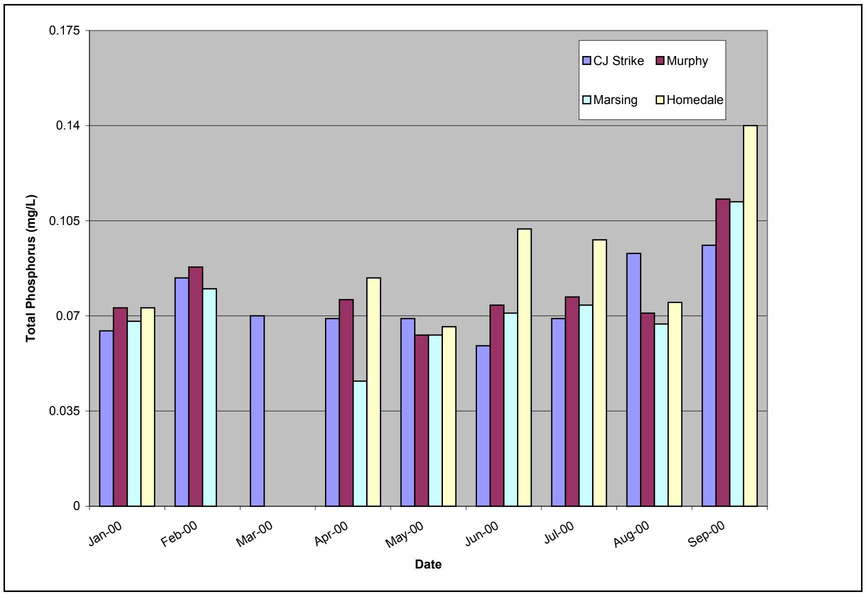

Figure 2.17 2000 Total Phosphorus Concentrations in the Snake River below CJ Strike Dam, and at Celebration Park (Murphy), Marsing, and Homedale

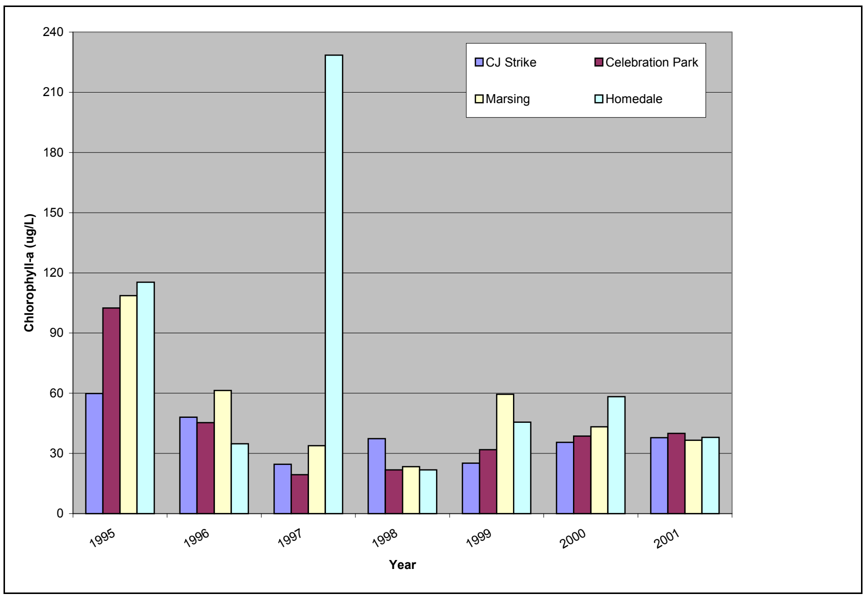

Figure 2.18 1995-2001 Maximum Annual Chlorophyll Concentrations in the Snake River below CJ Strike Dam, and at Celebration Park (Murphy), Marsing, and Homedale

Fisheries

The Snake River supports both cool and warm water fisheries. Table 11 shows the results of a recent U.S. Geological Survey (USGS) electrofishing effort below Swan Falls Dam, which showed a dominance of suckers and whitefish. The section of river from CJ Strike Dam to Swan Falls Dam is dominated by carp as shown in Figure 2.19 (IDFG 1989). The section of the Snake River from Swan Falls Dam down to the state line was dominated by small mouth bass in 1988, as shown in Figure 2.20. Historically, anadromous spawning occurred in this reach. However, the presence of dams and elevated water temperatures prevent this from happening today.

Mountain whitefish, a salmonid species, spawn in the river segment below CJ Strike Dam. Spawning is triggered by a change in water temperature. Initiation of spawning occurs between 8-9 °C and peak spawning occurs between approximately 5-6 °C. Based on available temperature data, whitefish spawning primarily occurs between mid and late November and peaks in late December (Hoelscher, IPC, personal communication, 2002).

White sturgeon, a threatened species, are found in this the river segment below C.J Strike Dam, particularly in the faster flowing areas below Swan Falls Dam. Spawning habitat is closely linked to flow. Both discharge and temperature are triggers for spawning activity. Sturgeon eggs are broadcast and no parental care is provided. Eggs that settle into channels in high velocity areas are not as subject to predation as eggs that are found in slower moving water.

The low gradient section of the Snake River from Walters Ferry to the state line has the least potential for sturgeon spawning (IPC 1998). The only documented spawning area in the reach from below CJ Strike Dam to Swan Falls Dam is in the tailrace of CJ Strike Dam.

Juvenile and adult sturgeon are typically found in large deep pools, along current breaks, or in the thalweg of runs.

Table 11. 2000 electrofishing results: Snake River below Swan Falls Dam.

Organism Name: Genus Species (Common)	Number of Individuals	Percent Composition	Length Range Total (mm)	Weight Range (gm)	Origin	Trophic Group of Adults
Catostomidae columbianus (bridgelip sucker)	10	6.8	278-380	227-520	Native	Herbivore
Catostomus macrocheilus (largescale sucker)	67	45.6	36-537	1-1,505	Native	Omnivore
Micropterus dolomieui (smallmouth bass)	19	12.9	28-336	1-410	Introduced	Piscivore
Acrocheilus alutaceus (chislemouth)	6	4.1	40-275	1-200	Native	Herbivore
Cyprinus carpio (common carp)	7	4.8	6-680	1,520-5,600	Introduced	Omnivore
Ptychocheilus oregonensis (northern pikeminnow)	1	0.7	415	680	Native	Invertivore
Ictalurus punctatus (channel catfish)	1	0.7	496	1045	Introduced	Omnivore
Prosopium williamsoni (mountain whitefish)	36	24.5	124-374	17-583	Native	Invertivore

Collection Methods: Electrofishing; boat, backpack, Length Reach: 1,280 m, Time elapsed for each collection method: 13A 0.37 hours, 11A 0.20 hours, USGS 2000

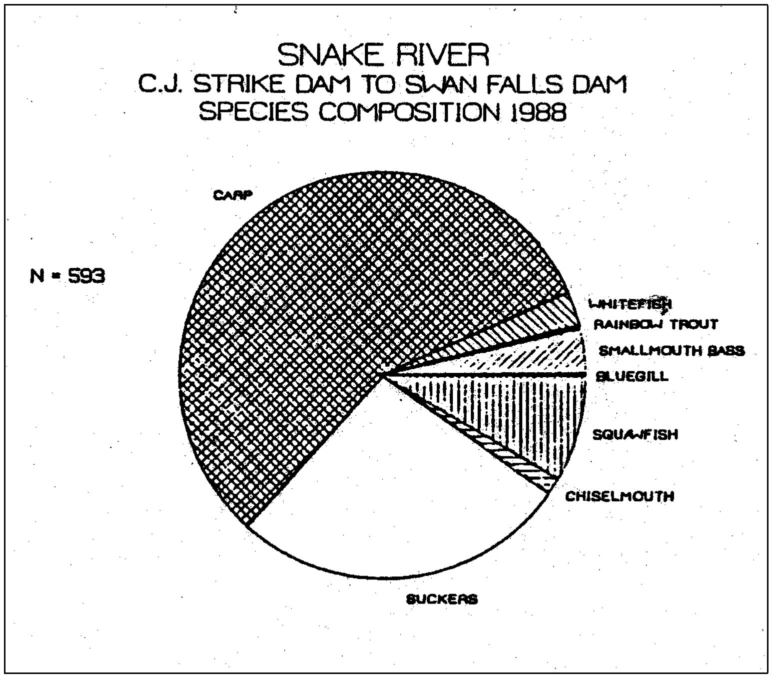

Figure 2.19 Species Composition: Snake River from CJ Strike Dam to Swan Falls Dam

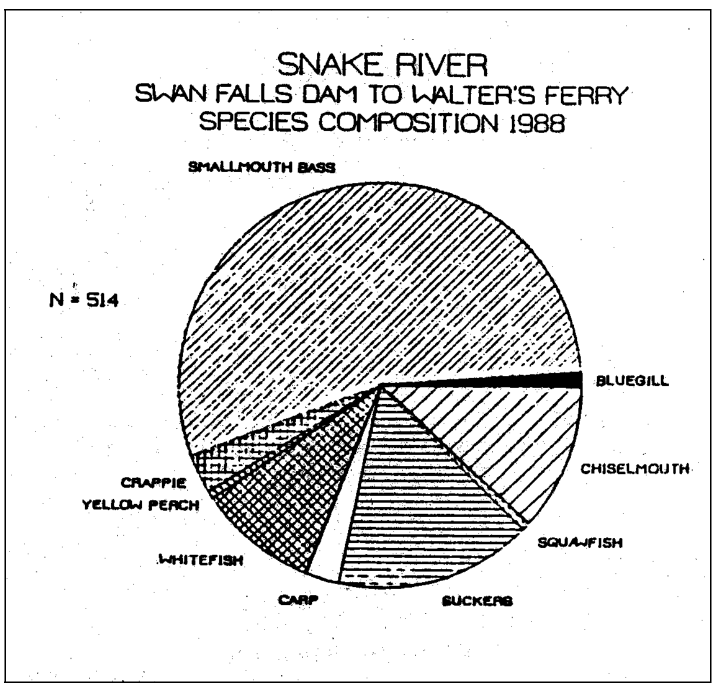

Figure 2.20 Species Composition from Swan Falls Dam to Walters Ferry

Macroinvertebrates
A Section 10 report for USFWS by Idaho Power described data for the listed reach starting below CJ Strike Dam to 36 miles downstream for macroinvertebrates (IPC 2001). The results showed a benthic community tolerant to organic enrichment and sediment. The samples were taken in predominantly run (shallow/fast) habitat with cobble-gravel substrate. After collection and identification, a series of biological assessment metrics were calculated, as shown in Table 12. The Idaho spring snail, listed as endangered, was found in 20% of the river collections and was found in greater densities in the edge water. River pool areas were dominated by the New Zealand mudsnail. These snails were found in 19% of the samples. Collector/gatherer macroinvertebrates represented the largest functional group collected.

Table 12. Macroinvertebrate survey results downstream of CJ Strike Dam (river miles 492-494, 489-491, 483-488, 478-482, 473-477, 468-472).

Metric	Result
Taxa Richness	48
Hilsenhoff Biotic Index	5.7
EPT[1] (no plecoptera)	20
EPTd/Chir[2]	3.2:1
Percent Idaho Springsnail	20%
Percent Dominant	20%
Percent Predator	3%
Percent Scraper	27%
Percent Collector/Gatherer	43%
Percent Collector/Filterer	25%
Percent Shredder	2%
Percent New Zealand Mudsnail	19%

1 Ephemeroptera, Plecoptera, Tricoptera
2 Chironomidae

U.S. Geological Survey water year 1998 macroinvertebrate data showed a Hilsenhoff Biotic Index scores of 5.37 and 5.32, indicating some amount of organic pollution. This was consistent with the Idaho Power data shown above. The *Hydropsyche* and *Cheumatopsyche* genera that dominated the sample are pollution tolerant, indicating some amount of degradation in the reach.

Status of Beneficial Uses in the Snake River
Cold water aquatic life and recreational uses in the Snake River are impaired due to high nutrient levels. In-river nutrient concentrations result in nuisance aquatic growth and low DO levels which impair aquatic life and recreational uses. Elevated temperatures are impairing cold water aquatic life as evidenced by the summer 2002 Mountain Whitefish fish kill.

Conclusions

A TMDL will be completed for nutrients. Temperature will be recommended for listing during the next practical §303(d) cycle and a thermal site potential study will be done. DEQ also recommends that TDG be listed in the Snake River from below CJ Strike Dam to Castle Creek on the next §303(d) list. Sediment, pH, and bacteria are proposed for de-listing. Since changes in DO are closely tied to nutrient reductions, an explicit TMDL for DO will not be prepared at this time. The nutrient TMDL will have the net effect of increasing DO concentrations throughout the river. As such, the nutrient TMDL is essentially a surrogate DO TMDL. While an explict DO TMDL will not be prepared, DO will remain on the §303(d) list and monitored in conjunction with nutrient monitoring to track improvements.

Castle Creek

This section describes the physical, chemical and biological data for the listed segment of Castle Creek as well as separate discussions of the listed pollutants for North Fork Castle Creek and South Fork Castle Creek.

Hydrology

As shown in Figure 2.21, the only continuous flow measurement records for Castle Creek date back to 1910 (USGS 2002). These flow measurements were taken slightly above the upstream boundary of the listed reach. Peak runoff generally occurs in spring (April-May), although rain on snow events can cause early peak flows. During 2002, flows were below 1.0 cfs near the mouth by mid-July due to irrigation diversions upstream.

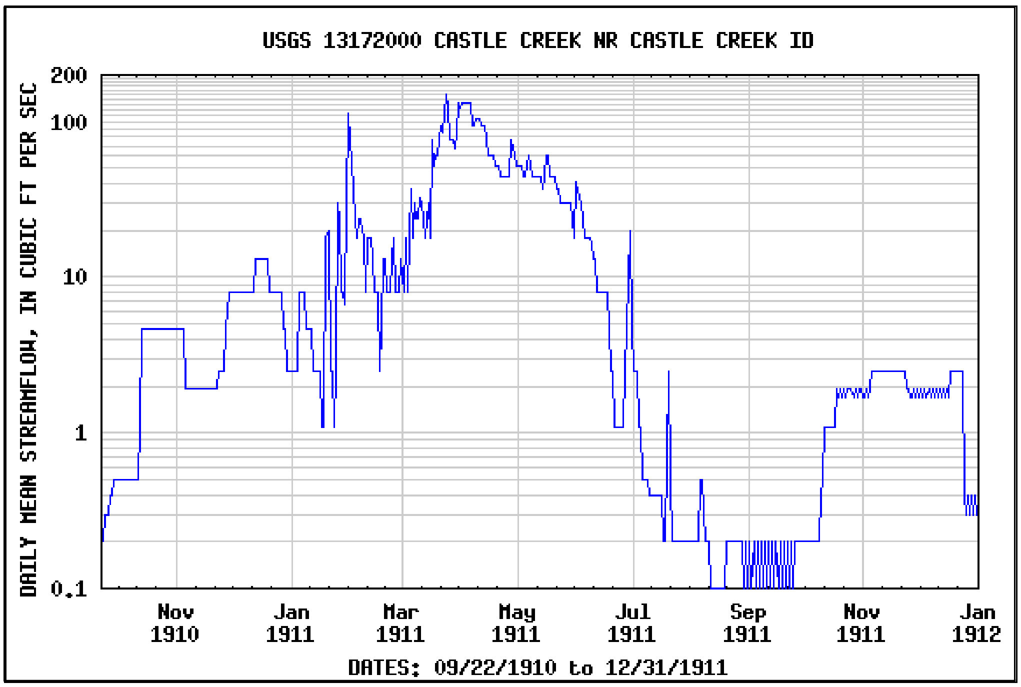

Figure 2.21 1910-1911 Hydrograph for Castle Creek

Temperature

Temperature loggers were installed on Castle Creek in spring of 2002. The locations are shown in Table 13 and Figure 2.22. Although Castle Creek is designated for salmonid spawning, IDFG determined that it is not an existing use in the listed section, nor is it likely to have been a historic use due to the low gradient and lack of spawning habitat (see Appendix F). Thus, the cold water aquatic life temperature criteria will be the only aquatic life standard used in the assessment of Castle Creek temperature data.

Table 13. Castle Creek temperature logger locations.

Site Name	Location
Castle 1	T4SR2ES06 SW/NW
Castle 2	T4SR1ES13 NE/NE
Castle 3	T5SR1ES10 NW/SW
Castle 3 Air	T5SR1ES10 NW/SW
Castle 4	T5SR1ES32 NE

The listed section of Castle Creek passes through agricultural lands where there is a reliance on geothermal artesian water for irrigation. Idaho Department of Water Resources (IDWR) records show flowing wells throughout the listed section of the watershed. Water comes out of the ground at temperatures close to 140 °F. Typically, the water flows into a cooling pond prior to irrigation use. After the water is used to irrigate, it is returned to Castle Creek via subsurface laminar flow or overland flow. A significant portion of the flow in Castle Creek during low flow months potentially consists of this cooled artesian water. Two of the flowing wells pre-date the CWA according to IDWR water rights records. The rest of the wells were drilled after 1972.

Stakeholders within the Castle Creek subwatershed are concerned that the bulk of the flow in Castle Creek is due to return water from these agricultural practices. DEQ staff investigated the use and location of artesian wells but due to time constraints was unable to quantitatively determine the amount of flow entering the creek from these sources. DEQ proposes to estimate a water budget for the subwatershed to determine the percentage of water in the stream resulting from artesian agricultural return. If a significant percentage is from the warm artesian return water, the necessity for a TMDL will be evaluated.

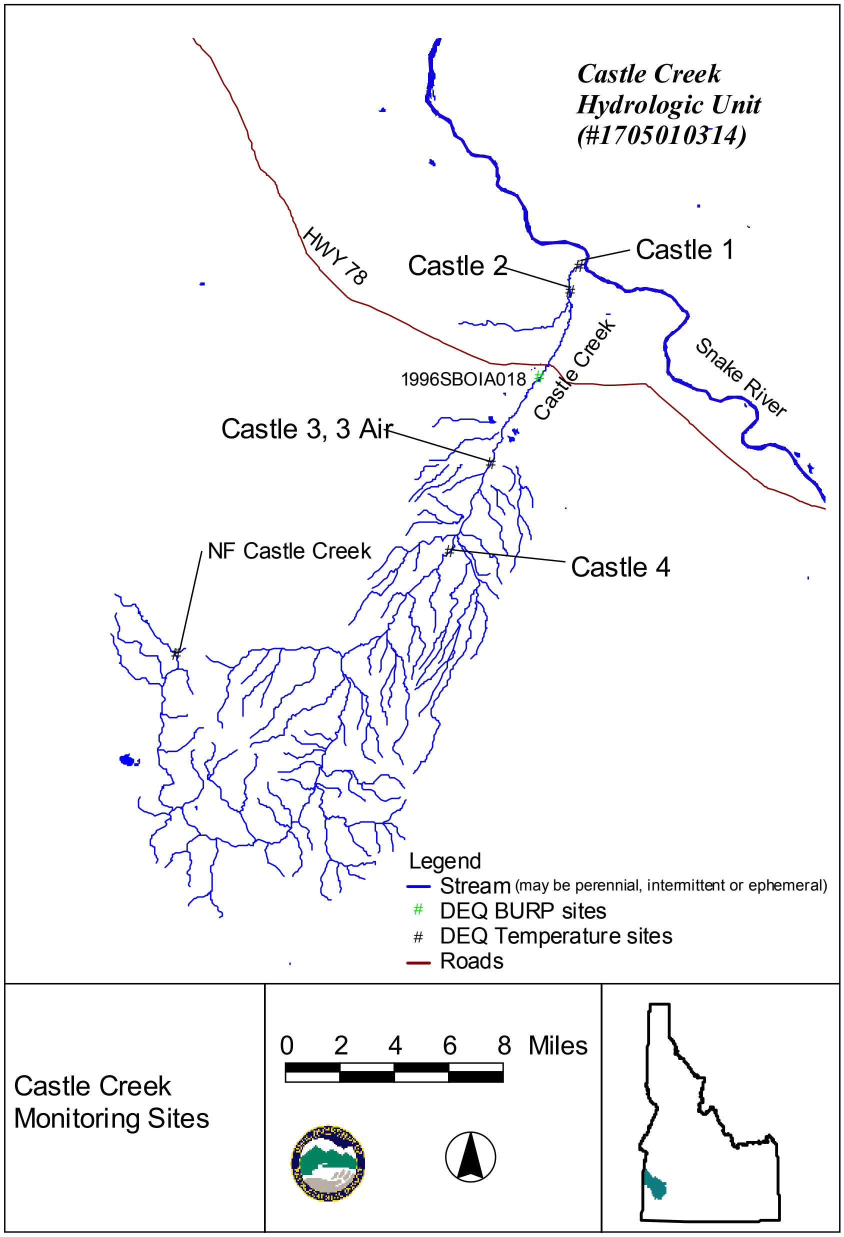

Figure 2.22 Castle Creek Monitoring Sites

Fisheries
The listed portion of Castle Creek is a low gradient section that IDFG has determined is not salmonid spawning habitat (see Appendix F). DEQ BURP data collected in 1995 show no young-of-the-year (born that year) salmonids present in the listed section of Castle Creek. Electrofishing conducted in 2002 also showed no salmonid species.

However, further up in the watershed in the higher elevation, higher gradient areas, there are redband trout populations. Table 14 shows the redband trout population data for Castle Creek. Although the data are not shown, speckled dace dominates the fish populations in both Castle Creek and North Fork Castle Creek.

Table 14. Castle Creek fish survey results.

Site	Date	Location	Redband Density
South Fork Castle Creek	10/93	South Fork Castle Creek above Clover Creek	0.539 /m^2
Castle Creek	8/77	Castle Creek below Gordy Ranch T7S R1W Section 3	0.167/m^2
Castle Creek (96SWIRO A18)	9/02	T4S R1E Section 14	No redbands
North Fork Castle Creek	8/01	North Fork Castle Creek at Alder Creek	0.035 /m^2

Macroinvertebrates
Table 15 shows the result of macroinvertebrate sampling. The Castle Creek sample was collected in the middle section of the listed reach and indicates poor diversity within the aquatic insect community. The South Fork Castle Creek sites show a diverse community of macroinvertebrates.

Table 15. Macroinvertebrate results for Castle Creek.

Site	Location	SMI[1]	Notes
South Fork Castle Creek	T8S R1W S16	56.02	Indicates a diverse macroinvertebrate community
South Fork Castle Creek	T8S 1W S8	55.56	Indicates a diverse macroinvertebrate community
Castle Creek (96SWIRO A18)	T4S 1E S26	15.92	Indicates poor macroinvertebrate diversity

[1]Stream macroinvertebrate index

Sediment
BURP data collected in 1996 show 100% fine substrate material (particles <6.0 mm in diameter), most of which was sand sized. The listed segment of Castle Creek is a response reach and more fines are expected to accumulate in the area. However, 100% fines greatly exceeds the 28% fines target (Overton et al. 1995) and does not provide suitable substrate for cold water aquatic life. Table 16 shows the BURP data for the listed section of Castle Creek.

Table 16. Sediment results for Castle Creek.

Castle Creek	Percent Fines
Castle Creek (96SWIROA18)	100%

Bank erosion survey results show areas of 80% or more stable banks in the upper 3 miles of the listed reach. However, downstream bank stabilities of less than 80% are prevalent. Bank survey results are located in Appendix H.

Riparian Survey
Figure 2.23 shows the results of a riparian survey done by the Idaho Soil Conservation Commission in 2001 (ISCC 2001). The author observed that bank stability was primarily provided by the roots of woody vegetation and to a lesser degree by herbaceous vegetation. From marker 18 downstream (north), there was an increase in the percentage of upland plants and weeds present. The study objective was to determine present grazing effects on the riparian area. The areas observed were given ratings, which are explained in more detail below.

- High: Obvious overgrazing; herbaceous and woody species are over-utilized, in poor condition if still present, compromising stream bank stability; stream bank shape indicates impact from overuse by livestock.

- Moderate: Obvious that grazing is occurring; herbaceous and woody species are somewhat over-utilized but stream bank stability may still be intact, though compromised; large river system that does not depend on stream bank herbaceous or woody species as much for stability; substrate-controlled stream or river.

- Low: Grazing is likely occurring but either fenced away from the riparian area and/or management is excellent; herbaceous and woody species are vigorous and stream bank stability seems good.

- NA: Livestock grazing is not occurring within the riparian area.

- ?: The degree of grazing impact is not known due to limited visual access to riparian area.

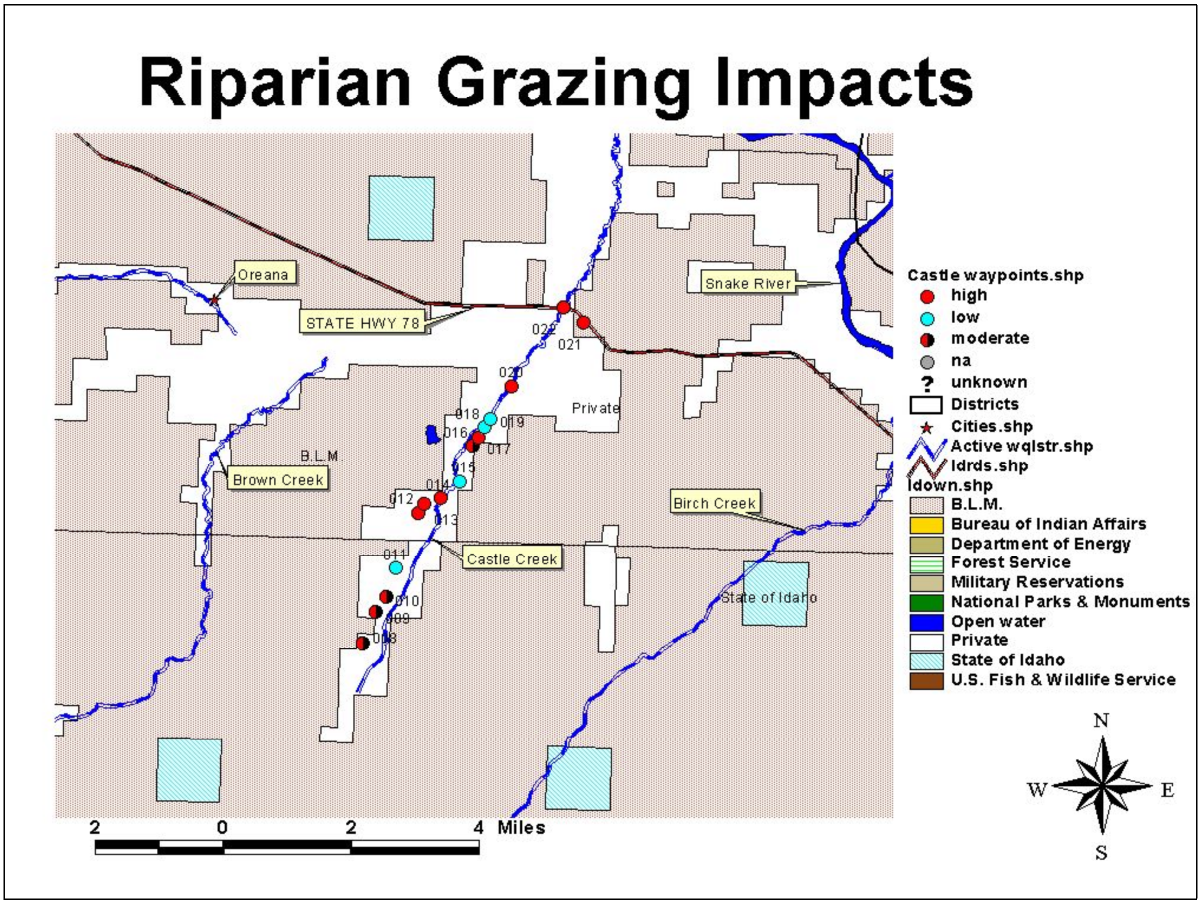

Figure 2.23 Riparian Grazing Impacts to Castle Creek

North Fork Castle Creek Temperature
North Fork Castle Creek temperature data were collected in 2002. This is a very low volume stream and inadequate flow data is available to fully characterize the system. North Fork Castle Creek goes dry in the upper sections from late June onwards although there is perennial flow farther downstream. The lack of data made it difficult to determine when flows dropped below 1 cfs. DEQ staff did not have access to the lower reaches of North Fork Castle Creek. DEQ will attempt to gain access in 2003. Figure 2.24 shows the daily average temperatures in the upper portion of the stream where DEQ was able to gain access.

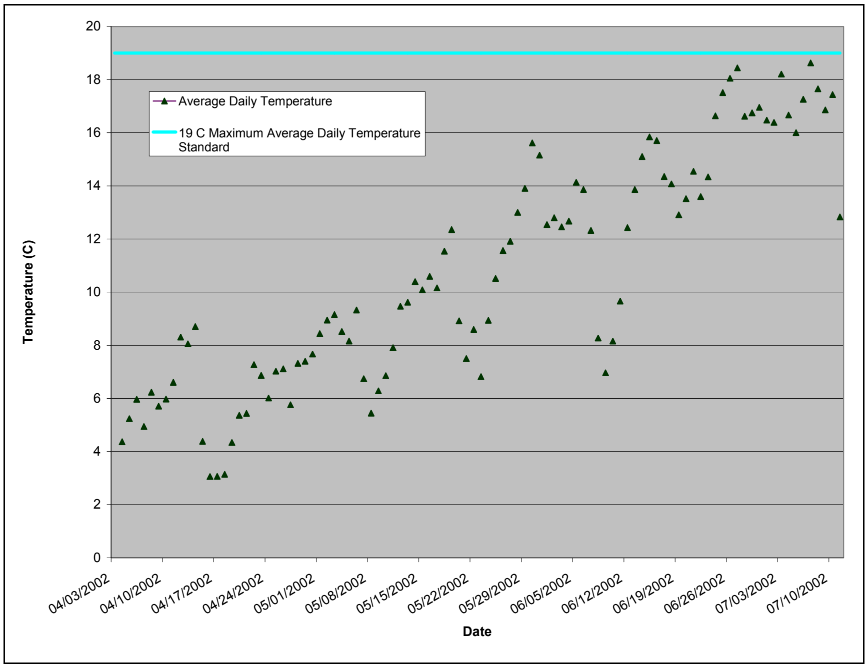

Figure 2.24 North Fork Castle Creek Average Daily Temperature (Flow > 1 cfs)

South Fork Castle Creek Bacteria

South Fork Castle Creek is listed for bacteria due to 1979 BLM data taken during the base flow period. DEQ staff were unable to resample the listed reach due to lack of access to the stream. The DEQ water body assessment process shows this reach to be fully supporting its beneficial uses.

While the current standard is based on *E. coli*, the old standard called for less than 500 cfu/100 mL instantaneously for primary contact recreation and less than 800 cfu/100 mL instantaneously for secondary contact recreation. The 1979 BLM sample met both the primary and secondary contact recreation standards.

Due to the fact that this listing is based on a single sample taken over 20 years ago, the sample met the standard at the time, and that flows in South Fork Castle Creek generally precludes ingestion, DEQ does not recommend a TMDL at this time. However, DEQ will attempt to re-sample SF Castle Creek in summer 2003 to determine definitively if the stream meets the state bacteria standards. Table 17 shows the results of BLM bacteria monitoring (BLM 1979).

Table 17. South Fork Castle Creek bacteria monitoring results

Location	Date	Fecal Coliform
South Fork Castle Creek	10/1/79	312 cfu/100mL

Status of Beneficial Uses

Cold water aquatic life uses in Castle Creek are impaired due to excess sediment in the stream, which is reflected in the low habitat and macroinvertebrate scores in the water body assessment.

Conclusions

The listed section of Castle Creek is impaired by sediment, with the greatest amount of sediment delivery occurring during periods of high flow in late spring. Bank erosion inventories indicated bank stability was less than 80%, particularly in the lower sections of the reach. Thus, a sediment TMDL for Castle Creek will be completed. The determination of whether a temperature TMDL is necessary for Castle Creek will be delayed until an evaluation of the artesion influence can be performed. This evaluation is expected to occur in 2003. The bacteria TMDL for the South Fork Castle Creek will be delayed due to a significant lack of data. Additional data is expected to be collected in 2003. The temperature TMDL for the North Fork Castle Creek will also be delayed due to a significant lack of data. Additional data will is expected to be collected in 2003.

Jump Creek

This section describes the physical, chemical and biological data for the listed segment of Jump Creek.

Surface Hydrology

Jump Creek is an intermittent stream as it flows through the Sands Basin, but becomes perennial as it reaches the Snake River Plain. The hydrology of Jump Creek has been significantly modified over time by channelization, bank stabilization activities and the development of irrigation and drainage systems (Bauer 1994). Similar to the Lower Boise River basin, which is due north, the soils in the watershed became saturated as the lands adjacent to the stream were irrigated as cropland. As irrigation continued, the ground water level increased and began to interfere with soil and crop health. In response, drains were constructed and the existing channel was deepened to drain the excess ground water.

There is not a significant amount of flow data for Jump Creek, but enough exist to accurately characterize the stream's seasonal flow fluctuation in the perennial segment. Figure 2.25 shows the typical discharge rates at four longitudinally spaced locations in Jump Creek for the years 1992 and 1993 (Bauer 1994). The year 1992 was a lower than normal water year.

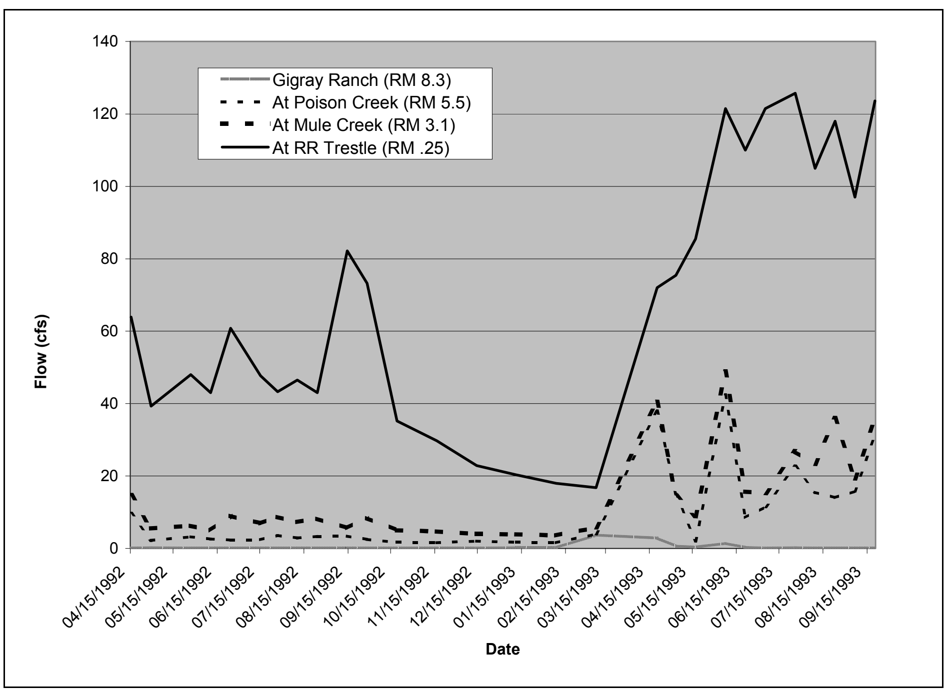

Figure 2.25 Monthly Flow at Four Locations in Jump Creek, 1992-1993.

Due to the irrigated nature of the Jump Creek subwatershed, a complicated system of canals, laterals, and diversions exists. Along with numerous small canals that drain into Jump Creek, three major water conveyances transect the system. The Southside Canal originates at the Owyhee Reservoir and travels east at the foot of the Owyhee Mountains where it joins the

A-Line and B-Line canals just upriver from Marsing. The Southside Canal has the potential to spill into Jump Creek at their intersection near Highway 78, but does so only when water is needed. The A-Line and B-Line canals convey water in a northwesterly direction from where they originate. The A-Line canal is siphoned over Jump Creek with no discharge to the creek. The B-Line is also siphoned over Jump Creek, but often spills into Jump Creek. The spill, which averages 5 cfs throughout the irrigation season, ensures the appropriate water level is maintained in the B-Line canal.

Mule Drain and Hortsman Drain account for nearly 80% of the total volume of water in Jump Creek as it enters the Snake River. However, in low flow years, such as 1992, Mule and Hortsman Drains can account for nearly all of the water in the stream. This is illustrated in Figure 2.26 (Bauer 1994).

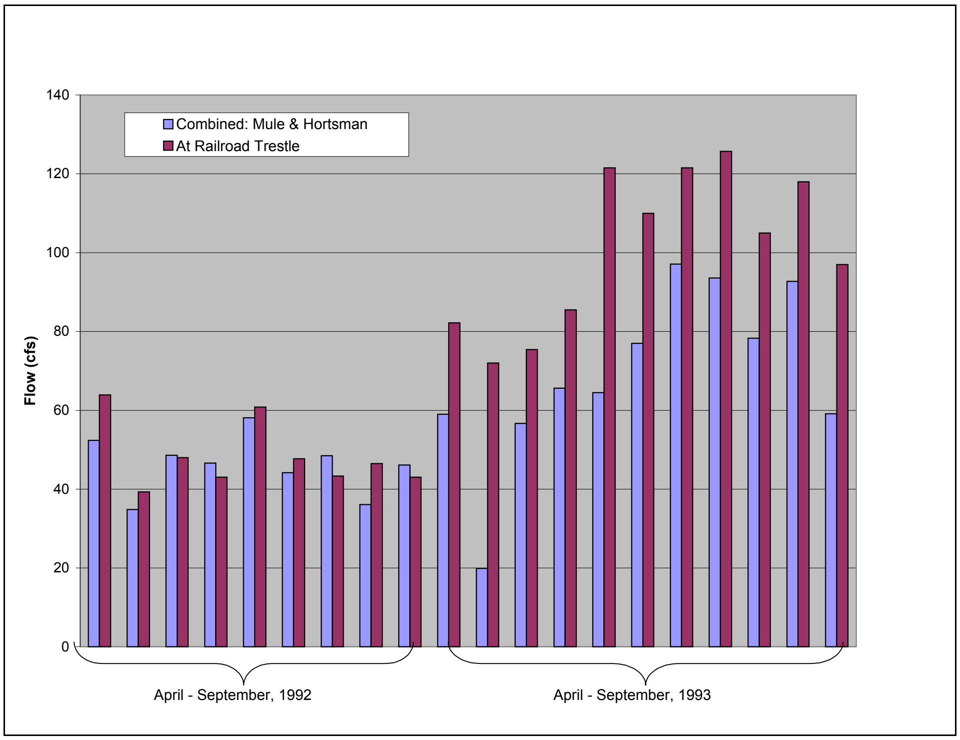

Figure 2.26 Flow Contribution to Jump Creek from Mule and Hortsman Drains, 1992 and 1993

Within the 4.9-mile stretch of stream that extends from the mouth of the canyon to the Snake River, the Town Canal withdrawal is the only major diversion. The Town Canal withdraws at an average rate of 15 cfs during the irrigation season. Jump Creek is not de-watered to the extent of other tributaries in the basin. All of the water removed from Jump Creek is used for agricultural related purposes.

Sediment
A significant amount of water column sediment data were collected by DEQ in 1992 and 1993 as part of the Jump Creek SAWQP project (Bauer 1994). Additional data have been collected by the Idaho Department of Agriculture (IDA) and Bureau of Reclamation in 2000 and 2001 for other agency-specific reasons. Figure 2.27 shows the DEQ monitoring locations. All three agencies sampled TSS, and the Bureau of Reclamation also sampled for SSC.

The irrigation season has a marked effect on TSS conditions in Jump Creek. Other than at Gigray Ranch, TSS concentrations in Jump Creek are notably higher during the irrigation season. Figure 2.28 shows beginning at Mule Creek, the typical seasonal average TSS concentration increases dramatically in the downstream direction. The concentration is nearly eighty times greater than that at Gigray Ranch by the time the stream reaches the Snake River. During the non-irrigation season the concentrations remain low, and even drop somewhat between Market Road and the Snake River. This drop is likely due to an influx of clean ground water as the stream approaches the river. The TSS loads follow the same trend as the concentrations, as illustrated in Figure 2.29. This indicates that irrigation season flows and land management activities play a critical role in TSS conditions in Jump Creek.

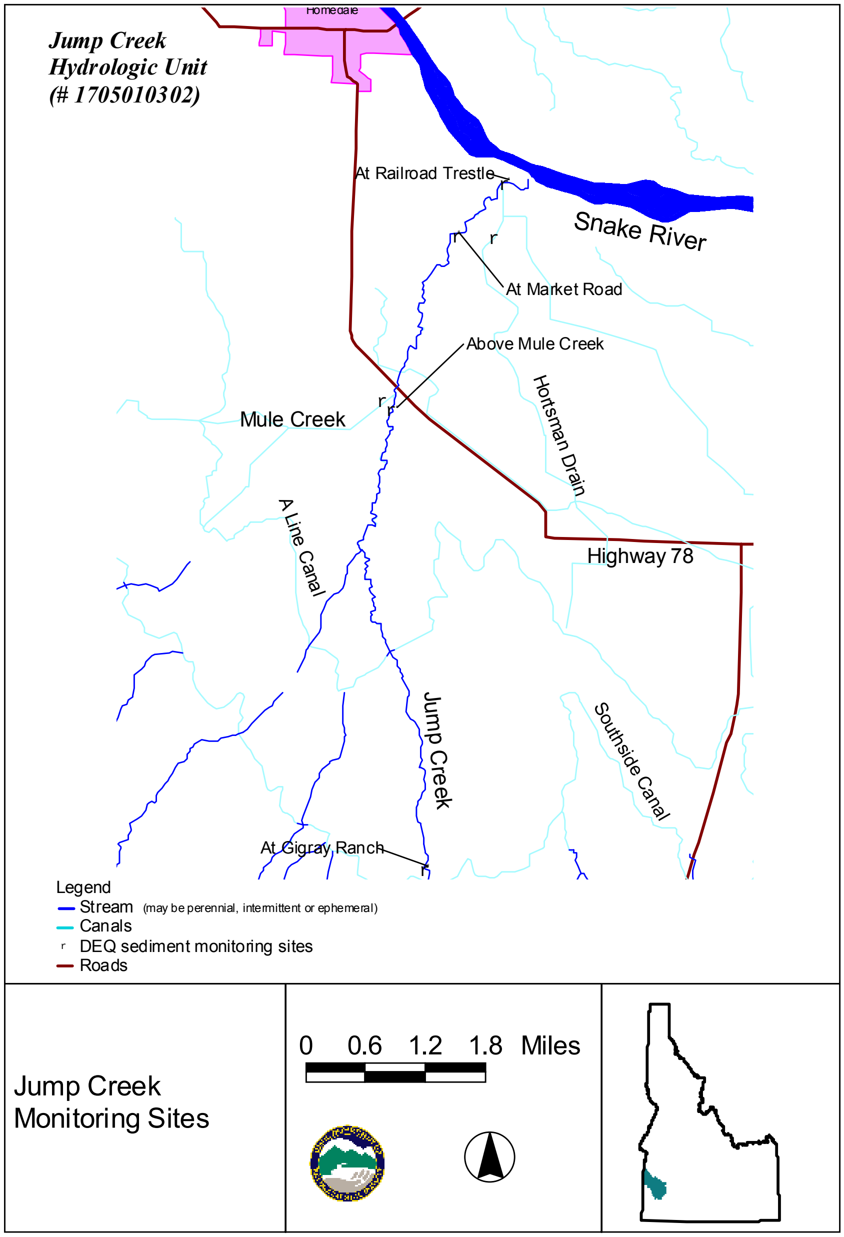

Figure 2.27 Jump Creek Monitoring Sites

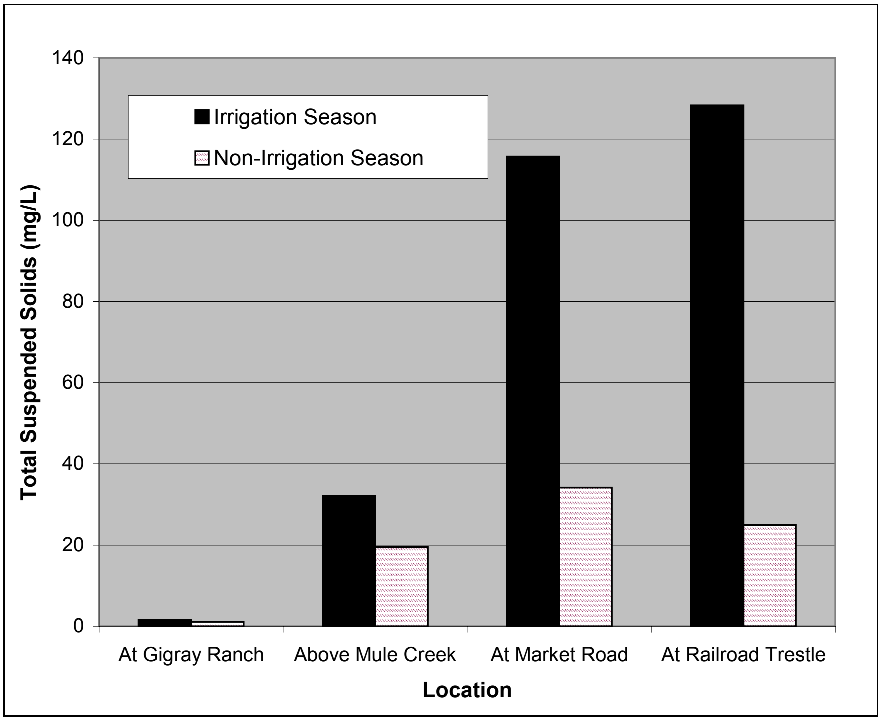

Figure 2.28 Typical Seasonal Variation in Total Suspended Solids Concentration in Jump Creek, 1992 and 1993 Irrigation Seasons

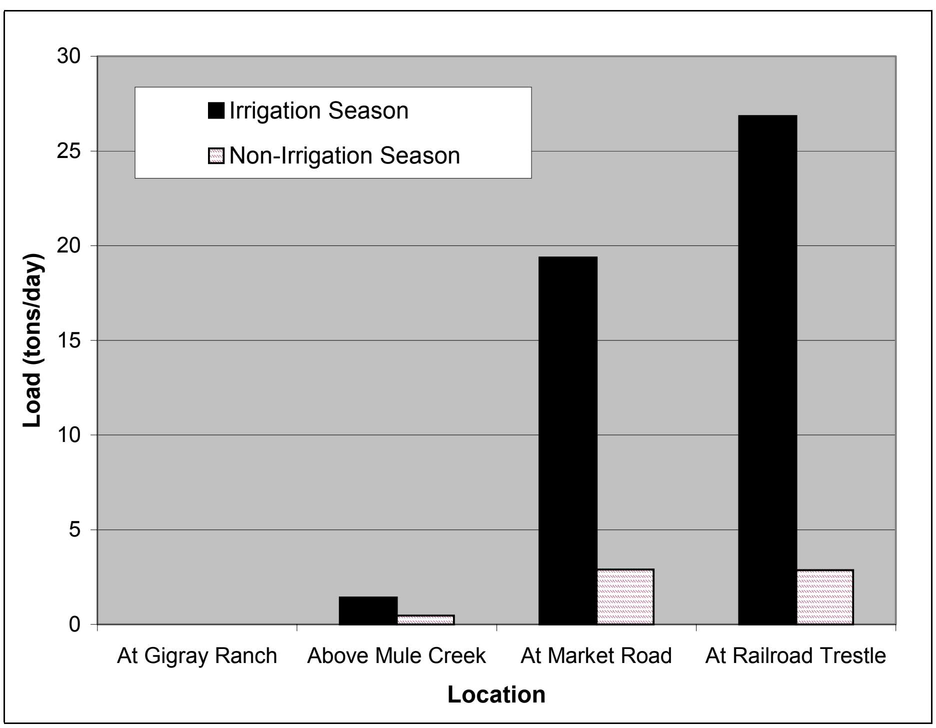

Figure 2.29 Typical Seasonal Variation in Total Suspended Solids Load in Jump Creek, 1992 and 1993 Irrigation Seasons

Jump Creek is located in an area of the watershed that has experienced very little noticeable change in the land use in the past 10 years (Griswold 2002). As a result, the sediment loads associated with particular land uses (agriculture, storm water, etc.) have remained relatively static. While the annual sediment load in any given year may fluctuate somewhat depending on the type(s) of crop being grown and the amount of water available for irrigation, the trend has remained very similar when observed over time. Figure 2.30 shows the sediment load near the mouth from a typical day each month in 1993 in comparison to 2001 loads. The sum of the annual load was 261 tons/day in 1993 and 296 tons/day in 2001. These loads are within 12% of one another, indicating the sources of loads have changed very little in the past 10 years.

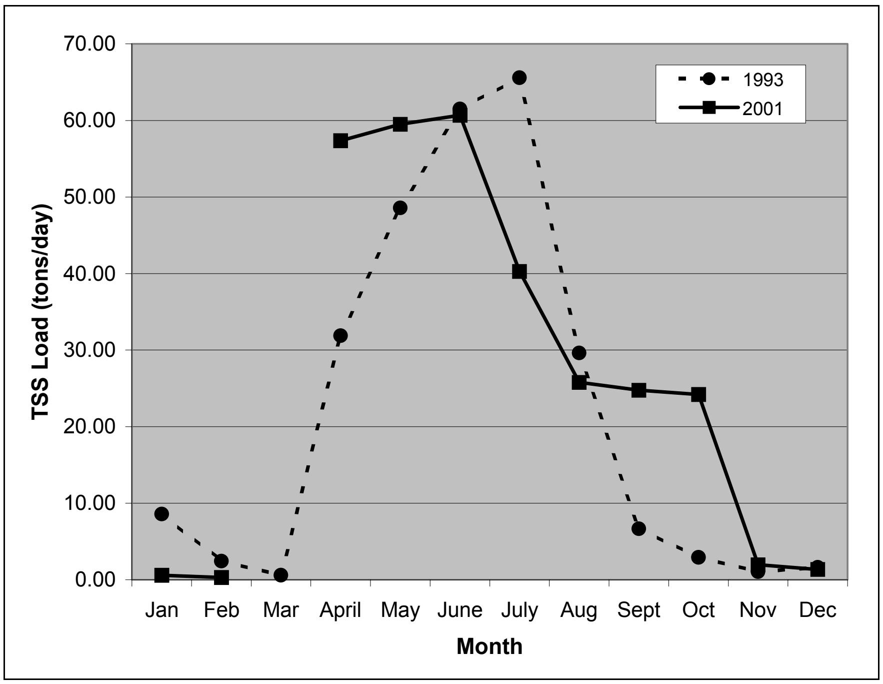

Figure 2.30 Sediment Load Near the Mouth of Jump Creek from a Typical Day each month in 1993 and 2001

Sediment Condition Assessment

As noted in Table 6, the Idaho Water Quality Standard for sediment is narrative, meaning there is not a numeric value against which TSS conditions in Jump Creek can be compared to determine compliance with the standards. However, there is a numeric water quality standard for turbidity, which says that surface water should be not exceed 25 NTU for greater than 10 consecutive days in any applicable mixing zone set by DEQ. The turbidity standard was used as a surrogate to calculate a numeric TSS target in Jump Creek. The TSS target can then be used to determine compliance with the water quality standards. The working assumption is that by decreasing turbidity levels to 25 NTU in Jump Creek there will be a measurable increase aquatic life distribution and abundance. While cold water aquatic life are not as sensitive to turbidity as they are to TSS, MacDonald (1991) suggests that enough sensitively exists to use turbidity as a cold water surrogate.

To assess the TSS condition in Jump Creek as it relates to the water quality standards, the monitoring data were used to develop a regression of TSS as a function of turbidity. The linear regression equation is based on 88 data pairs from the four longitudinally spaced monitoring locations in the stream (Gigray Ranch, at Poison Creek, above Mule Creek and at the railroad trestle). The irrigation season was determined to be the critical period because, as displayed in Figure 2.29, it is when nearly all of the loading to the stream occurs. For that reason, only data from the irrigation season were used to develop the regression. The regression equation describing the relationship between TSS and turbidity in Jump Creek is as follows:

TSS = 2.85(Turbidity) – 6.60

Figure 2.31 shows the regression of TSS as a function of turbidity. The equation has a coefficient of determination (R^2) of .93, which means that 93% of the data variability is explained by the turbidity data. This is a very good coefficient of determination, but is not surprising given that elevated turbidity levels in the water typically occur only during the irrigation season, when TSS concentrations are also elevated. The p-value is 9.33E-53, further indicating the strength of the correlation.

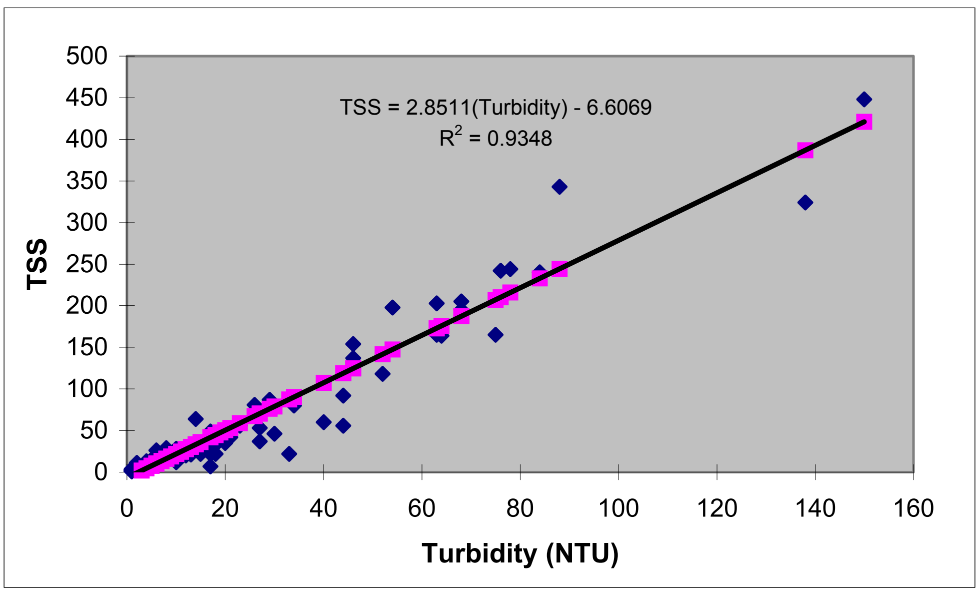

Figure 2.31 Regression of Total Suspended Solids as a Function of Turbidity in Jump Creek

By solving for TSS with a turbidity of 25 NTU, using the above regression equation, an instream TSS target of 65 mg/L was established. By maintaining 65 mg/L TSS in the stream, the turbidity standard of 25 NTU will be met. A water column suspended sediment target is desirable so that a TSS loading balance can be calculated to determine the cumulative impact of the tributaries and drains discharging to Jump Creek. Compliance with the sediment standard could be based on turbidity alone, but calculating turbidity-based loads and load reductions is difficult. With such a strong coefficient of determination, this approach will yield a better mechanism for determining how and where to make reductions.

Figure 2.28 shows that irrigation season (critical period) TSS concentrations are well in excess of 65 mg/L at the Market Road monitoring station. However, if a monitoring station had been located directly below Mule Creek, the data would have shows that instream concentrations exceed 65 mg/L as a result of Mule Creek mixing with Jump Creek. Table 18 illustrates the mixed TSS concentration of Jump Creek above Mule Creek and Mule Creek. The instream concentration increases from 32 mg/L to 157 mg/L as a result of Mule Creek mixing with Jump Creek.

Table 18. Mixed concentration of Jump Creek above Mule Creek and Mule Creek.

	Flow (cfs)	Total Suspended Solids (mg/L)
Jump Creek above Mule Creek	16.3	32.12
Mule Creek	12.11	326.21
Mixed Concentration	--	157.45

Irrigation season TSS concentrations in Jump Creek begin to exceed 65 mg/L directly below Mule Creek and continue to exceed 65 mg/L to the Snake River. As a result, the turbidity standard is not met and a TMDL is necessary for Jump Creek below Mule Creek. It is necessary for all sources, beginning with Mule Creek, to make sediment load reductions during the irrigation season. The TMDL portion of this document will describe the source reductions that must occur.

Fisheries

Fisheries data were available throughout most of Jump Creek. DEQ collected fish data in June 1992 at six locations extending from directly below the falls to directly above the Snake River. Rainbow trout, including juveniles, were located directly below the falls as well as near the mouth of the canyon. Below the canyon, only dace species, redside shiners and sucker species were located. The decline in salmonids was attributed to a loss of instream habitat complexity and a decrease in water clarity (Bauer 1994).

IDFG collected data at two locations directly above and below the Jump Creek Falls in 1994 (Allen 1995). Above the falls, IDFG estimated the density of redband trout to be 17 fish per 100 square meter. Of the 27 fish located, two were young of the year, suggesting that the fish are spawning in the stream. Below the falls, IDFG estimated the density of redband trout to be 58 fish per 100 square meter. A total of 86 fish were located, with 23 being young-of the-year, again indicating that the fish are successfully spawning in the stream. A comparison of the 1994 IDFG fish data to unpublished BLM data collected in 1977 indicates similar fish densities below the falls. Given the unmanaged and isolated nature of these sampling locations, it is unlikely that the fish populations have changed in recent time.

Macroinvertebrates
Macroinvertebrate samples were collected in 1998 in the Sands Basin and directly below Jump Creek Falls as part of BURP. The data from the Sands Basin location are not considered in this discussion because the stream is largely intermittent at that location. Directly below the falls, the SMI rating was 47.7, yielding a condition rating of 2.0 and an SMI-based support status of full support.

Macroinvertebrates were also sampled at four locations in 1993 as part of the Jump Creek SAWQP project. The samples were collected directly below the falls, at Gigray Ranch (near the mouth of the canyon), at Cemetery Road (below Poison Creek) and near the railroad trestle (near the mouth). The macroinvertebrate community showed a downstream decline in community diversity and in desirable taxa such as Ephemeroptera, Plecoptera and Tricoptera (EPT). The decline was attributed to the downstream loss of instream habitat, primarily suitable substrate complexity (Bauer 1994).

Status of Beneficial Uses
The data indicate that excess sediment is contributing to the decline in cold water aquatic life in Jump Creek. Consequently, DEQ recommends preparing a TMDL for sediment with the intent of reducing TSS and turbidity levels and restoring cold water aquatic life to full support. Table 19 summarizes the beneficial use support status for Jump Creek.

Table 19. Status of Beneficial Uses in Jump Creek.

Segment	Designated Uses	Impaired Use	Pollutant Causing Impairment
Mule Creek to Snake River	Cold water aquatic life, primary contact recreation	Cold water aquatic life	Excess Sediment

Reynolds Creek

This section describes the physical, chemical and biological data for the listed segment of Reynolds Creek.

Surface Hydrology
Reynolds Creek is a perennial stream, even though at least 75% of the annual precipitation in the subwatershed occurs as snowfall (Hanson 2000). There is a significant amount of flow data (daily from 1963 to 2002) available from the Reynolds Creek Agricultural Research Station. Data are also available from other sources below the experimental station, but are far less frequent. Figure 2.32 shows the mean monthly discharge for Reynolds Creek at the Reynolds Creek Experimental Watershed (RCEW) outlet gauge, which is located just below Salmon Creek. The period of record is 1963 to 1996. The greatest mean monthly discharge occurs during the month of May due to snowmelt. The outlet gauge provides the best approximation of the flow volume reaching the lower segment of the stream (where the §303(d) listed segment is located) because there are only a few intermittent surface related inputs between the outlet gauge and the lower segment. The influence of groundwater input and losses on streamflow is unknown.

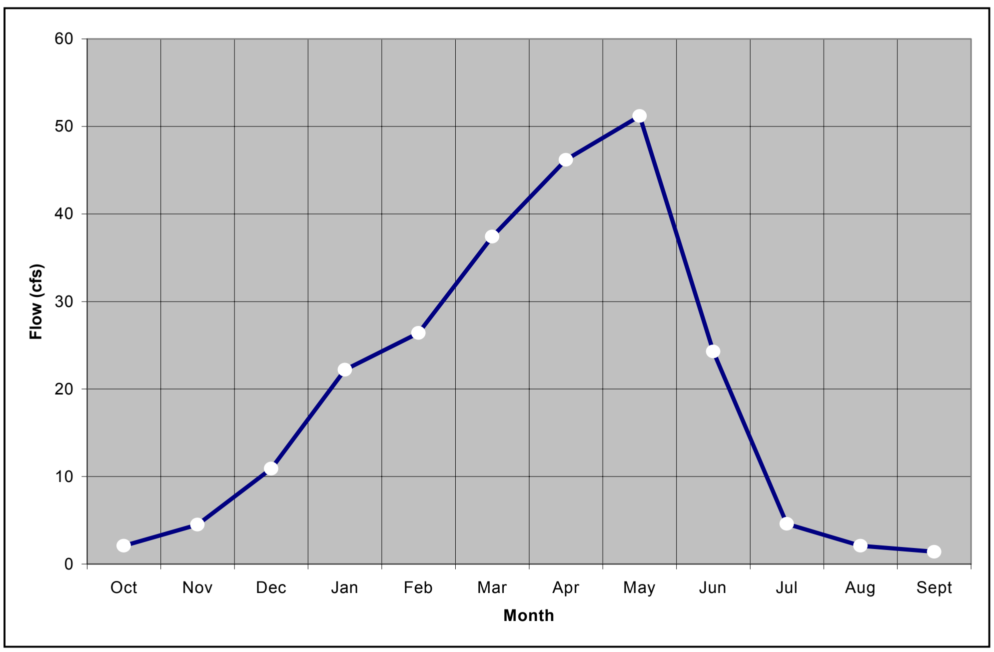

Figure 2.32 Mean Monthly Flow at the Reynolds Creek Experimental Watershed Outlet Gauge, 1963-1996

As mentioned, flow data for Reynolds Creek below the experimental station are far less abundant. BURP data collected on July 1, 1998, show a flow of 5.82 cfs just above Highway 78 and 22.37 cfs directly below the mouth of the canyon. Data collected in early 2002 shows a flow of slightly more than 3.0 cfs at the Highway 78 and 7.0 cfs at the mouth of the canyon.

Note the significant decrease in flow volume between the mouth of the canyon and Highway 78 in both years. Within this 4.9-mile stretch of stream that extends from the mouth of the canyon to the Snake River there are eight registered points of diversion, including the Bernard Ditch. Table 20 lists the diversion names and the cumulative water rights for each. These diversion structures de-water much of the lower segment for agricultural purposes. The total water right for Reynolds Creek during the period of March 15 – November 15 is 104.56 cfs. It should also be noted that the flows shown above were not normal, and may have been due to storm events that had recently occurred.

Table 20. Registered Points of diversion in Reynolds Creek from the mouth of the canyon to the Snake River.

Diversion Name (upstream to downstream)	Cumulative Water Right (cfs)
R. Brandau (East Ditch)	2.40[1]
R. Brandau (West Ditch)	2.40[1]
R.I.D. Lateral (Bernard Ditch)	17.24
Brandau Farms[2]	1.57
West Reynolds Lateral	9.78
H. Brandau	2.20
Young and Foote	15.14
Last Ditch Lateral	6.90

[1]R. Brandau East and West Ditch combined right is 2.40 cfs.
[2]Brandau Farms is also included in the combined R.I.D. Lateral since it can be diverted at either location.

An important feature of the hydrologic regime in Reynolds Creek is the peak discharge (flooding) events. These events have redefined the channel shape as the stream flows through the Snake River plain (Brandau 2002) and, generally speaking, these events account for most of the sediment yield from the Reynolds Creek Research Watershed (Johnson et al. 1974). While experimental station sediment data are not available below the outlet weir, it is reasonable to assume that the same is true regarding Reynolds Creek in the Snake River plain. Table 21 shows the ten highest recorded flows, organized chronologically, at the RCEW outlet gauge. Note that in1982 the flows occur within the same year. These flows were primarily a result of rain-on-snow events (Pierson et. al. 2000). Figure 2.33 shows the impact of a1956 flood on Reynolds Creek in the Snake River plain.

Table 21. Ten highest recorded flows at the Reynolds Creek Experimental Watershed outlet gauge, 1963-1996.

Date	Peak Flow (cfs)	Date	Peak Flow (cfs)
01-31-63	2,331	03-02-72	667
12-23-64	3,850	06-11-77	1,119
01-28-65	1,113	01-11-79	1,662
01-21-69	899	02-15-82	2,082
01-27-70	728	04-11-82	861

Figure 2.33 1956 Flood, Photo Taken Just Above Highway 78

Sediment

The water column sediment data available for Reynolds Creek below the Bernard Ditch is limited to TSS measurements collected by Analytical Laboratories in Boise during 1999, 2000, and 2001. Figure 2.34 shows the monitoring locations. The suspended solids data are shown in Figure 2.35 (ERO 2002). The data suggest that there is essentially no change in suspended material between the mouth of the canyon and Highway 78 and show that concentrations are very low. This is the case because there is very little agricultural return water below the Bernard Ditch. While several of the diversions listed in Table 20 can return water to Reynolds Creek, the water is used to irrigate grass pastures, which are high residue (retain soil well) and typically trap more sediment than they liberate. The stream bottom was visible at the Highway 78 crossing, even at high water, during March, April, May, and June 2002.

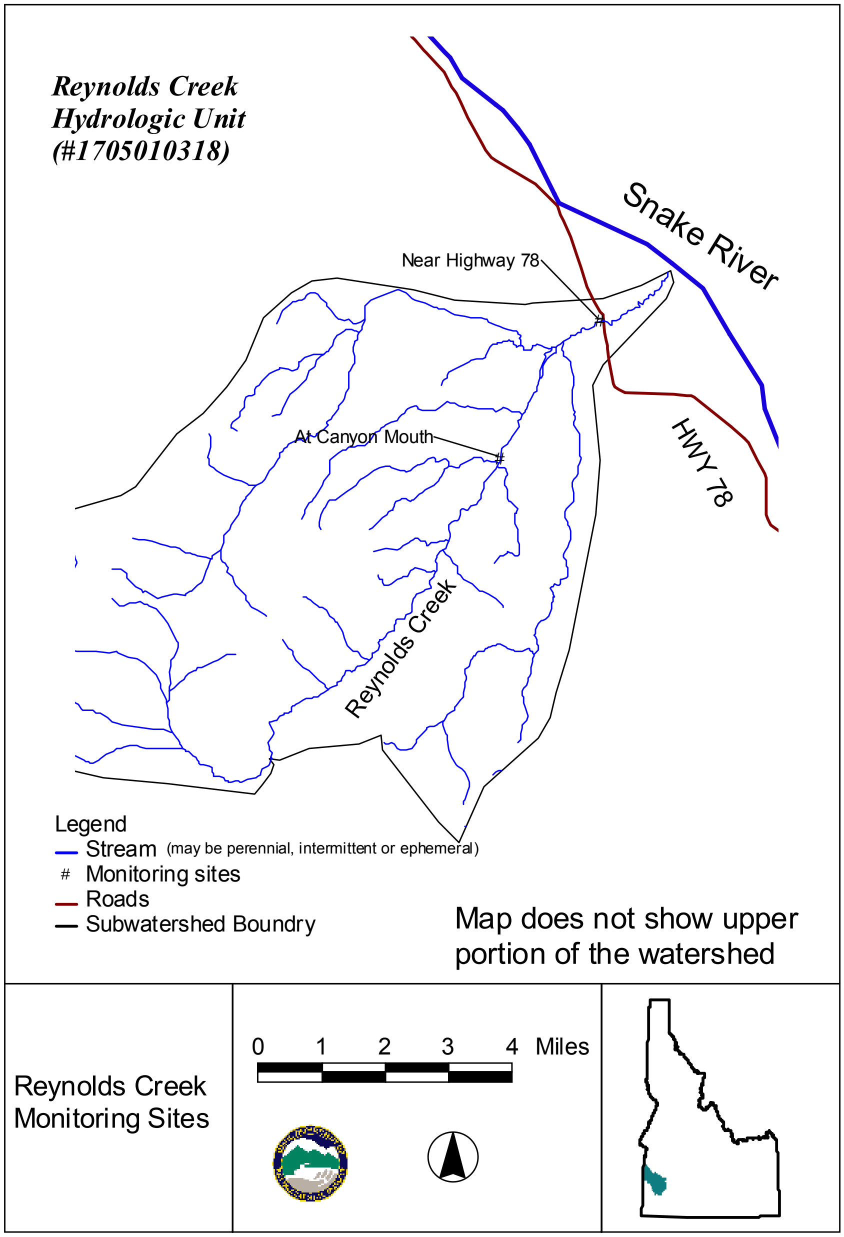

Figure 2.34 Reynolds Creek Monitoring Sites

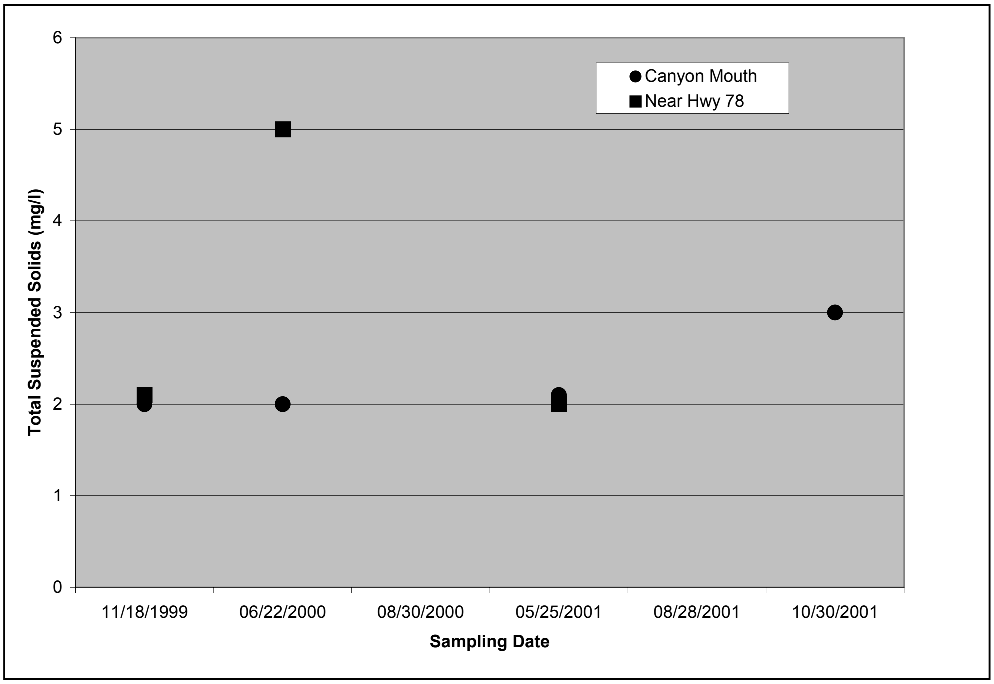

Figure 2.35 Total Suspended Solids Concentrations in Reynolds Creek, 1999 - 2001

Beyond the suspended solids data shown in Figure 2.35, there is no additional water column sediment information available below the RCEW outlet monitoring station. However, because only a few small, canyon-bound tributaries enter Reynolds Creek between the outlet monitoring site and where the stream enters the Snake River Plain, and the stream itself is bound by steep canyon walls, the RCEW data provide a reasonable estimation of suspended sediment conditions throughout the listed segment.

Suspended sediment data are available from the RCEW from 1965 to 1996. Figure 2.36 shows the suspended sediment monthly geometric means for the year 1995, a typical water year. The peak concentration that occurred in May is consistent with the findings of Johnson et al. (1974), in which they concluded runoff events yield most of the sediment in the Reynolds Creek Experimental Watershed. Figure 2.32 shows that for the period of record the highest mean monthly flows occur in May.

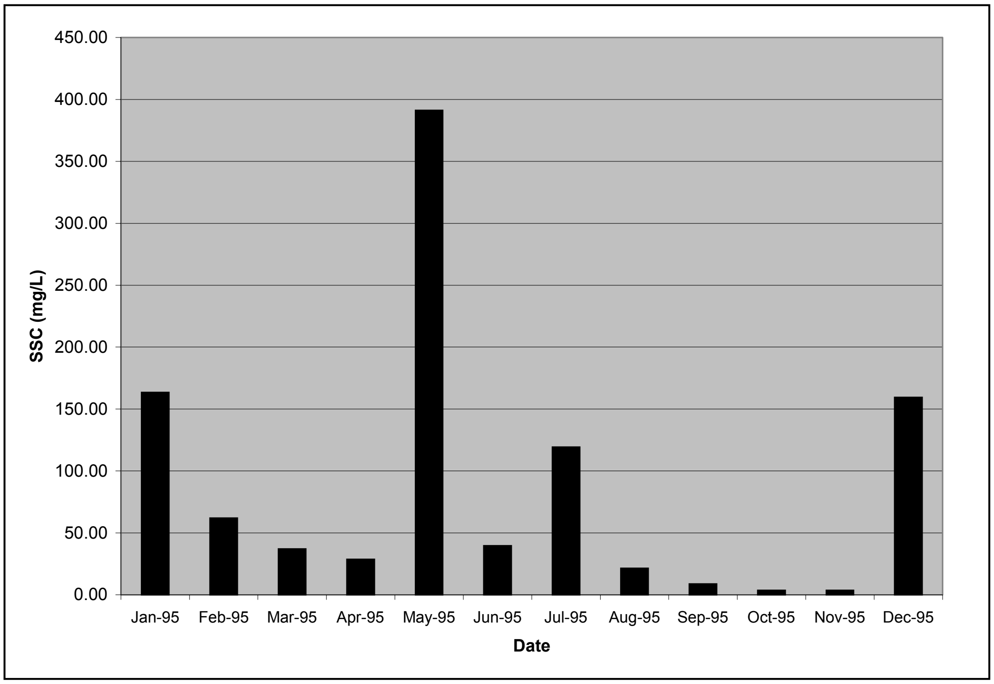

Figure 2.36 1995 Suspended Sediment Monthly Geometric Mean at the Reynolds Creek Experimental Station Outlet Gauge

As can be seen in Figure 2.36, the SSC in Reynolds Creek fluctuate with climate-related precipitation and are not closely linked to the irrigation season (April – September). Sediment concentrations during low flow periods of the year are nearly two orders of magnitude lower than during run-off periods, which include storm events (Pierson et al. 2000). Concentrations increase in the autumn as more precipitation begins to fall. They remain high through January but tend to decrease as snow begins to accumulate. The peak concentrations occur during the peak run-off period and then concentrations decrease and stabilize for the remainder of the year. The peak run-off period in the Reynolds Creek drainage is typically May, but can occur as early as late-March in a warm year. In those years the peak suspended sediment concentrations fluctuate accordingly. The increase in concentration that occurred in July 1995 was likely due to an extended precipitation event.

The data from the RCEW outlet station and land use information for Reynolds Creek below the Bernard Ditch indicate that nearly the entire sediment budget can be contributed to climactic events and the associated run-off, not anthropogenic sources.

Fisheries
No fisheries data were located for Reynolds Creek below the Bernard Ditch. However, anecdotal information from a local landowner indicates that trout have occasionally been harvested from the stream below the Bernard Ditch (Brandau 2002). The presence of young of the year trout, an indicator of spawning success, cannot be documented. Surveys performed in 1997 located wild redband trout above the community of Reynolds (Allen et al. 1998). Idaho Fish and Game fisheries biologists performed these surveys for the Bureau of Land Management and captured and identified 26 wild redband trout including young-of-the-

year fish. These data suggest that redband trout spawn in Reynolds Creek above the Snake River Plain. However, information does not exist to show whether redband trout spawn below the Bernard Ditch.

Aquatic Insects (Macroinvertebrates)
Macroinvertebrate samples were collected from Reynolds Creek at two locations in 1995 and two locations in 1998 as part of the DEQ BURP process. The 1995 data were collected near the community of Reynolds, in the upper portion of the watershed. The 1998 data were collected near Highway 78, in the segment of stream §303(d) listed for sediment. Table 22 shows that SMI score and the associated condition rating for each.

Table 22. Stream macroinvertebrate index (SMI) scores for samples collected from Reynolds Creek in 1995 and 1998.

Site ID	Sampling Location	SMI	Condition Rating	Support Status Based on SMI
1995SBOIA23	Above Reynolds Creek	56.23	3	Full Support
1995SBOIA24	Above Reynolds Creek	55.88	3	Full Support
1998SBOIA24	At mouth of lower Canyon Creek	50.42	2	Full Support
1998SBOIA25	Directly above Highway 78	47.69	2	Full Support

The SMI scores indicate there is a good diversity of aquatic insects in Reynolds Creek. Additionally, the abundance of EPT taxa, an indicator of good water quality, is 38% at the mouth of the lower canyon (1998SBOIA24) and 45% directly above Highway 78 (1998SBOIA25). For the basin in which Reynolds Creek is located, these are acceptable EPT taxa values.

Status of Beneficial Uses in Reynolds Creek
The data indicate that sediment is not impairing cold water aquatic life or salmonid spawning beneficial uses in Reynolds Creek. Consequently, DEQ does not recommend preparing a TMDL for sediment and recommends removing sediment as pollutants of concern in Reynolds Creek from the §303(d) list. Table 23 summarizes the beneficial use support status for Reynolds Creek.

Table 23. Status of Beneficial Uses in Reynolds Creek

Segment	Designated Uses	Impaired Use	Pollutants Causing Impairment
Bernard Ditch to Snake River	Cold Water Aquatic Life, Salmonid Spawning, Primary Contact Recreation	None	None

Sinker Creek

This section describes the physical, chemical and biological data for the listed segments of Sinker Creek.

Surface Hydrology

Sinker Creek is listed for sediment and temperature from below Diamond Creek to the Snake River. This segment of Sinker Creek is de-watered near the Snake River, with the de-watered segment extending from the Snake River to 1.5 miles upstream. Ranch managers report that the creek periodically (some years, but not every year) dries up in the section between Sinker 2 and Sinker 3 (as identified in Figure 2.38). From Diamond Creek downstream to this de-watered section flows typically run between 2-4 cfs during the summer months, as shown in Figure 2.37. The flow is regulated by Hulet Reservoir and irrigation activity. The presence of the reservoir appears to minimize the scouring effect of extreme flow events.

In addition, the effects of beaver ponds can be seen throughout the reach. The ponds act as sediment sinks and also increase channel width by backing water up, causing increases in temperature. These ponded areas, the reservoir, flow alteration and high air temperatures all contribute to high instream temperatures during the critical period from June 21 through September 21. As part of implementation the effects of beavers will be more quantitatively documented. However, in the reach between Diamond Creek and 1 mile below Hwy 78, DEQ staff documented 30 ponded areas. While many of these areas were not being actively used, the water was ponded up and the width of the stream greatly increased by the dams. Temperature increases are expected in these areas. In addition, the riparian area in a portion of these areas is suboptimal due to heavy beaver use. Beavers, in general, are beneficial to riparian area, however in the short term, they may put extreme pressure on the riparian area. There is livestock grazing in this area, in general from 2-4 weeks in March with infrequent sporadic light use thereafter.

Stream surveys by DEQ personnel showed that overall the system displays good biological integrity with a few isolated problem areas.

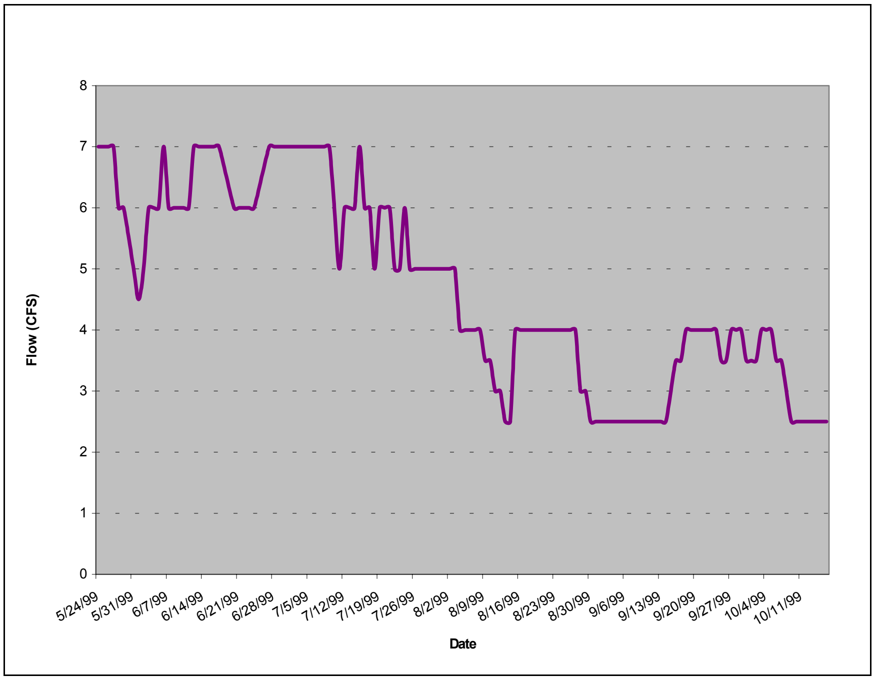

Figure 2.37 Water Year 1999 Flow, Sinker Creek at Joyce Ranch (T3S R1W S30)

Temperature and Other Physical Data

Thermographs were placed at three locations in Sinker Creek by DEQ staff in the winter of 2002, as shown in Table 24 and Figure 2.38. Temperature readings were collected every hour and 12 minutes through mid-September in order to characterize temperature trends and temperatures during the hottest part of the year. The Sinker 3 thermograph serves as the compliance point for temperature since that logger was directly above the diversion. Below the diversion, flows fall below 1 cfs by the end of June and remain such through the rest of the irrigation season.

Table 24. Sinker Creek thermograph location.

Thermograph	Location
Sinker 1	T3S R1W S 30
Sinker 2	T3S R1W S 21
Sinker 3	T3S R1W S 13

Data from July 11-13 were above the maximum weekly maximum temperature (MWMT) (101.73 °F using Grand View station National Climactic Data Center data from 1971-2000, following WBAG II (Grafe et al 2002) protocol) and those data were excluded from the analysis. During the critical period from June 21-September 21, at the compliance point (Sinker 3), 20% of the days had water temperatures above the 19 °C maximum daily average as shown in Figure 2.40. These periods corresponded to both the periods of highest ambient air temperatures and lowest flows. Sinker 1, about 2 miles below the top of the listed reach, met water quality standards as shown in Figure 2.39. There are over 30 ponded areas due to beaver dams between Sinker 1 and Sinker 2. These areas resulted in overall warmer temperature increases than between Sinker 2 and Sinker 3. In fact, at certain times of the summer, Sinker 3 showed cooler temperatures than Sinker 2. This may be because of the flow contribution by springs below Sinker 2.

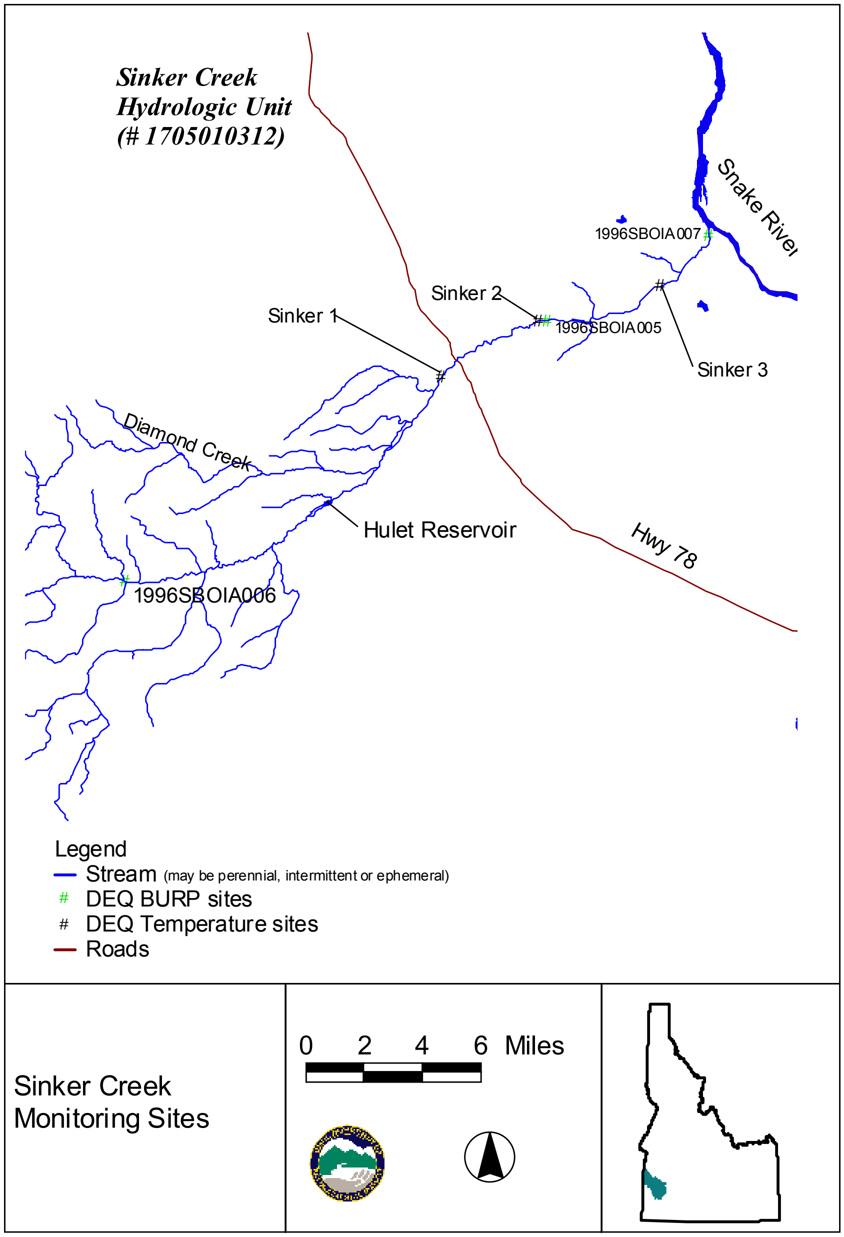

Figure 2.38 Sinker Creek Monitoring Sites

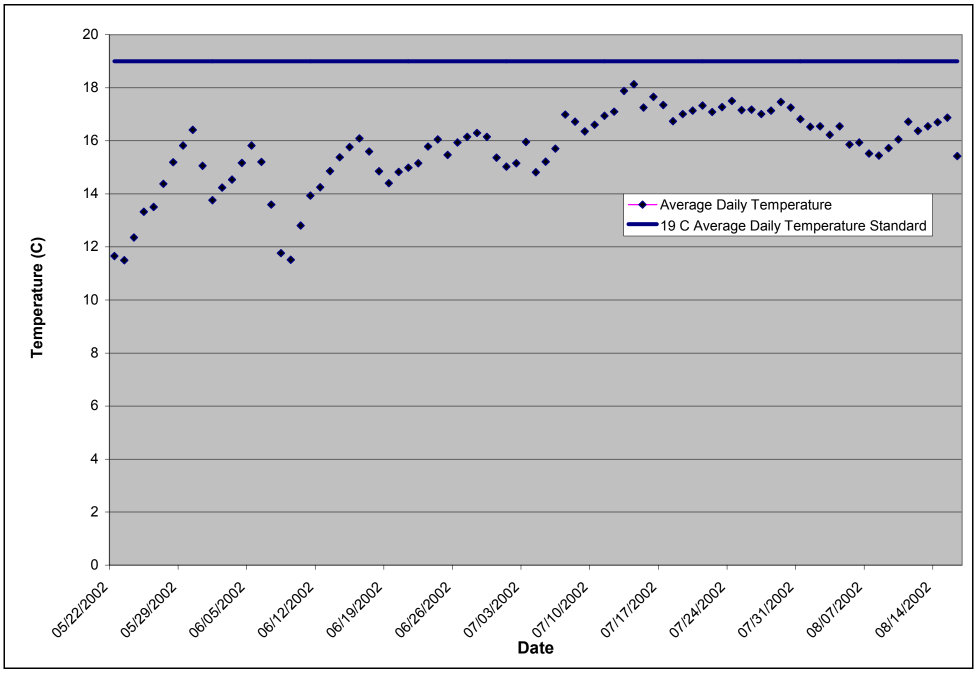

Figure 2.39 Comparison of Sinker Creek Average Daily Temperatures at Sinker 1 to Cold Water Aquatic Life Maximum Daily Average Temperature Standard

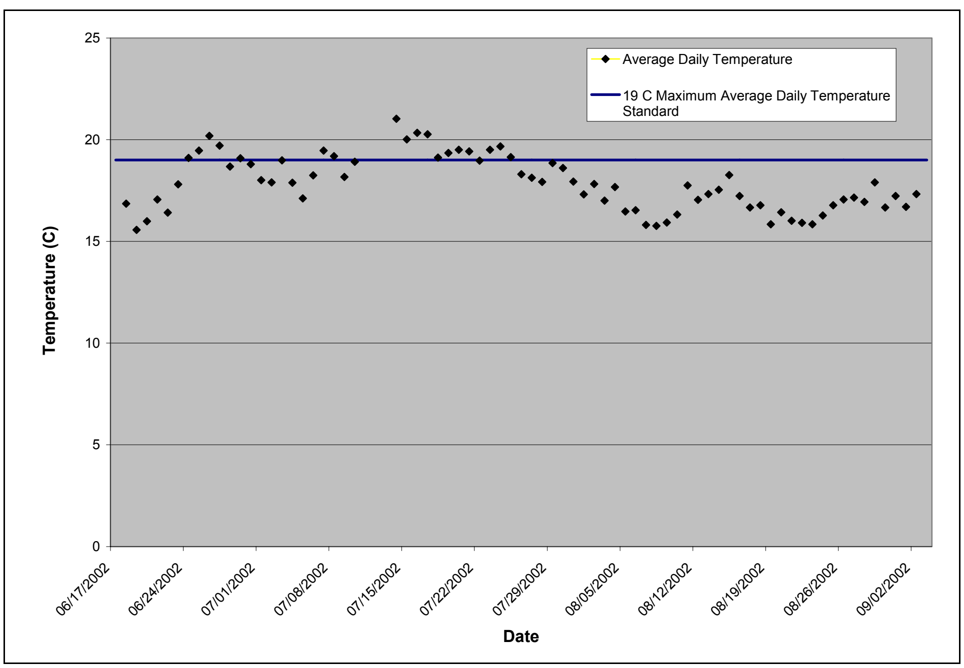

Figure 2.40 Comparison of Average Daily Temperature at Sinker 3 with Cold Water Aquatic Life Maximum Average Daily Temperature Standard

Sediment

A riparian survey by the Idaho Soil Conservation Commission showed high impacts to the riparian area in the listed section. However, sediment surveys of Sinker Creek south of Highway 78 showed little impact to the channel, and thus, to aquatic life from grazing activity. The BLM has collected proper functioning condition data for Scotch Bob Creek (a tributary to Sinker Creek) and the upper reaches of Sinker Creek. The proper functioning condition data indicate that the riparian areas in these sections are in unsatisfactory condition. PFC condition ratings may indicate either an upward, static or downward trend. An analysis of the riparian condition of pastures showed that the middle section of the listed reach was in satisfactory condition. The parts of the reach closer to the mouth, which get significantly de-watered, were listed as unsatisfactory (BLM-Owyhee RMP 1999).

Based on this information, DEQ determined that the majority of sediment delivery was from instream channel erosion in the listed section. Hulet Reservoir above the section effectively acts as a sediment sink for the majority of sediment delivered from upstream.

DEQ staff conducted channel erosion inventories in 2002 to assess sediment loading from instream erosion. In order to extrapolate measurements to the rest of the listed reach, the inventory sections were delineated by land use. Representative segments were evaluated for stream erosion and then those results extrapolated to the rest of the system. Appendix H contains the bank erosion inventory worksheets and the TMDL section of this document contains further discussion of the results. Additional bank stability data collected as part of DEQ's BURP program are located in Table 25.

Gully erosion occurs in the Sinker Creek subwatershed due to the combination of steep terrain, erodible soils, and occasional severe rain events. Gullies that were readily apparent in aerial photos were assessed in the field by DEQ staff in order to quantify sediment contribution. One gully was identified as a sediment contributor from aerials but a ground survey showed that an earthen berm had been constructed at the bottom to catch water and sediment. While not stopping the gullying action, the berm was stopping contribution of sediment to Sinker Creek and was therefore not assessed. Any land management practices exacerbating the gullying action need to be examined during implementation to prevent a huge bolus of sediment laden water from either going around the berm or breaking through it. The berm itself appears to be made up of largely unconsolidated soil material.

Table 25. Sinker Creek Bank Stability

Data Type[1]	Year Collected	Site	% Fines	Bank Stability
BURP SMI/Upper Sinker Creek 96SWIROA6	6/6/96	Lat: 43 03 51.70 Long: 116 38 3.70	28.3%	100%
BURP SMI/Middle Sinker Creek 96SWIROA5	6/6/96	Lat: 43 09 14.94 Long: 116 26 58.09	52.2%	99%
BURP SMI/Lower Sinker Creek	6/6/96	Lat: 43 10'58.98 Long: 116 22 44.38	78.4%	50%

[1]BURP = Beneficial Use Reconnaissance Program, SMI = stream macroinvertebrate index
Shading indicates electrofishing took place in listed section of Sinker Creek.

Fisheries

Fisheries data show spawning redband trout populations above Hulet Reservoir. Below the reservoir, in the §303(d) listed section, no young-of-the-year redband have been found. This is likely due to a combination of factors relating to flow alteration, lack of spawning habitat due to stream characteristics, and barriers to fish migration due to Hulet Reservoir. Table 26 show the fisheries data for Sinker Creek.

Table 26. Fisheries Data for Sinker Creek

Data Type[1]	Date	Location	Fish
IDFG	Summer 1976	Sinker Creek at Silver City Road Crossing	7 redbands/100m^2
DEQ-BURP	6/14/95	Sinker Creek above Hulet Reservoir T4S R2W S15 T4S R3W S24	Redbands (80-210 mm) Dace
DEQ-BURP	6/15/95	Sinker Creek, 0.5 miles below Highway 78 T3S R1W S29	2 redbands (197 and 223 mm), dace, bridgelip sucker
IDFG	August 1996	Sinker Creek at Silver City Road Crossing	34 redbands/100 m^2
IDFG	Spring 2001	T3S R1W S29	Redbands (age 2 and older)
IDFG	Summer 2002	T3S R1W S29	2 redbands (no young-of-the-year)

[1]IDFG = Idaho Department of Fish and Game, DEQ-BURP = Department of Environmental Quality Beneficial Use Reconnaissance Program
Shading indicates electrofishing took place in listed section of Sinker Creek.

Macroinvertebrates

No coldwater indicators were found in any of the macroinvertebrate samples collected by DEQ. The macroinvertebrate index score for middle Sinker Creek was in the 10th-25th percentile of the expected reference condition for streams in this basin while upper Sinker

Creek was above the 25th percentile of reference condition. Lower Sinker Creek was below the minimum threshold of reference condition but these macroinvertebrate results are of little utility for cold water aquatic life use determination since that section of stream is normally dry during the critical period from June 22 to September 21. The macroinvertebrate sampling occurred prior to the critical period for this section of stream. Table 27 shows the macroinvertebrate data for Sinker Creek.

Table 27. Macroinvertebrate data for Sinker Creek.

Data Type[1]	Year Collected	Site	SMI[2]
BURP SMI/Upper Sinker Creek 96SWIROA6	6/6/96	Lat: 43 03 51.70 Long: 116 38 3.70	67
BURP SMI/Middle Sinker	6/6/96	Lat: 43 09 14.94 Long: 116 26 58.09	46.74
BURP SMI/Lower Sinker Creek	6/6/96	Lat: 43 10' 58.98" Long: 116 22' 44.38	19.65

[1]BURP = Beneficial Use Reconnaissance Program, SMI = stream macroinvertebrate index
[2]Stream macroinvertebrate index
Shading indicates electrofishing took place in listed section of Sinker Creek.

Status of Beneficial Uses
Initially, the 1996 BURP data used in the water body assessment process indicated full support of beneficial uses in the upper and middle reaches. In the lower reach the assessment process indicated that beneficial uses were not fully supported. However, it is important to note that this section is de-watered during the critical period. Low macroinvertebrate scores are to be expected.

While Sinker Creek is listed for salmonid spawning, there is no evidence of redband spawning in this reach. Young-of-the-year have not been found in past electrofishing efforts and only a few adult redbands were found. Idaho Department of Fish and Game fisheries data show redbands higher in the watershed above Hulet Reservoir.

The Idaho Department of Fish and Game has determined that the listed section of Sinker Creek has not historically, nor is currently, a spawning habitat due to gradient and temperature regimes (Dillon 2002). IDFG further states that this section of Sinker Creek is currently and has also in the past been primarily a migratory corridor (Appendix F). The reservoir and the various diversions also serve as barriers to fish migration to the downstream section for spawning. The storage of water in the reservoir as well as the de-watering of the stream result in higher water temperatures, but it is unlikely that changes in management activities would result in lowering water temperatures to salmonid spawning criteria due to the overriding effect of high ambient air temperatures and flow alteration activities.

Since salmonid spawning does not occur in the listed section of Sinker Creek, the temperature standard for salmonid spawning will not be applied and instead the cold water temperature standard will apply throughout the year. The lower end of Sinker Creek (Sinker 2 thermograph) has shown temperature violations and thus, cold water aquatic life uses are not fully supported. Salmonid spawning occurs in the upper reach (the unlisted section) and IDFG data showed an increase in young of the year populations in their 1995 fish surveys, indicating support of spawning in the upper reaches (IDFG 1997).

Overall, Sinker Creek supports beneficial uses in some areas and not in others. Sediment is above the 28% fines target and the temperature standard is not met in the lower reaches.

Conclusions
The data show that aquatic life beneficial uses in Sinker Creek are not fully supported and a TMDL is recommended for temperature and sediment.

Squaw Creek

This section describes the physical, chemical and biological data for the listed segments of Squaw Creek.

Surface Hydrology
Squaw Creek is listed from headwaters to mouth for temperature. Squaw Creek goes dry or reaches a base flow of less than 1 cfs before or during July every year by the time it reaches the "Cut-off Road" below the canyon (Squaw 2, see Table 28 for location) (DEQ 1995, 2002). In 2002, flows dropped below 1 cfs before June 21 (the start of the critical period for cold water aquatic life). In the upper reaches, perennial pools exist and there are refugia within the stream that will support fish populations. A private reservoir in the upper reach of Squaw Creek has been stocked in the past, resulting in fish in the upper reach. Low flows make Squaw Creek more susceptible to peak temperatures due to the influence of both air temperature and solar radiation. Riparian improvements would provide some benefit to stream quality but not to a large enough degree to prevent heating of the water above the standard during times of extremely hot weather. Squaw Creek is proposed for de-listing of temperature because beneficial uses are supported when there is water above 1 cfs.

Temperature
In spring 2002, temperature loggers were installed by DEQ in five locations in Squaw Creek from close to the headwaters to within 0.5 miles of the Snake River. The locations of the temperature loggers are shown in Table 28. When there was water above 1 cfs in the creek, average daily temperatures were below 19 °C. The Squaw 3 thermograph was used as a compliance point because this portion of the creek appears to have perennial flow, while Squaw 2 was completely dry by mid-July. As shown in Figure 2.41, temperature standards are met in Squaw Creek when there is sufficient flow and, thus, a TMDL is not necessary.

Table 28. Temperature logger location in Squaw Creek.

Temperature Logger I.D.	Location
Squaw 1	T2N R4W S35
Squaw 2	T1N R4W S8
Squaw 3	T1N R5W S25
Squaw 4	T1S R5W S13
Squaw 5	T1S R5W S30

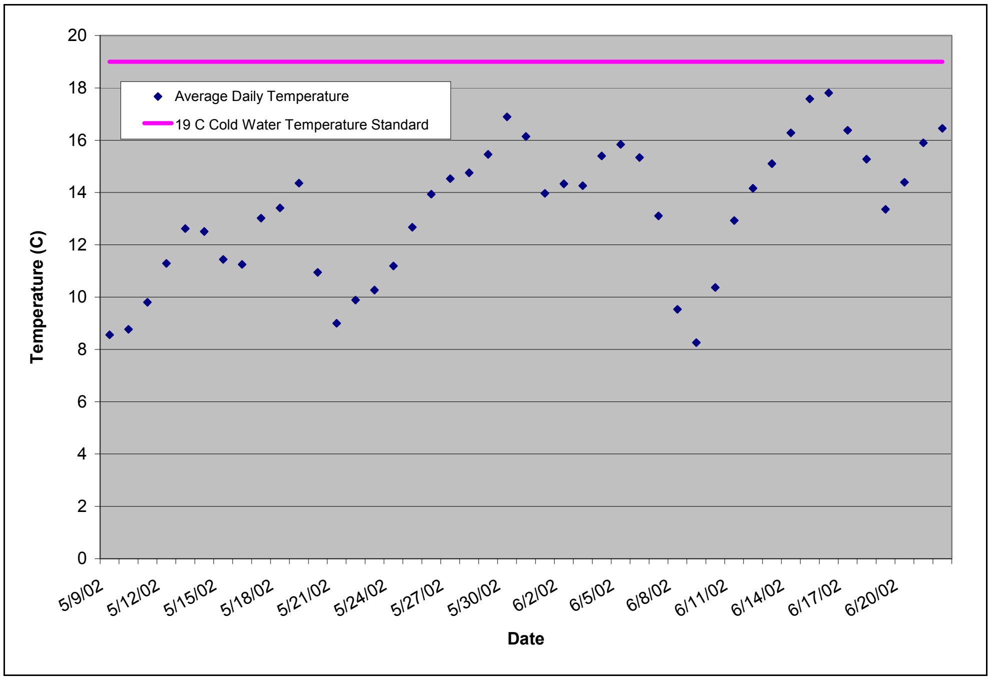

Figure 2.41 Average Daily Temperatures in Squaw Creek at Squaw 3 Thermograph

Sediment
The segment of Squaw Creek listed for sediment (3.9 km upstream or river to mouth) runs primarily through pastureland and uncultivated scrub (rangeland). Low sinuosity and low gradient characterize this reach. The upper half of this section is largely dry after early June due to lack of flow: water subs out into the gravels and is diverted out of the reach. Water remains in the lower half due to contributions from springs and pasture runoff. However, the flow is typically less than 1 cfs. Flow had already dropped to 0.16 cfs in early May 2002.

Instream channel erosion was not considered since generally the creek is dry or less than 1 cfs except during peak runoff events. There is no agricultural return water diverted back into the creek. Most of the irrigation in this listed reach of Squaw Creek is on permanent pasture and is done primarily by sprinkler. Flood irrigation takes place early in the year when there is adequate runoff to fulfill the water right and water returns to the creek via subsurface laminar flow and overland flow. The runoff from pastures is generally not sediment-laden due to the filtering action of the plants. Suspended sediment concentration samples were taken and the results are shown in Table 29.

Table 29. Total suspended solids concentrations in Squaw Creek at Highway 78.

Sampling Date	Suspended Sediment Concentration (mg/L)
7/17/02	15
8/2/02	8
8/15/02	9.2
9/4/02	4.9

Suspended sediment concentration levels are far below the maximum 50 mg/L target in place on the Snake River. This target is based on work by Newcombe and Jensen (1996) and is protective of juvenile as well as adult salmonids. Thus, this target is protective of the presumed cold water beneficial uses in Squaw Creek. Sediment is not impairing beneficial uses in this reach.

Conclusion
DEQ proposes to de-list Squaw Creek for sediment and temperature; a TMDL is not required.

Succor Creek

This section describes the physical, chemical and biological data for the listed segments of Succor Creek. For purposed on analyzing and discussing the data, Upper Succor Creek is defined as the headwaters to the Oregon Line. Lower Succor Creek is defined as the Oregon Line to the Snake River. Tables 2.43 and 2.44 show the boundaries of each.

Surface Hydrology
In most years Succor Creek is perennial in both the upper and lower segments. The upper segment is considered perennial due to the presence of naturally occurring pools that support aquatic life (as per the Idaho Water Quality Standards). However, in normal water years the stream contains no discernible flow between the pools after the spring run-off period. Figures 2.42 and 2.43 show pictures of the stream as it typically appears between the perennial pools. There are four adjudicated diversions above Succor Creek Reservoir. Otherwise, the hydrology of upper Succor Creek has not been significantly modified over time. Below the reservoir, the stream flows continuously due to discharge from the reservoir. Although in 1992, the driest year on record in many portions of Idaho, the stream was dry below the reservoir. Lower Succor Creek has been hydrologically modified for agricultural related purposes. Similar to Jump Creek, the soils in the subwatershed became saturated as the lands adjacent to the stream were irrigated as cropland. As irrigation continued, the ground water level increased and began to interfere with soil and crop health. In response, drains were constructed and the existing channel was deepened to drain the excess groundwater.

There is not a significant amount of flow data for lower Succor Creek, but enough exists to accurately characterize the stream's seasonal flow fluctuation in the segment. Figure 2.44 shows the typical discharge rates in lower Succor Creek near Homedale (IDA 2001). The hydrograph is typical for a system that is influenced by the irrigation season (April–September). The base flow period extends from November through February. The flow increases in March and April as spring run-off occurs and irrigation water is added to the system. Flows are relatively similar throughout the summer and eventually return to base flow as the irrigation season comes to an end.

Due to the irrigated nature of the lands adjacent to lower Succor Creek, a network of canals, laterals, and diversions exist within the system. Within the 5.4-mile stretch of stream that extends from the Oregon line to the Snake River, there are approximately five agricultural return drains and one major withdrawal (Patch Canal). Sage Creek, which enters lower Succor Creek 1.6 miles upstream from the Snake River, is the largest of the agricultural return drains. Lower Succor Creek is not de-watered to the extent of some other tributaries in the basin. All of the water removed from lower Succor Creek is used for agricultural purposes.

Figure 2.42 Upper Succor Creek below Cottonwood Creek, October 17, 2003

Figure 2.43 Upper Succor Creek below Cottonwood Creek, October 17, 2003

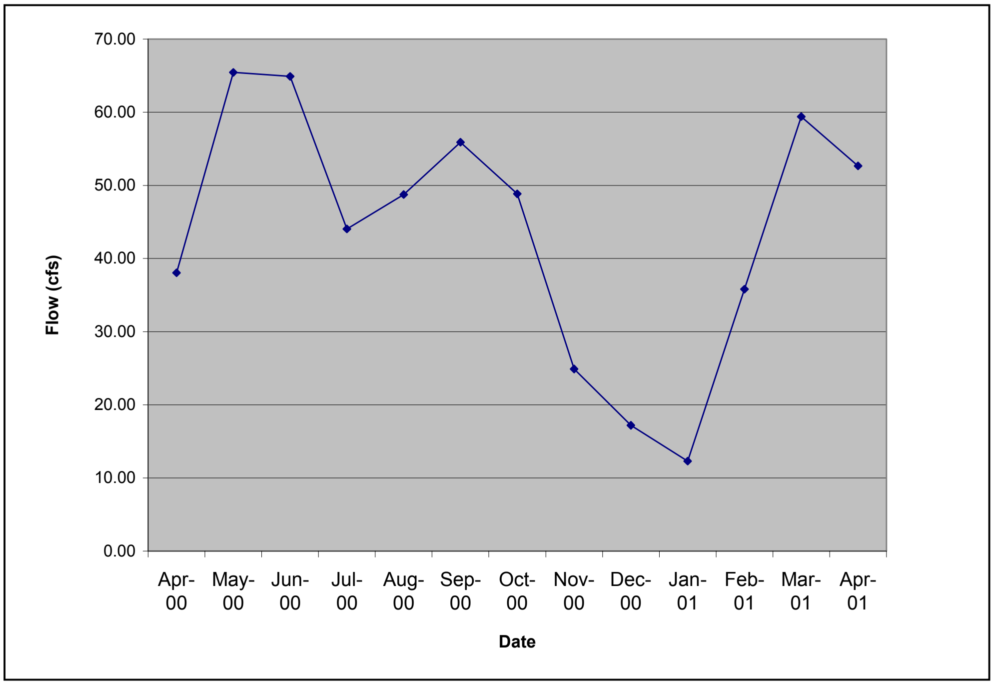

Figure 2.44 Typical Monthly Flows in lower Succor Creek Near Homedale (2000-2001)

The flow data available for upper Succor Creek is limited to flows collected as part of the DEQ BURP surveys in various years and 2002 field surveys. Table 30 shows the flows at selected locations in upper Succor Creek during 1994, 1995, and 2002.

Table 30. Flows in upper Succor Creek.

Location	Date	Flow (cfs)
0.92 miles upstream from reservoir	6/2/94	7.31
0.92 miles upstream from reservoir	6/7/95	31.5
0.92 miles upstream from reservoir	6/19/02	14.77
0.92 miles upstream from reservoir	8/21/02	0
6.70 miles upstream from reservoir	6/2/94	6.32
6.70 miles upstream from reservoir	6/6/95	27.3
6.70 miles upstream from reservoir	8/1/95	0.43
9.70 miles upstream from reservoir	5/20/02	19.67
9.70 miles upstream from reservoir	7/1/02	2.24
9.70 miles upstream from reservoir	8/21/02	0

As illustrated in Table 30, the flows in upper Succor Creek are largely influenced by the water year. The flow directly above the reservoir was 7.31 cfs in June 1994, a year of low snow pack. The following year (June 1995), the snow pack was much higher and the subsequent stream flow was nearly four times that of 1994. This wide range of annual flow conditions is typical for streams in Owyhee County.

Succor Creek Reservoir (located in upper Succor Creek)
Succor Creek Reservoir is located in Idaho approximately 4.4 miles upstream of the Oregon border. Completed in 1979, the reservoir was constructed primarily to hold water late into the growing season for agriculture below the reservoir. The capacity of the reservoir is 6,400 acre-feet and in most years, the reservoir reaches capacity. Active withdrawal typically begins in May or June as the need for water below the reservoir becomes necessary; however, the dam construction allows for open spill from the surface of the reservoir when water is not being withdrawn. The active withdrawal point in the dam is near the bottom, although the exact distance from the top of the dam is unknown. The water depth at the dam during full pool is between 80 and 90 feet. Normally, a 40-foot minimum pool is kept throughout the year, unless the pool is reduced to maintain the headgate. Flow data provided by the Succor Creek District Improvement Company shows that an average inflow between 5/27/02 and 6/23/02 of 14.18 cfs. This flow closely corresponds with measurements taken by DEQ on 6/19/02. The flow was 14.77 cfs less than a mile above the reservoir. The Succor Creek District Improvement Company data also show an average reservoir outflow of 42.26 cfs for the period of 5/27/02 to 8/16/02. These data illustrate the managed, unnatural flows that occur below the reservoir.

Water Column Data
DEQ and the Idaho Department of Agriculture (IDA) have collected water column data over the past three years. The water column monitoring locations have primarily been below the Oregon State line on lower Succor Creek while the temperature and habitat (sediment) locations have been above the Oregon State line in upper Succor Creek. Figures 2.45 and 2.46 show the monitoring locations. Note that Succor Creek originates in Idaho, flows into Oregon and then re-enters Idaho near Homedale. The monitoring data from directly below the reservoir in Figure 2.45 consists only of instantaneous temperature data used to populate the SSTEMP temperature model used to develop the temperature TMDL.

Bacteria (E. Coli)
While bacteria is not a §303(d) listed pollutant in Succor Creek, there is a significant amount of recent data indicating that *E. Coli* is in excess in the lower Succor Creek (Oregon State line to Snake River). The IDA collected *E. Coli* data throughout most of 2000 and into 2001. The data were collected above and below Sage Creek, which enters lower Succor Creek 1.6 miles upstream from the Snake River. Data were also collected from Sage Creek. There are no data available for upper Succor Creek.

Figure 2.47 shows the *E. Coli* concentrations in lower Succor Creek above and below Sage Creek. All but ten samples exceed the instantaneous criterion of 406 organisms/100 mL. The geometric mean could not be calculated because five samples were not collected over a 30-day period. However, the magnitude of the *E. Coli* concentrations and the consistency with which the exceedances occur (all but ten samples exceeded the criterion) suggest that had the data been collected the geometric mean criterion (126 organisms/100 mL) would likely have been exceeded.

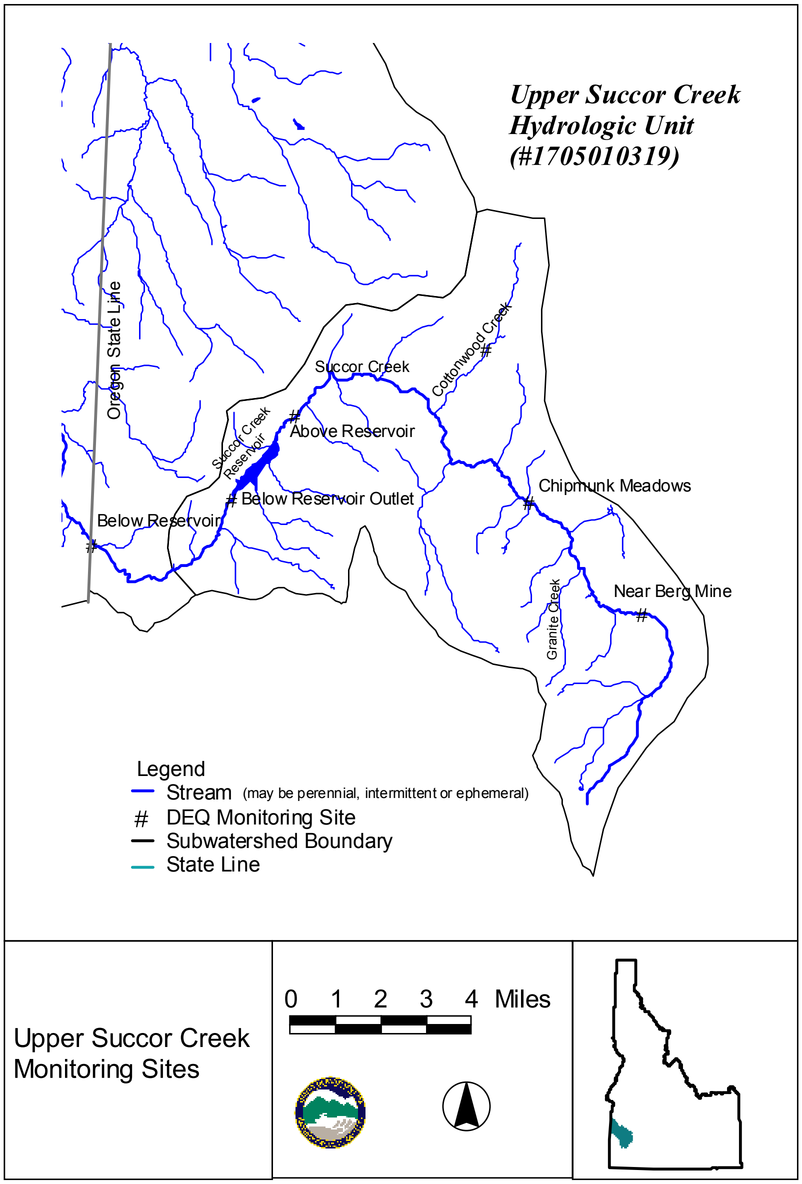

Figure 2.45 Upper Succor Creek Temperature Monitoring Sites

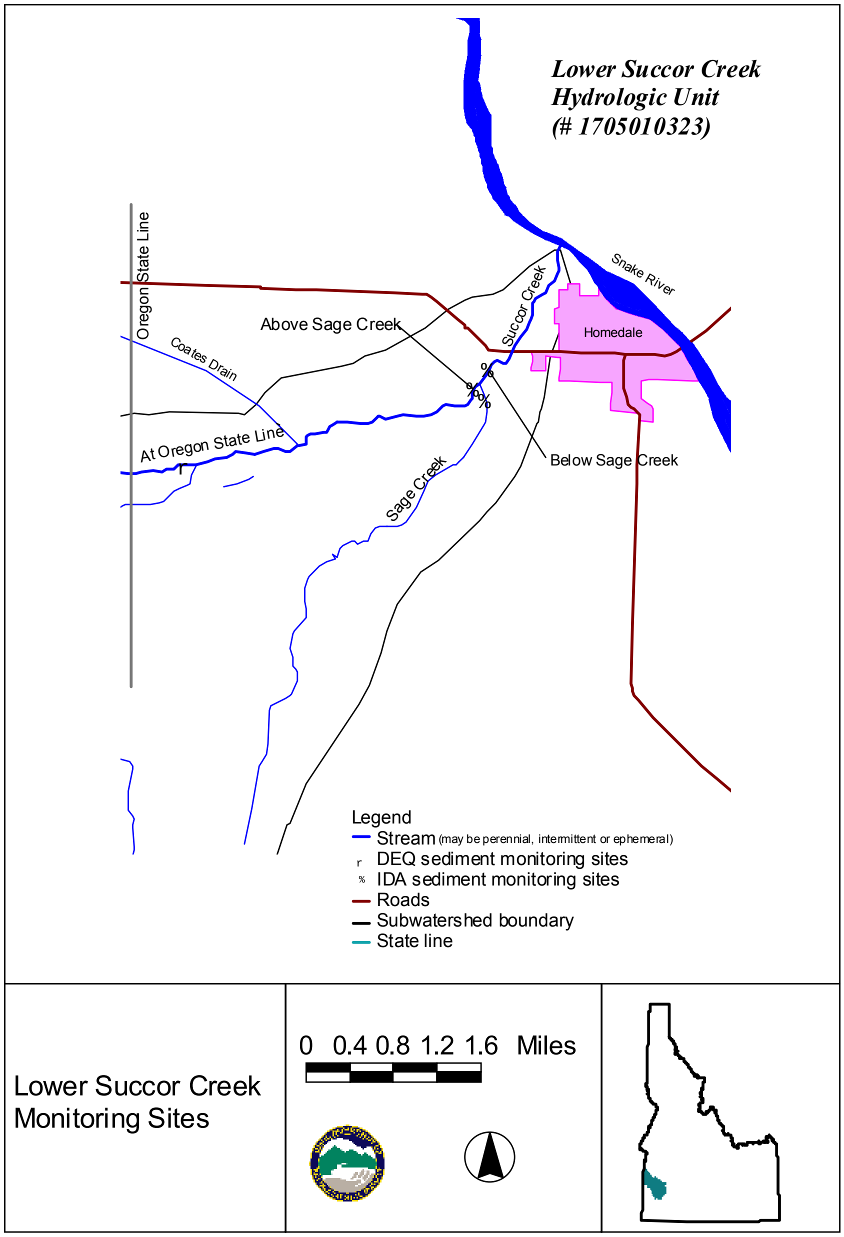

Figure 2.46 Lower Succor Creek Sediment Monitoring Sites

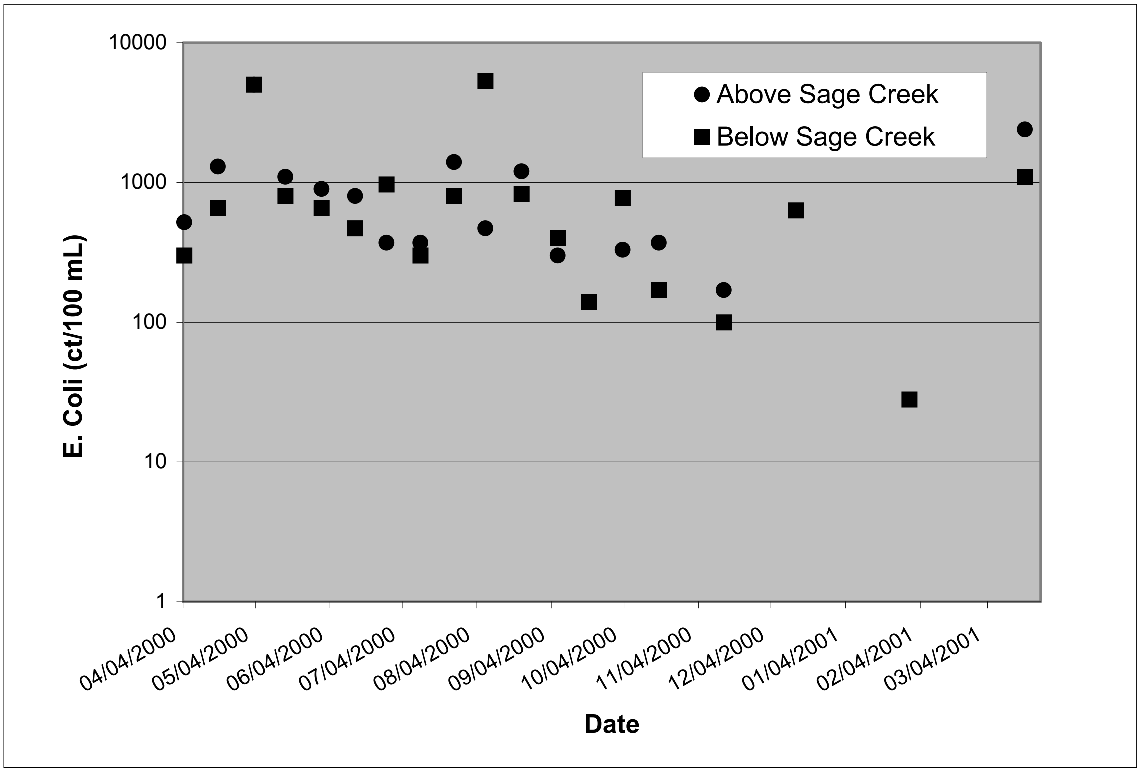

Figure 2.47 *E. Coli* Concentrations in lower Succor Creek, Above and Below Sage Creek

In August 2001, DEQ collected *E. Coli* samples near Homedale as part of the BURP program. Four samples were collected over a 17-day period starting at the first of the month. Again, five samples were not collected over 30 days, but the geometric mean of the four samples collected over 17 days was 794 organisms/100 mL. Even if the fifth sample were to have been 0 organisms/100 mL, the geometric mean would still have been greater than the 126 organisms/100 mL standard. The concentrations of the first four samples were 580; 580; 3,700; and 320 organisms/100 mL. Based on these concentrations, it seems unlikely that the fifth sample would have been even close to 0 organisms/100 mL.

Sediment

The IDA collected water column sediment data from lower Succor Creek and Sage Creek in 2000 and into 2001 in support of the Succor Creek constructed wetlands project. The sediment parameter sampled was TSS. In addition, in 2002 DEQ collected irrigation season TSS data directly below the Oregon line. The sediment sample sites can be seen in Figure 2.46. There are no water column sediment data available from upper Succor Creek, but visual surveys of the water during the 2002 field season suggest that water column concentrations are low above the reservoir. At all locations the stream bottom was visible, even during the spring runoff period. Figure 2.48 shows a dated photograph of the water column and substrate near Berg Mine. Note the good water clarity and good distribution of substrate material.

Figure 2.48 Water Column and Substrate Quality near Berg Mine on May 20, 2002

As shown in Figure 2.49, the irrigation season sediment load from Sage Creek has a marked effect on the TSS concentration in lower Succor Creek near Homedale. Directly above Sage Creek, the average irrigation season concentration is 22 mg/L. Below Sage Creek, the concentration increases to 83 mg/L. The monitoring locations are located directly above and below Sage Creek. Therefore, the increase in concentration below Sage Creek can be primarily attributed to Sage Creek. The TSS loads follow the same trend as the concentrations, as illustrated in Figure 2.50.

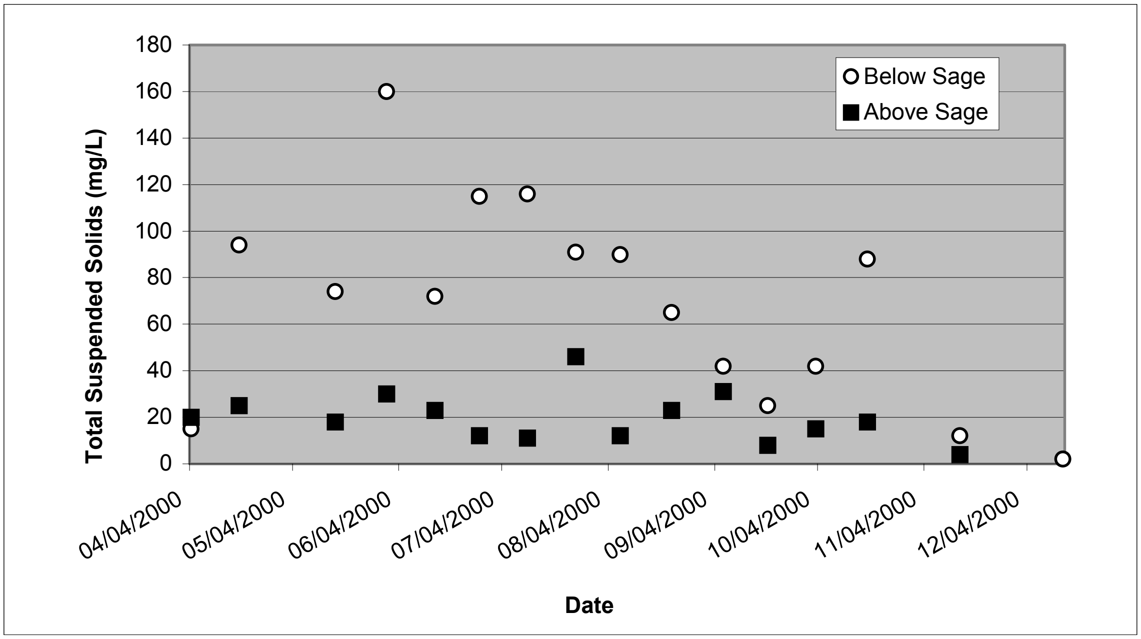

Figure 2.49 Total Suspended Sediment Concentrations in lower Succor Creek Above and Below Sage Creek

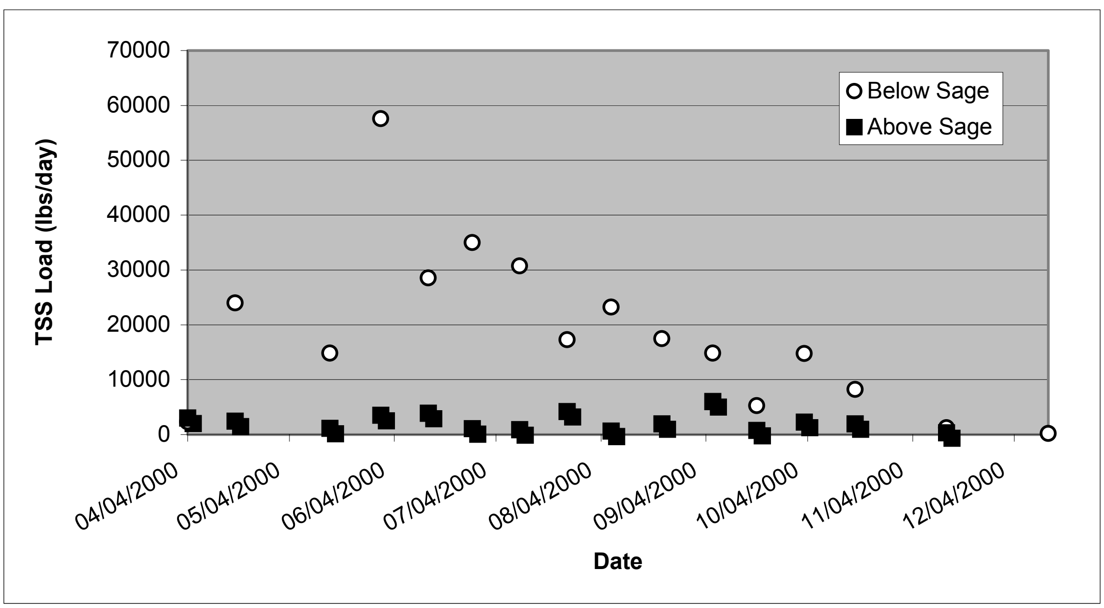

Figure 2.50 Total Suspended Solids Loads in lower Succor Creek Above and Below Sage Creek

Above Sage Creek the irrigation season and non-irrigation season TSS concentrations are very similar (22 and 12 mg/L, respectively). At the Oregon line the irrigation season TSS concentration is 16 mg/L. The irrigation season increase from 16 mg/l at the Oregon line to 22 mg/L above Sage Creek suggests that while there is a measurable increase in TSS concentration, it is not significant (only 5 mg/L).

Sediment Condition Assessment

As illustrated in Table 6, the Idaho water quality standard for sediment is narrative, meaning there is not a numeric value against which TSS conditions in lower Succor Creek can be compared to determine compliance with the standards. Site-specific conditions must be assessed to determine an appropriate sediment target. The sediment target should be linked to conditions that will ensure the water quality standards are met. In the case of lower Succor Creek, the average irrigation season TSS concentration in the stream above Sage Creek will be considered the TSS target for the remainder of the stream. This value is 22 mg/L. The target of 22 mg/L TSS will be applied during the irrigation season (critical period) because, as displayed in Figure 2.50, the irrigation season is when nearly all of the loading occurs to the stream. The target of 22 mg/L represents the TSS conditions in the stream during a time of year loads are the highest, yet, as discussed below, aquatic life beneficial uses can remain supported. The target of 22 mg/L also represents TSS conditions only slightly above those arriving from Oregon where the immediate (to Idaho) land uses are relatively similar.

To address the suitability of 22 mg/L TSS as a target that will support cold water aquatic life, the TSS conditions in the lower Boise River (located northeast of Succor Creek in hydrologic unit 17050114) are used as a comparison. Speaking in terms of TSS conditions, the lower Boise River sediment TMDL (DEQ 1999) segmented the river into two reaches, above the city of Middleton and below the city of Middleton. Above the city of Middleton, the Boise River contains an irrigation season average TSS concentration of 15 mg/L. The irrigation season average SSC is 20 mg/L. It was determined in the lower Boise River TMDL that the concentration of SSC in the river above Middleton (20 mg/L) was not causing the impairment of aquatic life beneficial uses, including salmonid spawning. The target used in the Lower Boise River is 50 mg/L.

A TSS target in lower Succor Creek that directly corresponds with 20 mg/L SSC cannot be determined. However, when collected from the same water body, if TSS is low SSC is typically low as well. Based on this analysis, it is reasonable to assume that since 15 mg/L TSS is supporting aquatic life beneficial uses in the lower Boise River, 22 mg/L TSS will support aquatic life beneficial uses in lower Succor Creek. The two values are significantly similar in terms of their effect on fish. Additionally, an SSC concentration corosponding with 22 mg/L TSS would likely be below the 50 mg/L threshold established for the lower Boise River.

Figure 2.49 and Table 31 illustrate that over the course of a typical irrigation season, TSS concentrations in lower Succor Creek are in excess of 22 mg/L below Sage Creek. Total suspended solids load reductions are necessary from Sage Creek in order to maintain 22 mg/L. The TMDL portion of this document (Chapter 5) will identify the extent of the necessary reductions.

Table 31. Typical irrigation season total suspended solids concentration and load in lower Succor Creek.

Location	Concentration (mg/L)	Load (lbs/day)
Above Sage Creek	22 mg/L	2,562
Below Sage Creek	83 mg/L	30,692

Substrate Particle Size Distribution
Substrate particle size distributions are measured as part of the DEQ BURP program using the Wolman Pebble Count procedure (Wolman 1954). These data give information about the percentage of fine material (<6 mm in diameter) in the substrate and the overall distribution of larger material. Less than 30% fine substrate material in riffles is desirable for salmonid spawning and for a healthy macroinvertebrate community (Bjorn and Rieser 1991, Rhodes et al. 1994, Witzell and MacCrimmon 1983). Hence, less than 30% fines is a suitable surrogate used in other water quality studies and other TMDLs, including the lower Boise River and Garcia River (California).

Wolman pebble counts have been conducted at six locations in Succor Creek. Table 32 shows the location of each count and the relative percentage of fine substrate material at each site. Due to the small data set, these relative percentages have a low level of statistical rigor. However, until additional data can be collected, they represent the best available data.

Table 32. Percentage of fine substrate material (<6 mm) in Succor Creek.

Location	Date	Percent Fines
Near Homedale	8/01/01	57%
3.15 miles below Succor Creek Reservoir	8/20/02	51%
0.92 miles upstream from reservoir	6/02/94	28%
0.92 miles upstream from reservoir	6/07/95	17%
0.92 miles upstream from reservoir	6/19/02	23%
		Average = 23%
6.7 miles upstream from reservoir (Chipmunk Meadows)	6/02/94	50%
6.7 miles upstream from reservoir (Chipmunk Meadows)	6/06/95	54%
6.8 miles upstream from reservoir (Chipmunk Meadows)	8/08/95	29%
		Average = 44%
9.7 miles upstream from reservoir (Near Bergh Mine)	5/20/02	18%

Each of the locations in Table 32 are representative of a segment of Succor Creek. That is, the data are indicative of the overall conditions in the segment as they relate to substrate conditions. The representativeness is based on a variety of factors, including similar near stream land uses, channel types, and geographic location. For example, the stretch of stream below Chipmunk Meadows is considered a different segment than in Chipmunk Meadows because it is isolated by steep canyon walls and is not as readily available for grazing. Table 33 shows the segments of Succor Creek as they relate to the locations given in Table 32.

Table 33. Stream segments represented by BURP monitoring locations.

Location	Stream Segment Represented
Near Homedale	Oregon Line to Snake River
3.15 miles below reservoir	Succor Creek Reservoir to Oregon Line
0.92 miles upstream from reservoir	Tributary at T3S R5W Sec 1, SE to Succor Creek Reservoir
6.7 miles upstream from reservoir (Chipmunk Meadows)	Granite Creek to Tributary at T3S R5W Sec 1, SE

As indicated in Table 32, three segments of Succor Creek exceed the target of 28% fines in riffles. The land use data for upper Succor Creek (Figure 1.15) indicate that the primary land use is rangeland. Therefore, after the spring runoff event, stream bank erosion is most likely the largest source of sediment to the stream.

The Data Assessment Methods section of this chapter describes the linkage that has been developed between 80% bank stability and 28% fine substrate material in riffles. This linkage will be used to develop the TMDLs for each of the segments in Table 33 that exceed 28% surface fines. The TMDL portion of this document (Chapter 5) will identify the reductions necessary to meet 28%.

Temperature

The water temperatures in Succor Creek are only one element of the overall water quality. However, temperatures have a significant influence over the use of the stream by aquatic insects, fish, and even swimmers. Two sets of criteria apply to water temperature in upper Succor Creek, one for cold water aquatic life and another for salmonid spawning. These criteria are described further in Table 6. DEQ collected temperature data from upper Succor Creek and Cottonwood Creek (tributary to Succor Creek) over the summer of 2002. Additional data were collected in 1995 near Chipmunk Meadows. Temperature sampling sites can be seen in Figure 2.45. During the 2002 monitoring effort, HOBO temperature loggers were placed near the Berg Mine, directly above the reservoir, below the reservoir, and at the Idaho/Oregon line. Note that the period of record is not the same at all locations. The period of record was largely dictated by accessibility to the sites.

Figures 2.51 through 2.60 show the instantaneous and daily average temperature data from each location as it compares to allowable temperatures for cold water aquatic life and salmonid spawning. Note that on each figure the spawning period does not extend beyond

June 15. June 15 marks the end of the typical redband trout spawning period in the hydrologic unit (Appendix B). Additionally, at the site directly above the reservoir, data were not available during the spawning period. Only the cold water aquatic life period is assessed for Cottonwood Creek since it is not designated for salmonid spawning.

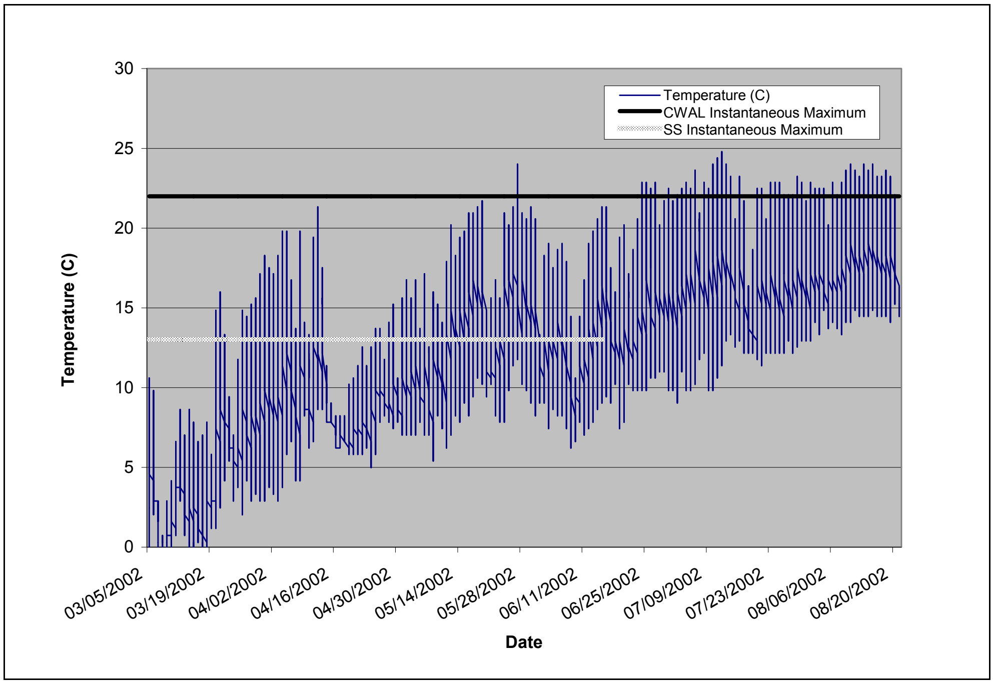

Figure 2.51 Comparison of the Cold Water Aquatic Life and Salmonid Spawning Instantaneous Water Temperature Criteria to Instantaneous Water Temperatures in upper Succor Creek at the Idaho/Oregon Line

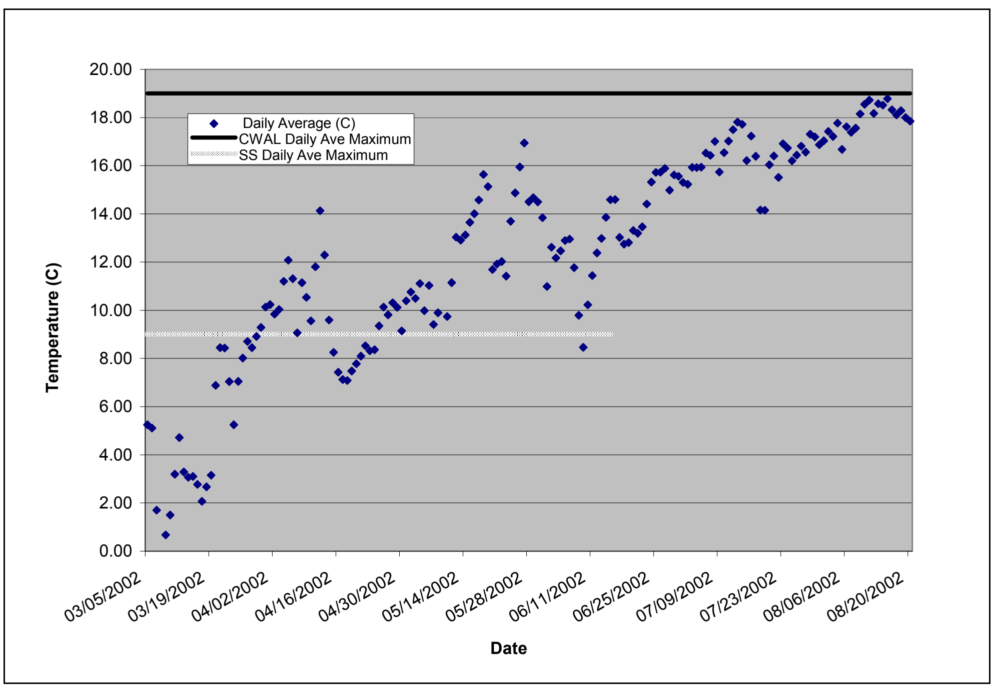

Figure 2.52 Comparison of the Cold Water Aquatic Life and Salmonid Spawning Maximum Daily Average Water Temperature Criteria to the Daily Average Water Temperatures in upper Succor Creek at the Idaho/Oregon Line

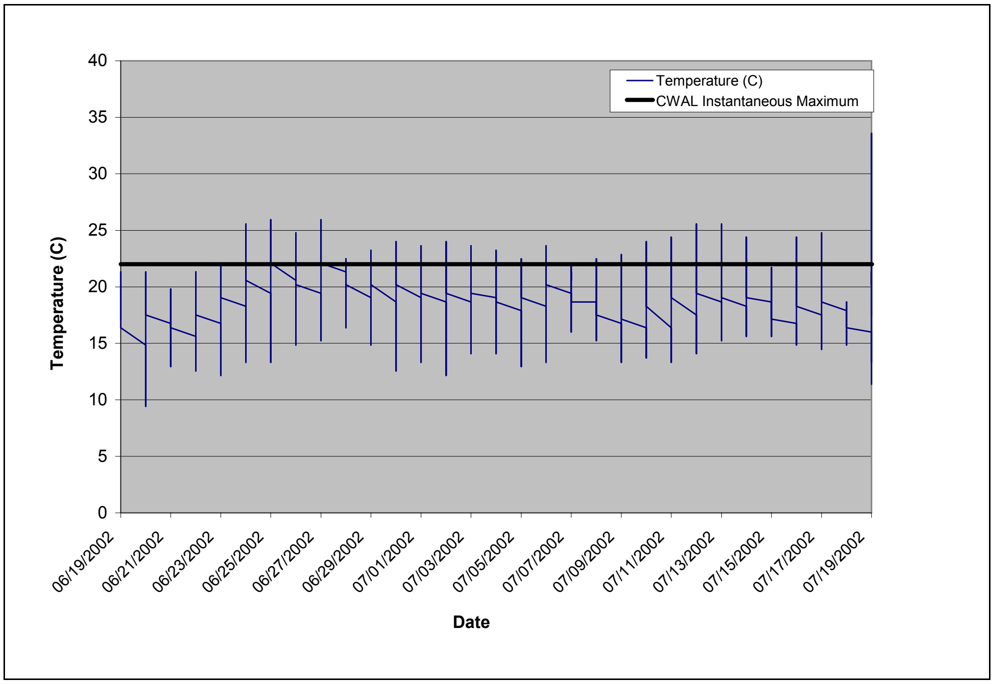

Figure 2.53 Comparison of the Cold Water Aquatic Life Instantaneous Water Temperature Criteria to Instantaneous Water Temperatures in Succor Creek Directly above upper Succor Creek Reservoir

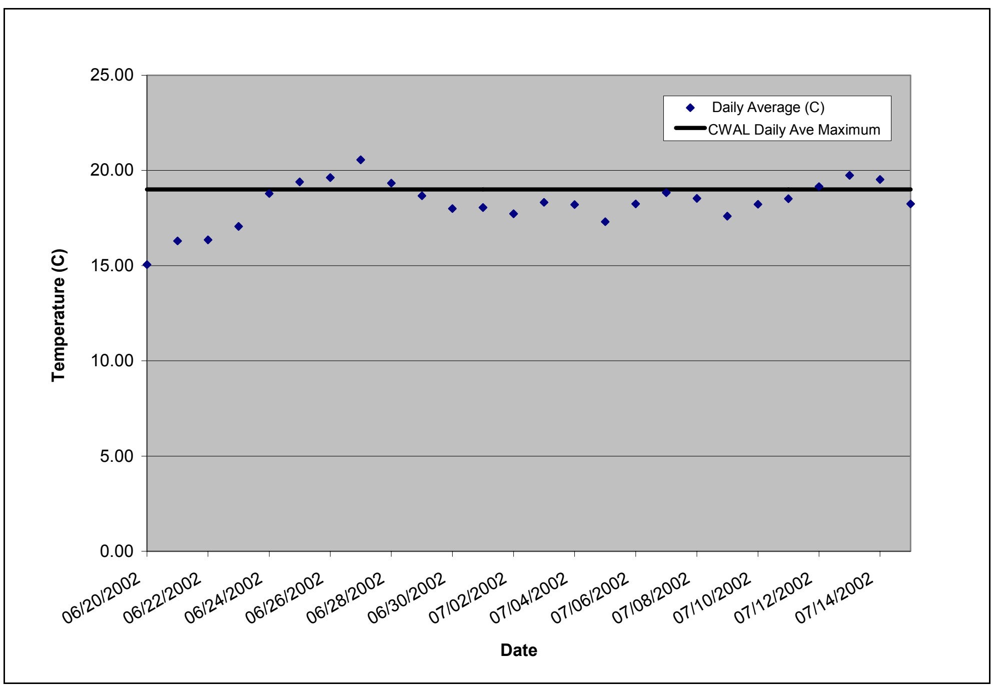

Figure 2.54 Comparison of the Cold Water Aquatic Life Maximum Daily Average Water Temperature Criteria to the Daily Average Water Temperatures in upper Succor Creek Directly above Succor Creek Reservoir

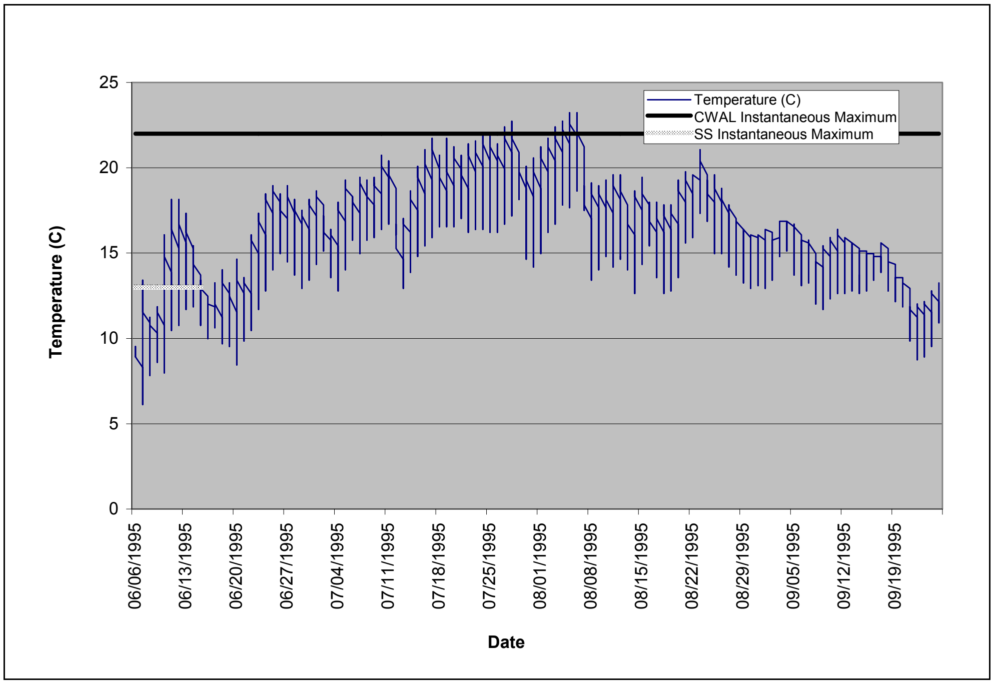

Figure 2.55 Comparison of the Cold Water Aquatic Life and Salmonid Spawning Instantaneous Water Temperature Criteria to Instantaneous Water Temperatures in upper Succor Creek near Chipmunk Meadows

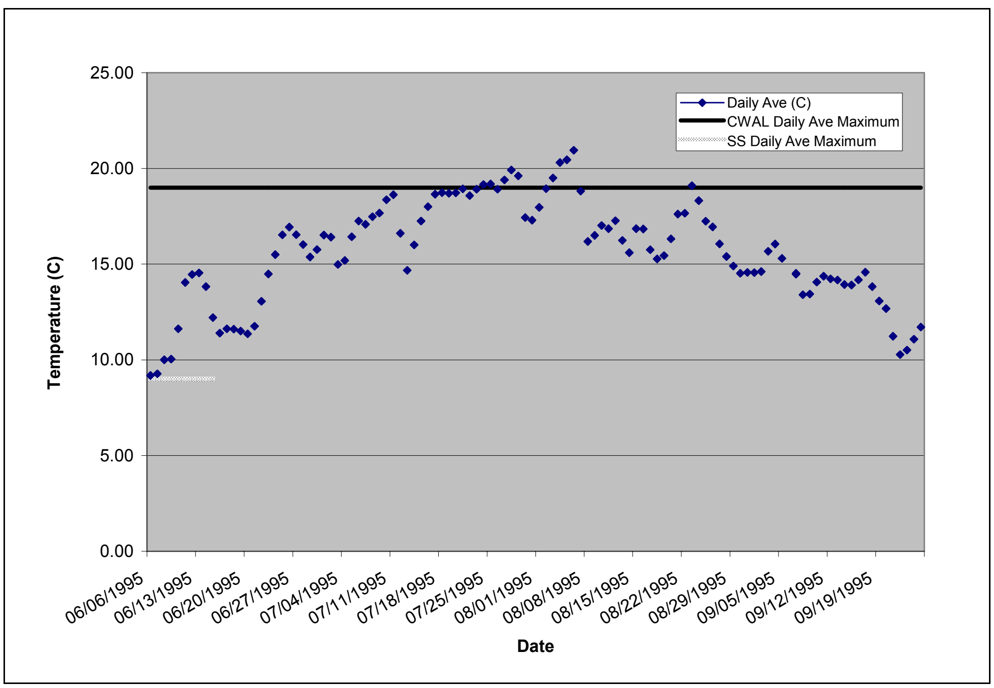

Figure 2.56 Comparison of the Cold Water Aquatic Life and Salmonid Spawning Maximum Daily Average Water Temperature Criteria to the Daily Average Water Temperatures in upper Succor Creek near Chipmunk Meadows

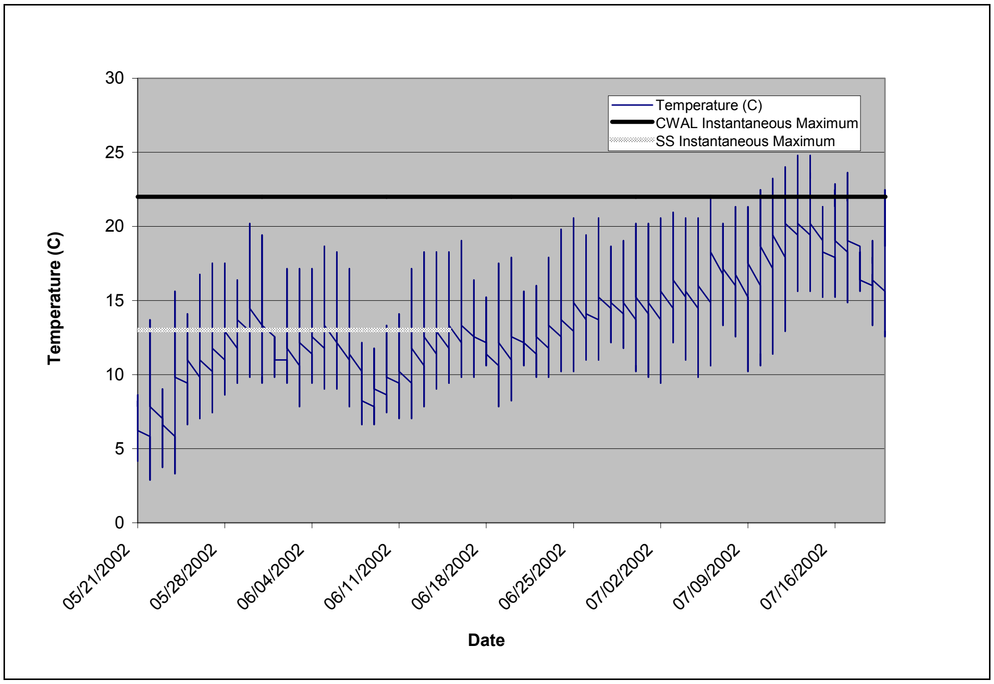

Figure 2.57 Comparison of the Cold Water Aquatic Life and Salmonid Spawning Instantaneous Water Temperature Criteria to Instantaneous Water Temperatures in upper Succor Creek near the Berg Mine

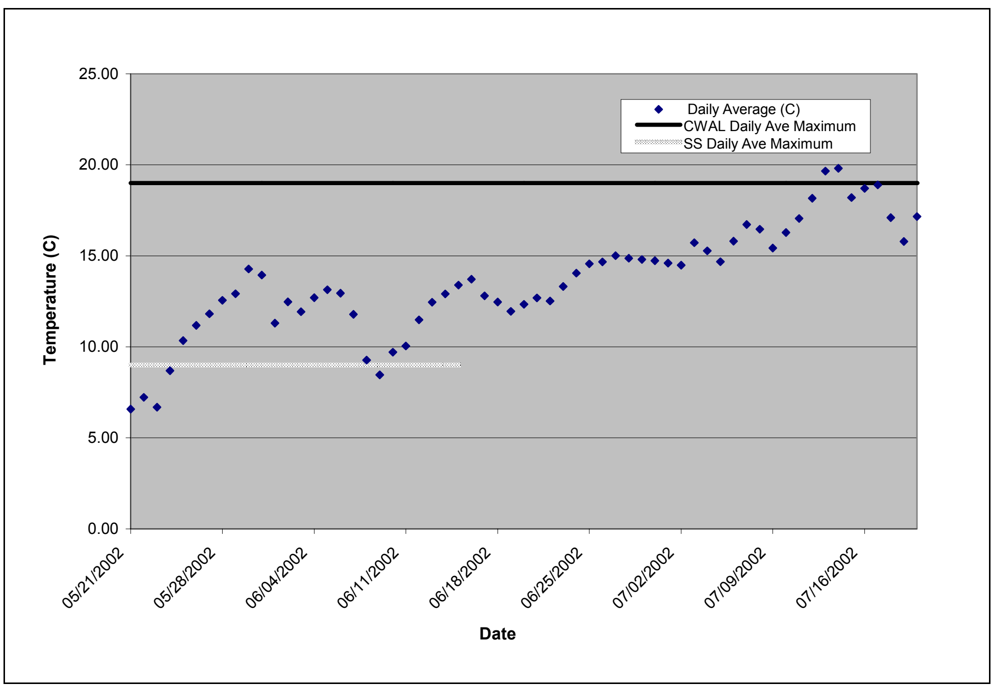

Figure 2.58 Comparison of the Cold Water Aquatic Life and Salmonid Spawning Maximum Daily Average Water Temperature Criteria to the Daily Average Water Temperatures in upper Succor Creek near the Berg Mine

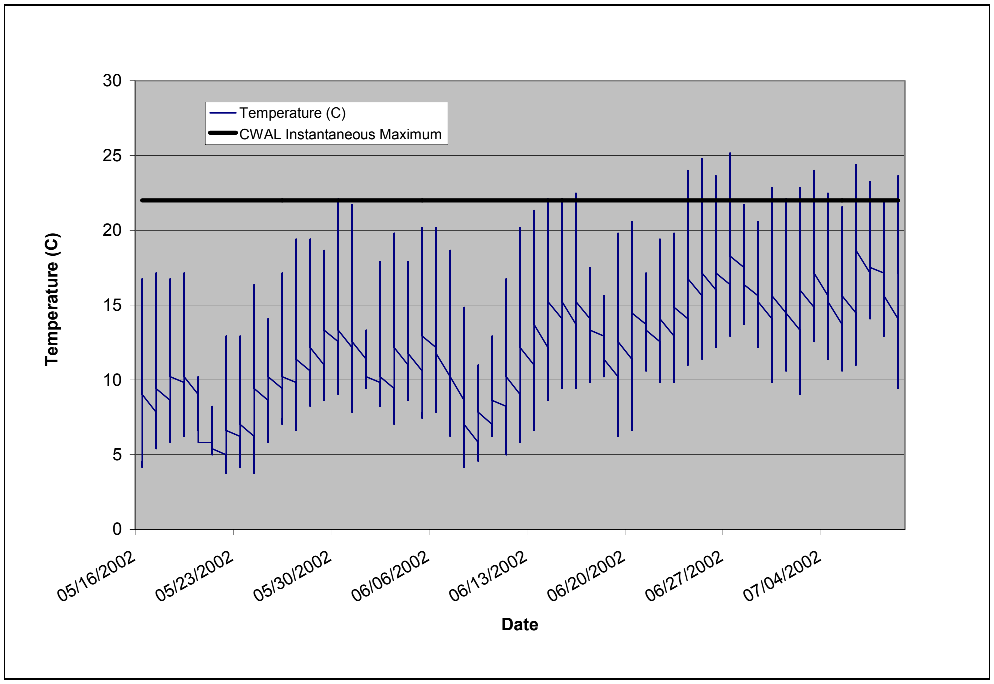

Figure 2.59 Comparison of the Cold Water Aquatic Life Instantaneous Water Temperature Criterion to Instantaneous Water Temperatures in Cottonwood Creek

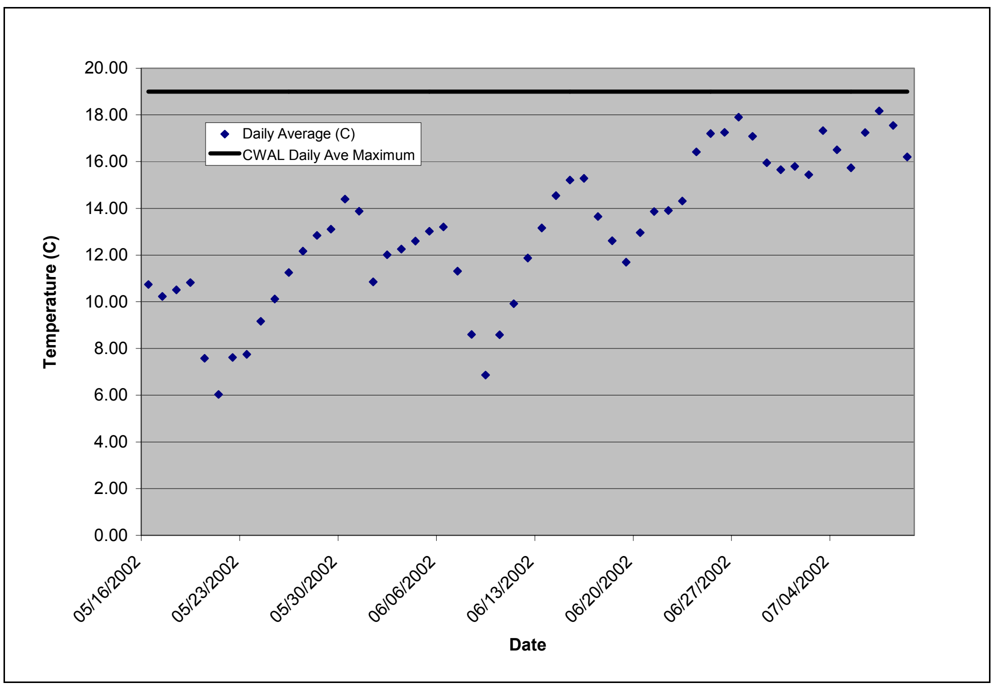

Figure 2.60 Comparison of the Cold Water Aquatic Life Daily Average Water Temperature Criterion to the Daily Average Water Temperatures in Cottonwood Creek

To evaluate the temperature data in upper Succor and Cottonwood Creeks as they pertain to the water quality criteria, the 10% guidance described in the EPA 305(b) guidance and integrated into WBAG II was used (Grafe et al. 2002). This guidance says that up to 10% of the available data during the defined critical period can exceed the water quality standard without violating that standard. The critical period for salmonid (redband) spawning is March 1 through June 15. The critical period for cold water aquatic life is June 22 through September 21. For example, during the redband trout spawning and rearing season (March 1 - June 15), up to 10% of the available temperature measurements can exceed the instantaneous criterion of 13 °C and the daily average criterion of 9 °C without the standards being exceeded. Tables 34 and 35 show the percentage of available water temperatures at each location exceeding the cold water aquatic life and salmonid spawning criteria during the critical periods. Directly above the reservoir, in Chipmunk Meadows and near the Berg Mine, temperature data were not available for the full extent of the critical periods. Hence, assumptions were made to accommodate for this lack of data. These assumptions are described below.

Table 34. Percentage of available water temperatures exceeding the cold water aquatic life criteria for the critical period of, June 22 through September 21.

Location	Exceed CWAL[1] Instant Maximum 22 °C	Exceed CWAL Daily Average 19 °C
At the Idaho/Oregon line Data available from 6/22 to 8/21	12%[2]	0%
Directly above Reservoir Data available from 6/22 to 7/19	16%[3]	19%[4]
Near Chipmunk Meadows Data available for the extent of the CWAL critical period	2%	9%
Near Berg Mine Data available from 6/22 to 7/19	6%	9%
Cottonwood Creek Data available from 5/16 to 7/9	9%	0%

[1]Cold water aquatic life
[2]Assumes that 12% of the measurements after 8/21 (to 9/21) remain above the criterion
[3]Assumes that 16% of the measurements after 7/19 (to 9/21) remain above the criterion
[4]Assumes that 19% of the measurements after 7/19 (to 9/21) remain above the criterion

Table 35. Percentage of available water temperatures exceeding the salmonid spawning criteria during the critical period of March 1 through June 15.

Location	Exceed SS[1] Instant Maximum 13 °C	Exceed SS Daily Average 9 °C
At the Idaho/Oregon line Data available for the extent of the spawning period	24%	65%
Directly above Reservoir Data available from 6/19 to 7/15	Insufficient Data	Insufficient Data
Near Chipmunk Meadows Data available from 6/6 to 7/15	4%[2]	11%[2]
Near Berg Mine Data available from 5/21 to 7/15	8%[3]	22%[3]

[1]Salmonid spawning
[2]Assumes that 100% of the measurements before 6/6 (back to 3/1) are below the criterion
[3]Assumes that 100% of the measurements before 5/21 (back to 3/1) are below the criterion

Tables 34 and 35 show that water temperature at the Idaho/Oregon line exceeds the criteria for salmonid spawning as well as the instantaneous maximum criterion for cold water aquatic life. The daily average criterion for cold water aquatic life is not exceeded. Exceedances of the salmonid spawning instantaneous maximum criterion begin to occur in early April and become chronic by late April. From late April through the remainder of the period the criterion is exceeded nearly every day. The timing of the salmonid spawning daily average exceedances is very similar to the instantaneous maximum exceedances. Again, the exceedances begin in early April and become chronic by late April, with the remainder of the period being over the criterion. The cold water aquatic life instantaneous maximum exceedances begin to occur in late June and extend throughout the summer months. Twelve percent of the available data exceed the cold water aquatic life criterion. However, due to insufficient data, the entire critical period for cold water aquatic life cannot be evaluated. Data are not available for the period between August 22 and September 21. To address this, it is assumed that 12% of the data for the remaining 30 days (8/22 - 9/21) continue to exceed the criterion. Given that September is typically a cooler month than August, this is a conservative assumption that is protective of the aquatic life resource.

Table 34 shows that the water temperature directly above Succor Creek Reservoir exceeds the criteria for cold water aquatic life. However, again due to insufficient data, the entire critical period cannot be evaluated. Actual data are only available from June 19 through July 15. To address this, the same approach as described above is used for cold water aquatic life. It is assumed that the remaining percentage of the measurements would exceed the criterion. The timing of the cold water aquatic life exceedances is difficult to determine due to the lack of data earlier in the year. However, based on the period of record, exceedances of the instantaneous criterion occur nearly every day throughout the summer months.

Data are not available directly above the reservoir during the critical period to assess salmonid spawning. This is the location where the logger was vandalized. However, as shown in Table 35, water temperatures exceeding the salmonid spawning criteria typify the remaining segments of the stream. Therefore, DEQ assumes that this segment of stream also exceeds the criteria. Given current shading conditions on upper Succor Creek above the reservoir, this is more than likely the case.

Table 34 shows that water temperatures near Chipmunk Meadows and the Berg Mine do not exceed the criteria for cold water aquatic life. However, Table 35 shows that water temperatures exceed the salmonid spawning daily average criterion, but not the instantaneous maximum criterion at both locations. Again, data are not available for the entire salmonid spawning critical period. If it is assumed that 100% of the measurements prior to June 6 and May 21 (the dates data become available at each location) are below the criteria, the percentage of instantaneous maximum criterion exceedances falls from 36% (not shown in table) to 4% near Chipmunk Meadows and 29% (not shown in table) to 8% near the Berg Mine. Both adjusted percentages are below 10%. At both locations the daily average percentage remains above 10% (11% near Chipmunk Meadows and 22% near the Berg Mine). The timing of the salmonid spawning criterion exceedances near Chipmunk Meadows is difficult to determine due to limited data. Near the Berg Mine, the data show that beginning in late May, nearly all of the values exceed the criterion.

Status of Beneficial Uses

The *E. Coli* data indicate that the primary contact recreation criteria are exceeded in lower Succor Creek (Oregon line to Snake River). Consequently, DEQ recommends preparing a bacteria TMDL for lower Succor Creek with the intent of reducing the *E. Coli* levels in the stream to levels that will meet the water quality standards.

The data also indicate that excess substrate sediment (sediment on the stream bottom) is impairing cold water aquatic life and salmonid spawning in two segments of upper Succor Creek (above the Oregon line). The segments impaired by sediment extend from Granite Creek to Little Cottonwood Creek (T3S, R5W, Section 1, SE - Chipmunk Meadows) and from the mouth of the Succor Creek Reservoir to the Oregon line. The segment of stream from the Sage Creek to the Snake River (lower Succor Creek) is also impaired by excess sediment. Consequently, DEQ recommends preparing a TMDL for sediment in these segments of Succor Creek with the intent of reducing the percentage of fine substrate material in upper Succor Creek and reducing TSS concentrations in lower Succor Creek.

Upper Succor Creek exceeds the temperature criteria for cold water aquatic life directly above the reservoir and at the Idaho/Oregon line. The cold water aquatic life criteria are not exceeded near the Berg Mine and in Chipmunk Meadows. Additionally, the salmonid spawning criteria are exceeded at all locations above the Oregon line. DEQ recommends temperature TMDLs at these locations. The issue of natural vs. anthropogenic heat will be addressed in the TMDL portion of the document.

Table 36 summarizes the beneficial use support status throughout Succor Creek as it relates to the pollutants of concern in the stream.

Table 36. Status of beneficial uses in Succor Creek.

Pollutant / Segment	Beneficial Uses Support Status	Impaired Use[1]	Comments
Sediment	--[2]	--	--
Headwaters to Granite Creek	Not Impaired	--	--
Granite Creek to T3S, R5W, Sec1, SE	Impaired	CWAL, SS	Excess fine substrate material, >28% fines
T3S, R5W, Sec1, SE to reservoir	Not Impaired	--	--
Reservoir to Oregon line	Impaired	CWAL, SS	Excess fine substrate material, >28% fines
Sage Creek to Snake River	Impaired	CWAL	Excess total suspended solids, >22 mg/L
Temperature	--	--	--
Headwaters to Berg Mine	Impaired	SS	CWAL not impaired
Berg Mine to Chipmunk Meadows	Impaired	SS	CWAL not impaired
Chipmunk Meadows to head of reservoir	Impaired	SS, CWAL	--
Ouflow of reservoir to Oregon Line	Impaired	SS, CWAL	--
Cottonwood Creek	Not Impaired		--
Bacteria (*E. Coli*)	--	--	--
Oregon line to Snake River	Impaired	PCR	--

[1]CWAL: cold water aquatic life, SS: salmonid spawning, PCR: primary contact recreation
[2]--: Cells left intentionally blank

2.4 Data Gaps

The best available data were used to develop the current subbasin assessment and TMDL. The data were used to reach conclusions of support status and to develop defensible TMDLs. However, DEQ acknowledges there are additional data that would be helpful to increase the accuracy of the analyses. The data gaps that have been identified are outlined in Table 37.

Table 37. Data gaps identified during development of the Mid Snake River/ Succor Creek Subbasin Assessment and TMDL.

Pollutant or Other Factor	Data Gap
Flow	Multiple year irrigation season flow data for lower Succor Creek and Jump Creek. Multiple year flow data for upper Succor Creek Multiple year flow data for those streams deemed intermittent as per Appendix E Multiple year flow data for Castle Creek and flow data for artesian water inputs into Castle Creek
Biological (fish and macroinvertebrates)	Additional salmonid presence/absence information for Succor Creek, particularly during irrigation flow and spawning periods
Bacteria	Multiple year bacteria data for lower Succor Creek and tributaries collected at a frequency sufficient to determine the monthly geometric mean *E. Coli* concentration.
Sediment	Multiple year irrigation season total suspended solids data for Succor Creek, Jump Creek, and their tributaries Multiple year total suspended solids data for upper Succor Creek Bedload data for Succor Creek and the Snake River Updated substrate particle size data for upper Succor Creek Multiple year total suspended solids data for Reynolds Creek
Dissolved Oxygen	Substrate/water interface dissolved oxygen measurements Continuous dissolved oxygen measurements taken at the end of the river reach
Temperature	Multiple year temperature data for upper Succor, Sinker and North Fork Castle Creeks, particularly during the salmonid spawning and cold water aquatic life critical periods Site-specific data to populate the SSTEMP temperature model, as per the guidance in Appendix G
Nutrients	Increased monthly sampling of nutrients, assessment of phosphorus recycling in system

Where viable, steps should be taken to fill the data gaps. Planned efforts to do so will be further outlined in the TMDL implementation plan. The information developed through these efforts may be used to revise the appropriate portions of the TMDL, and determine and/or adjust implementation methods and control measures. Changes to the TMDL will not result in the production of a new TMDL document. Minor changes will be in the form of addenda to the existing document(s). More extensive changes will be in the form of supplementary documentation or chapter replacement. Wherever practical, the goal is to build upon rather than replace the original work. The schedule and criteria for reviewing new data will be addressed in the TMDL implementation plan. The opportunity to revise the TMDL and necessary control measures is consistent with current and developing EPA TMDL guidance, which emphasizes an iterative approach to TMDL development and implementation. However, any additional effort on the part of DEQ to revise the TMDL or implementation plan and control measures must be addressed on a case-by-case basis, as additional funding becomes available.

2.5 Assessment Summary

Seven stream segments in the Mid Snake River/Succor Creek subbasin require TMDLs for sediment, nutrients, temperature, bacteria, or combinations thereof. Table 38 summarizes the stream segments addressed in this assessment and the actions that will be taken as a result of the assessment.

Table 38. Summary of subbasin assessment conclusions.

Water Body	Boundary	Listed Pollutants	Proposed Action
Snake River WQLS: 2670 AU: 006_07	CJ Strike Reservoir (below dam) to Castle Creek	Sediment	De-list sediment List TDG
Snake River WQLS: 2669 AU: 006_07	Castle Creek to Swan Falls	Sediment	De-list sediment
Snake River WQLS: 2668 AU: 006_07, 001_07	Swan Falls to Boise River	Bacteria, dissolved oxygen, nutrients, sediment, pH, flow alteration	De-list bacteria, sediment, pH TMDL for nutrients Dissolved oxygen will be addressed by the nutrient TMDL No action for flow alteration List temperature

Water Body	Boundary	Listed Pollutants	Proposed Action
Birch Creek WQLS: 2684 AU: 021_02, 03, 04	Headwaters to Snake River	Sediment	De-list sediment
Brown Creek WQLS: 2682 AU: 019_02, 03, 04	Headwaters to Catherine Creek	Sediment, Temperature	De-list sediment, temperature
Castle Creek WQLS: 2680 AU: 014_03, 04, 05	T5SR1ES28 to Snake River	Temperature, sediment, flow alteration	TMDL for sediment, Delay TMDL for temperature to collect additional data No action for flow alteration
Corder Creek WQLS: 2685 AU: 025_02	Headwaters to Snake River	Sediment	De-list sediment
Cottonwood Creek WQLS: none AU: 003_02	Headwaters to Succor Creek	Temperature	De-list temperature
Hardtrigger Creek WQLS: 2675 AU: 008_02	Headwaters to Snake River	Sediment	De-list sediment
Jump Creek WQLS: 2673 AU: 005_02,03	Headwaters to Snake River	Habitat Alteration	TMDL for sediment No action for habitat alteration
McBride Creek WQLS: 2672 AU: 004_02,03	Headwaters to Oregon Line	Temperature, sediment, flow alteration	De-list temperature, sediment No action for flow alteration
North Fork Castle Creek WQLS: 2680 AU: 014_02a	Headwaters to Castle Creek	Temperature	Delay TMDL for temperature to collect additional data
Pickett Creek WQLS: 2681 AU: 016_02, 03	T5SR1WS32 to Catherine Creek	Sediment	De-list sediment

Water Body	Boundary	Listed Pollutants	Proposed Action
Pickett Creek WQLS: 6681 AU: 016_02	Headwaters to T5SR1WS32	Temperature, sediment, flow alteration	De-list temperature, sediment No action for flow alteration
Poison Creek WQLS: 2687 AU: 006_02, 03	Headwaters to Shoofly Creek	Not Listed, See Chapter 1	No Action
Rabbit Creek WQLS: 2677 AU: 026_02	Headwaters to Snake River	Sediment	De-list sediment
Reynolds Creek WQLS: 2676 AU: 009_04	Diversion to Snake River	Sediment	De-list sediment
Sinker Creek WQLS: 2679 AU: 006_03	Diamond Creek to Snake River	Temperature, sediment, flow alteration	TMDL for temperature, sediment No action for flow alteration
South Fork Castle Creek WQLS: 2683 AU: 014_02	Headwaters to Castle Creek	Bacteria	Delay TMDL for bacteria to collect additional data
Squaw Creek WQLS: 2674 AU: 007_02, 03	HW to Snake River	Temperature	De-list temperature
Squaw Creek WQLS: 2674 AU: 007_03	Unnamed tributary 3.9 km upstream to Snake River	Sediment	De-list sediment
Succor Creek WQLS: 2671 AU: 002_04	Oregon line to Snake River	Sediment, flow alteration	TMDL for sediment, bacteria No action for flow alteration
Succor Creek WQLS: 6671 AU: 002_02, 03	Headwaters to Oregon line	Temperature, sediment	TMDL for sediment Delay TMDL for temperature to collect additional data

3. Subbasin Assessment – Pollutant Source Inventory

3.1 Sources of Pollutants of Concern

This chapter describes the point and nonpoint pollutant sources within the Mid Snake River/Succor Creek HUC. The nonpoint source descriptions are not intended to be specific. Rather, it is a description of the general processes whereby pollutants are delivered to the water bodies of concern.

Point Sources

The only NPDES permitted sources in the watershed are the wastewater treatment plants (WWTP) in Homedale and Marsing. Table 39 shows the permit limits for these facilities. Currently, the Marsing facility discharges TSS at levels that average below 50 mg/L. Neither of these facilities contains phosphorus limits in their current permits. The Homedale facility consists of a series of ponds and sand filters followed by chlorine treatment. After treatment, the effluent discharges into a drainage ditch that flows 0.25 miles prior to discharging into the Snake River. Prior to entering the Snake River, the ditch flows through a slough, which may contribute to nutrient removal. The Marsing facility consists of a series of aerated lagoons followed by chlorine treatment.

Table 39. National Pollution Discharge Elimination System-permitted facilities in the Mid Snake River/Succor Creek Watershed.

Facility	Design Capacity (mgd)[1]	Year Plant First Went into Operation	TSS[2] Limit
City of Marsing WWTP[3] (Permit # ID0021202)	0.3	1988	70 mg/L[4]
City of Homedale WWTP(Permit # ID0020427)	0.4	1980	70 mg/L

[1]Million gallons per day
[2]Total suspended solids
[3]Wastewater treatment plant
[4]Milligrams per liter

RCRA and CERCLA Sites

There are several sites in the Mid Snake River/Succor Creek subbasin that must comply with the federal Resource Conservation and Recovery Act (RCRA) or the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), commonly called Superfund. Most of these are CERCLA sites (Table 40), which are primarily associated with pesticide storage and disposal. The US Ecology Site is the only RCRA site. It operates under a permit administered by DEQ. It is a CERCLA site as well.

Table 40. RCRA and CERCLA Sites

Facility ID	Facility Name	Public Land Survey Location
ID1141100015	USDOI BLM[1] Hulet Dump	T3S R1W Sec 15
ID2141190031	USDOI BLM Pickles Butte Airstrip	T2N R2W Sec 28
ID3141190014	USDOI BLM Pesticide Dump Murphy	T3S R1W Sec 35
ID4141190013	USDOI BLM Pesticide Dump Site, Reynolds	T3N R5W Sec 3
ID6141190011	USDOI BLM Owyhee County Marsing/Homedale Landfill	T4N R5W Sec 32
ID6141190045	USDOI BLM Dry Lakes Airstrip	T1N R1W Sec 26
ID7141190010	USDOI BLM Owyhee County Wilson Creek Landfill	T1S R3W Sec 13
IDD072981533	Owyhee County Marsing Airport	T3N R4W Sec 26
IDD980726020	Homedale ARPT Pesticide Dump Site	T3N R5W Sec 10
IDD980980247	Marsing Building Center	T3N R4W Sec 34
IDD984666784	Agriculture Supply Inc.	T2N R4W Sec 3
IDD073114654	US Ecology/Envirosafe Services of Idaho Inc. Site B	T4S R2E Sec 19

[1]U.S. Department of the Interior, Bureau of Land Management

Nonpoint Source Pollutants

This description is not intended to be specific. Rather, it is a description of the general processes whereby pollutants are delivered to the water bodies of concern. A detailed description of locations and potential sites for improvement will be located in the final implementation plan.

Phosphorus

Phosphorus is found naturally throughout the environment. It can be present as a constituent of certain rock types (silicious igneous rock) and in the mineral *apatite*. The environment itself can also be a factor in the phosphorus levels occurring within a region, due to the climate, pH of natural waters, and the presence of other substances that may adsorb or release phosphorus. However, there are also anthropogenic nutrient sources that greatly increase phosphorus levels over those found naturally. Applied fertilizers in farming or landscaping, the duration and density of livestock grazing, the creation of artificial waterways and water levels through agricultural practices, and the presence of sewage and septic waste (treated and untreated) in the surface, subsurface, and ground water of a region often represent significant contributions to the phosphorus concentrations in an area.

Nitrogen

Nitrogen occurs in the environment in a variety of sources and forms. It can be present as a mineral constituent of certain rock types; as a result of the decomposition of plant and other organic material; in rainfall; as a component of agricultural or urban/suburban runoff; and as a constituent in treated or untreated wastewater from industrial, municipal, or septic discharges. In addition, the air is composed of about 80% nitrogen gas. Blue-green algae can use atmospheric nitrogen at the surface-water interface or the nitrogen dissolved in the water as a source of nitrogen to support growth. Since algae can use atmospheric nitrogen, reducing nitrogen in the water is not often targeted as a factor to achieve water quality improvements in water systems dominated by blue-green algae. Since reducing watershed-based sources of nitrogen is not usually a successful treatment option in these systems, total phosphorus reductions are often sought.

Sediment

The most common source of sediment in the tributaries is erosion. Sediment may originate from natural causes such as landslides, forest or brush fires, high flow events; or anthropogenic sources such as urban/suburban storm water runoff or erosion from roadways, agricultural lands, and construction sites. Sediment loads within the system are highest in the spring when high flow volumes and velocities result from snowmelt in the higher elevations.

The contribution of mass wasting to sediment loading in the Mid Snake River/Succor Creek watershed is low. While Figure 1.6 (in Chapter 1) shows areas of potentially high erosion, the majority of high erosion areas shown around the Snake River are areas of steep cliffs and aerial photo analysis showed bare ground that did not show large-scale landslide events along the river. These areas were determined using slope, wind erodibility groups, and K factor analysis.

Temperature

Increases and decreases in water temperature are due to changes in the amount of heat reaching the water. There are several factors that contribute to the amount of heat reaching the water in the Mid Snake River/Succor Creek watershed. The anthropogenic factors include agricultural return water, agricultural withdrawals, dams, and a loss of riparian vegetation (shading). Natural factors include seasonal air temperature changes, natural dams, and naturally warm springs that feed water to the stream. In addition, at times riparian vegetation has been lost both to manmade (i.e. poor grazing practices, off-road vehicle use) and natural causes (i.e. rain on snow event). Only those anthropogenic sources that are directly controllable are addressed in this TMDL.

Bacteria

Bacteria enter water bodies in a number of ways. Wastewater treatment plants and failing septic systems are the most common sources in watersheds that contain urban influences. Domestic pet waste can also be a significant source. In rural and agricultural areas the most common sources are farm and ranch animals and wildlife, although failing septic systems can also be a significant source if they are situated adjacent to a water body.

Pollutant Transport

Nutrients

Consideration of flow is important in the evaluation of nutrient, phytoplankton, periphyton, and rooted macrophyte concentrations. In a riverine system, flow transports phytoplankton and nutrients from upstream to downstream in an advective or dispersive transport mode. In other words, the riverine system is a dynamic system in which nutrients are being continually cycled as the water moves downstream. The flow regimen is important in determining the result of this combination of component concentrations. High flows can flush dissolved constituents like nutrients downstream, replacing them with the lower concentrations in the high flows. Since nutrient concentrations are inversely related to flow, nutrient retentiveness is much lower in high flow years than in low flow years. High flows can also scour periphyton and rooted macrophytes, reducing their mass considerably. Finally, high flows can scour sediments causing movement of the sediment downstream and increasing nutrient concentrations at the same time by releasing nutrients tied up in the sediments prior to scouring (Armstrong 2001).

Sediment
While no quantitative information is available, it is recognized that a substantial amount of sediment can be generated and transported relatively long distances by extreme precipitation events, such as the 1956 flood in Reynolds Creek. It has been estimated these rare events can account for the movement of a greater volume of sediment in a single event than would be expected to occur in an entire water year under average conditions (BCC 1996). Sediment transport, and the transport and delivery of sediment-bound pollutants, are directly associated with increased flow volumes and high velocities.

Bacteria
Bacteria are primarily transported from its point of origin during precipitation and irrigation activities. Bacteria can enter surface water via movement from manured fields, problem feedlots and overgrazed pastures. Insufficient sewage management systems (septic tanks) may also transport bacteria, especially in areas where the water table is shallow and readily mixes with surface water. Bacteria may also be transported in stormwater in areas where stormwater is discharged directly to the water body.

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

Point Sources

Two discrete point sources exist within the basin. The Homedale and the Marsing WWTPs treat the wastewater from each respective community and the immediate outlying area. Both facilities are federally regulated as part of the NPDES program. As part of the discharge monitoring report portion of their NPDES permits, the WWTPs are required to monitor their effluent to determine compliance with their permit effluent limits. Effluent limits are set to levels at which it has been certified that violations in the state water quality standards will not occur as a result of the effluent. If permit violations occur, the facility is required to notify the U.S. Environmental Protection Agency (EPA) and DEQ to find a solution. The monthly discharge monitoring reports are sent to EPA and DEQ and are kept on file at the facility.

In 1996, EPA reissued the Idaho general NPDES permit for confined animal feeding operations. This general permit allows permitted facilities to discharge animal waste only during unusual climatic events. The permit also requires permitted facilities to land apply animal waste at agronomic rates, and requires record keeping of animal waste management practices. It is believed these provisions will reduce discharges to surface waters and reduce impacts to ground water.

The Idaho Department of Agriculture Beef Cattle Animal Feeding Operation (AFO) Program was initiated to bring Idaho into compliance with the Beef Cattle Environmental Act in the shortest possible timeframe. The impetus of the program is to bring an estimated 1,500 Beef Cattle AFOs into compliance with the Beef Cattle Environmental Act. Additionally, the Department of Agriculture will regulate all beef cattle AFOs. In the past, only beef Confined Animal Feeding Operations were regulated.

Nonpoint Sources

In Ada, Owyhee, Canyon, and Elmore Counties, there are existing water quality programs for nonpoint source pollutant reductions. Cooperators may make improvements on their own or seek cost-share funds from one of the many programs available. Most of the agricultural programs are either state or federally funded through the Idaho Soil Conservation Commission (ISCC) or the NRCS. These programs are targeted at the agricultural community to assist with conservation practices. For example, the Owyhee Soil Conservation District (SCD) and the Canyon SCD have Water Quality Program for agriculture money available to address on-the-farm pollutant reductions although Canyon SCD has not yet had any state or federal project areas in the Mid Snake River/Succor Creek watershed. Owyhee SCD had an EQIP Priority Area for Jump Creek. Table 41 shows some of the typical component practices that may serve as stand alone best management practices (BMPs) or be used in combination to address agricultural related pollutants. The appropriate component or combination of components is determined on a site-specific basis. The Water Quality Program for Agriculture is a state of Idaho water quality program that provides cost share incentives to local operators for pollutant reductions. The Ada, Bruneau, Canyon, Elmore, and Owyhee SCDs work with agricultural operators in the respective counties to provide technical assistance to implement BMPs. The agricultural community, through local conservation districts and other funding sources, has demonstrated a willingness to protect water quality throughout the basin.

Table 41. Typical management components used to address agricultural related pollutants, either stand alone or in combination (not a complete list)

Best Management Practice	Control Effectiveness	Installation Cost	Maintenance Cost
Sediment			
Livestock Exclusion	High	Moderate	Low
Sediment Basins	High	Low	Moderate
Surge Irrigation System	High	High	Moderate
Sprinkler Irrigation System	High	High	Moderate
Filter Strips	Moderate	Low	Low
Polyacrylamide (PAM)	Moderate	Moderate	Moderate
Bacteria			
Livestock Exclusion	High	Moderate	Low
Waste Management System	High	High	Moderate
Wetland Development	Moderate	High	Moderate
Prescribed Grazing	Moderate	Low	Low
Fencing	Low	Moderate	Low
Nutrients			
Livestock Exclusion	High	Moderate	Low
Nutrient Management	High	Moderate	Low
Filter Strips	Moderate	Low	Low
Irrigation Water Management	Moderate	Low	Low
Fencing	Low	Moderate	Low

Other state and federal funding sources include the state §319 grant program, the Resource Conservation and Rangeland Development Program, the USDA Environmental Quality Incentive Program, the Wildlife Habitat Incentives Program, and IDWR agricultural loans. Participation from local operators is voluntary. Other sources of funding include private sources such as Ducks Unlimited, The Nature Conservancy, and colleges and universities.

Reasonable Assurance

The state has responsibility under Sections 401, 402, and 404 of the CWA to provide water quality certification. Under this authority, the state reviews dredge and fill, stream channel alteration, and NPDES permits to ensure that the proposed actions will meet the Idaho's water quality standards.

Under Section 319 of the CWA, each state is required to develop and submit a nonpoint source management plan. Idaho's most recent nonpoint source management plan was finalized in December 1999. The plan was submitted to and approved by the EPA. Among other things, the plan identifies programs to achieve implementation of nonpoint source BMPs, includes a schedule for program milestones, outlines key agencies and agency roles, identifies available funding sources, and is certified by the state attorney general to ensure that adequate authorities exist to implement the plan.

Idaho's nonpoint source management plan describes many of the voluntary and regulatory approaches the state will take to abate nonpoint pollution sources. One of the prominent programs described in the plan is the provision for public involvement, such as the formation of Basin Advisory Groups (BAGs) and Watershed Advisory Groups (WAGs). The WAGs are to be established in high priority watersheds to assist DEQ and other state agencies in formulating specific actions needed to decrease pollutant loading from point and nonpoint sources that affect water quality limited water bodies. The Mid Snake River/Succor Creek WAG was established in July 2002 and is the designated advisory group for the basin.

The Idaho water quality standards refer to existing authorities to control nonpoint pollution sources in Idaho. Some of these authorities and responsible state agencies are listed in Table 42.

Table 42. State of Idaho's regulatory authority for nonpoint pollution sources.

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

The state of Idaho uses a voluntary approach to address agricultural nonpoint sources. However, regulatory authority can be found in the water quality standards (IDAPA 58.01.02.350.01 through 58.01.02.350.03). IDAPA 58.01.02.054.07 refers to the Idaho Agricultural Pollution Abatement Plan (Ag Plan), which provides guidance to the agricultural community and includes a list of approved BMPs (IDHW and SCC 1993). A portion of the Ag Plan outlines responsible agencies or elected groups (Soil Conservation Districts) that will take the lead if nonpoint source pollution problems need to be addressed. For agricultural activity, it assigns the local SCDs to assist the landowner/operator with developing and implementing BMPs to abate nonpoint pollution associated with the land use. If a voluntary approach does not succeed in abating the pollutant problem, the state may seek injunctive relief for those situations that may be determined to be an imminent and substantial danger to public health or the environment (IDAPA 58.01.02.350.02(a)).

The *Idaho Water Quality Standards and Wastewater Treatment Requirements* specify that if water quality monitoring indicates that water quality standards are not being met, even with the use of BMPs or knowledgeable and reasonable practices, the state may request that the designated agency evaluate and/or modify the BMPs to protect beneficial uses (IDAPA 58.01.02.52). If necessary, the state may seek injunctive or other judicial relief against the operator of a nonpoint source activity.

The water quality standards list designated agencies responsible for reviewing and revising nonpoint source BMPs: the Soil Conservation Commission for grazing and agricultural activities, the Department of Transportation for public road construction, Idaho Department of Agriculture for aquaculture, and DEQ for all other activities (IDAPA 58.01.02.003).

5. Total Maximum Daily Loads

A TMDL prescribes an upper limit on the 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 LA, 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 NB load is also effectively a reduction in the LC 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 is 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. This document represents the loading analyses for the pollutants addressed by the Mid Snake River/Succor Creek subbasin assessment. The determination of targets and the critical season for the Snake River is largely based upon the work done in the SR-HC TMDL, not only because the work is applicable to this segment but also so that this segment meets the established targets where it enters the SR-HC reach.

Nonpoint sources are generally those sources that discharge over a diffuse area. They are generally not permitted and are more difficult to quantify than point sources due to the disperse nature of their discharges. Nonpoint source discharge occurs in all segments of the Mid Snake River/Succor Creek reach and includes agriculture, urban/suburban, storm water, ground water, and natural loading.

5.1 Instream Water Quality Targets

Instream water quality targets were selected such that they will restore full support of designated beneficial uses. Important considerations in target selections were critical periods for target application, recovery time for the water body, and appropriateness of surrogates.

Target Selection

The following section describes the water quality targets used to develop TMDLs. In some cases, surrogates are used as the target. In the temperature TMDLs (Table 53), riparian potential (shading) is used as a surrogate for the excess heat in the water, which is expressed in terms of joules. In the bank sediment TMDLs (Table 46), bank stability is used as a surrogate for maintaining less than 30% fine material in the riffles. In the nutrient TMDL (Table 51), total phosphorus is used as a surrogate for the narrative nutrient standard. Additional details regarding how each surrogate is used are located in the following sections.

Temperature
Temperature targets are established on a stream-by-stream basis and are based upon the lowest possible temperature that can be expected given practical stream shading, width/depth conditions, and monitored atmospheric conditions. These targets were established using the SSTEMP model to determine instream temperatures based on site potential shade parameters and width/depth measurements. The numeric standards do not apply in all cases because they realistically **cannot be met** throughout the reach, even under ideal shading and width/depth situations. In these cases, the ”best achievable temperature” is used as the target. The best achievable temperature is based on the practical amount of shading possible as defined in the TMDL. Stated another way, in instances where the best achievable temperature is used as the target, there is no anticipation that the water quality standard(s) will be achieved.

Site potential shading characteristics are derived from riparian community information for the particular area. Site potential shading is not an estimate of pre-settlement conditions. The Owyhee drainages have seen changes as a result of anthropogenic impacts (i.e., channel armoring, straightening, entrenchment) and the historic condition is no longer attainable. Thus, site potential shading is based upon maximum vegetation heights, maximum density, and optimal vegetative offset of the most likely and optimal riparian community group for the particular stream segment. Potential changes in width/depth ratios are also taken into account for the particular channel type, but changes in the existing channel type are not modeled.

In instances where the numeric standards **can be met**, the respective cold water aquatic life and salmonid spawning criteria are used as the target. The application of the criteria to the data takes into account the critical period for each respective beneficial use.

The designated reaches provide habitat for fish (including salmonids in some cases) and other cold water aquatic life. Therefore, it is important that temperature levels be appropriate to support them. The targets determined by SSTEMP are appropriate because information from surrounding watersheds (data as well as anecdotal) indicates that streams historically have temperatures over this target, even when aquatic species were present in healthy populations (USFWS 1957, 1958).

The Mid Snake River/Succor Creek watershed has always had high summer air temperatures, high solar radiation, and low summer flows. Temperatures are exacerbated by certain land use practices including flow diversion, but water temperatures have most likely never been cold during the hottest periods of the year. Native fish have either physiologically adapted to the high temperatures or have been able to find colder water refugia in deep pools and by springs during periods of high stream temperatures. Factoring in these natural conditions, the temperature targets are based upon the temperature decrease expected under optimal habitat conditions, which, while above the state numeric criteria in some cases, are protective of the native fish and their reproductive cycle.

The TMDL must account for seasonal variation. The majority of temperature exceedances and low flows occur in July and August. Since it is not possible to change allocations of shade over a year, allocations were set based on the critical summer period.

The Mid Snake River/Succor Creek drainage is subject to both fires and flash flood events. Depending upon land management practices, it may take at least 10-15 years (maybe up to 25 years) to reestablish vegetation and reach site potential shade after such events.

Sediment

Sediment conditions as they relate to the water quality standards are assessed through the interpretation of the narrative criteria based on impacts to aquatic life. Current guidelines established by other TMDL efforts recommend less than or equal to 80 mg/L suspended sediment for acute events lasting less than 14 days, and less than or equal to 50 mg/L for acute events lasting less than 60 days. These targets are based on the work of Newcombe and Jensen (1996). The Lower Boise River Sediment TMDL (DEQ 1998) established these concentrations for support of designated beneficial uses in the lower Boise River drainage; these targets were also established for the SR-HC TMDL. These are the targets that will be used for the mainstem Snake River. Based in part on the work of several authors, it is the opinion of DEQ that these targets will be protective of both aquatic life (EIFAC 1964, NAS/NAE 1973, Miller 1998, Newcombe and Jensen 1996) and water quality, and should meet the requirements of the CWA. The identification of the acute 80 mg/L target will allow natural runoff and storm events (for which aquatic life in the Snake River are adapted) to be accommodated by the TMDL.

Jump Creek and Succor Creek (from the Oregon line to the Snake River) contain elevated suspended solids concentrations as a result of agricultural return water. Using the available data, site-specific TSS targets have been developed for these tributaries. The targets are linked to conditions that will ensure the water quality standards are met in each respective tributary. In lower Succor Creek, the average irrigation season TSS concentration in the stream above Sage Creek will be considered the TSS target for the remainder of the stream. This value is 22 mg/L and will be applied during the irrigation season (critical period) as the irrigation season is when nearly all of the loading occurs to the stream. The target of 22 mg/L represents the TSS conditions in the stream during a time of year when loads are the highest, yet, as discussed in the subbasin assessment portion of this document (Chapter 2), aquatic life beneficial uses can remain supported.

In Jump Creek, monitoring data were used to develop a regression of TSS as a function of turbidity. The linear regression equation is based on 88 data pairs from the four longitudinally spaced monitoring locations in the stream. The irrigation season was determined to be the critical period because that is when nearly all of the loading occurs to the stream. For that reason, only data from the irrigation season were used to develop the regression. By solving for TSS with a turbidity of 25 NTU an instream TSS target of 65 mg/L is established. By maintaining 65 mg/L TSS in the stream, a turbidity of 25 NTU will be maintained. Additional details regarding the regression and the method by with the target was established can be found in the subbasin assessment portion of this document under the analysis of the Jump Creek data (Chapter 2).

The primary source of sediment in the remaining listed tributaries to the Snake River is instream erosional processes. For these tributaries where the largest amount of sediment is produced from instream processes, a target of greater than 80% stream bank stability is recommended. This surrogate measure has been used in other TMDLs, such as the Pahsimeroi TMDL (DEQ 2001a), and is based on findings by Overton et al. (1995). Using NRCS (1983) derived equations, erosion rates and total tons of eroded sediment/year can be calculated using bank inventory ratings. This 80% bank stability target has been linked to 28% fines in both the Blackfoot and Pahsimeroi TMDLs (DEQ 2001 a and b). This percent fines target has been shown to support salmonids and, thus by corollary, is protective of coldwater aquatic life.

To qualify the seasonal and annual variability and critical timing of sediment loading, climate and hydrology must be considered. The sediment analysis characterizes loads using average annual or seasonal rates determined from empirical characteristics that developed over time within the influence of peak and base flow conditions. While deriving these estimates it is difficult to account for seasonal and annual variation within a particular time frame; however, the seasonal and annual variation is accounted for over the longer time frame under which observed conditions have developed.

Annual erosion and sediment delivery are functions of a climate, where wet water years typically produce the highest sediment loads. Additionally, the annual average sediment load is not distributed equally throughout the year. Most of the erosion typically occurs during a few critical months. For example, in the Mid Snake River/Succor Creek watershed, most stream bank erosion occurs during spring runoff. The sediment analysis uses empirically derived hydrologic concepts to help account for variation and critical time periods. First, field-based methods consider critical hydrologic mechanisms. For example stream bank erosion inventories account for the fact that most bank recession occurs during peak flow events when banks are saturated. Second, the estimated annual average sediment delivery from a given watershed is a function of bankfull discharge or the average annual peak flow event.

Reduction of stream bank erosion prescribed within this TMDL is directly linked to the improvement of riparian vegetation density and structure to armor stream banks, reduce lateral recession, trap sediment, and reduce the erosive energy of the stream, thus reducing sediment loading. In reaches that are down-cut, or that have vertical erosive banks, continued erosion may be necessary to re-establish a functional floodplain that would subsequently be colonized with stabilizing riparian vegetation. This process could take many years. It is also expected that improvement of riparian vegetation density and structure may reduce the potential for temperature and bacteria loading in the future.

Nutrients

The Mid Snake River/Succor Creek watershed is directly above the Hells Canyon reach of the Snake River. The Mid Snake River/Succor Creek segment of the Snake River must meet the loading targets of the SR-HC TMDL at the Oregon state line. Because both the SR-HC TMDL and the Mid Snake River/Rock Creek TMDL derived similar nutrient targets, the research for those TMDLs was applied to this TMDL. The more conservative target from the SR-HC TMDL (DEQ 2001) was selected for Mid Snake River/Succor Creek TMDL. The following is a discussion of target selection adapted from both the aforementioned TMDLs.

Nutrient conditions in streams as they relate to the water quality standards are assessed through the interpretation of the narrative criteria based on excessive or nuisance aquatic growth. Numeric targets established to support designated beneficial uses within the tributaries are based on an understanding of nutrient transport and processing within this system; research carried out in systems with similar climate and geology; and the linkage established between inflowing nutrient concentrations, organic growth and decay, and water chemistry processes (affecting DO, pH, nutrient desorption, etc). This target will be protective of recreation and aquatic life uses and of water quality, thereby meeting the requirements of the CWA. Attaining the target should result in full support of the designated beneficial uses within the system.

The TP target for this segment has been set at 0.07 mg/L based on upstream and downstream targets set by the SR-HC and Mid Snake River/Rock Creek TMDLs. The Mid Snake River/Succor Creek reach is directly above the SR-HC reach and, thus, must meet the SR-HC 0.07 mg/L TP target where the two reaches meet. The critical period for application of this target is May through September.

Since phosphorus has been shown to be the limiting nutrient for algal growth in the Snake River system and because many of the BMPs for this area will be efficient for both nitrogen and phosphorus, instream targets are based on TP. Total phosphorus, rather than orthophosphate, was chosen because although ortho-phosphate is more biologically available, TP is more stable, represents all phosphorus that may become available for biological uptake, and is more reproducible in the lab on a method to method basis (DEQ 2001).

A water quality target of 0.075 mg/L TP was established for two separate reaches analyzed by the Twin Falls Regional Office of DEQ as part of their TMDL effort on the Mid Snake River/Rock Creek. The first analysis was derived from the EPA's recommended targets for various water bodies (USEPA 1986). In free-flowing rivers, the TP recommended target is 0.100 mg/L, for lake tributaries the recommended target is 0.050 mg/L TP, and for lakes and reservoirs the recommended target is 0.025 mg/L TP. The middle Snake River has a modified flow regime with run-of-the-river impoundments. Based on discussions and research conducted by the technical advisory committee of the middle Snake River water management plan (1988 to 1992), DEQ concluded that the best reasonable, preliminary target value for water column TP would be 0.075 mg/L.

The second analysis was derived from RBM10 model simulations. The RBM10 is a simulation water quality model of the middle Snake River (between Milner Dam, river mile 640.0, and Upper Salmon Falls Dam, river mile 583.0) for purposes of water resource planning. The RBM10 has also been used as a decision support tool in the Spokane River and on the Snake River above Milner Dam (Yearsley 1991, 1996).

There have been four, 10-year model simulations performed using flow data from 1930-1939, which represent the lowest flow years of hydrologic record. By using the assimilative capacity of the Middle Snake River under the "worst case flow" conditions, model simulations provided an answer to two objectives: (1) to evaluate the relative effectiveness of various industry management actions at improving instream water quality; and (2) to verify that the proposed industry load reductions would, on average, lead to attainment of the instream TP goal at Gridley Bridge under adverse flow conditions. Additionally, under high flow conditions the instream target should be easier to achieve given the dilution effect from water quantity. Results of the simulation runs show that within 10 years of BMP implementation, proposed nutrient reductions should attain the instream TP target goal. The modeling results gave a value of 0.0728 mg/L at the compliance point.

The modeling also showed the resultant plant biomass decrease for macrophytes and epiphytes in response to nutrient reduction of TP. Upon reductions, the plant biomass was reduced by 20-30% and would therefore improve reduced impacts to beneficial uses of the Middle Snake River caused by nuisance/excessive aquatic vegetation.

The 0.07 mg/L target was chosen for the entire Mid Snake River/Succor Creek reach because it is a more conservative target than the 0.0725 mg/L target for the Middle Snake River and because this reach has connectivity with the SR-HC reach. The Snake River from King Hill to CJ Strike Reservoir (HUC 107050101) TMDL has not been completed and, thus, a more conservative target is appropriate in case these TMDLs determine a target lower than 0.075 mg/L is necessary.

Bacteria
Bacteria targets are consistent with the numeric water quality standards for the protection of human health. As described in Table 6, the targets are expressed in terms of an instantaneous maximum and a 30-day geometric mean. If the instantaneous maximum is exceeded in a single sample, 4 additional samples must be collected within a 30-day period to calculate the geometric mean.

<u>Monitoring Points</u>

Monitoring points for each water body were discussed in detail in Section 2.3. Refer to that section for the location of monitoring points for each water body. An attempt was made in each subwatershed to monitor a representative sections of the streams, including a downstream compliance point for temperature and water chemistry measurements.

5.2 Load Capacity

The LC is the amount of pollutant a water body can receive without violating water quality standards. Seasonal variations and a MOS to account for any uncertainty are calculated within the LC. The MOS accounts for uncertainty about assimilative capacity, the precise relationship between the selected target and beneficial use(s), and variability in target measurement. The LC is based on existing uses within in the watershed. The LC for each water body and specific pollutant are tailored to both the nature of the pollutant and the specific use impairment.

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.

Temperature
In the stream segments shown in Table 38 requiring temperature TMDLs, the temperature water quality standard has not been met and the pollutant is excess heat. The primary source of temperature increases under anthropogenic control are those that increase the amount of solar radiation reaching the stream surface. Thus, the load of this resultant excess "heat" is calculated in joules per square meter per second (joules/m^2/sec). The LC is the amount of heat in the stream when the criteria or the best achievable temperature are met.

Stream shading is used as a surrogate for solar radiation. Therefore, the LC can also be expressed as the amount of shade needed to attain temperature standards. Where the numeric criteria cannot be met, naturally achievable conditions apply and full site potential shade is necessary.

Nutrients
The LC for nutrients was determined by calculation using the target of 0.07 mg/L TP and average flow values (calculated from 1999 and 2000 flow data, as described in Chapter 2).

Flow values for the Snake River at river mile 409 were determined using a flow budget developed for the SR-HC TMDL and applying the calculated proportional flow increase on a per mile basis.

The phosphorus LC is identified for an average flow scenario. While these values are helpful in giving a relative understanding of the reductions required, and will apply reasonably over most water years, it should be noted that the absolute level of reduction required will depend on flow and concentration values specific to a given water year. The target shown to result in attainment of water quality standards and support of designated uses in the reach is an instream concentration of less than or equal to 0.07 mg/L TP. Transport and deposition of phosphorus, and the resulting algal growth within the reach, is seasonal in nature. Therefore, application of the 0.07 mg/L TP target is also seasonal in nature, extending from the beginning of May through the end of September. The length of this period was also determined by when BMPs would be most effective.
Currently, total phosphorus levels are above the target concentration outside this period. However, algal blooms result from a combination of several factors including water temperature. Generally, water temperature precludes major nuisance blooms from occurring in early spring and late fall. In the fall, algal blooms may occur but after BMP implementation, the instream nutrient reductions during the critical period should prevent these blooms. In addition, BMPs are most effective during the critical period, which means that many BMPs will still have a protective effect outside of the critical period.

Due to water column nutrients, particularly TP, being more abundant than plant uptake rates, responses by plant communities to management efforts will take time. As TP inputs are reduced, plants that obtain nutrients from the water column (such as algae, epiphytes, and *Cerratophyllum sp.*) will likely be the first to decline. Because nutrients persist longer in sediments, plants that obtain nutrients from the sediments (such as *Potamogeton sp.*) will persist longer. Nevertheless, as reductions in TP (and sediment) continue, sediment bound nutrients will gradually be depleted as plant uptake outpaces recharge rates.

Sediment
The LC for sediment was determined based on the origin of the sediment. In those instances where the sediment generated from stream bank erosion, the LC is based on the load generated from banks that are greater than 80% stable. This load defines the LC for the remaining segments of the stream. In instances where a numeric water column target is defined, the LC is based on the instream load that would be present when the target is met. For example, the instream TSS target for Jump Creek is 65 mg/L. The LC for Jump Creek is based on maintaining 65 mg/L TSS throughout the stream during the critical flow period.

Bacteria
The LC for bacteria is based on the state water quality standard for *E. Coli.* The bacteria LC is expressed in terms of concentration (colonies/ml) because it is impractical to calculate a mass load for bacteria.

5.3 Estimates of Existing Pollutant Loads

Regulations allow that loadings "may range from reasonably accurate estimates to gross allotments, depending on the availability of data and appropriate techniques for predicting the loading," (40 CFR 130.2(I)). The type and amount of data available greatly influenced how DEQ calculated existing loads. These methods have been discussed in detail in the Data Assessment Methods section of this document (see Section 2.3).

Temperature
In temperature-listed streams, average daily and maximum temperatures were determined for the monitored period. These temperatures were translated into joules using SSTEMP. The amount of joules in the water represents existing conditions. In addition, SSTEMP was used to determine existing shade conditions for the reach.

Nutrients
The current nutrient load in the Snake River was calculated using an average water year and averaged concentrations from 1999 and 2000 (1999 and 2000 were used because that is the most current data and would reflect any BMPs implemented). A direct average load calculation was utilized, using average nutrient concentration data and average flow data (years 1995, 1999, and 2000).

Sediment
In instances where the primary source of sediment is from bank erosion, existing sediment loads were determined using the bank erosion inventory process. This method provided direct measurement of erosion rates within the reach. This erosion rate was then used to calculate the current instream delivery of sediment within the system. In instances where sediment was generated via agricultural or other nonpoint source activities, the existing loads were calculated using measured water column data.

Bacteria
Where possible, the current bacteria geometric mean concentrations are calculated by collecting 5 samples over a 30-day period. Otherwise, the instantaneous maximum concentrations are evaluated.

5.4 Load Allocations

Margin of Safety

The MOS factored into all load allocations is implicit. The MOS includes the conservative assumptions used to determine existing sediment loads. Conservative assumptions made as part of the loading analysis are discussed below.

Sediment: Instream Channel Erosion
An implicit MOS exists due to a number of reasons: 1) desired bank erosion rates are representative of background conditions; and 2) water quality targets for percent fines are consistent with values measured and as set by local land management agencies based on

established literature values and incorporate an adequate level of fry survival to provide for stable salmonid production. In the case of upper Succor Creek, Castle Creek and Sinker Creek, reference bank conditions are based on banks that are greater than 80% (about 85%) stable. Since the 28% fines target is based on 80% bank stability, an implicit MOS is included.

Sediment: Water Column Targets
Total suspended solids water column targets are used for lower Succor Creek and Jump Creek TMDLs. In the case of lower Succor Creek, the TSS target is 22 mg/L. The 22 mg/L target is linked by reference to a segment target of the lower Boise River containing TSS conditions of 15 mg/L and aquatic life communities that are not impaired by water column sediment. An implicit MOS applies because of the difference in water column materials between the two systems. In the lower Boise River, the TSS load is primarily composed of small sands and large silts. In Succor Creek, the TSS load is primarily composed of silt and other smaller materials. The larger material in the lower Boise River presents a greater threat to aquatic life (primarily due to the abrasion of fish gills), yet the TSS targets are very similar. Thus, using 22 mg/L as a target in Succor Creek is conservative.

In the case of Jump Creek, the TSS target is 65 mg/L. This target is linked to maintaining a turbidity of 25 NTU throughout the stream. An implicit MOS applies because of this link. Twenty-five NTU is the turbidity criterion that must not be exceeded for more than 10 consecutive days in any applicable mixing zone set by DEQ and is by definition more stringent than the instantaneous turbidity criterion of 50 NTU above background. Thus, since the TSS link was made to 25 NTU as opposed to 50 NTU, the target is conservative.

Nutrients
Accurately determining the nutrient loading is primarily dependent upon the accuracy and representativeness of sampling techniques and analytical methods. The SR-HC TMDL determined that a $\pm$13% MOS encompasses this probable range of error as well as the uncertainty in system uptake and assimilative capacity. This MOS was incorporated into the determination of the 0.07 mg/L TP target.

Temperature
By assuming that optimum potential riparian vegetative conditions could be met throughout modeled reaches, an implicit MOS was employed. Soil and topography conditions may preclude 100% attainment of optimum potential.

Bacteria
An implicit MOS is built into the TMDL by assuming that additional dilution does not become available as tributaries enter the stream.

Seasonal Variation

TMDLs must be established with consideration of seasonal variation. In the Mid Snake/Succor Creek hydrologic unit there are seasonal influences on nearly every pollutant addressed. The summer growing season is when concentrations of sediment and nutrients are the highest. This is also when water temperatures are elevated. The increase in temperature is due to a combination of agricultural return flow and warmer air temperatures. Seasonal variation as it relates to development of this TMDL is addressed simply by ensuring that loads are reduced during the critical period (when beneficial uses are impaired and loads are controllable). Thus, the effects of seasonal variation are built into the load allocations.

Critical Period

The critical period for each water body is based on the time when beneficial uses must be protected and when pollutant loads are the highest. Each respective TMDL was developed such that the water quality standards will be achieved year around, yet the critical period defines when loading reductions must occur. Table 43 shows the critical period for each water body.

Table 43. Critical periods for water bodies receiving TMDLs.

Water Body	Pollutant	Critical Period (Time of Year Applicable)
Snake River	Nutrients/Dissolved Oxygen	May 1 –September 30
Castle Creek, Sinker Creek, Succor Creek (Headwaters to Oregon Line)	Sediment	Year round
Succor Creek (Oregon Line to Snake River)	Sediment	May 1 –September 30
Succor Creek (Oregon Line to Snake River)	Bacteria	Year round
Castle Creek, Sinker Creek, Succor Creek (Headwaters to Oregon line)	Temperature	March 1-September 22
Jump Creek	Sediment	May 1 –September 30

Background

Sediment

Background sediment production from stream banks equates to the load at 80% stream bank stability as described in Overton et al. (1995), where stable banks are expressed as a percentage of the total estimated bank length. Natural condition stream bank stability potential is generally at 80% or greater for A, B, and C channel types in plutonic, volcanic, metamorphic, and sedimentary geology types.

The sediment load reductions are designed to meet the established instream water quality target of 28% or less fine sediment (less than 6.35 mm in diameter) in riffle areas suitable for salmonid spawning. Stream bank erosion reductions are quantitatively linked to tons of sediment per year. An inferential link is identified to show how sediment load allocations will reduce subsurface fine sediment to or below target levels. This link assumes that by reducing chronic sources of sediment, there will be a decrease in subsurface fine sediment that will ultimately improve the status of beneficial uses. Stream bank erosion load allocations are based upon the assumption that stream bank erosion is the primary source of sediment.

Nutrients

The following discussion comes from the SR-HC TMDL. The SR-HC TMDL assessed natural phosphorus conditions in the mainstem Snake River by looking at concentrations in the Blackfoot and Portneuf watersheds where there are high naturally occurring concentrations of phosphorus. Natural sources of nutrients include erosion of phosphorus-containing rock and soils through wind, precipitation, temperature extremes and other weathering events.

Natural deposits of phosphorus (Hovland and Moore, 1987) have been identified in the Snake River drainage near Pocatello, Idaho (RM 731.2). Geological deposits in the Blackfoot River watershed (inflow at RM 750.6) contain phosphorus in sufficient concentrations that they have been mined. The Snake River flows through this area some distance upstream of the SR-HC TMDL reach.

In an effort to assess the potential magnitude of natural phosphorus concentrations in the mainstem Snake River due to these geological deposits, total phosphorus concentrations occurring in the mainstem near the Blackfoot and Portneuf River inflows (RM 750.6 and 731.2 respectively) were evaluated. Data was available for the Snake River near Blackfoot, Idaho (USGS gage # 13069500, RM 750.1) and for the Blackfoot and Portneuf Rivers (USGS, 2001a). The mainstem Snake River and these tributary river systems, where they flow through the natural mineral deposits represent a worst-case scenario for evaluation of natural phosphorus loading and were identified as potential sources of naturally-occurring phosphorus to the SR-HC reach. USGS gauged flow data and water quality data from the 1970's to the late 1990's is available for the Blackfoot and Portneuf Rivers ((USGS gage # 13068500, and #13075500 respectively). Because both the mainstem and tributary watersheds have been settled for some time, and land and water management has occurred extensively, the data compiled represent both natural and anthropogenic loading.

Total phosphorus concentrations in the Snake River mainstem, measured near Blackfoot, Idaho (RM 750.1), from 1990 to 1998 averaged 0.035 mg/L (range = <0.01 to 0.11 mg/L, median = 0.03 mg/L, mode = 0.02 mg/L) (USGS, 2001a). Nearly 40 percent (23 samples) of the total data set showed total phosphorus concentrations less than or equal to 0.02 mg/L. Data represents year-round sampling. Winter sampling was slightly less frequent (approximately 19% of the total) than spring, summer or fall.

Natural phosphorus concentrations were not assessed as part of the Blackfoot River TMDL (IDEQ, 2001b). Total phosphorus concentrations in the Blackfoot River, measured near the mouth, from 1990 to 1999 averaged 0.069 mg/L (range = <0.01 to 0.43 mg/L, median = 0.04 mg/L, mode = 0.03 mg/L) (USGS, 2001a). Nearly 23 percent (12 samples) of the total data set showed total phosphorus concentrations less than or equal to 0.02 mg/L. Data represents year-round sampling. Winter sampling was less frequent (approximately 13% of the total) than spring, summer or fall.

Natural phosphorus concentrations were not assessed for the Portneuf River TMDL (IDEQ, 1999d). Total phosphorus concentrations in the Portneuf River, measured near the mouth, from 1990 to 1998 averaged 0.085 mg/L (range = <0.01 to 0.28 mg/L, median = 0.069 mg/L, mode = 0.03 mg/L) (USGS, 2001a). Nearly 21 percent (6 samples) of the total data set showed total phosphorus concentrations less than or equal to 0.02 mg/L. Data represents year-round sampling. Winter sampling represented approximately 22 percent of the total.

The fact that very low total phosphorus concentrations were observed routinely (more than 20% of the time) in the mainstem Snake River, the Blackfoot River and the Portneuf River, all watersheds with a high level of use and management show that the natural loading levels are likely below detection limit concentrations. The additional fact that these low concentrations were observed in watersheds in much closer proximity to the rich geological phosphorus deposits indicates that these deposits likely do not represent a significant source of high, natural loading to the Mid Snake River/Succor Creek TMDL reach, located well downstream from the mineral deposits identified.

Given the above discussion, the natural background concentration for total phosphorus in the mainstem Snake River has been estimated as at or below 0.02 mg/L for both the Mid Snake River/Succor Creek and SR-HC TMDL reaches. This value is based on the available data set. Data from the Snake River upstream of RM 409 was included in this data set to address the concern of enrichment of surface waters by the phosphoric deposits located in central and eastern Idaho (Hovland and Moore, 1987). Due to the fact that there are substantial anthropogenic influences in Snake River Basin, the lower 15th percentile value for total phosphorus concentration was selected as a conservative estimate of natural phosphorus concentration. In this manner, natural concentration levels for the mainstem Snake River were calculated conservatively. This initial estimate will be reviewed as additional data become available and revisions will be made as appropriate.

The estimated natural background loading concentration for the mainstem Snake River (0.02 mg/L) is most likely an overestimation of the natural loading but represents a conservative estimate for the purposes of load calculation. In addition, this concentration correlates well with other studies that have been completed and closely approximates the total phosphorus concentration identified for a reference system (relatively unimpacted) by the US EPA (US EPA, 2000d; Dunne and Leopold, 1978). Because phosphorus concentrations had dropped to below the detection limit in the Blackfoot watershed after implementation of BMPs, background was assessed at 0.02 mg/L based on the lowest 15th percentile value for phosphorus. This choice of percentile addressed bias introduced by using a lower percentile that contained values below the detection limit and lack of data located directly below the natural source of phosphorus.

Background concentrations of TP in the tributaries and drains as they relate to the overall load in the river were estimated to be negligible and were not accounted for in loading calculations.

Temperature
Background for temperature is considered to be the amount of heat in the water when the maximum riparian potential is met. Thus, the background temperature is the same as the loading capacity.

Sediment Allocations

The targets for TSS in lower Succor Creek and Jump Creek are 22 mg/L and 65 mg/L, respectively. The 22 mg/L target for lower Succor Creek is intended to provide protection for the mix of aquatic life species that inhabit the stream. The target is designed based on the TSS conditions in a segment of the lower Boise River that contains aquatic life unimpaired by suspended sediment. The 65 mg/L target for Jump Creek is based on maintaining a turbidity of 25 NTU throughout the stream. Jump Creek is not §303(d) listed for sediment. Therefore, the 65 mg/L target is not necessarily driven by aquatic life impairment, but rather, is driven by exceedances of 25 NTU during the irrigation season. A detailed discussion of the selection of the targets can be found in the subbasin assessment portion of this document (Chapter 2).

Tables 44 and 45 show the LAs for Sage Creek and for each of the major sources of sediment to Jump Creek. The sources were identified at a 1:24,000 scale. The allocations are designed to meet the TSS goals of 22 mg/L (lower Succor Creek) and 65 mg/L (Jump Creek) in the full length of the streams, with checkpoints near end of each stream. The lower Succor Creek load is calculated using the standard pollutant mixing equation: *mixed conc. =* $(conc_1 * flow_1) + (conc_2 * flow_2) / (flow_1 + flow_2)$ (Hammer 1986). The Jump Creek loads are calculated using the same mixing equation based on a mass balance of inflows and diversions, with the target as the instream goal. Fixed load targets were selected because the management practices that affect sediment loading to the streams are not expected to change on a day-to-day basis. Thus, the management practices should be developed to meet the load goals, which meet the target even when very low flow conditions occur in the stream. No point sources discharge to Succor or Jump Creeks. Additionally, there is no reserve for growth built into the allocations. Any additional point sources discharging to Succor or Jump Creek would receive a wasteload allocation of zero.

As described in section 5.2, the loading capacity for lower Succor Creek and Jump Creeks is based on maintaining the instream target at all locations in the stream. As such, the actual mass load capacity changes at any given location in the stream as flows increase (or decrease with diversions). In addition to the load allocations, Tables 44 and 45 show the load capacity for each stream at the final downstream compliance point. As shown in the tables, if the load allocations are met, the loading capacity will be met.

Table 44. Total suspended solids load allocations for Succor Creek.

Name	Typical Existing Load: 2001-2002 (tons/day)	Load Allocation (tons/day)	Percent Reduction from Existing Load
Succor Creek above Sage Creek	1.19	1.19	0%
Sage Creek	8.79	1.84	79%
Succor Creek at Homedale	Load Capacity: 3.03	Load achieved with reductions: 3.03	--

Table 45. Total suspended solids load allocations for Jump Creek.

Name	Typical Existing Load: 2001-2002 (tons/day)	Load Allocation (tons/day)	Percent Reduction from Existing Load
Mule Creek	10.67	2.13	80%
Field Scale near B-Line Canal	3.38	0.09	97%
B-Line Canal	1.19	0.88	26%
Kora Canal	5.08	0.35	93%
B-4 Lateral	0.41	0.18	57%
Hortsman Drain	15.83	8.22	48%
Jump Creek at Railroad Trestle	Load Capacity: 12.06	Load achieved with reductions: 11.25	--

The analysis of sediment inputs into lower Succor and Jump Creeks focuses on a critical condition from May through September, the standard irrigation season. It is within that season that the most significant loads of sediment are generated.

The analysis for lower Succor Creek shows that the irrigation season TSS load in Sage Creek must be reduced by 79% in order to maintain 22 mg/L throughout the stream. The mass balance analysis for Jump Creek shows that the irrigation season tributary TSS loads must be reduced anywhere between 26% and 97% in order to maintain 65 mg/L throughout the stream. Figure 5.1 shows the mixed concentration of Sage Creek and lower Succor Creek with a 79% reduction in TSS load from Sage Creek. Figure 5.2 show the mass balance for Jump Creek, which is based on an equal concentration allocation scenario for the 1993 data. Working with DEQ, the WAG concluded that an equal concentration allocation scenario is the most equitable for all sources in Jump Creek. One of the primary drivers for this decision is the fact that an equal concentration allocation scenario does not penalize those sources that have already implemented best management practices.

Figures 5.1 and 5.2 show that based on the LAs, the target concentrations, and hence the load capacities, are never exceeded in the stream. Since these years represent typical flow conditions in the basin, the LAs will be applied to all years. The loads are not particularly conservative, but are likely to occur relatively frequently in comparison to the most extreme conditions, and thus are a better basis for establishing load targets than the most extreme condition on record. Tables 44 and 45 display the current and typical existing loads (based on the years described above), and the LAs that represent reductions. The loads derived from this process ensure that the targets for suspended solids are met throughout the streams. Note that the mixed concentrations in Figures 5.1 and 5.2 do not exceed the respective targets for each stream.

	Flow	TSS (mg/L)	Mixed Flow in Succor Creek	Mixed Conc. in Succor Creek	Load Allocation (tons/day)	Current Load	% Reduction
Succor Creek above Sage	20.00	22.00			1.19	1.19	0
Sage Creek	31.00	22.00	51.00	22.00	1.84	8.79	79
Succor near Homedale			51.00	22.00			

Figure 5.1. Mixed Concentration of Total Suspended Solids in lower Succor Creek, Based on Sage Creek Load Reduction

	Flow	TSS (mg/L)	Mixed Flow in Jump Creek	Mixed Conc. in Jump Creek	Load Allocation (tons/day)	Current Load	% Reduction
Jump above Mule Creek	16.30	32.12					
Mule Creek	12.11	65	28.41	46.14	2.13	10.67	80
Field Scale near B-Line	0.50	65	28.91	46.46	0.09	3.38	97
B-Line Canal	5.00	65	33.91	49.20	0.88	1.19	26
Town Canal Withdrawal	-15.00	49	18.91	49.20			
Kora Canal	2.00	65	20.91	50.71	0.35	5.08	93
B-4 Lateral	1.00	65	21.91	51.36	0.18	0.41	57
Hortsman Drain	46.84	65	68.75	60.65	8.22	15.83	48
Jump at RR Trestle			68.75	60.65			

Figure 5.2. Total Suspended Solids Mass Balance for Jump Creek, Based on Equal Concentration Allocations

The remaining stream segments in the Mid Snake River/Succor Creek basin that are receiving sediment allocations are receiving them due to excess stream bank erosion. Table 46 shows the load allocations for these segments. The worksheets used to derive these load allocations are located in Appendix H. The current erosion rate is based on the bank geometry and lateral recession rate (as describe in Appendix G) at each measured reach. The target erosion rate is based on the bank geometry of the measured reach and the lateral recession rate at the reference reach. The reference reach is an area that contains greater than 80% bank stability and less than 28% fine substrate material. The loading capacity is the total load that is present when banks are at least 80% stable. As such, the loading capacity and the load allocations are the same. Note that these are the overall decreases necessary in the stream, but only apply to areas where banks are less than 80% stable. The determination of the reference reach was based solely on the water quality surrogates (e.g. bank stability, percent fines) at the reference site. The determination did not evaluate the land management activities that are contributing to the water quality.

Table 46. Stream bank erosion load allocations for Sinker Creek, upper Succor Creek, and Castle Creek.

Water Body	Current Erosion Rate (tons/mile/year)	Target Erosion Rate (tons/mile/year)	Current Total Erosion (tons/year)	Target Total Erosion (tons/year) Load Allocations Loading Capacity	% Decrease
Sinker Creek	35.26	32.20	352.57	322	8.64
Succor Creek (Granite Creek to Chipmunk Meadows)	214.80	36.52	637.96	108.45	83.07
Succor Creek (Directly below reservoir to Oregon line)	173.87	39.67	768.49	175.36	77.18
Castle Creek	56.35	43.41	704.35	542.63	21

Shaded cells represent existing loads

Bacteria Allocations

Lower Succor Creek is the only stream in Mid Snake River/Succor Creek hydrologic unit that requires a bacteria TMDL. The target for bacteria in lower Succor Creek is based upon the state criteria for primary contact recreation, for which the stream is designated. The entire reach below the Oregon line will accommodate primary contact recreation, therefore the compliance points for bacteria loading are any given location in the stream. The primary contact recreation beneficial use has associated numeric criteria in *Idaho's Water Quality Standards and Wastewater Treatment Requirements* (IDAPA 58.01.02.251):

Primary contact recreation *E. Coli* bacteria colonies:

- may not exceed 406/100 mL at any time;
- may not exceed a geometric mean of 126/100 mL based on a minimum of five samples taken every three days over a thirty day period.

Contact recreation is presumed to be possible or occurring at any location in the stream, during any time of the year. Thus, no single flow condition is considered a critical flow. Since the bacteria concentration in Succor Creek as it enters from Oregon is unknown, current loads and load reductions from Oregon cannot be determined. However, the data presented in the subbasin assessment show that by the time the stream reaches Homedale, concentrations are well in excess of the state criteria.

Table 47 shows the primary contact recreation geometric mean LAs for the tributaries to Succor Creek. The state of Oregon's allocation is consistent with Idaho's and Oregon's criteria for primary contact recreation. Assuming the stream enters Idaho at 126/100 mL, there will be no dilution available to downstream sources. The short length of the segment means that new dilution does not become available along the length of the stream. Thus, the tributaries to Succor Creek must be able to meet a geometric mean of 126/100 mL where they enter the stream. When dilution becomes available in the stream, tributaries may be able to discharge at slightly higher than the criteria. However, until data are collected to determine this, all sources to Succor Creek must be able to meet a geometric mean of 126/100 mL where they enter the stream. There are no point sources discharging to lower Succor Creek. Additionally, there is no reserve for growth built into the allocations. Any additional point sources discharging to Succor would receive a wasteload allocation of zero.

Table 47. Bacteria load allocations for Succor Creek.

Name	Existing Condition (#/100mL geometric mean)	Primary Contact Recreation Load Allocations (#/100mL geometric mean) Loading Capacity	Percent Reduction from Existing Load
Succor Creek at Oregon Line	Unknown	126	Unknown
Coates Drain	Unknown	126	Unknown
Murphy Drain	Unknown	126	Unknown
Sage Creek	266	126	53%

The bacteria load allocations are intended to target the geometric mean criteria for *E. Coli.* Compliance with those criteria must be judged using an appropriate number of samples. Tributaries should discharge bacteria in quantities that do not exceed state criteria for bacteria assuming little likelihood for dilution and minimal die-off. One measurement of bacteria at the mouth of a tributary that is greater than 126 colonies per 100 mL does not

constitute a violation of the allocation; compliance is determined when a tributary does not cause exceedances of the seasonally applicable criteria in Succor Creek.
While only the sources listed in Table 47 received explicit LAs for bacteria, other nonpoint sources of bacteria loading to the stream, such as pasture lands in the floodplain, wild horses (to the extent possible) and feeding operations, should be managed to prevent the movement of bacteria into the stream.

An implicit MOS is built into the bacteria TMDL for Succor Creek. The analysis assumes no dilution is available to the tributaries in Idaho, when in fact, if the state of Oregon discharges according to the Oregon criteria (126/100 mL), dilution would be available. Since the input flows to the stream are greater than the withdrawals, there is a net gain in volume as the stream flows toward the Snake River. As a result, dilution becomes available every time water enters the stream. Thus, if the sources meet their load allocations, the net bacteria concentration in the stream should consistently decrease in the downstream direction.

Nutrient Allocations

The allocation strategy used for the nutrient TMDL is "equal concentration," meaning that all sources must discharge at a concentration of 0.07 mg/L TP or less where they enter the river. This allocation applies to the Snake River from Swan Falls Dam to the Oregon line. Seasonal variation and critical conditions were accounted for in this allocation and the target applies from May-September. The instream seasonal concentration at River Mile 449.3 (Murphy) is 0.071 mg/L. An allocation for the sections of the river from CJ Strike Reservoir to Castle Creek and from Castle Creek to Swan Falls Dam may be necessary in the future. However, at this time a further delineation of tributary sources and instream concentrations above Swan Falls is necessary to determine where these allocations might need to occur. In addition, the Snake River where it exits CJ Strike Dam must meet the 0.07 mg/L target. Using 1999 and 2000 data, the Snake River below CJ Strike Dam discharges at 0.07 mg/L, meeting the target.

Table 48. Instream Total Phosphorus Average Concentrations

Location	May-September Average Concentration (mg/L)
Snake River below CJ Strike Dam	0.07
Snake River at river mile 449.3	0.071
Snake River at Marsing (river mile 425)	0.082
Snake River at Homedale (river mile 417)	0.087

The Mid Snake River/Succor Creek WAG felt that equal concentration was the most equitable allocation scenario because this method does not require any sources to discharge below the 0.07 mg/L target and it does not penalize those sources that have already implemented best management practices.

Table 49 shows the nonpoint source load allocations but does not specifically distribute them to the individual tributaries. This load was determined using an overall water budget for the Snake River. The flows and the load allocation were calibrated against the existing drain nutrient and flow data.

DEQ was able to delineate the nonpoint source loads from point source wasteloads, but tributary specific information was not available for an entire year for all the tributaries. Pollutant loads vary between years due to cropping patterns, water availability etc., and to use data from 1992, 1995, 1999, and 2000 for tributary/drain specific allocations could potentially overestimate an individual tributary's load.

The 1995 and 2000 flow data and 1999/2000 nutrient data were used to determine loads for the mainstem Snake River. The data were provided by both Idaho Power and USGS (IPC 2002, USGS 2000). These water years were used because they represented average flow years. The 1999 and 2000 nutrient data were used because they represented the most recent data available. The 2001 nutrient data was not used for these calculations because 2001 was an extremely low water year and was not considered representative of average conditions.

The point source wasteloads for the two WWTPs are based on a discharge of 3.5 mg/L of TP (average discharge for unmonitored facilities as determined by SR-HC TMDL) at design capacity. Table 50 shows the current wasteloads not the WLA at design capacity. These current loads are lower than the allocated loads because both of these facilities are currently operating well below design capacity. If the facility expands beyond its design capacity then phosphorus discharge limits will be incorporated into its permit, meaning that the facility must either land apply, upgrade to biological nutrient removal or integrate another phosphorus removal process, and/or engage in pollutant trading as part of expansion in order to meet the TMDL target.

As part of the implementation plan, the wastewater treatment facilities will be required to write a nutrient reduction plan. This allocation does not preclude these facilities from incorporating effluent trading into their nutrient management plans. The wasteload allocations and load allocations presented in this TMDL may be adjusted under a state-approved effluent trading program as long as the loading capacity is not exceeded

Based on the current loads and wasteloads shown in Tables 49 and 50, the LAs and WLAs necessary to meet and maintain 0.07 mg/L TP in the river are shown in Table 51.

Table 49. Loads from nonpoint sources to the Snake River in the Mid Snake River/Succor Creek Subbasin.

Wasteload Type	Location	Load	Estimation Method
Total Phosphorus	Drain and Tributaries	381 kg/day	Direct Load Average

Table 50. Waste loads from point sources to the Snake River in the Mid Snake River/Succor Creek Subbasin.

Wasteload Type	Location	Current Load (kg/day)	Load Allocation (kg/day)	NPDES[1] Permit Number
Total Phosphorus	Marsing WWTP	2 kg/day	4 kg/day	Permit # ID0021202
Total Phosphorus	Homedale WWTP	3 kg/day	5 kg/day	Permit # ID0020427

[1]National Pollutant Discharge Elimination System
[2]Wastewater treatment plant

Table 51. Total Phosphorus load and wasteload non point source allocations based on average water year (Snake River from Swan Falls Dam to Oregon Line).

Water Body	Current Load (kg/day)	Seasonal Load Capacity (kg/day)	Seasonal Background Load (kg/day)	Load Allocation (kg/day)	Reduction Required (%)
Snake River at Homedale	2071	1667	453	1205	19.5
Drains, Tributaries and unidentified sources[2]	381	84	0	84	78

[1]Wastewater treatment plant
[2]Total phosphorus background not determined for drains and tributaries, estimated to be negligible
[3]Seasonal background accounted for in the load capacity

The load allocations can be summarized by the following load allocation equation:

LC (1667)= NB(453)+LA (1205)+WLA(9)
(the MOS is accounted for in the target concentration used to calculate the LC)

Sources of unmeasured load may include nonpoint source runoff from anthropogenic sources and precipitation events, unidentified small tributaries and drains, errors in gauged flow measurements, and ground water sources. Monitoring of both point source discharge loads and instream water column concentrations will be undertaken as part of the implementation process. Instream monitoring will be described in more detail in the site-specific implementation plans that will be completed 18 months following the approval of this TMDL. It is expected that at a minimum such monitoring will include the measurement of water column TP, chlorophyll-a and DO within each segment during time frames that represent high, low, and average flow conditions.

Future Growth

Where applicable, states must include an allowance for future loading in their TMDL that accounts for reasonably foreseeable increases in pollutant loads with careful documentation of the decision-making process. This allowance is based on existing and readily available data at the time the TMDL is established. In the case of the Mid Snake River/Succor Creek TMDL, an allowance for future growth is not recommended until such time as reductions indicate that beneficial uses or state water quality standards have been restored. Therefore, the allowance for future growth is zero. Growth can occur under the following auspices: 1) pollutant trading, 2) no net increase above the instream target parameters, and 3) no discharge where land application is the preferred option.

In regards to the point sources in the watershed, since their current allocation is based on their operation at design capacity, any growth that requires expansion of the existing facility triggers phosphorus removal requirements. A reserve capacity allocation is initially implicit since these facilities are not operating at design capacity. The reserve capacity allocation is therefore the difference between the current discharge and design flow discharge. This allows for expansion of existing sources or addition of new point sources discharge through trading or demonstration of an offset within the system. Above and beyond their capacity, a future growth allowance is not calculated since these facilities will have to implement phosphorus removal strategies that typically decrease phosphorus loads by 80% (DEQ 2002).

Any future point sources will receive a wasteload allocation of zero. A discussion of reasonable assurance can be found in Chapter 4.

Temperature Allocations

Succor Creek and Sinker Creek require temperature TMDLs. The TMDLs for these streams are premised on meeting the state of Idaho water temperature criteria for cold water aquatic life and salmonid spawning. Table 52 shows the criteria and the time of year when the criteria apply.

Table 52. State of Idaho water temperature criteria.

Temperature Criteria	Cold Water Aquatic Life (June 22-Sept 21)	Salmonid Spawning (March 1-June 15)
Instantaneous Maximum	22 °C., 71.6 °F.	13 °C., 55.4 °F.
Maximum Daily Average	19 °C., 66.2 °F.	9 °C., 48.2 °F.

The temperature TMDLs were calculated using the SSTEMP model developed by Bartholow (1999). The SSTEMP model was used to determine a heat loading capacity and reduction requirements based on meeting the numeric criteria in Table 52.

It should be noted that the SSTEMP model provides a gross estimate of the heat lost or gained due to a change in vegetative shade. There are many unknowns when determining the effects of increased vegetation on channel width, channel length, air temperature, relative humidity, wind speed, or other physical/climatic attributes that will affect water temperature. Thus, as more information is collected, the model can be re-calibrated to reflect current conditions.

Where the numeric temperature criteria cannot be met, SSTEMP is used to determine the best achievable temperature. This instance arises when the system potential riparian vegetation for a stream does not achieve the criteria. This is common in the Mid Snake River/Succor Creek hydrologic unit, where the pattern of water temperatures closely tracks air temperatures. The system potential shade is defined as the near stream shade condition that can be expected at a site depending on physical factors such as ecoregion, elevation, topographic shade, soil properties, plant biology, and hydraulic processes. System potential vegetation is a large component of system potential shade.

The system potential for each respective stream segment requiring a temperature TMDL was determined via a combination of literature values and WAG input. The system potential is 70% system potential shade for Sinker Creek and 55% system potential shade for Upper Succor Creek (headwaters to Oregon Line). The value for Sinker Creek is higher than Succor Creek due to the fact that the stream channel is narrower, the vegetation offset is less and Sinker Creek also has more topographic shade. The expectation is that near stream vegetation will reduce direct solar radiation to the stream channel, cool microclimates on the water surface (such as a pool shaded by a willow root wad) and increase bank stability to improve channel morphology. To clarify the definition of system potential vegetation:

- System potential vegetation **is** an estimate of the riparian conditions that should exist without excessive anthropogenic activities that disturb or remove riparian vegetation. For example, 55% of upper Succor Creek should contain near 100% of its system potential.
- System potential **is not** an estimate of pre-anthropogenic conditions. It is unrealistic to expect that conditions will be restored to pre-settlement conditions. However, proper management should allow for an increase in riparian vegetation.

Load capacity is based on a mass/unit/time measurement of joules/m^2/sec. The SSTEMP model was calibrated to measured conditions for each month then utilized to determine the reduction of joules/m^2/sec required to achieve the temperature criteria or the best achievable temperature. The SSTEMP model also generates the amount of shade required to obtain the desired joules/m^2/sec. Thus, the LC will use the mass/unit/time measurement of joules/m^2/sec and the surrogate measure to meet the capacity will be a prescribed increase in percent shading. Appendix I shows the SSTEMP results for each model run for the months in which criteria are exceeded. Appendix G describes in detail the input variables for the model plus the validation methods used prior to each model run.

Table 53 shows the existing percent shade for each stream, estimated system potential shade, shade to meet the temperature criteria, the best achievable temperature, decrease in daily average temperature to meet the standard (or best achievable temperature), current solar load, solar load capacity, solar load decrease to meet the capacity (LA), and the required increase in shade. To increase the precision of the TMDL, each month in which the criteria are exceeded is modeled separately. This is appropriate because SSTEMP assumes all input variables are an average for the month being modeled. There are no point sources discharging to the streams in Table 53. Additionally, there is no reserve for growth built into the allocations. Any additional point sources discharging to the streams would receive a wasteload allocation of zero.

While SSTEMP was used to determine these allocations, it is important to note that during implementation, the vagaries of extreme high flows, intense beaver activity, soil condition etc. all may act individually or in concert to slow or prevent attainment of optimal shading conditions and thus achievement of the temperature standards. DEQ recognizes that these factors may prevent attainment and if in fact conditions beyond landowners reasonable control come into play, targets and/or timelines will be adjusted accordingly.

Table 53. Load allocations for streams requiring temperature TMDLs.

Stream Segment / Month	Existing shade as determined by SSTEMP (Riparian %)	Estimated system potential shade (Riparian %)	Shade to meet numeric temperature standards (Riparian %)	Temperature criteria -or- best achievable temperature (°C)	Decrease in current mean temperature (°C) to meet standard -or- best achievable temperature	Current solar load as per SSTEMP (j/m2/s)	Solar loading capacity (LC) based on shade to meet standard or best achievable temperature (j/m2/sec)	Solar load decrease (j/m2/s) to meet capacity (Load Allocation)	Required increase in shade (%)
North Fork Castle Creek	Insufficient Data to Develop TMDL								
Sinker Creek (July)	58.2	70.4*	70.4	19**	0.85	4.30	3.49	0.81	12 [a]
Succor Creek – Headwaters to Berg Mine									
May	16	55	55[b]	9.52	0.90	109.88	50.61	59.27	39
June	14	55	55[b]	10.67	1.22	183.80	115.26	68.54	41
Succor Creek – Berg Mine to Chipmunk Meadows									
May	14	55	55[b]	10.10	0.52	135.87	63.94	71.93	41
June	13	55	55[b]	11.46	0.71	205.86	120.81	85.05	42
Chipmunk Meadows to Succor Creek Reservoir	Insufficient Data To Develop TMDL								
Succor Creek - Reservoir to the Oregon Line									
May	14	55	55[b]	9.63	0.66	124.57	57.37	67.20	41
June	13	55	55[b]	10.76	0.87	202.35	122.03	80.32	42
July	13	55	24	22	0.20	208.78	184.88	23.90	11
August	14	55	53	22	1.61	87.59	43.34	44.25	39

Shaded Columns Represent Existing Conditions
[a] This percent shading increase starts 0.5 miles South of Hwy 78

[b] Temperature standard cannot be met with maximum potential riparian shading
* Sinker Creek has higher potential shading conditions then other streams due to narrow stream channel and higher topographic shading
**can meet 19 C temperature criteria for critical period with less than 10% of dates exceeding criteria

5.5 Implementation Strategies

Overview

The purpose of this implementation strategy is to outline the pathway by which a larger, more comprehensive, implementation plan will be developed 18 months after TMDL approval. The comprehensive implementation plan will provide details of the actions needed to achieve load reductions (set forth in a TMDL), a schedule of those actions, and specify monitoring needed to document actions and progress toward meeting state water quality standards. These details are typically set forth in the plan that follows approval of the TMDL. In the meantime, a cursory implementation strategy is developed to identify the general issues such as responsible parties, a time line, and a monitoring strategy for determining progress toward meeting the TMDL goals outlined in this document.

The geographic scope of this TMDL effort extends from the CJ Strike Dam outfall to where the river intersects the Oregon/Idaho border (Snake River mile 409) (hydrologic unit code 17050103). Also included are TMDLs for several tributaries to the Snake River, including Castle Creek, Sinker Creek, Jump Creek, and Succor Creek. Chapter 2 of the subbasin assessment describes the basin in more detail.

Responsible Parties

Development of the final implementation plan for the Mid Snake River/Succor Creek TMDL will proceed under the existing practice established for the state of Idaho. The plan will be cooperatively developed by DEQ, the Snake River/Succor Creek WAG, the affected private landowners, and other "designated agencies" with input from the established public process. Of the four entities, the WAG will act as the integral part of the implementation planning process to identify appropriate implementation measures. Other individuals may also be identified to assist in the development of the site-specific implementation plans as their areas of expertise are identified as beneficial to the process.

Designated state agencies are responsible for assisting with preparation of specific implementation plans, particularly for those sources for which they have regulatory authority or programmatic responsibilities. Idaho's designated state management agencies are:

- Idaho Department of Lands (IDL): timber harvest, oil and gas exploration and development, mining
- Idaho Soil Conservation Commission (ISCC): grazing and agriculture
- Idaho Department of Transportation (IDT): public roads
- Idaho Department of Agriculture (IDA): aquaculture, AFOs, CAFOs
- Idaho Department of Environmental Quality: all other activities

To the maximum extent possible, the implementation plan will be developed with the participation of federal partners and land management agencies (i.e., NRCS, U.S. Forest Service, BLM, U.S. Bureau of Reclamation, etc.). In Idaho, these agencies, and their federal and state partners, are charged by the CWA to lend available technical assistance and other appropriate support to local efforts/projects for water quality improvements.

All stakeholders in the Mid Snake River/Succor Creek subbasin have a responsibility for implementing the TMDL. DEQ and the "designated agencies" in Idaho have primary responsibility for overseeing implementation in cooperation with landowners and managers. Their general responsibilities are outlined below.

- **DEQ** will oversee and track overall progress on the specific implementation plan and monitor the watershed response. DEQ will also work with local governments on urban/suburban issues.
- **IDL** will maintain and update approved BMPs for forest practices and mining. IDL is responsible for ensuring use of appropriate BMPs on state and private lands.
- **ISCC**, working in cooperation with local Soil and Water Conservation Districts and ISDA, the NRCS will provide technical assistance to agricultural landowners. These agencies will help landowners design BMP systems appropriate for their property, and identify and seek appropriate cost-share funds. They also will provide periodic project reviews to ensure BMPs are working effectively.
- **IDT** will be responsible for ensuring appropriate BMPs are used for construction and maintenance of public roads.
- **IDA** will be responsible for working with aquaculture to install appropriate pollutant control measures. Under a memorandum of understanding with EPA and DEQ, IDA also inspects AFOs, CAFOs and dairies to ensure compliance with NPDES requirements.

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

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

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

Adaptive Management Approach

The goal of the CWA and its 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 this watershed, particularly because nonpoint sources are the primary concern. To achieve this goal, implementation must commence as soon as possible.

The TMDL is a numerical loading that sets pollutant levels such that instream water quality standards are met and designated beneficial uses are supported. DEQ recognizes that the TMDL is 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 MOS.

For the purposes of the Mid Snake River/Succor Creek TMDL, a general implementation strategy is being prepared for EPA as part of the TMDL document. Following this submission, in accordance with approved state schedules and protocols, a detailed implementation plan will be prepared for pollutant sources.

For the two point sources in the basin (Marsing and Homedale WWTPs), it is the initial expectation that the sources will meet their specific WLAs immediately. This is because their WLAs are based on loads at their design capacity and both plants are discharging at below capacity. For nonpoint sources, DEQ also expects that implementation plans be implemented as soon as practicable. However, DEQ recognizes that it may take some period of time, from several years to several decades, to fully implement the appropriate management practices. DEQ also recognizes that it may take additional time after implementation has been accomplished before the management practices identified in the implementation plans 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. 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 DEQ's expectation 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 when consistent with protecting water quality and 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. Should such events occur that negate all BMP activities, the appropriateness of re-implementing BMPs will be addressed on a case by case basis. In any case, post event conditions should not be exacerbated by management activities that would hinder the natural recovery of the system.

For some pollutants, pollutant surrogates have been defined as targets for meeting the TMDLs. The purpose of the surrogates is not to bar or eliminate human access or activity in the basin or its riparian areas. It is the expectation, however, that the specific implementation plan will address how human activities will be managed to achieve the water quality targets and surrogates. 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 implementation plan should identify potential constraints, but should also provide the ability to mitigate those constraints should the opportunity arise. If a nonpoint source that is covered by the TMDL complies with its finalized implementation plan, it will be considered in compliance with the TMDL.

DEQ intends to regularly review progress of the implementation plan. If DEQ determines the implementation plan has been fully implemented, that all feasible management practices have reached maximum expected effectiveness, but a TMDL or its interim targets have not been achieved, DEQ may reopen the TMDL and adjust it or its interim targets.

The implementation of TMDLs and the associated plan 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 stakeholders to overcome impediments to progress through education, technical support, or enforcement. 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.

In employing an adaptive management approach to the TMDL and the implementation plan, DEQ has the following expectations and intentions:

- Subject to available resources, DEQ intends to review the progress of the TMDLs and the implementation plans on a five-year basis.
- DEQ expects that designated agencies will also monitor and document their progress in implementing the provisions of the implementation plans for those pollutant sources for which they are responsible. This information will be provided to DEQ 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. These benchmarks will be used to measure progress toward the goals outlined in the TMDL.

- DEQ expects designated agencies to revise the components of their implementation plan to address deficiencies where implementation of the specific management techniques are found to be inadequate.
- If DEQ, in consultation with the designated agencies, concludes 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. This decision will be made based on the availability of resources at DEQ.

Monitoring and Evaluation

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

The implementation plan will be tracked by accounting for the numbers, types, and locations of projects, BMPs, educational activities, or other actions taken to improve or protect water quality. The mechanism for tracking specific implementation efforts will be annual reports to be submitted to DEQ.

The "monitoring and evaluation" component has two basic categories:

- Tracking the implementation progress of specific implementation plans; and
- Tracking the progress of improving water quality through monitoring physical, chemical, and biological parameters.

Monitoring plans will provide information on progress being made toward achieving TMDL allocations and achieving water quality standards, and will help in the interim evaluation of progress as described under the adaptive management approach.

Implementation plan monitoring has two major components:

- Watershed monitoring and
- BMP monitoring.

While DEQ has primary responsibility for watershed monitoring, other agencies and entities have shown an interest in such monitoring. In these instances, data sharing is encouraged. The designated agencies have primary responsibility for BMP monitoring.

Watershed Monitoring
Watershed monitoring measures the success of the implementation measures in accomplishing the overall TMDL goals and includes both in-stream and in-river monitoring. Monitoring of BMPs measures the success of individual pollutant reduction projects. Implementation plan monitoring will also supplement the watershed information available during development of associated TMDLs and fill data gaps.

In the Mid Snake River/Succor Creek TMDL, watershed monitoring has the following objectives:

- Evaluate watershed pollutant sources,
- Refine baseline conditions and pollutant loading,
- Evaluate trends in water quality data,
- Evaluate the collective effectiveness of implementation actions in reducing pollutant loading to the mainstem and/or tributaries, and
- Gather information and fill data gaps to more accurately determine pollutant loading.

BMP/Project Effectiveness Monitoring
Site or BMP-specific monitoring may be included as part of specific treatment projects if determined appropriate and justified, and will be the responsibility of the designated project manager or grant recipient. The objective of an individual project monitoring plan is to verify that BMPs are properly installed, maintained, and working as designed. Monitoring for pollutant reductions at individual projects typically consists of spot checks, annual reviews, and evaluation of advancement toward reduction goals. The results of these reviews can be used to recommend or discourage similar projects in the future and to identify specific watersheds or reaches that are particularly ripe for improvement.

Evaluation of Efforts over Time
Annual reports on progress toward TMDL implementation will be prepared to provide the basis for assessment and evaluation of progress. Documentation of TMDL implementation activities, actual pollutant reduction effectiveness, and projected load reductions for planned actions will be included. If water quality goals are being met, or if trend analyses show that implementation activities are resulting in benefits that indicate that water quality objectives will be met in a reasonable period of time, then implementation of the plan will continue. If monitoring or analyses show that water quality goals are not being met, the TMDL implementation plan will be revised to include modified objectives and a new strategy for implementation activities.

Implementation Time Frame
The implementation plan must demonstrate a strategy for implementing and maintaining the plan and the resulting water quality improvements over the long term. The final timeline should be as specific as possible and should include a schedule for BMP installation and/or evaluation, monitoring schedules, reporting dates, and milestones for evaluating progress. There may be disparity in timelines for different subwatersheds. This is acceptable as long as there is reasonable assurance that milestones will be achieved.

The implementation plan will be designed to reduce pollutant loads from sources to meet TMDLs, their associated loads, and water quality standards. DEQ recognizes that where implementation involves significant restoration, water quality standards may not be met for quite some time. In addition, DEQ recognizes that technology for controlling nonpoint source pollution is, in some cases, in the development stages and will likely take one or more iterations to develop effective techniques.

A definitive timeline for implementing the TMDL and the associated allocations will be developed as part of the implementation plan. This timeline will be developed in consultation with the WAG, the designated agencies, and other interested publics. In the meantime, implementation planning will begin immediately (2003). The goal is to attain the water quality standards and return beneficial uses to full support in the shortest time possible. DEQ expects full implementation of the TMDL and recovery of the beneficial uses to take upwards of 20 years. Some subwatersheds may take less time and some may take more, depending on the complexity of the system.

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Report Glossary

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 waterbodies 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.

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

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

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).

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.
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 wadable streams and rivers.

Benthic	Pertaining to or living on or in the bottom sediments of a water body.
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.
Biomass	The weight of biological matter. Standing crop is the amount of biomass (e.g., fish or algae) in a body of water at a given time. Often expressed as grams per square meter.
Biota	The animal and plant life of a given region.
Biotic	A term applied to the living components of an area.
Clean Water Act (CWA)	The Federal Water Pollution Control Act (commonly known as the Clean Water Act), as last re-authorized by the Water Quality Act of 1987, establishes a process for states to use to develop information on, and control the quality of, the nation's water resources.
Coliform Bacteria	A group of bacteria predominantly inhabiting the intestines of humans and animals but also found in soil. Coliform bacteria are commonly used as indicators of the possible presence of pathogenic organisms (also see Fecal Coliform Bacteria).
Community	A group of interacting organisms living together in a given place.
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 1.984 acre-feet per day.
Decomposition	The breakdown of organic molecules (e.g., sugar) to inorganic molecules (e.g., carbon dioxide and water) through biological and nonbiological processes.
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.
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.
Empirical	Relying on experiment and observation rather than theory.
Environment	The complete range of external conditions, physical and biological, that affects a particular organism or community.
Ephemeral Stream	A stream or portion of a stream that flows only in direct response to precipitation. It receives little or no water from springs and no long continued supply from melting snow or other sources. Its channel is at all times above the water table. (American 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).
Flow	See Discharge.
Fluvial	In fisheries, this describes fish whose life history takes place entirely in streams but migrate to smaller streams for spawning.
Fully Supporting	In compliance with water quality standards and within the range of biological reference conditions for all designated and exiting beneficial uses as determined through the *Water Body Assessment Guidance* (Grafe et al. 2002).
Fully Supporting Cold Water	Reliable data indicate functioning, sustainable cold water biological assemblages (e.g., fish, macroinvertebrates, or algae), none of which have been modified significantly beyond the natural range of reference conditions (EPA 1997).
Geographical Information Systems (GIS)	A georeferenced database.
Geometric Mean	A back-transformed mean of the logarithmically transformed numbers often used to describe highly variable, right-skewed data (a few large values), such as bacterial data.

Grab Sample	A single sample collected at a particular time and place. It may represent the composition of the water in that water column.
Gradient	The slope of the land, water, or streambed surface.
Ground Water	Water found beneath the soil surface saturating the layer in which it is located. Most ground water originates as rainfall, is free to move under the influence of gravity, and usually emerges again as stream flow.
Habitat	The living place of an organism or community.
Headwater	The origin or beginning of a stream.
Hydrologic Basin	The area of land drained by a river system, a reach of a river and its tributaries in that reach, a closed basin, or a group of streams forming a drainage area (also see Watershed).
Hydrologic Unit	One of a nested series of numbered and named watersheds arising from a national standardization of watershed delineation. The initial 1974 effort (USGS 1987) described four levels (region, subregion, accounting unit, cataloging unit) of watersheds throughout the United States. The fourth level is uniquely identified by an eight-digit code built of two-digit fields for each level in the classification. Originally termed a cataloging unit, fourth field hydrologic units have been more commonly called subbasins. Fifth and sixth field hydrologic units have since been delineated for much of the country and are known as watershed and subwatersheds, respectively.
Hydrologic Unit Code (HUC)	The number assigned to a hydrologic unit. Often used to refer to fourth field hydrologic units.
Hydrology	The science dealing with the properties, distribution, and circulation of water.
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.
Irrigation Return Flow	Surface (and subsurface) water that leaves a field following the application of irrigation water and eventually flows into streams.
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.
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.
Macroinvertebrate	An invertebrate animal (without a backbone) large enough to be seen without magnification and retained by a 500µm mesh (U.S. #30) screen.
Macrophytes	Rooted and floating vascular aquatic plants, commonly referred to as water weeds. These plants usually flower and bear seeds. Some forms, such as duckweed and coontail (*Ceratophyllum sp.*), are free-floating forms not rooted in sediment.

Margin of Safety (MOS)	An implicit or explicit portion of a water body's loading capacity set aside to allow the uncertainly about the relationship between the pollutant loads and the quality of the receiving water body. This is a required component of a total maximum daily load (TMDL) and is often incorporated into conservative assumptions used to develop the TMDL (generally within the calculations and/or models). The MOS is not allocated to any sources of pollution.
Mass Wasting	A general term for the down slope movement of soil and rock material under the direct influence of gravity.
Mean	Describes the central tendency of a set of numbers. The arithmetic mean (calculated by adding all items in a list, then dividing by the number of items) is the statistic most familiar to most people.
Metric	A discrete measure of something, such as an ecological indicator (e.g., number of distinct taxon).
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.
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.

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

Not Assessed (NA)
A concept and an assessment category describing water bodies that have been studied, but are missing critical information needed to complete an assessment.

Not Attainable
A concept and an assessment category describing water bodies that demonstrate characteristics that make it unlikely that a beneficial use can be attained (e.g., a stream that is dry but designated for salmonid spawning).

Not Fully Supporting
Not in compliance with water quality standards or not within the range of biological reference conditions for any beneficial use as determined through the *Water Body Assessment Guidance* (Grafe et al. 2002).

Not Fully Supporting Cold Water
At least one biological assemblage has been significantly modified beyond the natural range of its reference condition (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 that consume oxygen during decomposition.
Parameter	A variable, measurable property whose value is a determinant of the characteristics of a system, such as temperature, dissolved oxygen, and fish populations are parameters of a stream or lake.
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.
pH	The negative $\log_{10}$ of the concentration of hydrogen ions, a measure which in water ranges from very acid (pH=1) to very alkaline (pH=14). A pH of 7 is neutral. Surface waters usually measure between pH 6 and 9.
Phosphorus	An element essential to plant growth, often in limited supply, and thus considered a nutrient.
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.
Quantitative	Descriptive of size, magnitude, or degree.
Reach	A stream section with fairly homogenous physical characteristics.
Reconnaissance	An exploratory or preliminary survey of an area.
Reference	A physical or chemical quantity whose value is known, and thus is used to calibrate or standardize instruments.
Reference Condition	1) A condition that fully supports applicable beneficial uses with little affect from human activity and represents the highest level of support attainable. 2) A benchmark for populations of aquatic ecosystems used to describe desired conditions in a biological assessment and acceptable or unacceptable departures from them. The reference condition can be determined through examining regional reference sites, historical conditions, quantitative models, and expert judgment (Hughes 1995).
Reference Site	A specific locality on a water body that is minimally impaired and is representative of reference conditions for similar water bodies.
Representative Sample	A portion of material or water that is as similar in content and consistency as possible to that in the larger body of material or water being sampled.

Riffle	A relatively shallow, gravelly area of a streambed with a locally fast current, recognized by surface choppiness. Also an area of higher streambed gradient and roughness.
Riparian	Associated with aquatic (stream, river, lake) habitats. Living or located on the bank of a water body.
River	A large, natural, or human-modified stream that flows in a defined course or channel, or 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.
Stream	A natural water course containing flowing water, at least part of the year. Together with dissolved and suspended materials, a perennial 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.
Subbasin	A large watershed of several hundred thousand acres. This is the name commonly given to 4^{th} field hydrologic units (also see Hydrologic Unit).

Subbasin Assessment (SBA)	A watershed-based problem assessment that is the first step in developing a total maximum daily load in Idaho.
Subwatershed	A smaller watershed area delineated within a larger watershed, often for purposes of describing and managing localized conditions. Also proposed for adoption as the formal name for 6^{th} field hydrologic units.
Surface Fines	Sediments of small size deposited on the surface of a streambed or lake bottom. The upper size threshold for fine sediment for fisheries purposes varies from 0.8 to 605 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.
Thalweg	The center of a stream's current, where most of the water flows.

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 + Wasteload 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 Gas	Dissolved gas is a measure of the pressure of dissolved gas in the water column.
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.
Tributary	A stream feeding into a larger stream or lake.
Turbidity	A measure of the extent to which light passing through water is scattered by fine suspended materials. The effect of turbidity depends on the size of the particles (the finer the particles, the greater the effect per unit weight) and the color of the particles.
Wasteload Allocation (WLA)	The portion of receiving water's loading capacity that is allocated to one of its existing or future point sources of pollution. Wasteload allocations specify how much pollutant each point source may release to a water body.
Water Body	A stream, river, lake, estuary, coastline, or other water feature, or portion thereof.

Water Column	Water between the interface with the air at the surface and the interface with the sediment layer at the bottom. The idea derives from a vertical series of measurements (oxygen, temperature, phosphorus) used to characterize water.
Water 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.
Young-of-the-Year	Young fish born the year captured, evidence of spawning activity.

Appendix A. Unit Conversion Chart

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 (gal) Cubic Feet (ft^3)	Liters (L) Cubic Meters (m^3)	1 gal = 3.78 L 1 L = 0.26 gal 1 ft^3 = 0.03 m^3 1 m^3 = 35.32 ft^3	3 gal = 11.35 L 3 L = 0.79 gal 3 ft^3 = 0.09 m^3 3 m^3 = 105.94 ft^3
Flow Rate	Cubic Feet per Second (cfs)[1]	Cubic Meters per Second (m^3/sec)	1 cfs = 0.03 m^3/sec 1 m^3/sec = 35.31 cfs	3 cfs = 0.09 m^3/sec 3 m^3/sec = 105.94 cfs
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 lb
Temperature	Fahrenheit (°F)	Celsius (°C)	°C = 0.55 (F - 32) °F = (C x 1.8) + 32	3 °F = -15.95 °C 3 ° C = 37.4 °F

[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.

Appendix B. State and Site-Specific Standards and Criteria

- As per DEQ WBAG II guidance (Grafe et al. 2002), the Mid Snake/Succor Creek subbasin assessment uses the basin-specific salmonid spawning period for redband trout. The basin- specific spawning period is March 1 through June 15.

- Table B-1 outlines the water quality standards used in the Mid Snake/Succor Creek Subbasin Assessment and TMDL.

Table B-1. Idaho water quality standards uses in the Mid Snake/Succor Creek Subbasin Assessment and TMDL.

Pollutant	Applicable Water Quality Standard
Temperature	No greater than 22 degrees Celsius AND no greater than 19 degrees Celsius maximum daily average During salmonid spawning periods: no greater than 13 degrees Celsius AND no greater than 9 degrees Celsius maximum daily average
Dissolved Oxygen	Greater than 6.0 mg/L except in hypolimnion of stratified lakes and reservoirs
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 which impair designated beneficial uses
Turbidity	Less than 50 NTU[2] above background for any given sample or less than 25 NTU for more than 10 consecutive days (below any applicable mixing zone set by DEQ)
Bacteria	Less than 126 *E. coli* organisms/100 mL as a 30 day geometric mean with a minimum of five samples AND no sample greater than 406 *E. coli* organisms/100 mL
Floating, Suspended, or Submerged Matter (Nuisance Algae)	Surface waters shall be free from floating, suspended, or submerged matter of any kind in concentration 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
Excess Nutrients	Surface waters shall be free from excess nutrients that can cause visible slime growths or other nuisance aquatic growths impairing designated beneficial uses
pH	Hydrogen ion concentration (pH) values within the range of 6.5 to 9.0

[1]NTU = nephlometric turbidity unit

Appendix C. Data Sources

Table C-1. Major data sources for the Mid Snake River / Succor Creek Subbasin Assessment.

Water Body	Data Source[1]	Type of Data	When Collected
Snake River	Idaho Power Company, DEQ	Chemical	Ongoing
Succor Creek	IDA, DEQ, BLM, IDFG	Physical, Chemical, Biological	2000-2002
Jump Creek	IDA, DEQ, BLM, IDFG	Physical, Chemical, Biological	1992-93, 2000-2002
Reynolds Creek	ERO, DEQ, ARS	Physical, Chemical, Biological	1965-2001
All other tributaries	DEQ, BLM	Physical, Chemical, Biological	2001-2002

[1]DEQ = Department of Environmental Quality, IDA = Idaho Department of Agriculture, BLM = Bureau of Land Management, IDFG = Idaho Department of Fish and Game, ERO, ARS = Reynolds Creek Agricultural Research Station

Table C-2. Data tiers[1] for data used in the Mid Snake River/Succor Creek TMDL

Stream Segment	Data Source	Data Tier[1]	Proposed TMDL Actions
NF Castle Creek	DEQ	1	TMDL deferral for temperature
SF Castle Creek	BLM, DEQ BURP	1	TMDL deferral-no current bacteria information due to lack of access
Castle Creek	DEQ, BLM	1,2	A sediment TMDL has been prepared for the listed section of Castle Creek; temperature TMDL is deferred
Reynolds Creek (Bernard Ditch to Snake River)	ERO Consulting, Reynolds Creek Agriculture Research Station, DEQ BURP	1	De-list sediment
Jump Creek (Headwaters to Snake River)	Bureau of Reclamation, Owyhee Soil Conservation District, DEQ BURP	1	A sediment TMDL has been prepared for the Mule Creek to Snake River segment of Jump Creek
Sinker Creek (Diamond Creek to Snake River)	DEQ BURP, DEQ Bank Erosion Inventories, DEQ Temperature Loggers, BLM PFC study, Landowner flow data	1,2,3	Sediment and temperature TMDLs have been prepared for Sinker Creek from Diamond Creek down to the Snake River.
Snake River (CJ Strike Dam to Swan Falls Dam)	USGS, IPC, DEQ	1	De-list sediment
Snake River (Swan Falls Dam to Oregon Line)	USGS, IPC, DEQ	1	De-list sediment, pH, bacteria Nutrient allocation DO allocation deferred due to lack of information

Succor Creek (Headwaters to Oregon Line)	DEQ BURP, DEQ Bank Erosion Inventories, DEQ Temperature Loggers	1, 2	Sediment and bacteria TMDLs have been prepared for the headwaters to Oregon line segment. The Tier 2 data are flow data provided by the Succor Creek District Improvement Co.
Succor Creek (Oregon Line to Snake River)	Idaho Department of Agriculture, DEQ Chemical, DEQ BURP	1	A bacteria TMDL has been prepared for the Oregon line to Snake River segment. A sediment TMDL has been prepared from Sage Creek to Snake River.
Cottonwood Creek (Headwaters to Succor Creek)	DEQ Temperature Loggers	1	De-list temperature
Rabbit Creek (Headwaters to Snake River)	DEQ Field Surveys[2]	1	De-list temperature
Corder Creek (Headwaters to Snake River)	DEQ Field Surveys[2]	1	De-list temperature
McBride Creek	DEQ BURP, DEQ Field Surveys[2]	1	De-list temperature
Poison Creek	DEQ BURP, DEQ Field Surveys[2]	1	The Poison Creek in HUC 17050103 is not 303(d) listed. This is a mistake in the 303(d) list.
Hardtrigger Creek	DEQ BURP, DEQ Field Surveys[2]	1	De-list sediment
Pickett Creek	DEQ BURP, DEQ Field Surveys[2]	1	De-list sediment and temperature
Brown Creek	DEQ BURP, DEQ Field Surveys[2]	1	De-list temperature
Birch Creek	DEQ BURP, DEQ Field Surveys[2]	1	De-list sediment
Squaw Creek	DEQ BURP, DEQ, BLM	1	De-list sediment, temperature

[1]Based on IDEQ Water Body Assessment Guidance definitions of Tier 1-Tier 3 data (Grafe et. al. 2002)
[2] Consists of site visits with the intent of collecting flow based data (or) site visits to confirm a zero-flow

Appendix D. Distribution List

USEPA, REGION 10
1200 6TH AVE OW-134
SEATTLE WA 98101

DUANE LA FAYETTE
P.O. BOX 590
BRUNEAU ID 83604

DAVID FERGUSON
2270 PENITENTIARY RD
BOISE ID 83712

TONY BENNETT
2270 PENITENTIARY RD
BOISE ID 83712

PETE SINCLAIR
19 REICH ST, PO 486
MARSING ID 83639

IDAHO STATE LIBRARY
325 W. STATE STREET
BOISE ID 83702

SCOTT KOBERG
132 SW 5TH AVE.
MERIDIAN ID 83642

KEITH GRISWOLD
2208 E. CHICAGO
CALDWELL ID 83605

MELBA CITY HALL
PO 209
MELBA ID 83641

HOMEDALE PUBLIC LIBRARY
25 W. OWYHEE AVE
HOMEDALE ID 83628

MARSING PUBLIC LIBRARY
PO BOX 60
MARSING ID 83639

GANDVIEW PUBLIC LIBRARY
GRANDVIEW ID 83624

JERRY HOAGLAND
HC 79 BOX 44
MELBA ID 83641

WILLIAM PARKER
PO BOX 626
BRUNDEAU ID 83604

RONALD PARKS
233 RODEO AVE
CALDWELL ID 83605

ROBERT THOMAS
HC 79 BOX 2060
OREANA ID 83650

CHARLES KIESTER
RT 1 BOX 235
MARSING ID 83639

ZIGMUND NAPKORA
3948 DEVELOPMENT AVE
BOISE ID 83705

CONNIE BRANDAU
HC 79 BOX 61
MELBA ID 83641

BRIAN COLLETT
HC 79 BOX 2197
OREANA ID 83650

JAMES KENT FRISCH
HC 85 BOX 366
GRAND VIEW ID 83624

BRIAN HOELSCHER
PO BOX 70
BOISE ID 83707

REX BARRIE
PO BOX 67
HOMEDALE ID 83628

Appendix E. An Assessment of Intermittence for §303(d) Listed Streams in the Mid Snake River/Succor Creek watershed (HUC 17050103)

Introduction and Scope

The Mid Snake River/Succor Creek watershed (HUC 17050103) is a 2,002 square mile watershed consisting of the Snake River from CJ Strike Dam to the Idaho/Oregon line (river mile 409) and several perennial and intermittent streams. Table 1 and Figure 1 show the §303(d) listed intermittent streams in 17050103, which are the streams of concern addressed in this analysis. The state of Idaho defines an intermittent stream as one that has a period of zero flow for at least one week during most years or has a 7Q2 hydrologically-based flow of less than 0.10 cfs (IDAPA 58.01.02.003.51). If a stream contains naturally perennial pools containing significant aquatic life, it is not considered intermittent.

Table 1. §303(d) listed intermittent streams in HUC 17050103

Stream Name	**§303(d) Listed Boundaries**	**Aspect**
McBride Creek	Headwaters to Oregon Line	South of the Snake River
Corder Creek	Headwaters to Snake River	North of the Snake River
Rabbit Creek	Headwaters to Snake River	North of the Snake River
Brown Creek	Headwaters to Catherine Creek	South of the Snake River
Hardtrigger Creek	Headwaters to Snake River	South of the Snake River
Birch Creek	Headwaters to Snake River	South of the Snake River
Poison Creek	Headwaters to Shoofly Creek	South of the Snake River
Pickett Creek	Headwaters to Catherine Creek	South of the Snake River

The hydrology of each stream in Table 1 is different depending on its location in the watershed. The upper segment (before it enters the Snake River valley) of each stream typically flows for a few months during the late winter and early spring and goes dry shortly thereafter. The lower segments (in the Snake River valley) are quite varied. In some cases, the lower segments rarely contain water, even when the upper segments contain water. In these instances the water seeps into the ground before it can inundate the lower channel. In other cases, the lower segments contain water even after upper segments have gone dry. The presence of water in these instances is likely due to a combination of irrigation practices and ground water influence. In other instances, water has not been documented in the stream at all, although it is apparent that it existed historically.

The intent of this evaluation is to use the available data to show that the streams in Table 1 are intermittent. Ideally, a calculation of the 7Q2 in combination with field notes and photographs would be used to determine the intermittence of a stream. Unfortunately, insufficient flow data exists to calculate the 7Q2.

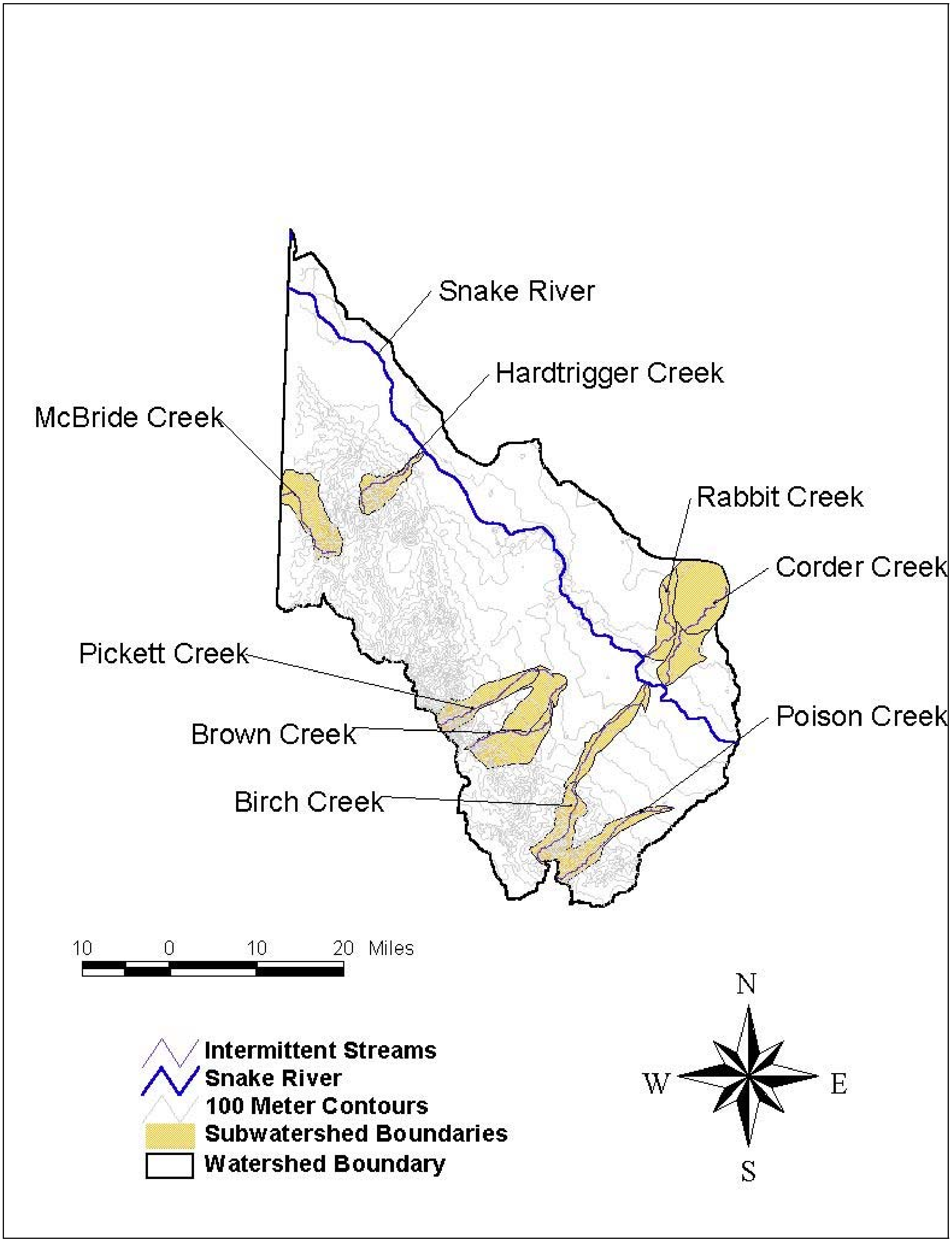


Figure 1. 303(d) listed intermittent streams in HUC 17050103

While some states have developed region specific regression equations to calculate the 7Q2 for ungaged streams, none were identified for Idaho. Regression equations to estimate the annual average stream flows were located, but the standard error of the estimates for the Snake River Basin were too large to provide reasonable flow estimates. Given the lack of flow data to calculate the 7Q2, two lines of evidence are used for the evaluation: 1) instantaneous flow measurements collected as part of BURP and 2) time-dated site photographs. These lines of evidence provide sufficient data to determine whether periods of zero-flow exist.

The water quality standards (IDAPA 58.01.02.070.07) state that water quality standards shall only apply to intermittent waters during optimum flow periods sufficient enough to support the beneficial uses for which the water body has been designated. The optimum flow for contact recreation is equal to or greater than 5.0 cfs. The optimum flow for aquatic life is equal to or greater than 1.0 cfs.

The implication of this rule is that a TMDL for a stream is not appropriate unless it is shown that a *pollutant* impairs aquatic life when flows exceed 1.0 cfs. The hydrology of most intermittent streams, including those listed in Table 1, is such that the time of year when flows exceed 1.0 cfs corresponds with spring runoff. Determining beneficial use support status during the runoff period often yields false determinations of pollutant-caused impairment. These false determinations occur because the biotic community in the stream is limited by high velocity flushing flows as runoff occurs and then by a shortage of time to establish a fully functioning community before the stream goes dry. Thus, the aquatic life community is limited by hydrological conditions, not pollutants.

If instances occur where the flow exceeds 1.0 cfs during base flow (non-spring runoff) and the biota is impaired by a pollutant, further evaluation will be performed and a TMDL will be considered. If this instance does not occur it will be assumed that a TMDL is not appropriate and the stream will be proposed for de-listing. If the stream is a large pollutant contributor to downstream waters (such as the Snake River), the development of a pollutant management plan will be considered.

Flow Data Summary

Photographs of the following streams can be found in Appendix 1 at the conclusion of this analysis. Table 2 summarizes the flow data for each stream. It should be noted that many of the streams flow to the Snake River. The confluence of those streams often contain water year around due to backwater and Snake River bank storage. This hydrological aspect of the stream is not considered when determining the intermittence of the system.

McBride Creek

McBride Creek extends for a length of 12 miles from its headwaters to where it enter Jump Creek. Flow data from June 1996 show flows of 0.20 cfs in the lower segment and 0 cfs in the upper segment. Flow data from July 2001 shows a flow of 0 cfs in the lower segment. There are no major tributaries to McBride Creek and its flow regime is dictated by the water year. In a normal year, McBride Creek typically goes dry by late May or early June.

Corder Creek
Corder Creek extends for a length of 17.2 miles from its headwaters to where it enters the Snake River. Flow data from May 1995, June 1998 and March 2002 all show a flow of 0 cfs. Along with Rabbit Creek, Corder Creek is one of the two §303(d) listed streams that flows in a southerly direction into the Snake River. Water has not been documented in Corder Creek and the stream channel is difficult to find because it has been filled with tumbleweeds. Corder Creek may flow during extreme, episodic flood events, but there is no evidence of recent water.

Rabbit Creek
Rabbit Creek extends for a length of 11.9 miles from its headwaters to where it enters the Snake River. Flow data from May 1995, June 1998, and March 2002 all show a flow of 0 cfs. Along with Corder Creek, Rabbit Creek is one of the two §303(d) listed streams that flows in a southerly direction into the Snake River. Water has not been documented in Rabbit Creek and the stream channel is difficult to find due to the overgrowth of sagebrush. Rabbit Creek may flow during extreme, episodic flood events, but there is no evidence of recent water.

Brown Creek
Brown Creek extends for a length of 17.1 miles from its headwaters to where it enters Catherine Creek. Buckaroo Creek, which is located near the Brown Creek headwaters, is the only major tributary. Buckaroo Creek is only 5.7 miles in length and only contributes water during the spring snowmelt. Flow data for Brown Creek from June 1996 shows a flow of 0.50 cfs in the upper segment. The lower segment was dry, although a small amount of water was located in the stream near its confluence with Catherine Creek. Data from July 2001 shows a flow of 0 cfs in the upper segment. Data from March 2002 also shows that water was present in the upper segment (no measurement taken), but that no water was present in the lower segment. In a normal year, the upper segment of Brown Creek goes dry by mid to late June. The lower segment may contain water during storm events, but goes dry shortly thereafter.

Hardtrigger Creek
Hardtrigger Creek extends for a length of 12.7 miles from its headwaters to where it enters the Snake River. There are no major tributaries to Hardtrigger Creek. Flow data from July 1995 and August 1996 indicate no flow in the upper and lower segments, respectively. Data from June 1998 show a flow of 3.9 cfs in the lower segment and 5.1 cfs in the upper segment. While visiting the stream in March 2002, DEQ staff noted that the flow was less than 1.0 cfs and was beginning to go dry. In a normal year Hardtrigger Creek typically goes dry by mid to late June.

Birch Creek
Birch Creek extends for a length of 24.5 miles from its headwaters to where it enters the Snake River. McKeeth Wash, which enters Birch Creek near the mouth, is the only major tributary to the stream. McKeeth Wash is 13 miles in length and contributes water only during the spring snowmelt. Flow data for Birch Creek from May 1995 show a flow of 3.8 cfs in the lower segment. Data from July 2001 at the upper segment show a flow of 0 cfs.

When DEQ visited the lower segment of the stream in March 2002 the stream was dry. The upper segment of Birch Creek contains water for a short period of time in the spring but is dry shortly thereafter. The lower segment contains water for a longer period of time but is typically dry by June.

Poison Creek

Poison Creek extends for a length of 17.5 miles from its headwaters to where it enters Shoofly Creek. There are no major tributaries to Poison Creek. Flow data from July 1995 shows a flow of 0.3 cfs in the lower segment. Data from July 2001 from locations in the upper and lower segments show flows of 0 cfs. The upper segment of Poison Creek carries water during the spring snowmelt, but goes dry shortly thereafter. The lower segment is dry except during peak runoff periods or extreme storm events.

Pickett Creek

Pickett Creek extends for a length of 16.37 miles from its headwaters to where it enters Catherine Creek, a tributary to Castle Creek. There are no major tributaries to Pickett Creek. The lowermost mile of Pickett Creek has flows, generally below 1 cfs except during high water, year round due to the flow contribution of springs. The flows in the upper reach of Pickett Creek dropped below 1 cfs in July and the creek was dry by fall. The middle section of Pickett Creek went dry in mid-July approximately 3 miles upstream of where Pickett Creek flows into Catherine Creek. Landowners state that, in general, Pickett Creek is dry in the middle section by mid to late June, depending upon the water year.

Table 2. Flow data for selected intermittent streams in HUC 17050103 (flows in cfs)

Stream Name								
Date	McBride	Corder	Rabbit	Brown	Hardtrigger	Birch	Poison	Pickett
5/95		0	0	US-.50 LS-0		LS-3.8		US-24.94
7/95					US-0 LS-0		LS-.30	
6/96	US-0 LS-.20							US-14.91 MS-7.8 LS-6.1
8/96					US-0 LS-0			
6/98		0	0		US-5.1 LS-3.9			
6/01						US-0		
7/01	LS-0			US-0			US-0 LS-0	
3/02		0	0		US-<1	LS-0		
5/02								US-13.58
7/02								US-0.28 LS-0.86
10/02								0

US = Upper Segment
LS = Lower Segment
Blank Cells indicate no data available

Conclusion

The data in the aforementioned narratives and in Table 2 show that in a normal water year each of the streams have extended periods of zero flow following spring runoff. As such, the streams are considered intermittent and the pollutant standards outlined in the *Idaho Water Quality Standards and Wastewater Treatment Requirements* apply only during base flow periods when flows exceed 1.0 cfs. The data in Table 2 also show that in a normal year the base flow condition in each stream is a dry channel. Periods of zero flow extending well beyond one week in length are the normal condition for these streams. Additionally, in the years when water has remained present into the expected base flow months (July-September) the flows were well below 1.0 cfs. For these reasons, TMDLs will not be prepared for McBride, Corder, Rabbit, Brown, Hardtrigger, Birch, Pickett, and Poison Creeks.

Appendix 1. Photographs of §303(d) listed intermittent streams in HUC 17050103.

Birch Creek

Lower Segment, March 2002

Upper Segment, July 2001

Brown Creek

Lower Segment, March 2002

Upper Segment, March 2002

Lower Segment, June 1996

Corder Creek

June 1998

March 2002

Rabbit Creek

April 2002

April 2002

McBride Creek

Lower Segment, June 1996

Upper Segment, June 1996

Lower Segment, July 2001

Hardtrigger Creek

Lower Segment, August 1996

Upper Segment, August 1996

Upper Segment, June 1998

Poison Creek

Lower Segment, July 2001

Upper Segment, July 2001

Pickett Creek

October 2002

Appendix F. Segments of the §303(d) Listed Streams in HUC 17050103 Appropriate for Salmonid Spawning – Correspondence between DEQ and IDFG

STATE OF IDAHO
DEPARTMENT OF
ENVIRONMENTAL QUALITY

1445 North Orchard • Boise, Idaho 83706-2239 • (208) 373-0550

Dirk Kempthorne, Governor
C. Stephen Allred, Director

May 28, 2002

Mr. Jeff Dillon
Regional Fishery Manager
Idaho Department of Fish and Game
3101 S. Powerline Road
Nampa ID 83686

RE: Status of Salmonid Populations in Castle, Sinker, Reynolds and Succor Creeks

Dear Mr. Dillon:

The Idaho Department of Environmental Quality (IDEQ) is currently preparing the Subbasin Assessment (SBA) as part of the Total Maximum Daily Load (TMDL) process for hydrologic unit 17050103 (see enclosed maps). The purpose of the SBA is to evaluate the current water quality conditions and determine whether a TMDL is necessary. Castle, Sinker, Reynolds and Succor Creeks are included in the SBA.

A critical part of the SBA is to determine whether the designated beneficial uses are appropriate. The segments of Castle, Sinker, Reynolds and Succor Creeks identified on the enclosed maps and in Table 1 are designated in the *Idaho Water Quality Standards and Wastewater Treatment Requirements* for salmonid spawning. However, a review of the hydrologic regime, temperature regime and stream gradient leads IDEQ to believe that these segments are not salmonid spawning segments and are erroneously designated as such.

Table 1. Stream segments of concern

Stream Name	Segment
Castle Creek	Township 5S, Range 1E, Section 28 to Snake River
Sinker Creek	Diamond Creek to Snake River
Reynolds Creek	Bernard Ditch to Snake River
Succor Creek	Idaho-Oregon Line to Snake River

Recognizing that the Idaho Department of Fish and Game is the agency responsible for managing the fisheries of Idaho, IDEQ would like to garner IDFG's opinion into this matter. Please review the enclosed maps and provide a written response to the following questions:

1. Are salmonids known to spawn in the segments of Sinker, Castle, Reynolds and Succor Creeks identified on the maps? If so, when was spawning activity last documented?

Mr. Jeff Dillon
Regional Fishery Manager
Idaho Department of Fish and Game
3101 S. Powerline Road
Nampa ID 83686

page 2

2. If salmonid spawning is not occurring in the segments of Sinker, Castle, Reynolds and Succor Creeks identified on the maps, do the segments have the ecological potential to support spawning? If so, what aspects of the segments need to improve before spawning will occur? If not, why is spawning unlikely to occur?

3. What are IDFG's management goals for fish populations and fisheries in the segments of Sinker, Castle, Reynolds and Succor Creeks identified on the maps?

IDEQ appreciates IDFG's participation in helping to accurately characterize the status of salmonid spawning in the aforementioned streams. These characterizations are imperative in identifying appropriate TMDL goals. If we can answer any questions, please feel free to contact Bryan Horsburgh at 373-0550.

Sincerely,

Craig Shepard
Regional Manager
Water Quality

Enclosures

Cc: Steve West, IDEQ
Leslie Freeman, IDEQ
Bryan Horsburgh, IDEQ

IDAHO FISH & GAME
SOUTHWEST REGION
3101 South Powerline Road
Nampa, Idaho 83686

RECEIVED
JUL 01 2002
DEPARTMENT OF
ENVIRONMENTAL QUALITY
BOISE REGIONAL OFFICE

Dirk Kempthorne/Governor
Steven Huffaker/Director

Craig Shepard
Idaho Department of Environmental Quality
1445 N. Orchard
Boise, ID 83706-2239

June 27, 2002

RE: Request for information on Castle, Sinker, Reynolds, and Succors creeks

Craig,

We have reviewed our files and reports for data on the above streams within the reaches outlined in the maps you provided. Unfortunately IDFG has virtually no fish data for these reaches, likely because most or all are located on private property and are heavily impacted by habitat alterations and irrigation withdrawals and return flows. We do have thermograph data for some reaches, all of which indicates temperatures above 25C during summer months.

Redband trout are present in all of these streams in reaches above those of interest. Typically the upper reaches are located on public land, have higher gradient, and better habitat.

Although we have no definitive data, I agree that the reaches outlined are unlikely to support salmonid spawning under current conditions. Historically, the lower reaches were likely used as seasonal migration corridors connecting upstream populations to the Snake River. Currently there may be barriers to upstream migrants at some irrigation diversions. Given the low gradient and temperature regime, I suspect that the potential to support trout spawning is low, even if substantial habitat improvement occurred. Maintaining or enhancing suitability as migration corridors remains important.

All of these streams are managed for wild redband trout fisheries, with the knowledge that currently most or all of the resident populations occur in upper reaches on public land. Succor Creek Reservoir is supplemented with sterile hatchery rainbow trout.

If you have questions or would like access to the thermograph data, please feel free to contact me.

Regards,

Jeff C Dillon

Jeff Dillon
Regional Fishery Manager

Keeping Idaho's Wildlife Heritage

Equal Opportunity Employer • 208-465-8465 • Fax: 208-465-8467 • Idaho Relay (TDD) Service: 1-800-377-3529 • http://www.state.id.us/fishgame

Appendix G. Major Assessment Methods Used in the Mid Snake River/Succor Creek Subbasin Assessment – WBAG II, SSTEMP, Stream Bank Erosion Inventory

DEQ Water Body Assessment Guidance Document (WBAG) II

WBAG II (Grafe et al. 2000) is available in its entirety on DEQ's web page. The address is: http://www.deq.state.id.us/water/surface_water/wbag/WBAG2001.htm

The 10 major components of WBAG II are described in this technical appendix

This Water Body Assessment Guidance (WBAG) is intended as an analytical tool to guide individuals through a standardized assessment process. The WBAG describes Idaho Department of Environmental Quality (DEQ) methods used to evaluate data and determine beneficial use support of Idaho water bodies. This document is a revision of the 1996 WBAG (DEQ 1996).

A water body assessment entails analyzing and integrating multiple types of water body data to address three primary objectives.

1. Determine the beneficial use support of a water body.

2. Determine the degree of biological integrity.

3. Compile descriptive information about the water body.

The regulatory context of the assessment process and how these rules, regulations, and policies are related to DEQ reporting requirements are discussed in Section 1. The Clean Water Act and Idaho water quality standards drive the assessment process and DEQ reporting requirements for the 303(d) list, 305(b) report, subbasin assessments, and legislative reports.

Section 2 discusses how DEQ collects, analyzes, and manages DEQ data used in the assessment process. This section describes the Beneficial Use Reconnaissance Program (BURP) and trend monitoring network. This also includes the methods used to stratify (classify data by stream order and land use) and compare the data for use support determination. Additionally, Section 2 explains the Idaho Water Body Identification System (the scale used to define Idaho water bodies) and the DEQ method used to distinguish between streams and rivers (water body classes for bioassessment).

In Section 3, the WBAG provides guidance on how to identify beneficial uses for assessment purposes. For designated waters, the assessor simply looks to the Idaho water quality standards. However, for undesignated waters, DEQ identifies beneficial uses for assessment based on existing data. Actual subsequent use designations may be different, depending upon additional information that may be received following the procedures described in Idaho Code and water quality standards.

In Section 4, the DEQ policy concerning when and how data from sources other than BURP may be used in water body assessments is discussed. All data are evaluated based on scientific rigor and relevance criteria. Tier I data, that is BURP compatible, is incorporated directly into the appropriate aquatic life assessment index.

Non-BURP compatible Tier I data may also be used for 303(d) listing or delisting purposes, if it meets DEQ data policy requirements set forth in this section.

DEQ uses Tier II data for 305(b) reporting and subbasin assessments, and Tier III data for planning purposes.

The interpretation of numeric or narrative criteria exceedances is explained in Section 5. Narrative criteria are largely evaluated based on the DEQ bioassessment process. A violation of numeric criteria for dissolved oxygen, pH, turbidity, temperature, and total dissolved gas occurs when more than 10 percent of the measurements are above the numeric criteria. DEQ considers climatic conditions, natural background, and species-specific spawning time periods when evaluating whether 10 percent or more of the temperature measurements are above the numeric criteria.

Section 6 explains how DEQ uses multimetric indexes to determine aquatic life use support. DEQ uses different indexes depending on whether the water body is classified as a stream or river. The Stream Macroinvertebrate Index, Stream Habitat Index, and Stream Fish Index comprise the stream indexes; the river indexes consist of the River Macroinvertebrate Index, River Diatom Index, and River Fish Index. Supporting technical analyses for these documents are found in the *Idaho Stream Ecological Assessment Framework* (Grafe 2002b) and *Idaho River Ecological Assessment Framework* (Grafe 2002c) documents distributed separately from the WBAG.

DEQ uses the integrated results from the appropriate multi-metric indexes to evaluate subcategories (cold water aquatic life and salmonid spawning) of the aquatic life beneficial use. DEQ applies appropriate numeric criteria separately for cold water aquatic life and salmonid spawning before formulating a final aquatic life use support determination.

How DEQ uses bacteria and toxic data to assess contact recreation beneficial use support is described in Section 7. DEQ uses the geometric mean of bacteria data to determine if water quality standards for primary or secondary contact have been violated. When no data are available, DEQ may evaluate the potential risk for a violation in determining use support.

In Section 8, how DEQ uses toxics data to evaluate domestic, agricultural, and industrial water supplies is discussed. In general, DEQ presumes these uses are fully supporting unless there is evidence to the contrary. This policy is similarly applied for wildlife habitat and aesthetics, as explained in Section 9.

Section 10 attempts to further explain the assessment process through the use of an example. The policies and methods described in Sections 2 through 7 are illustrated in this example. In Section 11, how the public may appeal use support determinations is discussed. The public may petition against assessment determinations during appropriate 303(d) listing or subbasin assessment public comment periods. DEQ will review the appeal and respond accordingly.

SSTEMP Modeling Approach

The SSTEMP v. 1.2.2 model is used to calculate the heat gained or lost from a parcel of water as it passes through a segment. The model assesses the affect parameters such as solar radiation, channel morphology, instream flow, air temperature, and stream shading have on water temperature.

The SSTEMP model requires input data for 28 parameter and state variables ranging from channel conditions to climate. Many of these parameters were kept constant for all model runs. Other parameters were varied based on site-specific conditions. The following is a description of the model-input parameters as they relate to the streams in the Mid Snake River/Succor Creek watershed.

Input Variables

<u>Stream Hydrology:</u>

Segment Inflow: For all scenarios with headwater streams, this value was set at zero. For stream segments below the headwaters, the flow was measured using the standard set interval method using a Marsh-McBirney flow meter.

Inflow Temperature: For all scenarios with headwater streams, this value was set at 6.0 ^{o}C. For stream segments below the headwaters, the temperature was measured using HOBO temperature loggers.

Segment Outflow: This value was measured using the standard set interval method using a Marsh-McBirney flow meter.

Accretion Temperature: This is the expected ground water temperature. This value is the average yearly air temperature from the nearest climatic gauging station. Data were taken from the Western Regional Climate Center at http://www.wrcc.dri.edu/climsum.html.

<u>Stream Geometry:</u>

Segment Lengths: These were derived from the stream reach length from GIS coverages.

Latitude: These were derived from a USGS 7.5-minute quad maps.

Dams at Heads of Segments: No dams were figured into the model.

Upstream Elevation: This was determined for each stream reach from USGS 7.5-minute quad maps.

Downstream Elevation: This was determined for each stream reach from USGS 7.5-minute quad maps.

Width's A Term: This is the wetted width of the stream when the model is calibrated. The width was calculated when flow was determined. This is the value used as the width's A Term in the model. The width value was adjusted to 12 in some model runs to represent a width/depth ratio consistent with an unimpaired Rosgen Type C channel. The use of the wetted width is an accepted input parameter if the stream width is not varied during the model run (Bartholow 1999).

Width's B Term: If wetted width is used in the model, then the Width's B Term is zero.

Manning's n: This is a roughness coefficient used to describe the amount stream bottom. A default value of 0.035 was used because of the variability of substrate in the Mid Snake River/Succor Creek watershed. The substrate varies from sand-silt to large boulders. The gradient can vary from 1-6%.

Meteorology:

Air Temperature: This value is the daily mean air temperature for each month as determined by the nearest climatic gauging station. Data were taken from the Western Regional Climate Center at http://www.wrcc.dri.edu/climsum.html. In some streams, HOBO temperature loggers were place on the stream bank. Thus, local site specific data are available.

Maximum Air Temperature: The maximum air temperature is predicted by SSTEMP unless the user overrides the value. This override was used on Succor Creek below the reservoir because exceedances of the maximum daily temperature values occurred.

Relative Humidity: This value is the mean of four monthly values as determined by the nearest climatic gauging station. Data were taken from the Western Regional Climate Center at http://www.wrcc.dri.edu/climsum.html. The value was then corrected for elevation using the following formula:

$$Rh = R_o*[1.6040\text{^}(T_o-T_a)] * [T_a+273.16)/(T_o+273.16)]$$

where: Rh = relative humidity for temperature T_a
R_o = relative humidity at station T_a
T_a = air temperature at segment
To = air temperature at station
^ = exponentiation

$$0 <= Rh <= 1$$

Wind Speed: The value obtained was from the National Weather Service in Boise, Idaho.

Ground Temperature: This is the expected ground temperature. This value is the average yearly air temperature from the nearest climatic gauging station. Data were taken from the Western Regional Climate Center at http://www.wrcc.dri.edu/climsum.html.

Thermal Gradient: A default setting of 1.65 joules/m^2/sec was used.

Possible Sun: This value was obtained from the National Weather Service in Boise, Idaho.

Dust Coefficient: The input value was set at 6 units for entire run of the model. The input value range is 3 to 10 as supplied by Bartholow (1999) and taken from Tennessee Valley Authority (1972). The middle value was used as the input value due to a lack of data.

Ground Reflectivity: The input value was set at 15 and represents flat ground and rock (range 12-15). The high value was selected due to bare soils with high amounts of silt and sand in the surrounding soils.

Solar Radiation: This was defined by the model based on input parameters.

Stream Shade:

Shade: This was generated by the model based on input values for calibration. Shade contains both topographic and vegetation shade. Vegetative shade then adjusted to obtain water quality criteria or the best achievable temperature (if the criteria cannot be met). Topographic shade was determined by value input from topographic attitude. The model then determined vegetation shade as shade increased. That is, since the topographic shade is a steady state input, increases in total shade represent an increase in vegetation shade.

Optional Shading Parameters:

Shading parameters are optional inputs. For the Mid Snake River/Succor Creek watershed these values were entered during calibration using available data or estimates of vegetative potential. In most incidences, once the required reductions (joules/m^2/sec) were calculated the model ignored these parameters.

Segment Azimuth: This was determined from USGS 7.5-minute topographic maps. Streams that have a general south to north flow (headwaters to mouth) have an azimuth of zero (0.00 radians).

Topographic Attitude: This is a measure of the average incline to the horizon on both the left and right banks. This value was determined one of two ways: 1) by calculating the elevation change over the distance and converting it to a degrees (rise over run) with a USGS 7.5 minute topographic map or 2) measuring it in the field with an inclinometer.

Vegetation Height: Most of the riparian woody vegetation associated with riparian areas in the Mid Snake River/Succor Creek Watershed is willows (S*alix sp.*). Some of the willow species that can be encountered include whiplash willow (*S. lasiandra*), sandbar willow (*S. longifollia*), and coyote willow (*S. exigua*). Most of these species are low lying shrubs with a canopy height between 7 and 15 feet. To account for different species, an input value of 12 to 13 feet was set as default for vegetation height.

Vegetation Crown: Many of the aspects discussed in vegetation height hold true for the vegetation crown. Most of the woody vegetation in the riparian areas are low brushy species with multiple shoots creating a dense canopy. To account for different species encountered, an input value of 10 feet was set as the default for vegetation canopy on both the west and east sides.

Vegetation Offset: Vegetation offset is the distance from the edge of the water body to the main trunk of the riparian vegetation. Values ranging from 2 to 10, depending on the stream, were used in the model.

Vegetation Density: Bartholow (1999) suggested a dense emergent vegetation cover could have a vegetation density 90%. This value was used as "quality" portion of the vegetation density measurement. The second portion of the vegetation density measurement is the "quantity" measurement. For example, in Succor Creek it is estimated that 25% of the banks contain shade producing vegetation. Based on these values, the vegetation density used in the model is .90*.25 = 23%.

* Density values for Sinker Creek derived from Idaho Conservation Data Center, IDFG (2001) literature values

Time of Year:

Time of Year: The value was set at the 1st or 15th of each month being modeled. This computes an average value for a 30-day model run. This value is most important for determining length of day and angle of the sun.

Output Variables

<u>Intermediate Values:</u>

Day Length: This value was determined by the input for time of year and latitude.

Slope: This value was calculated from input values for elevation change and stream length

Width: This is the same as the width input value.

Depth: This value was calculated from segment outflow, gradient and depth.

Vegetation Shade: this is total shade minus topographic shade. Vegetation shade may vary based on time of year and azimuth inputs.

Topographic Shade: The model calculates this from input for latitude, time of year, azimuth, and topographic attitude.

<u>Mean Heat Flux (Inflow or Outflow):</u>

Convection: Convection component heat flux gain or loss at inflow or at outflow.

Atmosphere: Atmosphere component heat flux gain.

Conduction: Conduction component heat flux gain or loss at inflow or outflow.

Friction: Friction component heat flux gain or loss.

Evaporation: Friction component heat flux gain or loss at inflow or outflow.

Solar: Solar component heat flux gain or loss.

Background Radiation: Background radiation component heat flux gain or loss at inflow or outflow.

Vegetation: Vegetation component heat flux gain or loss.

Net: Net increase or decrease of heat flux from the sum of the above mentioned components.

<u>Model Results-Outflow Temperature:</u>

Predicted Mean Temperature: Model predicted mean daily water temperature in relation to model inputs.

Estimated Maximum Temperature: Model estimated maximum water daily temperature.

Approximate Minimum Temperature: Model approximated minimum daily water temperature (mean temperature - (maximum temperature-mean temperature)).

Mean Equilibrium: Model mean daily water temperature equilibrium if conditions remain the same.

Maximum Equilibrium: Model maximum daily water temperature equilibrium which the maximum temperature may approach.

Minimum Equilibrium: Model minimum daily water temperature which the minimum temperature may approach (equilibrium mean temperature - (equilibrium maximum temperature - equilibrium mean temperature)).

Model Validation

The model was validated by determining the root mean square error for the average daily temperatures for each month. The root mean square error presents an estimate of the variation in the same units as the measurement (e.g. ^{o}C). The following tables describe the results for validation of the SSTEMP model and those water temperatures measured in each water body. Overall the model has provided a reasonable estimate of predicting current conditions and establishing reasonable guidance for predicting water temperature changes by increasing the amount of shade.

Validation Results for May – Succor Creek

	Actual Measured Daily Average C°	Predicted Daily Average C°
HW to Berg	10.56	10.42
Berg to Chipmunk	Insufficient	Data
Res. to Oregon	12.7	10.3
Average	11.3	10.4
Root Mean Square Error	1.43 C°	--
Relative Error	13.8%	--

Validation Results for June – Succor Creek

	Actual Measured Daily Average C°	Predicted Daily Average C°
HW to Berg	12.6	11.9
Berg to Chipmunk	13.1	12.2
Res. to Oregon	13.1	11.6
Average	12.9	11.9
Root Mean Square Error	0.59 C°	--
Relative Error	4.9%	--

Validation Results for July – Succor Creek

	Actual Measured Daily Average C°	Predicted Daily Average C°
Res. to Oregon	16.3	14.9
Average	16.3	14.9
Root Mean Square Error	NA	NA
Relative Error	NA	NA

Validation Results for August – Succor Creek

	Actual Measured Daily Average C^o	Predicted Daily Average C^o
Res. to Oregon	17.9	16.7
Average	17.9	16.7
Root Mean Square Error	NA	NA
Relative Error	NA	NA

Validation Results for July 2000 – Sinker Creek

Diamond Creek to Snake River	Actual Measured Daily Average C^o	Predicted Daily Average C^o
July 17, 2002	20.27	20.83
July 18, 2002	19.12	18.73
July 19, 2002	19.35	19.02
July 20, 2002	19.5	19.27
July 21, 2002	19.43	19.66
July 22, 2002	18.97	19
July 23, 2002	19.5	20.36
Average	19.45	19.55
Root Mean Square Error	1.16 C^o	--
Relative Error	5.9%	--

Stream Bank Erosion Inventory

Introduction

The intent of this summary is to document the instream sediment measures and data assessment methods used to develop the gross sediment budget used in the Mid Snake River/Succor Creek TMDL. These data are intended to characterize the existing condition of the stream banks, estimate the desired level of erosion and sedimentation (define reference conditions), and provide baseline data that can be used in the future to track the effectiveness of TMDL implementation. For example, the stream bank erosion inventories can be repeated after implementation and ultimately provide an adaptive management or feedback mechanism.

Stream Bank Erosion Inventory

The stream bank erosion inventory is used to estimate background and existing stream bank erosion following methods outlined in the proceedings from the NRCS Channel Evaluation Workshop (1983). Using the direct volume method, subsections of Succor Creek, Sinker Creek and, Castle Creek were surveyed to determine the extent of chronic bank erosion and estimate the needed reductions.

The NRCS stream bank erosion inventory is a field based methodology that measures stream bank/channel stability, length of active eroding banks, and bank geometry. The stream bank/channel stability inventories were used to estimate the long-term lateral recession rate. The recession rate is determined from field evaluation of stream bank characteristics that are assigned a categorical rating ranging from 0 to 3. The categories of rating factors and rating scores are:

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

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

Vegetation/Cover On Banks:
- Predominantly perennials or rock-covered - 0
- Annuals / perennials mixed or about 40% bare - 1
- Annuals or about 70% bare - 2
- Predominantly bare - 3

Bank/Channel Shape:
- V - Shaped channel, sloped banks - 0
- Steep V - Shaped channel, near vertical banks - 1
- Vertical Banks, U - Shaped channel - 2
- U - Shaped channel, undercut banks, meandering channel - 3

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

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

Each measured stream segment, which is representative of a larger reach of stream, is rated based on the criteria above. Each category is rated and summed. For example, a stream segment may receive a weighted score of 7 based on bank stability = 1, bank condition = 1, vegetation/cover on banks = 1.5, bank/channel shape = 2.0, channel bottom = 0.5, deposition = 1. From a score of 7, the stream segment then receives a weighted cumulative rating based on the criteria below. A score of 7 receives a cumulative rating of moderate.

Cumulative Rating:

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

From the cumulative rating, the weighted lateral recession rate is assigned. This lateral recession a rate defines the amount of bank being lost per year due to bank erosion.

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

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

Site Selection

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

Because it is often unrealistic to survey every stream segment, sampled reaches were used and bank erosion rates were extrapolated over a larger stream segment. The length of the sampled reach is a function of stream type variability where streams segments with highly variable channel types need a large sample, whereas segments with uniform gradient and consistent geometry need smaller sample.

Stream reaches are subdivided into sites with similar channel and bank characteristics. Breaks between sites are made where channel type and/or dominate bank characteristics change substantially. This is commonly defined by a corresponding change in land use. In a stream with uniform channel geometry there may be only one site per stream reach, whereas in an area with variable conditions there may be several sites.

Field Method

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

Field crews surveyed selected stream reaches measuring bank length, slope height and bank full width and depth. Additionally, while surveying field crews photograph key problem areas.

Bank Erosion Calculations

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

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

where:
E = bank erosion over sampled stream reach (tons/yr/sample reach)
A_E = eroding area (ft^2)
R_{LR} = lateral recession rate (ft/yr)
ρ_B = bulk density of bank material (lps/ft^3)

Total bank erosion is expressed as an annual average. However, the frequency and magnitude of bank erosion events are greatly a function of soil moisture and stream discharge (Leopold et al 1964). Because channel erosion events typically result from above average flow events, the annual average bank erosion value should be considered a long term average. For example, a 50-year flood event might cause 5 feet of bank erosion in one year, and over a ten-year period this event accounts for the majority of bank erosion. These factors have less of an influence where bank trampling is the major cause of channel instability.

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

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

To facilitate consistent data collection, the NRCS developed rating factors to estimate lateral recession rate. Similar to methods developed by Pfankuch (1975), the NRCS method measures bank and channel stability, and then uses the ratings as surrogates for bank erosion rates. For the Mid Snake River/Succor Creek TMDL, the NRCS measurement method is used (as described above). The lateral recession rates for each stream can be found in the worksheets in Appendix H.

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

Appendix H. Stream Bank Erosion Inventory Results

The analyses that follow provide the data used to populate Table 46 in the TMDL chapter of this document. Appendix G contains the specific information regarding the equation variables.

Succor Creek Segments

1. Headwaters to Granite Creek
2. Granite Creek to Little Cottonwood Creek
3. Little Cottonwood Creek to Succor Creek Reservoir
4. Succor Creek Reservoir to Oregon Line

Castle Creek Segments

1. Township 5S, Range 1W Section 28 to Snake River

The overall current erosion rate for Castle Creek was calculated by taking a weighted average of the erosion rates (tons/mile/year) calculated for the four sections listed in this appendix. These four sections comprised more than 90% of the listed reach.

The target bank erosion rate was determined by using the erosion rate for the reference section. This method takes into account slope lengths as well as the lateral recession rate for an area of 85% bank stability. This target erosion rate provides a benchmark for the amount of sediment expected to be lost from an 85% stable bank of similar stream classification. The overall bank erosion rate for the entire stream was compared to the target bank erosion rate to determine % reduction in erosion necessary to support beneficial uses.

Sinker Creek Segments

1. Diamond Creek to Snake River

Succor Creek

Headwaters to Granite Creek — Segment Length → 6.36 miles

Segment #	Ave Slope HT (ft)	Bank Length (ft)	A_E (ft^2)	R_{LR}	D_B
1	3.47	100	346.7	0.034	110
2	3.52	200	703.3		
3	2.35	100	235.0		
4	1.25	250	312.5		
5	0.50	250	125.0		
6			0.0		
7			0.0		
8			0.0		
9			0.0		
10			0.0		
		900	1722.5 Total Area		

Slope Heights

Seg 1	Seg 2	Seg 3	Seg 4	Seg 5
3	3.1	1.2	0.5	1.3
5	6	1.7	0.9	0.5
2.5	5.2	2.3	1.6	0.6
4	2.1	2.3	1.6	0.2
3.2	3.7	2.4	1.8	0.2
3.1	1	4.2	1.1	0.2

$E = [A_E * R_{LR} * D_B]/2000$

3.2	tons/year	Bank erosion rate at sampled reach
18.90	tons/mile/year	Bank erosion rate per mile
120.18	tons/year	Total erosion from segment per year

This site is considered the reference condition for the remainder of Succor Creek.
The banks are 85% stable and the percent surface fines in riffles is 18%, which is below the target of 28%

Succor Creek

Granite Creek to Trib at T3S, R4W, Sec 1 Segment Length → 2.97 miles

Segment #	Ave Slope HT (ft)	Bank Length (ft)	A_E (ft^2)	R_{LR}	D_B	Target R_{LR}
1	4.42	180	795.0	0.2	110	0.034
2	3.91	231	902.8	↓	↓	(85% BS)
3	3.11	195	606.9			
4	3.49	210	733.3			
5	3.39	210	712.3			
6	4.23	84	354.9			
7			0.0			
8			0.0			
9			0.0			
10			0.0			
		1110	4105.2 Total Area			

$E = [A_E*R_{LR}*D_B]/2000$

45.2 tons/year Bank erosion rate at sampled reach

214.80 tons/mile/year Bank erosion rate per mile

637.96 tons/year Total erosion from segment per year

7.7 tons/year Target erosion rate at sampled reach

36.52 tons/mile/year Target bank erosion rate per mile

108.45 tons/year Target total erosion from segment per year

178.28 tons/mile/year Load Reduction that will be achieved at 85% BS

83.00 Percent Reduction

Slope Heights

Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6
3.6	2.9	3.3	1.6	1.9	5.5
3.9	2.9	3.3	3.3	4.2	5.2
3.9	2.9	3.3	6.6	2.9	2.3
3.9	3.6	4.3	1.9	3.6	3.9
4.3	3.6	3.9	1.9	2.6	
10.2	5.5	2.6	1.9	5.2	
3.9	6.9	2.9	1.9	2.3	
3.9	4.3	1.3	1.9	2.3	
4.6	2.9		1.3	2.3	
2.9	3.9		2.6	6.2	
3.3	2.6		5.2	4.6	
4.6	4.9		11.8	2.6	

Succor Creek

Tributary at T3S, R4W, Sec 1 to Reservoir   Segment Length → 6.67 miles

Segment #	Ave Slope HT (ft)	Bank Length (ft)	A_E (ft^2)	R_{LR}	D_B	Target R_{LR}
1	1.85	42	77.7	0.024	110	0.034
2	2.62	291	761.5	↓	↓	(85% BS)
3	1.16	213	247.4			
4	1.61	247	396.8			
5			0.0			
6			0.0			
7			0.0			
8			0.0			
9			0.0			
10			0.0			
		793	1483.4 Total Area			

$E = [A_E*R_{LR}*D_B]/2000$

2.0 tons/year — Bank erosion rate at sampled reach

13.04 tons/mile/year — Bank erosion rate per mile

86.96 tons/year — Total erosion from segment per year

2.8 tons/year — Target erosion rate at sampled reach

18.47 tons/mile/year — Target bank erosion rate per mile

123.20 tons/year — Target total erosion from segment per year

-5.43 tons/mile/year — Load Reduction that will be achieved at 85% BS

-41.67 Percent Reduction

No Reduction Necessary in this reach

Slope Heights

Seg 1	Seg 2	Seg 3	Seg 4
2.9	2.7	1	1.14
2.7	1	0.82	1.8
1.3	4.6	1.37	2.9
1.6	1.8	1.5	1.8
1.6	2.5	1.14	1
1	3.1	1.14	1

Succor Creek

Reservoir Outlet to Idaho/Oregon Line — Segment Length → 4.42 miles

Segment #	Ave Slope HT (ft)	Bank Length (ft)	A_E (ft^2)	R_{LR}	D_B	Target R_{LR}
1	3.54	324	1145.8	0.149	110	0.034
2	4.80	90	432.0	↓	↓	(85% BS)
3	4.47	90	402.0			
4	4.26	348	1481.9			
5	3.84	210	805.6			
6			0.0			
7			0.0			
8			0.0			
9			0.0			
10			0.0			
		1062	4267.3 Total Area			

Slope Heights

Seg 1	Seg 2	Seg 3	Seg 4	Seg 5
3.9	3.9	10.5	1.9	5.2
4.6	3.9	2.3	2.3	5.2
3.3	9.8	2.3	5.9	4.2
3.6	1.6	2.3	2.9	4.6
4.6		8.8	12.4	2.9
2.6		3.9	2.6	1.9
3.6		3.3	5.2	1.6
2.3		2.6	2.6	1.6
4.2		4.2	5.9	1.6
1.6			1.9	4.6
4.6			1.9	8.8
			5.6	

$E = [A_E * R_{LR} * D_B]/2000$

35.0	tons/year	Bank erosion rate at sampled reach
173.87	tons/mile/year	Bank erosion rate per mile
768.49	tons/year	Total erosion from segment per year
8.0	tons/year	Target erosion rate at sampled reach
39.67	tons/mile/year	Target bank erosion rate per mile
175.36	tons/year	Target total erosion from segment per year
134.19	tons/mile/year	Load Reduction that will be achieved at 85% BS
77.18	Percent Reduction	

Castle Creek

Upper Section Segment Length → 3.5 miles

Segment #	Ave Slope HT (ft)	Bank Length (ft)	A_E (ft^2)	R_{LR}	D_B	Target R_{LR}
1	1.20	87	104.4	0.05	110	0.05
2	2.00	18	36.0	↓	↓	(85% BS)
3	2.18	51	111.2			
4	2.02	90	181.5			
5	1.47	75	110.0			
6	2.25	63	141.8			
7	1.87	99	185.3			
8	4.28	57	244.2			
9	4.18	78	326.3			
10	4.13	87	359.6			
11	3.00	54	162.0			
12	5.68	84	477.1			
13	5.93	69	408.8			
14	1.65	156	258.1			
15	0.76	51	38.8			
16	4.19	75	314.0			
17	4.83	60	289.8			
		1254	3748.8			
			Total Area			

$E = [A_E * R_{LR} * D_B]/2000$

10.3	tons/year	Bank erosion rate at sampled reach
43.41	tons/mile/year	Bank erosion rate per mile
151.92	tons/year	Total erosion from segment per year

10.3	tons/year	Target erosion rate at sampled reach
43.41	tons/mile/year	Target bank erosion rate per mile
151.92	tons/year	Target total erosion from segment per year

0.00	tons/mile/year	Load Reduction that will be achieved at 85% BS
0.00	Percent Reduction	

Slope Heights

Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10
0.4	1.9	2	1.7	2	2	1.1	4	2	3
1.6	1.2	2.8	1	2	2	1.1	1	5	4.4
0.6	3	1.6	1	1.1	1.4	1.1	5.6	2.9	11
1.8	1.6	1	3.9	1	3.1	1.1	7	9	1.6
0.6	2.3	3.5	3.4	2.2	2	4.1	3.1	1.4	3.7
2.2			1.1	0.5	3	1	5	4.8	1.1
						3.6			

Seg 11	Seg 12	Seg 13	Seg 14	Seg 15	Seg 16	Seg 17
1	1.4	5	2.5	0.1	7.11	1
1	6	12.1	1.4	1	1.4	1
1.7	2	4	2	1	5.9	1.4
3	16	2.6	1.2	0.5	1.6	3
9	3		4.4	1.2	2	4
2.3			1.2		7.11	9
			1.4			6
			0.11			7
			2			9
			1.2			6.9
			1.1			
			1.4			
			1.6			

Castle Creek

Middle Section

Segment Length → 3.5 miles

Segment #	Ave Slope HT (ft)	Bank Length (ft)	A_E (ft^2)	R_{LR}	D_B	Target R_{LR}
1	1.00	1638	1638.0	0.11	110	0.05
2	3.60	1600	5760.0	↓	↓	(85% BS)
3	1.00	1600	1600.0			
4						
5						
6						
7						
8						
9						
10						
		4838	8998.0 Total Area			

$E = [A_E * R_{LR} * D_B]/2000$

54.4	tons/year	Bank erosion rate at sampled reach
59.41	tons/mile/year	Bank erosion rate per mile
207.94	tons/year	Total erosion from segment per year
43.41	tons/mile/year	Target bank erosion rate per mile
16.00	tons/mile/year	Load Reduction that will be achieved at 85% BS
26.93	Percent Reduction	

Castle Creek

Lower Section — Segment Length → 3 miles

Segment #	Ave Slope HT (ft)	Bank Length (ft)	A_E (ft^2)	R_{LR}	D_B	Target R_{LR}
1	1.20	78	93.6	0.046	110	0.05
2	0.63	216	136.8	↓	↓	(85% BS)
3	0.99	153	150.8			
4	0.98	117	115.1			
5						
6						
7						
8						
9						
10						
		564	496.3 Total Area			

Slope Heights

Seg 1	Seg 2	Seg 3	Seg 4
0.5	0.5	1	0.8
1.2	1.4	0.8	1
0.8	0.4	0.8	0.6
3	0.5	1.4	1.3
0.8	0.5	0.5	0.5
0.9	0.5	1	1.7
		1.4	

$E = [A_E*R_{LR}*D_B]/2000$

1.3 tons/year — Bank erosion rate at sampled reach

11.75 tons/mile/year — Bank erosion rate per mile

35.26 tons/year — Total erosion from segment per year

43.41 tons/mile/year — Target bank erosion rate per mile

0.00 Percent Reduction

Castle Creek

Lower Section

Segment Length ⟶ 2.5 miles

Segment #	Ave Slope HT (ft)	Bank Length (ft)	A_E (ft^2)	R_{LR}	D_B	Target R_{LR}
1	5.28	156	823.7	0.11	110	0.05
2	3.04	272	826.9	↓	↓	(85% BS)
3	3.90	240	936.0			
4						
5						
6						
7						
8						
9						
10						
		668	2586.6 Total Area			

$E = [A_E * R_{LR} * D_B]/2000$

15.6	tons/year	Bank erosion rate at sampled reach
123.69	tons/mile/year	Bank erosion rate per mile
309.23	tons/year	Total erosion from segment per year
43.41	tons/mile/year	Target bank erosion rate per mile
80.28	tons/mile/year	Load Reduction that will be achieved at 85% BS
64.90	Percent Reduction	

Sinker Creek

Diamond Creek to Snake River — Segment Length: 10 miles; actual 10.77 *

Segment #	Ave Slope HT (ft)	Bank Length (ft)	**A_E (ft^2)**	**R_{LR}**	**D_B**	**Target R_{LR}**
1	2.50	26400	66000.0	0.044	110	0.044
2	2.80	7920	22176.0	0.031	110	(85% BS)
3	2.60	7920	20592.0	0.085	110	
4	2.30	10560	24288.0	0.044	110	
Total		52800	133056.0 Total Area			

Slope Heights

Seg 1	Seg 2	Seg 3	Seg 4	Seg 5
3.9	3.9	10.5	1.9	5.2
4.6	3.9	2.3	2.3	5.2
3.3	9.8	2.3	5.9	4.2
1.6			1.9	4.6
4.6			1.9	8.8
			5.6	

$E = [A_E * R_{LR} * D_B]/2000$

352.6	tons/year	Bank erosion rate at sampled reach
35.26	tons/mile/year	Bank erosion rate per mile
352.57	tons/year	Total erosion from segment per year

322.0	tons/year	Target erosion rate at sampled reach
32.20	tons/mile/year	Target bank erosion rate per mile
322.00	tons/year	Target total erosion from segment per year

3.06	tons/mile/year	Load Reduction that will be achieved at 85% BS
8.67	Percent Reduction	

Appendix I. SSTEMP Model Inputs and Outputs – Model Run Sheets

The analyses that follow provide the data used to populate Table 53 in the TMDL chapter of this document. Appendix G contains the specific information regarding the derivation of the SSTEMP input variables.

The input variables for each of the SSTEMP model runs used in this TMDL are shown in this appendix. The SSTEMP model interface is included as Figure 1 in this appendix to illustrate where each of the respective input variables fits into the model interface. The variables within Figure 1 do not represent any of the Mid Snake River/Succor Creek data.

Succor Creek Segments

1. Headwaters to Berg Mine: May-June
2. Berg Mine to Chipmunk Meadows: May-June
3. Succor Creek Reservoir to Oregon Line: May-August

Sinker Creek Segments

1. Diamond Creek to Snake River: July

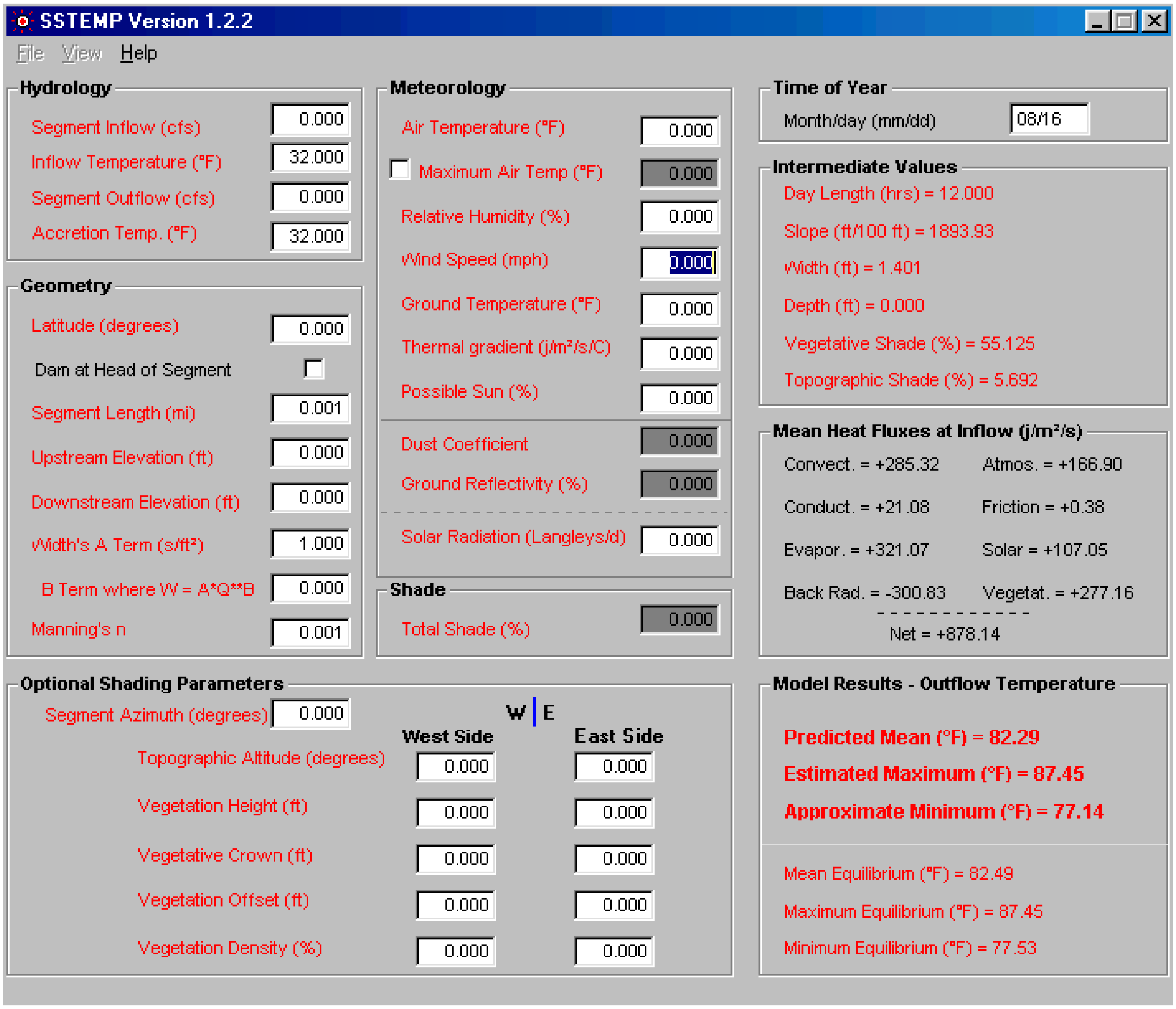


Figure 1. SSTEMP model interface: (values do not represent any of the Mid Snake River/Succor Creek data)

```
"SSTEMP (1.2.2)  ","09/25/2002  10:27 am"
```

Succor Creek: "HW to Berg Mine - May - Existing"

```
"English",          "Segment Inflow (cfs)",              "0.000"
"International",    "Inflow Temperature (°C)",           "6.000"
"English",          "Segment Outflow (cfs)",             "21.500"
"English",          "Accretion Temp. (°F)",              "47.850"
"English",          "Latitude (degrees)",                "42.972"
"English",          "Segment Length (mi)",               "5.550"
"English",          "Upstream Elevation (ft)",           "6560.99"
"English",          "Downstream Elevation (ft)",         "5577.00"
"English",          "Width's A Term (s/ft²)",            "12.999"
"English",          "  B Term where W = A*Q**B",         "0.000"
"English",          "Manning's n",                       "0.035"
"English",          "Air Temperature (°F)",              "53.600"
"English",          "Relative Humidity (%)",             "56.500"
"English",          "Wind Speed (mph)",                  "9.400"
"English",          "Ground Temperature (°F)",           "47.850"
"English",          "Thermal gradient (j/m²/s/C)",       "1.650"
"English",          "Possible Sun (%)",                  "71.000"
"English",          "Dust Coefficient",                  "6.000"
"English",          "Ground Reflectivity (%)",           "15.000"
"English",          "Solar Radiation (Langleys/d)",      "563.132"
"English",          "Total Shade (%)",                   "15.529"
"English",          "Segment Azimuth (degrees)",         "-44.977"

"West Side Parameters"
"English",          "Topographic Altitude (degrees)",    "15.000"
"English",          "Vegetation Height (ft)",            "13.000"
"English",          "Vegetative Crown (ft)",             "10.000"
"English",          "Vegetation Offset (ft)",            "5.000"
"English",          "Vegetation Density (%)",            "22.500"

"East Side Parameters"
"English",          "Topographic Altitude (degrees)",    "15.000"
"English",          "Vegetation Height (ft)",            "13.000"
"English",          "Vegetative Crown (ft)",             "10.000"
"English",          "Vegetation Offset (ft)",            "5.000"
"English",          "Vegetation Density (%)",            "22.500"
"English",          " Maximum Air Temp (°F)",            "57.386"

"Dam at Head of Segment","Unchecked"
" Maximum Air Temp (°F)","Unchecked"
"Solar Radiation","Disabled"
"Total Shade","Disabled"
"Month/day","05/01"
```

"Predicted Mean (°C) = 10.42"

```
"Estimated Maximum (°F) = 61.57"
"Approximate Minimum (°F) = 39.94"
"Mean Equilibrium (°F) = 57.76"
"Maximum Equilibrium (°F) = 68.15"
"Minimum Equilibrium (°F) = 47.37"
```

SSTEMP (1.2.2) ","09/27/2002 09:20 am"

Succor Creek: "HW to Berg Mine - May - Allocation"

"English",	"Segment Inflow (cfs)",	"0.000"
"International",	"Inflow Temperature (°C)",	"6.000"
"English",	"Segment Outflow (cfs)",	"21.500"
"English",	"Accretion Temp. (°F)",	"47.850"
"English",	"Latitude (degrees)",	"42.972"
"English",	"Segment Length (mi)",	"5.550"
"English",	"Upstream Elevation (ft)",	"6560.99"
"English",	"Downstream Elevation (ft)",	"5577.00"
"English",	"Width's A Term (s/ft²)",	"12.999"
"English",	" B Term where W = A*Q**B",	"0.000"
"English",	"Manning's n",	"0.035"
"English",	"Air Temperature (°F)",	"53.600"
"English",	"Relative Humidity (%)",	"56.500"
"English",	"Wind Speed (mph)",	"9.400"
"English",	"Ground Temperature (°F)",	"47.850"
"English",	"Thermal gradient (j/m²/s/C)",	"1.650"
"English",	"Possible Sun (%)",	"71.000"
"English",	"Dust Coefficient",	"6.000"
"English",	"Ground Reflectivity (%)",	"15.000"
"English",	"Solar Radiation (Langleys/d)",	"563.132"
"English",	"Total Shade (%)",	"55.000"
"English",	"Segment Azimuth (degrees)",	"-44.977"

"West Side Parameters"

"English",	"Topographic Altitude (degrees)",	"15.000"
"English",	"Vegetation Height (ft)",	"13.000"
"English",	"Vegetative Crown (ft)",	"10.000"
"English",	"Vegetation Offset (ft)",	"5.000"
"English",	"Vegetation Density (%)",	"22.500"

"East Side Parameters"

"English",	"Topographic Altitude (degrees)",	"15.000"
"English",	"Vegetation Height (ft)",	"13.000"
"English",	"Vegetative Crown (ft)",	"10.000"
"English",	"Vegetation Offset (ft)",	"5.000"
"English",	"Vegetation Density (%)",	"22.500"
"English",	" Maximum Air Temp (°F)",	"57.386"

"Dam at Head of Segment","Unchecked"
" Maximum Air Temp (°F)","Unchecked"
"Solar Radiation","Disabled"
"Total Shade","Enabled"
"Month/day","05/01"

"Predicted Mean (°C) = 9.52"
"Estimated Maximum (°F) = 55.35"
"Approximate Minimum (°F) = 42.93"
"Mean Equilibrium (°F) = 52.57"
"Maximum Equilibrium (°F) = 59.69"
"Minimum Equilibrium (°F) = 45.46"

"SSTEMP (1.2.2) ","09/25/2002 10:30 am"

Succor Creek: "HW to Berg Mine - June - Existing"

"English",	"Segment Inflow (cfs)",	"0.000"
"International",	"Inflow Temperature (°C)",	"6.000"
"English",	"Segment Outflow (cfs)",	"19.670"
"English",	"Accretion Temp. (°F)",	"47.850"
"English",	"Latitude (degrees)",	"42.972"
"English",	"Segment Length (mi)",	"5.550"
"English",	"Upstream Elevation (ft)",	"6560.99"
"English",	"Downstream Elevation (ft)",	"5577.00"
"English",	"Width's A Term (s/ft²)",	"12.999"
"English",	" B Term where W = A*Q**B",	"0.000"
"English",	"Manning's n",	"0.035"
"English",	"Air Temperature (°F)",	"61.200"
"English",	"Relative Humidity (%)",	"51.500"
"English",	"Wind Speed (mph)",	"9.000"
"English",	"Ground Temperature (°F)",	"47.850"
"English",	"Thermal gradient (j/m²/s/C)",	"1.650"
"English",	"Possible Sun (%)",	"76.000"
"English",	"Dust Coefficient",	"6.000"
"English",	"Ground Reflectivity (%)",	"15.000"
"English",	"Solar Radiation (Langleys/d)",	"647.966"
"English",	"Total Shade (%)",	"14.465"
"English",	"Segment Azimuth (degrees)",	"-44.977"

"West Side Parameters"

"English",	"Topographic Altitude (degrees)",	"15.000"
"English",	"Vegetation Height (ft)",	"13.000"
"English",	"Vegetative Crown (ft)",	"10.000"
"English",	"Vegetation Offset (ft)",	"5.000"
"English",	"Vegetation Density (%)",	"22.500"

"East Side Parameters"

"English",	"Topographic Altitude (degrees)",	"15.000"
"English",	"Vegetation Height (ft)",	"13.000"
"English",	"Vegetative Crown (ft)",	"10.000"
"English",	"Vegetation Offset (ft)",	"5.000"
"English",	"Vegetation Density (%)",	"22.500"
"English",	" Maximum Air Temp (°F)",	"65.239"

"Dam at Head of Segment","Unchecked"
" Maximum Air Temp (°F)","Unchecked"
"Solar Radiation","Disabled"
"Total Shade","Disabled"
"Month/day","06/01"

"Predicted Mean (°C) = 11.89"
"Estimated Maximum (°F) = 65.46"
"Approximate Minimum (°F) = 41.33"
"Mean Equilibrium (°F) = 64.35"
"Maximum Equilibrium (°F) = 73.59"
"Minimum Equilibrium (°F) = 55.11"

"SSTEMP (1.2.2) ","09/27/2002 09:20 am"

Succor Creek: "HW to Berg Mine - June - Allocation"

"English",	"Segment Inflow (cfs)",	"0.000"
"International",	"Inflow Temperature (°C)",	"6.000"
"English",	"Segment Outflow (cfs)",	"19.670"
"English",	"Accretion Temp. (°F)",	"47.850"
"English",	"Latitude (degrees)",	"42.972"
"English",	"Segment Length (mi)",	"5.550"
"English",	"Upstream Elevation (ft)",	"6560.99"
"English",	"Downstream Elevation (ft)",	"5577.00"
"English",	"Width's A Term (s/ft²)",	"12.999"
"English",	" B Term where W = A*Q**B",	"0.000"
"English",	"Manning's n",	"0.035"
"English",	"Air Temperature (°F)",	"61.200"
"English",	"Relative Humidity (%)",	"51.500"
"English",	"Wind Speed (mph)",	"9.000"
"English",	"Ground Temperature (°F)",	"47.850"
"English",	"Thermal gradient (j/m²/s/C)",	"1.650"
"English",	"Possible Sun (%)",	"76.000"
"English",	"Dust Coefficient",	"6.000"
"English",	"Ground Reflectivity (%)",	"15.000"
"English",	"Solar Radiation (Langleys/d)",	"647.966"
"English",	"Total Shade (%)",	"55.000"
"English",	"Segment Azimuth (degrees)",	"-44.977"

"West Side Parameters"

"English",	"Topographic Altitude (degrees)",	"15.000"
"English",	"Vegetation Height (ft)",	"13.000"
"English",	"Vegetative Crown (ft)",	"10.000"
"English",	"Vegetation Offset (ft)",	"5.000"
"English",	"Vegetation Density (%)",	"22.500"

"East Side Parameters"

"English",	"Topographic Altitude (degrees)",	"15.000"
"English",	"Vegetation Height (ft)",	"13.000"
"English",	"Vegetative Crown (ft)",	"10.000"
"English",	"Vegetation Offset (ft)",	"5.000"
"English",	"Vegetation Density (%)",	"22.500"
"English",	" Maximum Air Temp (°F)",	"65.239"

"Dam at Head of Segment","Unchecked"
" Maximum Air Temp (°F)","Unchecked"
"Solar Radiation","Disabled"
"Total Shade","Enabled"
"Month/day","06/01"

"Predicted Mean (°C) = 10.67"
"Estimated Maximum (°F) = 58.21"
"Approximate Minimum (°F) = 44.19"
"Mean Equilibrium (°F) = 58.61"
"Maximum Equilibrium (°F) = 65.05"
"Minimum Equilibrium (°F) = 52.18"

```
"SSTEMP (1.2.2)  ","09/25/2002  10:34 am"
```

Succor Creek: "Berg Mine to Chipmunk - May - Existing"

```
"English",          "Segment Inflow (cfs)",               "21.500"
"International",    "Inflow Temperature (°C)",            "10.010"
"English",          "Segment Outflow (cfs)",              "29.300"
"English",          "Accretion Temp. (°F)",               "47.850"
"English",          "Latitude (degrees)",                 "43.000"
"English",          "Segment Length (mi)",                "3.050"
"English",          "Upstream Elevation (ft)",            "5577.00"
"English",          "Downstream Elevation (ft)",          "5250.00"
"English",          "Width's A Term (s/ft²)",             "14.000"
"English",          "  B Term where W = A*Q**B",          "0.000"
"English",          "Manning's n",                        "0.035"
"English",          "Air Temperature (°F)",               "53.590"
"English",          "Relative Humidity (%)",              "56.500"
"English",          "Wind Speed (mph)",                   "9.400"
"English",          "Ground Temperature (°F)",            "47.850"
"English",          "Thermal gradient (j/m²/s/C)",        "1.650"
"English",          "Possible Sun (%)",                   "71.000"
"English",          "Dust Coefficient",                   "6.000"
"English",          "Ground Reflectivity (%)",            "15.000"
"English",          "Solar Radiation (Langleys/d)",       "561.849"
"English",          "Total Shade (%)",                    "13.991"
"English",          "Segment Azimuth (degrees)",          "-45.000"

"West Side Parameters"
"English",          "Topographic Altitude (degrees)",     "10.000"
"English",          "Vegetation Height (ft)",             "13.000"
"English",          "Vegetative Crown (ft)",              "10.000"
"English",          "Vegetation Offset (ft)",             "5.000"
"English",          "Vegetation Density (%)",             "22.500"

"East Side Parameters"
"English",          "Topographic Altitude (degrees)",     "10.000"
"English",          "Vegetation Height (ft)",             "13.000"
"English",          "Vegetative Crown (ft)",              "10.000"
"English",          "Vegetation Offset (ft)",             "5.000"
"English",          "Vegetation Density (%)",             "22.500"
"English",          " Maximum Air Temp (°F)",             "57.377"

"Dam at Head of Segment","Unchecked"
" Maximum Air Temp (°F)","Unchecked"
"Solar Radiation","Disabled"
"Total Shade","Disabled"
"Month/day","05/01"
```

"Predicted Mean (°C) = 10.62"

```
"Estimated Maximum (°F) = 60.82"
"Approximate Minimum (°F) = 41.40"
"Mean Equilibrium (°F) = 59.54"
"Maximum Equilibrium (°F) = 69.68"
"Minimum Equilibrium (°F) = 49.40"
```

```
"SSTEMP (1.2.2)  ","09/27/2002  09:21 am"
```

Succor Creek: "Berg Mine to Chipmunk - May - Allocation"

```
"English",          "Segment Inflow (cfs)",              "21.500"
"International",    "Inflow Temperature (°C)",           "10.010"
"English",          "Segment Outflow (cfs)",             "29.300"
"English",          "Accretion Temp. (°F)",              "47.850"
"English",          "Latitude (degrees)",                "43.000"
"English",          "Segment Length (mi)",               "3.050"
"English",          "Upstream Elevation (ft)",           "5577.00"
"English",          "Downstream Elevation (ft)",         "5250.00"
"English",          "Width's A Term (s/ft²)",            "14.000"
"English",          "  B Term where W = A*Q**B",         "0.000"
"English",          "Manning's n",                       "0.035"
"English",          "Air Temperature (°F)",              "53.590"
"English",          "Relative Humidity (%)",             "56.500"
"English",          "Wind Speed (mph)",                  "9.400"
"English",          "Ground Temperature (°F)",           "47.850"
"English",          "Thermal gradient (j/m²/s/C)",       "1.650"
"English",          "Possible Sun (%)",                  "71.000"
"English",          "Dust Coefficient",                  "6.000"
"English",          "Ground Reflectivity (%)",           "15.000"
"English",          "Solar Radiation (Langleys/d)",      "561.849"
"English",          "Total Shade (%)",                   "55.000"
"English",          "Segment Azimuth (degrees)",         "-45.000"

"West Side Parameters"
"English",          "Topographic Altitude (degrees)",    "10.000"
"English",          "Vegetation Height (ft)",            "13.000"
"English",          "Vegetative Crown (ft)",             "10.000"
"English",          "Vegetation Offset (ft)",            "5.000"
"English",          "Vegetation Density (%)",            "22.500"

"East Side Parameters"
"English",          "Topographic Altitude (degrees)",    "10.000"
"English",          "Vegetation Height (ft)",            "13.000"
"English",          "Vegetative Crown (ft)",             "10.000"
"English",          "Vegetation Offset (ft)",            "5.000"
"English",          "Vegetation Density (%)",            "22.500"
"English",          " Maximum Air Temp (°F)",            "57.377"

"Dam at Head of Segment","Unchecked"
" Maximum Air Temp (°F)","Unchecked"
"Solar Radiation","Disabled"
"Total Shade","Enabled"
"Month/day","05/01"
```

"Predicted Mean (°C) = 10.10"

```
"Estimated Maximum (°F) = 55.55"
"Approximate Minimum (°F) = 44.80"
"Mean Equilibrium (°F) = 54.38"
"Maximum Equilibrium (°F) = 61.24"
"Minimum Equilibrium (°F) = 47.51"
```

"SSTEMP (1.2.2) ","09/25/2002 10:35 am"

Succor Creek: "Berg Mine to Chipmunk - June - Existing"

```
"English",          "Segment Inflow (cfs)",             "19.670"
"International",    "Inflow Temperature (°C)",          "11.300"
"English",          "Segment Outflow (cfs)",            "27.300"
"English",          "Accretion Temp. (°F)",             "47.850"
"English",          "Latitude (degrees)",               "43.000"
"English",          "Segment Length (mi)",              "3.050"
"English",          "Upstream Elevation (ft)",          "5577.00"
"English",          "Downstream Elevation (ft)",        "5250.00"
"English",          "Width's A Term (s/ft²)",           "14.000"
"English",          "  B Term where W = A*Q**B",        "0.000"
"English",          "Manning's n",                      "0.035"
"English",          "Air Temperature (°F)",             "61.200"
"English",          "Relative Humidity (%)",            "51.500"
"English",          "Wind Speed (mph)",                 "9.000"
"English",          "Ground Temperature (°F)",          "47.850"
"English",          "Thermal gradient (j/m²/s/C)",      "1.650"
"English",          "Possible Sun (%)",                 "76.000"
"English",          "Dust Coefficient",                 "6.000"
"English",          "Ground Reflectivity (%)",          "15.000"
"English",          "Solar Radiation (Langleys/d)",     "646.503"
"English",          "Total Shade (%)",                  "13.033"
"English",          "Segment Azimuth (degrees)",        "-45.000"

"West Side Parameters"
"English",          "Topographic Altitude (degrees)",   "10.000"
"English",          "Vegetation Height (ft)",           "13.000"
"English",          "Vegetative Crown (ft)",            "10.000"
"English",          "Vegetation Offset (ft)",           "5.000"
"English",          "Vegetation Density (%)",           "22.500"

"East Side Parameters"
"English",          "Topographic Altitude (degrees)",   "10.000"
"English",          "Vegetation Height (ft)",           "13.000"
"English",          "Vegetative Crown (ft)",            "10.000"
"English",          "Vegetation Offset (ft)",           "5.000"
"English",          "Vegetation Density (%)",           "22.500"
"English",          " Maximum Air Temp (°F)",           "65.239"

"Dam at Head of Segment","Unchecked"
" Maximum Air Temp (°F)","Unchecked"
"Solar Radiation","Disabled"
"Total Shade","Disabled"
"Month/day","06/01"
```

"Predicted Mean (°C) = 12.17"

```
"Estimated Maximum (°F) = 64.64"
"Approximate Minimum (°F) = 43.16"
"Mean Equilibrium (°F) = 65.86"
"Maximum Equilibrium (°F) = 74.90"
"Minimum Equilibrium (°F) = 56.81"
```

"SSTEMP (1.2.2) ","09/27/2002 09:22 am"

Succor Creek: "Berg Mine to Chipmunk - June - Allocation"

"English",	"Segment Inflow (cfs)",	"19.670"
"International",	"Inflow Temperature (°C)",	"11.300"
"English",	"Segment Outflow (cfs)",	"27.300"
"English",	"Accretion Temp. (°F)",	"47.850"
"English",	"Latitude (degrees)",	"43.000"
"English",	"Segment Length (mi)",	"3.050"
"English",	"Upstream Elevation (ft)",	"5577.00"
"English",	"Downstream Elevation (ft)",	"5250.00"
"English",	"Width's A Term (s/ft²)",	"14.000"
"English",	" B Term where W = A*Q**B",	"0.000"
"English",	"Manning's n",	"0.035"
"English",	"Air Temperature (°F)",	"61.200"
"English",	"Relative Humidity (%)",	"51.500"
"English",	"Wind Speed (mph)",	"9.000"
"English",	"Ground Temperature (°F)",	"47.850"
"English",	"Thermal gradient (j/m²/s/C)",	"1.650"
"English",	"Possible Sun (%)",	"76.000"
"English",	"Dust Coefficient",	"6.000"
"English",	"Ground Reflectivity (%)",	"15.000"
"English",	"Solar Radiation (Langleys/d)",	"646.503"
"English",	"Total Shade (%)",	"55.000"
"English",	"Segment Azimuth (degrees)",	"-45.000"

"West Side Parameters"

"English",	"Topographic Altitude (degrees)",	"10.000"
"English",	"Vegetation Height (ft)",	"13.000"
"English",	"Vegetative Crown (ft)",	"10.000"
"English",	"Vegetation Offset (ft)",	"5.000"
"English",	"Vegetation Density (%)",	"22.500"

"East Side Parameters"

"English",	"Topographic Altitude (degrees)",	"10.000"
"English",	"Vegetation Height (ft)",	"13.000"
"English",	"Vegetative Crown (ft)",	"10.000"
"English",	"Vegetation Offset (ft)",	"5.000"
"English",	"Vegetation Density (%)",	"22.500"
"English",	" Maximum Air Temp (°F)",	"65.239"

"Dam at Head of Segment","Unchecked"
" Maximum Air Temp (°F)","Unchecked"
"Solar Radiation","Disabled"
"Total Shade","Enabled"
"Month/day","06/01"

"Predicted Mean (°C) = 11.46"
"Estimated Maximum (°F) = 58.60"
"Approximate Minimum (°F) = 46.64"
"Mean Equilibrium (°F) = 60.14"
"Maximum Equilibrium (°F) = 66.37"
"Minimum Equilibrium (°F) = 53.91"

```
"SSTEMP (1.2.2)  ","09/25/2002  10:43 am"
```

Succor Creek: "Reservoir to Oregon - May - Existing"

```
"English",          "Segment Inflow (cfs)",              "33.500"
"International",    "Inflow Temperature (°C)",           "9.160"
"English",          "Segment Outflow (cfs)",             "35.500"
"English",          "Accretion Temp. (°F)",              "45.980"
"English",          "Latitude (degrees)",                "43.000"
"English",          "Segment Length (mi)",               "4.420"
"English",          "Upstream Elevation (ft)",           "4600.00"
"English",          "Downstream Elevation (ft)",         "4220.00"
"English",          "Width's A Term (s/ft²)",            "16.400"
"English",          "  B Term where W = A*Q**B",         "0.000"
"English",          "Manning's n",                       "0.035"
"English",          "Air Temperature (°F)",              "51.880"
"English",          "Relative Humidity (%)",             "56.500"
"English",          "Wind Speed (mph)",                  "9.400"
"English",          "Ground Temperature (°F)",           "45.980"
"English",          "Thermal gradient (j/m²/s/C)",       "1.650"
"English",          "Possible Sun (%)",                  "71.000"
"English",          "Dust Coefficient",                  "6.000"
"English",          "Ground Reflectivity (%)",           "15.000"
"English",          "Solar Radiation (Langleys/d)",      "561.410"
"English",          "Total Shade (%)",                   "14.262"
"English",          "Segment Azimuth (degrees)",         "45.000"

"West Side Parameters"
"English",          "Topographic Altitude (degrees)",    "17.000"
"English",          "Vegetation Height (ft)",            "13.000"
"English",          "Vegetative Crown (ft)",             "10.000"
"English",          "Vegetation Offset (ft)",            "5.000"
"English",          "Vegetation Density (%)",            "22.500"

"East Side Parameters"
"English",          "Topographic Altitude (degrees)",    "17.000"
"English",          "Vegetation Height (ft)",            "13.000"
"English",          "Vegetative Crown (ft)",             "10.000"
"English",          "Vegetation Offset (ft)",            "5.000"
"English",          "Vegetation Density (%)",            "22.500"
"English",          " Maximum Air Temp (°F)",            "55.667"

"Dam at Head of Segment","Unchecked"
" Maximum Air Temp (°F)","Checked"
"Solar Radiation","Disabled"
"Total Shade","Disabled"
"Month/day","05/01"
```

"Predicted Mean (°C) = 10.29"

```
"Estimated Maximum (°F) = 59.64"
"Approximate Minimum (°F) = 41.39"
"Mean Equilibrium (°F) = 58.29"
"Maximum Equilibrium (°F) = 68.58"
"Minimum Equilibrium (°F) = 48.01"
```

"SSTEMP (1.2.2) ","09/27/2002 09:22 am"

Succor Creek: "Reservoir to Oregon - May - Allocation"

"English",	"Segment Inflow (cfs)",	"33.500"
"International",	"Inflow Temperature (°C)",	"9.160"
"English",	"Segment Outflow (cfs)",	"35.500"
"English",	"Accretion Temp. (°F)",	"45.980"
"English",	"Latitude (degrees)",	"43.000"
"English",	"Segment Length (mi)",	"4.420"
"English",	"Upstream Elevation (ft)",	"4600.00"
"English",	"Downstream Elevation (ft)",	"4220.00"
"English",	"Width's A Term (s/ft^2)",	"16.400"
"English",	" B Term where W = A*Q**B",	"0.000"
"English",	"Manning's n",	"0.035"
"English",	"Air Temperature (°F)",	"51.880"
"English",	"Relative Humidity (%)",	"56.500"
"English",	"Wind Speed (mph)",	"9.400"
"English",	"Ground Temperature (°F)",	"45.980"
"English",	"Thermal gradient (j/m^2/s/C)",	"1.650"
"English",	"Possible Sun (%)",	"71.000"
"English",	"Dust Coefficient",	"6.000"
"English",	"Ground Reflectivity (%)",	"15.000"
"English",	"Solar Radiation (Langleys/d)",	"561.410"
"English",	"Total Shade (%)",	"55.000"
"English",	"Segment Azimuth (degrees)",	"45.000"

"West Side Parameters"

"English",	"Topographic Altitude (degrees)",	"17.000"
"English",	"Vegetation Height (ft)",	"13.000"
"English",	"Vegetative Crown (ft)",	"10.000"
"English",	"Vegetation Offset (ft)",	"5.000"
"English",	"Vegetation Density (%)",	"22.500"

"East Side Parameters"

"English",	"Segment Azimuth (degrees)",	"17.000"
"English",	"Topographic Altitude (degrees)",	"17.000"
"English",	"Vegetation Height (ft)",	"13.000"
"English",	"Vegetative Crown (ft)",	"10.000"
"English",	"Vegetation Offset (ft)",	"5.000"
"English",	"Vegetation Density (%)",	"22.500"

"Dam at Head of Segment","Unchecked"
" Maximum Air Temp (°F)","Checked"
"Solar Radiation","Disabled"
"Total Shade","Enabled"
"Month/day","05/01"

"Predicted Mean (°C) = 9.63"
"Estimated Maximum (°F) = 54.42"
"Approximate Minimum (°F) = 44.23"
"Mean Equilibrium (°F) = 53.12"
"Maximum Equilibrium (°F) = 60.09"
"Minimum Equilibrium (°F) = 46.15"

"SSTEMP (1.2.2) ","09/25/2002 10:42 am"

Succor Creek: "Reservoir to Oregon - June - Existing"

"English",	"Segment Inflow (cfs)",	"31.500"
"International",	"Inflow Temperature (°C)",	"9.610"
"English",	"Segment Outflow (cfs)",	"33.500"
"English",	"Accretion Temp. (°F)",	"45.980"
"English",	"Latitude (degrees)",	"43.000"
"English",	"Segment Length (mi)",	"4.420"
"English",	"Upstream Elevation (ft)",	"4600.00"
"English",	"Downstream Elevation (ft)",	"4220.00"
"English",	"Width's A Term (s/ft^2)",	"16.400"
"English",	" B Term where W = A*Q**B",	"0.000"
"English",	"Manning's n",	"0.035"
"English",	"Air Temperature (°F)",	"59.590"
"English",	"Relative Humidity (%)",	"51.500"
"English",	"Wind Speed (mph)",	"9.000"
"English",	"Ground Temperature (°F)",	"45.980"
"English",	"Thermal gradient (j/m^2/s/C)",	"1.650"
"English",	"Possible Sun (%)",	"76.000"
"English",	"Dust Coefficient",	"6.000"
"English",	"Ground Reflectivity (%)",	"15.000"
"English",	"Solar Radiation (Langleys/d)",	"646.036"
"English",	"Total Shade (%)",	"13.107"
"English",	"Segment Azimuth (degrees)",	"45.000"

"West Side Parameters"

"English",	"Topographic Altitude (degrees)",	"17.000"
"English",	"Vegetation Height (ft)",	"13.000"
"English",	"Vegetative Crown (ft)",	"10.000"
"English",	"Vegetation Offset (ft)",	"5.000"
"English",	"Vegetation Density (%)",	"22.500"

"East Side Parameters"

"English",	"Topographic Altitude (degrees)",	"17.000"
"English",	"Vegetation Height (ft)",	"13.000"
"English",	"Vegetative Crown (ft)",	"10.000"
"English",	"Vegetation Offset (ft)",	"5.000"
"English",	"Vegetation Density (%)",	"22.500"
"English",	" Maximum Air Temp (°F)",	"76.000"

"Dam at Head of Segment","Unchecked"
" Maximum Air Temp (°F)","Checked"
"Solar Radiation","Disabled"
"Total Shade","Disabled"
"Month/day","06/01"

"Predicted Mean (°C) = 11.63"
"Estimated Maximum (°F) = 67.66"
"Approximate Minimum (°F) = 38.20"
"Mean Equilibrium (°F) = 64.79"
"Maximum Equilibrium (°F) = 77.70"
"Minimum Equilibrium (°F) = 51.88"

"SSTEMP (1.2.2) ","09/27/2002 09:23 am"

Succor Creek: "Reservoir to Oregon - June - Allocation"

"English",	"Segment Inflow (cfs)",	"31.500"
"International",	"Inflow Temperature (°C)",	"9.610"
"English",	"Segment Outflow (cfs)",	"33.500"
"English",	"Accretion Temp. (°F)",	"45.980"
"English",	"Latitude (degrees)",	"43.000"
"English",	"Segment Length (mi)",	"4.420"
"English",	"Upstream Elevation (ft)",	"4600.00"
"English",	"Downstream Elevation (ft)",	"4220.00"
"English",	"Width's A Term (s/ft²)",	"16.400"
"English",	" B Term where W = A*Q**B",	"0.000"
"English",	"Manning's n",	"0.035"
"English",	"Air Temperature (°F)",	"59.590"
"English",	"Relative Humidity (%)",	"51.500"
"English",	"Wind Speed (mph)",	"9.000"
"English",	"Ground Temperature (°F)",	"45.980"
"English",	"Thermal gradient (j/m²/s/C)",	"1.650"
"English",	"Possible Sun (%)",	"76.000"
"English",	"Dust Coefficient",	"6.000"
"English",	"Ground Reflectivity (%)",	"15.000"
"English",	"Solar Radiation (Langleys/d)",	"646.036"
"English",	"Total Shade (%)",	"55.000"
"English",	"Segment Azimuth (degrees)",	"45.000"

"West Side Parameters"

"English",	"Topographic Altitude (degrees)",	"17.000"
"English",	"Vegetation Height (ft)",	"13.000"
"English",	"Vegetative Crown (ft)",	"10.000"
"English",	"Vegetation Offset (ft)",	"5.000"
"English",	"Vegetation Density (%)",	"22.500"

"East Side Parameters"

"English",	"Topographic Altitude (degrees)",	"17.000"
"English",	"Vegetation Height (ft)",	"13.000"
"English",	"Vegetative Crown (ft)",	"10.000"
"English",	"Vegetation Offset (ft)",	"5.000"
"English",	"Vegetation Density (%)",	"22.500"
"English",	" Maximum Air Temp (°F)",	"76.000"

"Dam at Head of Segment","Unchecked"
" Maximum Air Temp (°F)","Checked"
"Solar Radiation","Disabled"
"Total Shade","Enabled"
"Month/day","06/01"

"Predicted Mean (°C) = 10.76"
"Estimated Maximum (°F) = 61.64"
"Approximate Minimum (°F) = 41.10"
"Mean Equilibrium (°F) = 59.04"
"Maximum Equilibrium (°F) = 69.95"
"Minimum Equilibrium (°F) = 48.13"

```
"SSTEMP (1.2.2)  ","09/25/2002  10:47 am"
```

Succor Creek: "Reservoir to Oregon - July - Existing"

```
"English",          "Segment Inflow (cfs)",              "42.800"
"International",    "Inflow Temperature (°C)",           "13.500"
"English",          "Segment Outflow (cfs)",             "44.800"
"English",          "Accretion Temp. (°F)",              "45.980"
"English",          "Latitude (degrees)",                "43.000"
"English",          "Segment Length (mi)",               "4.420"
"English",          "Upstream Elevation (ft)",           "4600.00"
"English",          "Downstream Elevation (ft)",         "4220.00"
"English",          "Width's A Term (s/ft²)",            "16.400"
"English",          "  B Term where W = A*Q**B",         "0.000"
"English",          "Manning's n",                       "0.035"
"English",          "Air Temperature (°F)",              "68.200"
"English",          "Relative Humidity (%)",             "40.000"
"English",          "Wind Speed (mph)",                  "8.400"
"English",          "Ground Temperature (°F)",           "45.980"
"English",          "Thermal gradient (j/m²/s/C)",       "1.650"
"English",          "Possible Sun (%)",                  "87.000"
"English",          "Dust Coefficient",                  "6.000"
"English",          "Ground Reflectivity (%)",           "15.000"
"English",          "Solar Radiation (Langleys/d)",      "703.562"
"English",          "Total Shade (%)",                   "12.957"
"English",          "Segment Azimuth (degrees)",         "45.000"

"West Side Parameters"
"English",          "Topographic Altitude (degrees)",    "17.000"
"English",          "Vegetation Height (ft)",            "13.000"
"English",          "Vegetative Crown (ft)",             "10.000"
"English",          "Vegetation Offset (ft)",            "5.000"
"English",          "Vegetation Density (%)",            "22.500"

"East Side Parameters"
"English",          "Topographic Altitude (degrees)",    "17.000"
"English",          "Vegetation Height (ft)",            "13.000"
"English",          "Vegetative Crown (ft)",             "10.000"
"English",          "Vegetation Offset (ft)",            "5.000"
"English",          "Vegetation Density (%)",            "22.500"
"English",          " Maximum Air Temp (°F)",            "87.340"

"Dam at Head of Segment","Unchecked"
" Maximum Air Temp (°F)","Checked"
"Solar Radiation","Disabled"
"Total Shade","Disabled"
"Month/day","07/01"
```

"Predicted Mean (°C) = 14.86"

```
"Estimated Maximum (°F) = 73.06"
"Approximate Minimum (°F) = 44.42"
"Mean Equilibrium (°F) = 70.10"
"Maximum Equilibrium (°F) = 83.12"
"Minimum Equilibrium (°F) = 57.08"
```

```
"SSTEMP (1.2.2)  ","09/25/2002  11:05 am"
```

Succor Creek: "Reservoir to Oregon - July - Allocation"

```
"English",          "Segment Inflow (cfs)",             "42.800"
"International",    "Inflow Temperature (°C)",          "13.500"
"English",          "Segment Outflow (cfs)",            "44.800"
"English",          "Accretion Temp. (°F)",             "45.980"
"English",          "Latitude (degrees)",               "43.000"
"English",          "Segment Length (mi)",              "4.420"
"English",          "Upstream Elevation (ft)",          "4600.00"
"English",          "Downstream Elevation (ft)",        "4220.00"
"English",          "Width's A Term (s/ft²)",           "16.400"
"English",          "  B Term where W = A*Q**B",        "0.000"
"English",          "Manning's n",                      "0.035"
"English",          "Air Temperature (°F)",             "68.200"
"English",          "Relative Humidity (%)",            "40.000"
"English",          "Wind Speed (mph)",                 "8.400"
"English",          "Ground Temperature (°F)",          "45.980"
"English",          "Thermal gradient (j/m²/s/C)",      "1.650"
"English",          "Possible Sun (%)",                 "87.000"
"English",          "Dust Coefficient",                 "6.000"
"English",          "Ground Reflectivity (%)",          "15.000"
"English",          "Solar Radiation (Langleys/d)",     "703.562"
"English",          "Total Shade (%)",                  "24.000"
"English",          "Segment Azimuth (degrees)",        "45.000"

"West Side Parameters"
"English",          "Topographic Altitude (degrees)",   "17.000"
"English",          "Vegetation Height (ft)",           "13.000"
"English",          "Vegetative Crown (ft)",            "10.000"
"English",          "Vegetation Offset (ft)",           "5.000"
"English",          "Vegetation Density (%)",           "22.500"

"East Side Parameters"
"English",          "Topographic Altitude (degrees)",   "17.000"
"English",          "Vegetation Height (ft)",           "13.000"
"English",          "Vegetative Crown (ft)",            "10.000"
"English",          "Vegetation Offset (ft)",           "5.000"
"English",          "Vegetation Density (%)",           "22.500"
"English",          " Maximum Air Temp (°F)",           "87.340"

"Dam at Head of Segment","Unchecked"
" Maximum Air Temp (°F)","Checked"
"Solar Radiation","Disabled"
"Total Shade","Enabled"
"Month/day","07/01"
```

"Predicted Mean (°F) = 58.40"

```
"Estimated Maximum (°F) = 71.59"
"Approximate Minimum (°F) = 45.20"
"Mean Equilibrium (°F) = 68.64"
"Maximum Equilibrium (°F) = 81.26"
"Minimum Equilibrium (°F) = 56.02"
```

```
"SSTEMP (1.2.2)  ","09/25/2002  10:53 am"
```

Succor Creek: "Reservoir to Oregon - August - Existing"

```
"English",          "Segment Inflow (cfs)",              "10.740"
"International",    "Inflow Temperature (°C)",           "15.250"
"English",          "Segment Outflow (cfs)",             "12.700"
"English",          "Accretion Temp. (°F)",              "45.980"
"English",          "Latitude (degrees)",                "43.000"
"English",          "Segment Length (mi)",               "4.420"
"English",          "Upstream Elevation (ft)",           "4600.00"
"English",          "Downstream Elevation (ft)",         "4220.00"
"English",          "Width's A Term (s/ft²)",            "16.400"
"English",          "  B Term where W = A*Q**B",         "0.000"
"English",          "Manning's n",                       "0.035"
"English",          "Air Temperature (°F)",              "67.480"
"English",          "Relative Humidity (%)",             "40.000"
"English",          "Wind Speed (mph)",                  "8.200"
"English",          "Ground Temperature (°F)",           "45.980"
"English",          "Thermal gradient (j/m²/s/C)",       "1.650"
"English",          "Possible Sun (%)",                  "85.000"
"English",          "Dust Coefficient",                  "6.000"
"English",          "Ground Reflectivity (%)",           "15.000"
"English",          "Solar Radiation (Langleys/d)",      "640.028"
"English",          "Total Shade (%)",                   "13.767"
"English",          "Segment Azimuth (degrees)",         "45.000"

"West Side Parameters"
"English",          "Topographic Altitude (degrees)",    "17.000"
"English",          "Vegetation Height (ft)",            "13.000"
"English",          "Vegetative Crown (ft)",             "10.000"
"English",          "Vegetation Offset (ft)",            "5.000"
"English",          "Vegetation Density (%)",            "22.500"

"East Side Parameters"
"English",          "Topographic Altitude (degrees)",    "17.000"
"English",          "Vegetation Height (ft)",            "13.000"
"English",          "Vegetative Crown (ft)",             "10.000"
"English",          "Vegetation Offset (ft)",            "5.000"
"English",          "Vegetation Density (%)",            "22.500"
"English",          " Maximum Air Temp (°F)",            "86.310"

"Dam at Head of Segment","Unchecked"
" Maximum Air Temp (°F)","Checked"
"Solar Radiation","Disabled"
"Total Shade","Disabled"
"Month/day","08/01"
```

"Predicted Mean (°C) = 16.72"

```
"Estimated Maximum (°C) = 25.70"
"Approximate Minimum (°F) = 45.95"
"Mean Equilibrium (°F) = 66.93"
"Maximum Equilibrium (°F) = 81.02"
"Minimum Equilibrium (°F) = 52.84"
```

"SSTEMP (1.2.2) ","09/25/2002 11:05 am"

Succor Creek: "Reservoir to Oregon - August - Allocation"

"English",	"Segment Inflow (cfs)",	"10.740"
"International",	"Inflow Temperature (°C)",	"15.250"
"English",	"Segment Outflow (cfs)",	"12.700"
"English",	"Accretion Temp. (°F)",	"45.980"
"English",	"Latitude (degrees)",	"43.000"
"English",	"Segment Length (mi)",	"4.420"
"English",	"Upstream Elevation (ft)",	"4600.00"
"English",	"Downstream Elevation (ft)",	"4220.00"
"English",	"Width's A Term (s/ft²)",	"16.400"
"English",	" B Term where W = A*Q**B",	"0.000"
"English",	"Manning's n",	"0.035"
"English",	"Air Temperature (°F)",	"67.480"
"English",	"Relative Humidity (%)",	"40.000"
"English",	"Wind Speed (mph)",	"8.200"
"English",	"Ground Temperature (°F)",	"45.980"
"English",	"Thermal gradient (j/m²/s/C)",	"1.650"
"English",	"Possible Sun (%)",	"85.000"
"English",	"Dust Coefficient",	"6.000"
"English",	"Ground Reflectivity (%)",	"15.000"
"English",	"Solar Radiation (Langleys/d)",	"640.028"
"English",	"Total Shade (%)",	"53.000"
"English",	"Segment Azimuth (degrees)",	"45.000"

"West Side Parameters"

"English",	"Topographic Altitude (degrees)",	"17.000"
"English",	"Vegetation Height (ft)",	"13.000"
"English",	"Vegetative Crown (ft)",	"10.000"
"English",	"Vegetation Offset (ft)",	"5.000"
"English",	"Vegetation Density (%)",	"22.500"

"East Side Parameters"

"English",	"Topographic Altitude (degrees)",	"17.000"
"English",	"Vegetation Height (ft)",	"13.000"
"English",	"Vegetative Crown (ft)",	"10.000"
"English",	"Vegetation Offset (ft)",	"5.000"
"English",	"Vegetation Density (%)",	"22.500"
"English",	" Maximum Air Temp (°F)",	"86.310"

"Dam at Head of Segment","Unchecked"
" Maximum Air Temp (°F)","Checked"
"Solar Radiation","Disabled"
"Total Shade","Enabled"
"Month/day","08/01"

"Predicted Mean (°F) = 59.20"
"Estimated Maximum (°F) = 71.55"
"Approximate Minimum (°F) = 46.85"
"Mean Equilibrium (°F) = 61.80"
"Maximum Equilibrium (°F) = 73.91"
"Minimum Equilibrium (°F) = 49.68"

"SSTEMP (1.2.2)
Sinker Creek
Diamond Creek to Snake River

"English",	"Segment Inflow (cfs)",	"4.000"
"International",	"Inflow Temperature (°C)",	"17.650"
"English",	"Segment Outflow (cfs)",	"4.0"
"English",	"Accretion Temp. (°F)",	"51.3"
"English",	"Latitude (degrees)",	"42"
"English",	"Segment Length (mi)",	"7.70"
"English",	"Upstream Elevation (m)",	"1000"
"English",	"Downstream Elevation (m)",	"750.00"
"English",	"Width's A Term (s/ft²)",	"10.39"
"English",	" B Term where W = A*Q**B",	"0.000"
"English",	"Manning's n",	"0.035"
"English",	"Air Temperature (°F)",	"78.00"
"English",	"Relative Humidity (%)",	"37.00"
"English",	"Wind Speed (mph)",	"8.400"
"English",	"Ground Temperature (°F)",	"51.3"
"English",	"Thermal gradient (j/m²/s/C)",	"1.650"
"English",	"Possible Sun (%)",	"87.000"
"English",	"Dust Coefficient",	"6.000"
"English",	"Ground Reflectivity (%)",	"15.000"
"English",	"Solar Radiation (Langleys/d)",	"647.966"
"English",	"Total Shade (%)",	"70.200"
"English",	"Segment Azimuth (degrees)",	"0."

"Dam at Head of Segment","checked"
" Maximum Air Temp (°F)","Unchecked"
"Solar Radiation","Disabled"
"Total Shade","Enabled"
"Month/day","07/16"
** Used July 16th because this was the day with the hottest instream temperature. Did not use July 12-14th because these days exceeded the MWMT. Modeled the latter half of June and July when exceedances occurred to see if the site potential shade would result in meeting the criteria (10% or less exceedances)

Appendix J. Response to Public Comments

This appendix documents the comments received during the 45-day comment period for the Middle Snake River/Succor Creek Subbasin Assessment and Total Maximum Daily Load. The comment period extended from January 13, 2003 to February 28, 2003. The original comments as well as DEQ's response to the comments are documented in the following response to comment matrix. In some instances the comment is summarized. In others, the exact comment is given.

Comments From: Ron Cunningham, President Succor Creek District Improvement Co. Received via mail: February 10, 2003	**DEQ Response:**
1) "I support the delisting of many of the streams suggested for delisting. DEQ seems to have made a diligent effort to gather and analyze data to support the conclusions reached."	DEQ acknowledges the support of de-listing many of the streams in the basin.
2) "Some effort was made to consider the unique attributes of each stream and its drainage. The acknowledgement of this in 'Best Achievable Temperature' for a standard on the stream to which it applies, is an excellent determination.	DEQ agrees that the use of Best Achievable Temperature addresses the unique attributes of each stream and its drainage. DEQ acknowledges support for using Best Achievable Temperature.
3) "The equal concentration allocation scenario seemed to be a very fair and equitable way to address where efforts to make reductions need to be made, and where efforts would have to most impact on meeting water quality standards."	DEQ acknowledges support for the equal concentration allocation scenario.
4) 2002 flow data for Succor Creek Reservoir were provided.	The flow data will be integrated into the Succor Creek portion of the subbasin assessment. The data are very helpful in further characterizing the reservoir outflows.
5) A typo on page 190 was noted. !0,984 should read 1.984.	The typo will be fixed.
Comments From: Ron Blake, District Conservationist Natural Resources Conservation Services Received via e-mail: January 30, 2003	**DEQ Response:**
1) "I need to go on record saying to delist the lower segment of Birch Creek is a mistake. Birch Creek is being used as an ag drain collecting sediment-laden wastewater from irrigated cropland that flows to the Snake River. I have been assisting a landowner adjacent to Birch Creek develop a conservation plan. I have seen Birch Creek water look like flowing chocolate. This past December 2002, I was onsite and noticed seep water flows present in that lower segment of Birch	The data that DEQ collected suggests that Birch Creek is intermittent. The flows during the non-irrigation period appear to be below 1 cfs. If there is evidence that Birch Creek is contributing loads of sediments or nutrients to the Snake River in amounts that cause impairment of beneficial uses to the Snake River then the stream will be subject to load allocations. DEQ would welcome any data that is available showing that Birch Creek flows above 1 cfs year round. Any data submitted will be used in

Creek. Would that qualify the lower segment to be a perennial stream? I began working at the Mountain Home Field Office August of 1995. In 1996 I did conservation planning on several properties East and West of Grandview. I observed many farms without sprinkler irrigation systems using flood irrigation and generating waste water laden with sediment draining to the Snake River. I would hope that area East and West of Grandview, which involves intensively farmed cropland, could be helped to reduce their non point source pollution impacts to the Snake River."	determining whether or not to delist Birch Creek in the next 303(d) listing process.
Comments From: James Truesdell, Chairman Canyon Soil Conservation District Received via mail: February 10, 2003	**DEQ Response:**
1) Pg. 12-23. "A question as why "Wildlife" was left out of the Subbasin Characteristics? Wildlife should be described to the same degree as "Fisheries". With the discussion on wildlife, wild horses need to be addressed to the damage they can cause to riparian areas and springs. Wild horses are not actively managed like range cattle; wild horses can come and go at their own pleasure. Some discussion of the management objectives of BLM for their wild horse populations should be incorporated into the Subbasin Assessment." 2) Pg. 27, Third Paragraph. "Discussion of natural erosion talks about gullies, but does not discuss wild horses and elk impacting riparian areas. Private citizens do not actively manage elk and wild horses; State and Federal agencies manage them." 3) Pg. 30. "Jump Creek is not in Canyon County. Why does DEQ choose to add parts of Canyon County to Jump Creek Subwatershed? Jump Creek comes out of the Owyhee foothills and not Canyon County. Please describe why you have chosen to include Canyon County. Your description of the Jump Creek watershed talks about everything in Owyhee County, but your map on page 31 shows both Owyhee and Canyon Counties? 4) Pg. 31. Figure 1.10 Jump Creek Land Use. "Why does DEQ choose to add parts of Canyon County to Jump Creek Subwatershed? Jump Creek comes out of the Owyhee foothills and not Canyon County. Please fix your maps or describe why you have chosen to include Canyon County. If DEQ deletes the Canyon County portions from the Jump Creek subwatershed, a new	A discussion of BLM's management objectives for wild horse populations will be integrated into the subbasin assessment. A discussion of BLM's management objectives for wild horse populations will be integrated into the subbasin assessment. This map will be corrected in the final document to show Jump Creek solely in Owyhee County. This map will be corrected in the final document to show Jump Creek solely in Owyhee County.

subwatershed will need to be inserted into the document."	
5) Pg. 37. "Squaw Creek is not in Ada County. Why does DEQ choose to add parts of Ada County to Squaw Creek Subwatershed? Squaw Creek comes out of the Owyhee foothills and not Ada County. Please describe why you have chosen to include Ada County. Your description of the Squaw Creek watershed talks about everything in Owyhee County, but your map on page 31 shows both Owyhee and Ada Counties."	This map will be corrected in the final document to show Squaw Creek solely in Owyhee County.
6) Pg. 38. Figure 1.14 Squaw Creek Land Use. "Why does DEQ choose to add parts of Ada County to Squaw Creek Subwatershed? Squaw Creek comes out of the Owyhee foothills and not Ada County. Please fix your maps or describe why you have chosen to include Ada County. If DEQ deletes the Ada County portions from the Squaw Creek subwatershed, a new subwatershed will need to be inserted into the document."	This map will be corrected in the final document to show Squaw Creek solely in Owyhee County.
7) Pg. 40. "Where is a Figure for "Lower Succor Creek?"	An additional figure showing Lower Succor Creek will be inserted into the final document.
"Why is there not a subwatershed for everything that drains into the MidSnake reach? The MidSnake reaches are listed for pollutants, but the landuse maps are missing areas like Con Shea Basin or Murphy Flats in Owyhee County or the land in Elmore County next CJ Strike Reservoir. There is 570 plus acres of sprinkled cropland in Con Shea Basin north of Murphy, 6,500 acres of cropland at Murphy Flats and 13,000 plus acres of cropland in Elmore County. There is also landuse in between Hardtrigger and Reynolds Creeks along the river itself that drains into the Mid Snake."	The Mid Snake/Succor Creek Subbasin Assessment evaluated the beneficial use support status of the §303(d) listed subwatersheds only.
8) Pg. 44. First Paragraph, first sentence. "The sentence reads "The sparsely populated MidSnake River? Succor Creek watershed encompasses parts of Owyhee, Elmore and Canyon Counties." Parts of Ada County also flow into the watershed and need to be listed."	Ada County will be added to the sentence.
9) Pg. 44. Last Paragraph, last sentence. "Include Ada county and Ada Soil and Water Conservation District, Owyhee Soil Conservation District and Elmore Soil and Water Conservation District."	Ada county, Ada Soil and Water Conservation District, Owyhee Soil Conservation District and Elmore Soil and Water Conservation District will be added to the sentence.
10) Pg. 48. Table 5. Mid Snake River/Succor Creek Subbasin Designated Beneficial Uses. "List Succor Creek as Upper Succor Creek and Lower Succor Creek."	This change will be made in the final document.

11) Pg. 51. "Discussion of Natural factors affecting stream temperatures should state "Natural factors include, but are not limited to altitude, aspect, climate, weather, geothermal sources, riparian vegetation (shade), wildlife, and channel morphology (width and depth)."	DEQ will make this correction.
12) Pg. 85. Riparian Survey. "The survey was done by Idaho Soil Conservation Commission (ISCC), not the Idaho Soil Conservation Service."	DEQ will correct this error.
13) Pg. 86. "Fix the description of Figure 2.23 (Idaho Soil Conservation Commission 2002), not the Idaho Soil Conservation Service."	DEQ will correct this error
14) Pg. 109. Sediment. "The survey was done by Idaho Soil Conservation Commission (ISCC), not the Idaho Soil Conservation Service."	DEQ will correct this error.
15) Pg. 113. First Paragraph, First Sentence. "What is uncultivated scrub? Did DEQ mean rangeland?"	Yes, DEQ means rangeland.
16) Pg. 144. Fourth Paragraph, First Sentence. "Please include Ada County. Fourth Paragraph, Fourth Sentence. Owyhee SCD had an EQIP Priority Area for Jump Creek, Canyon SCD has had no state or federal project areas on the Mid Snake River/Succor Creek Watershed. Fourth Paragraph, Seventh Sentence. Add Ada SCD to the districts listed."	Ada SCD will be added to the districts listed.
17) Pg. 145. First Paragraph, First Sentence. "Change "federal Environmental Quality Incentives Program" to "USDA Environmental Quality Incentives Program."	The change to USDA Environmental Quality Incentives Program will be made.
18) Pg. 158. Third Paragraph. "Please review with Tonya Dombrowski the new wording from the Lower Snake/Hells Canyon TMDL for this paragraph. Here are the concerns that were voiced during the comment period for Lower Snake/Hells Canyon TMDL: Pgs. 245-246 . 3.2.3.1 Natural Sources. These two pages have many errors within this section. Idaho Soil Conservation Commission (ISCC) and Idaho Association of Soil Conservation District (IASCD) employees (Justin Krajewski and Chris Fischer) were contacted to give us information about pages 245 and 246 and these are their comments. The monitoring sites are USGS	The revised SR-HC TMDL background wording that addresses these comments will be incorporated into the document.

"gage"stations and are greater than 20 miles from the phosphorus mines currently operating. Two reservoirs on the Blackfoot River are above that USGS gage station near Blackfoot. Could the Blackfoot Reservoir be the source for nutrients? This question led to some bridge board sampling below it. Chris's bridge board sampling occurred on 4 sites on the Blackfoot River all below the Blackfoot Reservoir. Chris's wadeable stream sampling occurred at just 1 site on the Blackfoot River below the Lanes and Diamond creeks confluence which is greater than 10 miles above the USGS gage station at Henry. 1970's should be 1970s (plural not possessive) Landuses are "Agricultural, range, forest and urban are the major landuses within the subbasin (Figure 6)." not the activities described as timber harvest, farming, ranching, and livestock grazing. Isn't ranching and livestock grazing redundant? The Portneuf TMDL's greatest reductions in total phosphorus are required below the Pocatello WWTP. The reduction in sediment coming from non-irrigated cropland that has been enrolled in CRP may have had an effect on total phosphorus concentrations because TSS and TP are thought to be related in the Portneuf Subbasin. The Blackfoot River is not in the Portneuf River Subbasin and is not an area targeted for BMPs at this time. In fact there has been no formal implementation projects on private Ag land in the Blackfoot River Subbasin and implementation is far from complete, although about 15,000 acres have been enrolled in CRP over the last 15 years. However on public lands the USFS has completed implementation of riparian BMPs on Diamond Creek and IDFG has completed work on their property. Blackfoot TMDL (page 61) quotes are "The success of most of these programs and projects is unknown." and "Initiation of CRP program has likely been an important component to water quality improvement in the Blackfoot River	

Subbasin." Fischer, 2001 data is very limited. Fischer, P. reference is incorrect. Fischer emailed to the Pocatello IDEQ and no personal communication occurred. Several subwatersheds have not been targeted for implementation in the Portneuf River Subbasin. There have been five SAWQP projects, 1 WQPA project, 1 EQIP priority area and four 319 riparian projects out of 34 critical subwatersheds. None of our specific implementation for agricultural BMPs restores to natural conditions because we don't know what "natural conditions" are. We restore our values or beneficial uses such as primary contact recreation, salmonid spawning and cold water biota, and Ag water supply not "natural conditions". The total phosphorus target is 0.075 mg/L for the Portneuf TMDL and is similar to the Mid-Snake TMDL. Although the natural levels for nitrogen and phosphorus are unknown, assumptions can be made. Sediment: nutrient relationships should be looked at carefully. The total phosphorus target is 0.1 mg/L for the Blackfoot TMDL and is higher than the Portneuf and Mid-Snake TMDLs. Why there is 0.025 mg/L difference between the Blackfoot and Portneuf TMDLs is unknown? Both rivers flow into the Snake River and into American Falls Reservoir. "with the success realized in the Blackfoot River watershed" What success and what indicator? There have been 15,869 of non-irrigated cropland converted to 7,362 to CRP and another 8,179 acres planted to permanent pasture. Very few acres of cropland remain below the reservoir but thousand of acres are still farmed above the reservoir. The Blackfoot Reservoir isn't listed either. Pocatello IDEQ wrote in the Blackfoot TMDL, "The recommended target of 0.1 mg/l total phosphorus follows the EPA "Gold Book."	
19) Pg. 163. Second Paragraph. "Should read "While only the sources listed in table 47 received explicit LAs for bacteria, other nonpoint sources of	This change will be made in the final document.

bacteria loading to the stream, such as pasture lands in the floodplain, wildlife, wild horses, and feeding operations should be managed to prevent the movement of bacteria into the stream."	
20) "The Lower Boise River DNA Bacteria study has proven that wildlife contribute to the bacteria loading within a watershed and should be mentioned. It is not all agriculture delivering bacteria to streams. Until the quantity of agricultural bacteria sources are known, all possible bacteria sources should be listed.	DEQ acknowledges that agriculture is not the only source of bacteria to streams. Wildlife will be added as a potential source in the final document.
21) Pg. 170. Second Paragraph, Fifth Bullet, Second Sentence. "Besides dairies, IDA will inspect Animal Feeding Operations (AFOs)."	AFOs will be added to the sentence.
Comments From: Zigmund M. Napkora, Hydrologist Bureau of Land Management Lower Snake River District Received via email: January 20, 2003	**DEQ Response:**
1) Page XV. "SS (suspended sediment) and/or SSC (suspended sediment concentration)"	These acronyms will be added.
2) Page 27, Paragraph 2,5. "Refer to Rosgen "C" channels as U-shaped. Type "F" channels are U-shaped. Type F channels in fine sediments are entrenched and disconnected from the floodplain and generally indicate a degraded system. Type C channels are meandering, bar-forming channels, with a floodplain. If these channels are U-shaped, they are probably not the appropriate channel type for the environmental setting."	This error will be corrected in the final document. None of the streams evaluated in the subbasin assessment and TMDL are Type "F" channels, thus should not be characterized as U-shaped.
3) Page 65, Paragraph 2. "Please include the reference to the Idaho Power study."	The reference will be added.
4) Page 81, Paragraph 3. "The third sentence refers to the IDFG letter in Appendix F. This sentence is an incorrect interpretation of the letter. Paragraph 3 implies that trout did not and do not spawn there because of low gradient and lack of habitat. The letter states that: "Although, we have no definitive data, I agree that the reaches outlined are unlikely to support salmonid spawning under **current conditions**. Historically, the lower reaches were likely used as seasonal migration corridors connecting upstream populations to the Snake River. Currently, there may be barriers to upstream migrants at some irrigation diversions. Given the low gradient and temperature regime, I suspect that the potential to support trout spawning is low, even if substantial habitat improvement occurred. Maintaining or enhancing suitability as	The letter from IDFG states "**Historically**, the lower reaches were likely used as seasonal migration corridors connecting upstream populations to the Snake River." DEQ's interpretation of this correspondence is that currently and "historically" this reach (and the other reaches outlined in the letter) are not and were never spawning reaches.

migration corridors remains important."	
5) Page 85, Paragraph 1. "Sites a target of 28% fines. What is the reference for the 28%?"	This target is based on other TMDLs (DEQ 2001a, 2001b) as referenced in the "References Cited" section.
6) Page 88, Paragraph 2. "Last sentence refers to North Fork Castle Creek. Is the correct reference the main stem Castle Creek?"	The correct reference is the main stem Castle Creek.
7) Page 89, Figure 2.25. "Would be helpful to have the river mile or mile post indicated on the legend to help the reader see the spatial relationship between the sample sites."	River mile will be added to the legend.
8) Page 90, Paragraph 4. "Please include SAWQP in the acronym list"	SAWQP will be placed in the acronym list.
9) Page 93, Figure 2.28. "Just checking, is the Y-axis TSS or SSC?"	As indicated by the figure, the Y-axis is Total Suspended Solids.
10) Page 98, Paragraph 2. "Modify the last sentence to read: The influence of groundwater **inputs or losses to the groundwater table are** unknown."	The sentence will be modified to read: The influence of groundwater inputs and losses on stream flow is unknown.
11) Page 99, Paragraph 2. "Modify the third sentence to read: While sediment data are not available **downstream of the RCEW tollgate weir**, it is reasonable…."	The sentence will be modified accordingly.
12) Page 100, Paragraph 1. "Fifth sentence refers to "high residue". Please explain what this means."	A brief definition of "high residue" will be added to the text.
13) Page 102, Figure 2.35. "Is this data from RCEW? If not, why not use their data. RCEW may have only summarized data through 1996. But data are available to the present."	As indicated in the document, Figure 2.25 is generated using data collected by ERO Consulting. No RCEW data exists for the §303(d) listed segment of Reynolds Creek.
14) Page 122, Figures 2.47, 2.48. "Would be helpful if the symbols are consistent."	The symbols will be changed so that they are consistent in both figures.
15) Page 150, Paragraph 4. "Not sure what is meant by the "Owyhee drainage". Do you mean Owyhee Front drainages? Or streams that originate in the Owyhee Front and flow north to the Snake River? Modify second sentence to read: **Depending on land management practices, it may** take at least….."	Owyhee drainages will be changed to Mid Snake River/Succor Creek watershed drainages. The sentence will be modified to include "depending upon land management practices…"
16) Page 151, Paragraph 3. "Second sentence refers to a target of 80% stream bank stability. Refer to Appendix A in "General Technical Report RMRS-GTR-47, April 2000, Monitoring the	Numerous authors have determined that between 80% and 85%+ is an achievable bank stability target for naturally functioning streams. The Pahsimeroi TMDL (DEQ 2001) used 80% bank stability as the

Vegetation Resources in Riparian Areas, Alma H. Winward. USDA Forest Service Rocky Mountain Research Station". Bank stability will depend on stream type and substrate. With most low gradient streams capable of attaining 85% or better."	surrogate for 28% fine material in riffles. Since 28% is also the substrate target used in the Mid Snake/Succor Creek TMDL, it will remain consistent with the Pahsimeroi TMDL.
17) Page 169, Table 53. "Current solar load column. Is this from SSTEMP, also?"	Current solar load is determined using SSTEMP. The table will be changed accordingly.
18) " It would be helpful to have Figure 4-2 (page 4-4) from Rosgen's book. This is the figure that shows diagrams of the various channel types…"	DEQ feels that the channel shapes for the streams of interest are suitably described in the document.
19) "Include SSC and TDG (total dissolved gas) in the glossary."	TDG will be included in the glossary. Suspended sediment is already included in the glossary and a discussion of SSC occurs in the text.
20) "May want to include a discussion of the recent fires that occurred in Jump Creek drainage and SF Sinker Creek."	Comment noted.
Comments From: Faye Pfrimmer Mayor, City of Marsing Received via fax: February 28, 2003	**DEQ Response:**
Please consider no change in the permit levels for the City of Marsing wastewater treatment plant for the following reasons: 1) The wastewater treatment plant was designed to treat the sewage of approximately 1300 individual homes. The wastewater treatment plant currently serves the equivalent of 500 homes, more or less. Therefore the contribution of the wastewater treatment plant is well below the design capacity and may NEVER reach the capacity it was designed for. Also, the excess capacity allows for better treatment of the effluent, thereby impacting the watershed less than projected in the TMDL. 2) In the event the permit levels for the City of Marsing are altered in a way that would prohibit the historic effluent discharge into the Snake River, the next best alternative for the effluent disposal would be land application. Please consider the burden this would pose for the City of Marsing. The City of Marsing does not own property of the size and type that would be needed to take the effluent. The City of Marsing does not own the equipment or employ the staff to accomplish the land application Grant (free) money is not readily available to fund any change to the system. If the City of Marsing is	At this time, the TMDL does not require Marsing to meet the instream nutrient target. As stated in your comment, the Wastewater Treatment plant may never reach capacity in which case no changes would need to be made. The TMDL allows time for planning to meet the nutrient target by only requiring the city of Marsing to meet the target if the WWTP goes over design capacity. DEQ acknowledges the preliminary investigation that Marsing has done in examining the nutrient reduction options available to them.

forced to abandon the current system of discharge the money will be compelled from the residents of this community through a substantial increase in sewer fees The City of Marsing wastewater treatment plant operates safely and efficiently as it is. The contribution, any contribution, the wastewater treatment plant has to the water quality of the Snake River has to be infinitesimal compared to the other contributing sources outlined in the TMDL. The City of Marsing is a socially and economically disadvantaged community. Many, in fact, most of our residents are comprised of senior citizens, migrant laborers, farm workers and the working poor that live on a fixed or low income. These are good honest people who live in this town because it is affordable and they enjoy a good, quiet quality of life. When it is no longer affordable to live in Marsing, the folks will leave and Marsing will become a ghost town. An increase in sewer fees, any increase will mean a decrease of some other basic necessity. It would be a shame to have already disadvantaged families going without food to pay their SEWER bill. In summary, the cost to implement effluent disposal by land application would be absolutely prohibitive to the residents. The City of Marsing has conducted preliminary estimates of the cost to change to this type of effluent disposal and not only is the City faced with designing and constructing additional effluent storage, the City will have to bear the cost of engineering and construction to deliver the effluent for land application. The construction and engineering costs of the system coupled with the ongoing expense of transporting and spreading the effluent are just more than the residents of Marsing will be able to bear.	
Comments From: Harold Puri Mayor, City of Homedale Received via mail: February 28, 2003	**DEQ Response:**
1) "Homedale's current wastewater treatment facility operates well within the current requirement of DEQ. Historically the facility has operated safely and has experienced few problems. Should the proposed permit levels be initiated, the City's only alternative to our current system would be land application. Land application, which would be tremendously expensive as the alternative effluent disposal, would, by necessity, be passed onto city residents who can ill afford any increases in public services. Owyhee County,	This TMDL allows the Homedale Waste Water Treatment Plant to continue discharging at their current level. This TMDL allows time to plan for and obtain funds for nutrient removal by stating that the Homedale WWTP must meet the nutrient target of 0.07 if the plant is going to undergo expansion. The Homedale facility will have to experience considerable growth before design capacity is met.

including the City of Homedale, has one of the lowest per capita incomes in the state of Idaho. Our current population is 40% Hispanic, most of which rely on seasonal agricultural based employment and live, at best, with serious financial limitations. Senior citizens comprise another large number of our residents, they live on fixed incomes and would be faced with decreasing other basic necessities in order to pay their sewer bills. I believe Homedale's current wastewater treatment facility, has little, if any effect on the water quality of the Snake River. I would ask that you consider the tremendous impact of your proposed changes on all residents living in small rural communities in our State."	
Comments From: Robert Walker City Engineer, City of Homedale Received via fax: February 28, 2003	**DEQ Response:**
1) "As Engineer for the City I am hereby requesting that discharge levels for the City's wastewater treatment lagoon facility not be altered and I would ask that you consider the following: Capacity: Homedale's wastewater treatment lagoon facility was designed for a monthly maximum flow rate of 0.45 MGD. At the present time the annual average daily flow rate is 0.25 MGD and the maximum daily flow rate is 0.29 MGD. Therefore, the City of Homedale will have to experience considerable growth before the wastewater treatment lagoon facility reaches its design capacity. Economic Impact: As with all small rural communities the economic impact of the proposed discharge level proposed changes would be devastating Current Operation: Homedale's wastewater treatment facility currently operates safely, efficiently and well within current DEQ requirements.	This TMDL allows the Homedale Waste Water Treatment Plant to continue discharging at their current level. This TMDL allows time to plan for and obtain funds for nutrient removal by stating that the Homedale WWTP must meet the nutrient target of 0.07 if the plant is going to undergo expansion. The Homedale facility will have to experience considerable growth before design capacity is met which will give the city time to figure out how to finance any future changes.
Comments From: Craig Baker, Ranch Manager Sierra del Rio Received via fax: February 26, 2003	**DEQ Response:**
1) Sinker Creek should be designated as an intermittent stream. Even the historic name by which it is known indicates that it is naturally dewatered in some sections and then rises again in another area. On page 35 and page 105 the draft assessment says that the stream is dewatered below the diversion for Nahas Reservoir. In	The intermittent stream classification used in this TMDL is for those streams where perennial pools do not exist. Sinker Creek appears to have perennial pools throughout the summer in this reach. However, the stretch below the diversion for Nahas Reservoir is dewatered and does not have perennial pools. This stretch was not considered for

actuality, it is also frequently dewatered through a section of the old Tyson Ranch, which is currently called the Edwards Ranch. Twice in my tenure here I have seen it bone dry at the Nahas diversion in August and most every year it falls below 1 cfs for periods in the month of August.	the TMDL allocations. The section below the Edwards Ranch and above the Nahas diversion does not have bank stability problems and is not subject to riparian shade increases beyond those which would occur from the existing vegetation increasing in size. This will be documented as part of the implementation process.
2) "I believe that the temperature goals are unattainable by your definition on page 149. By this definition in the draft I believe the temperature listing should be dropped at least in the section between the Edwards Ranch and the Nahas Ranch. This section is basically inaccessible to all but the most dedicated hiker and some occasional wildlife. This area has been virtually unaffected by any influence other than nature for many, many years. If ever a place could be called pristine this would surely qualify. As such it has a very narrow stream channel and almost total shading in many areas. I feel that the effects of the narrow, very rocky canyon on ambient temperature has been overlooked. But probably the biggest unaddressed cause is the 30 or so beaver dams on this stream. As stated on page 105 they do act as sediment sinks which should help that situation but as for temperature goals, they work against us. By pooling the water, slowing it down and exposing to longer to the sunlight and hot air the temperature is raised."	Topographic shade as well as ground reflectivity was accounted for in the SSTEMP model. If additional information is gathered that suggests that other parts of Sinker Creek have natural factors that prevent target attainment, the temperature target will be adjusted accordingly.
3) "The fisheries question has been addressed by the letter from Jeff Dillon on page 241 and should be considered not suitable for spawning in the reaches of interest. It is also quite difficult to have fish habitat in a dry stream."	Comment noted.
Comments From: Paul Nettleton, Owner/Manager Joyce Livestock Company Received via fax: February 28, 2003	**DEQ Response:**
1) The conclusions of DEQ personnel about aquatic life beneficial uses not being fully supported may or may not be true since much of the data used to make this determination is more than six years old or has been 'extrapolated' from other areas. This could explain why DEQ has failed to take into account the devastation that has occurred from extensive beaver activity in the middle area of the 303(d) listed section. This beaver activity has destroyed a large majority of the woody vegetation in the past four years and caused extensive bank instability from lost root systems. Washouts have occurred when dams were abandoned because wood supplies were	A narrative analysis of the effects of beaver will be included in this TMDL. TMDLs include an analysis of both natural and human sources of pollutants. The actual effect of beavers will be further accounted for in the implementation plan in coordination with IDFG.

depleted. Few areas of this six mile section of stream between the Sinker 1 thermograph site and the sinker 3 site have been unaffected by beavers. While the document briefly mentions beaver ponds on page 105 and correctly attributes an increase in water temperatures, DEQ has certainly not given this activity the importance it deserves. This is especially true considering that no livestock grazing occurs in this middle section for 11 months out of the year whereas the upper area of the listed section which met water quality standards (at Sinker 1 thermal site) is grazed year-round. At the present time the only control on beavers is the fur market and whoever landowners can get to trap them. 2) DEQ should have reached the conclusion in this listed section that temperature standards and sedimentation/bank stability goals are unattainable unless beaver activity is controlled. The total listed reach of Sinker Creek is only a human-controlled conveyance for irrigation and has not been a natural stream ever since the construction of the dam more than 25 years ago. Flow rates are strictly controlled by releases from the dam. Therefore the erosion rates inventoried on page 270 are inaccurate and irrelevant because there are no naturally occurring high flows that would cause such erosion except the occasional infrequent desert cloudburst in the dry gullies below the dam. The only other possible erosion source is the washout of abandoned beaver dams.	Additional narrative on beavers will be added. DEQ inventories only actively eroding sections of the stream that would be affected by the high flows that occur presently. DEQ found that the banks are in relatively good condition as evidenced by the small reduction in bank erosion necessary to meet the requirements of the sediment TMDL (8%). There are areas of banks where there is slumping, sloughing, and these areas deliver sediment directly into the creek. There are many streams in Idaho that are human controlled and supply irrigation water. This characteristic does not relieve DEQ from preparing a TMDL for impaired streams and attempting to implement measures to achieve water quality standards.
Comments From: William H. Parker, Sportsman Bruneau, ID Received via fax: February 28, 2003	**DEQ Response:**
1) This TMDL lacks the scientific data to back up some of its conclusions. In particular, 303(d) listed streams are often listed without having adequate data to prove water quality impairment. 2) Page 27: The Montana State University reference does not exist. 3) The committee and personnel charged with the oversight of the Implementation Process need to have the scientific data specific to this area in regard to making changes that are necessary for the TMDL.	DEQ feels that adequate justification has been provided in the subbasin assessment to warrant §303(d) listing of the Snake River (C.J. Strike Dam to Castle Creek) for temperature and TDG, Jump Creek (Mule Creek to Snake) for sediment, and Succor Creek (Oregon line to Snake) for bacteria. DEQ will correct the reference. The implementation plan will be developed cooperatively by the affected stakeholders, the WAG, and the designated agencies (including DEQ). All of these entities will have access to the scientific data necessary the update the TMDL.

Comments From: Mark Frost, Chairman Bruneau River Soil Conservation District Received via fax: February 27, 2003	**DEQ Response:**
1) When describing the watershed characteristics, there is no mention of the effects that wildlife may have in respect to water quality issues. (i.e. elk, wild horses). 2) Pg 138 Table 38, Add TDG to the glossary. 3) Pg. 163, "Under nutrient allocations in table 48, it shows that the Snake River below CJ Strike has a phosphorus concentration of 0.07 and the Snake River at mile 449.3 has a concentration of 0.071. We do not feel that this segment should have a nutrient allocation for such a small difference of 0.001, since the degree of error for the spreadsheet that you used is 0.1 (100 times greater). 4) The TMDL needs more concrete data that meets scientific standards to be valid. Locations of samples, how they were taken, what time of day they were taken, were they representative samples. All these factors need to be considered. 5) The District will support further evaluation of perennial stream segments and upland conditions in 2003. This will include development of a TMDL implementation plan on stream segments with perennial flow and documented problems. 6) DEQ should not try to set the practices required to meet the TMDL problems in the TMDL—that should be done in the implementation plan.	A narrative of possible effects of wildlife will be added in a Wildlife section. TDG will be added to the glossary. While this is a small amount, it represents a significant load in lbs/day. DEQ is conducting additional monitoring this summer to assess the pollutant load contributions from this section of the Snake River from CJ Strike Dam to Swan Falls. This additional data will be used to determine whether an allocation is warranted. Data will also be collected on drains and tributaries in the area to determine nutrient loading. The data used to develop the TMDL were collected and analyzed using sound and peer reviewed scientific principles. DEQ acknowledges that additional data would help increase the accuracy of the document. However, given the limited timeline to develop the TMDL, the best available data were used. DEQ acknowledges and appreciates the readiness of the District to participate in monitoring and implementation work. DEQ's intention is to summarize a range of potential implementation measures in the TMDL, but actual implementation measures will be determined as part of the conservation plan with each landowner.
Comments From: Robert Thomas, Thomas Brothers Oreana, Idaho Received via fax: February 28, 2003	**DEQ Response:**
1) Only a limited amount of data was used in the assessments. It is difficult to assess a watershed with such limited data, particularly when that time frame is one of the three dries since the end of the 19^{th} century	DEQ agrees that assessments with limited data are difficult. However, DEQ is charged with writing TMDLs with the data that is available and tries to gather additional data whenever possible. The TMDL process is iterative, meaning that if new data is collected that shows different results, the TMDL can be adjusted accordingly.

2) The authors state that the climate in Boise is semi-arid and thus relatively similar to the watershed. Using the rainfall figure 1.1, the difference between Boise and Grandview is an astonishing 60%. There are differences in even which direction storm fronts approach in the Oreana area.	The authors acknowledge that there are differences between Grand View and Boise. DEQ only used Boise meteorological data when Grand View data was unavailable (i.e. percent sunshine). For the final TMDL, DEQ will verify whether there is Oreana or Reynolds Creek information available for those instances when Boise meteorological data was used.
3) Pg. 82, in reference to Castle Creek, regarding artesian (hot) water, will a water budget ever be completed and if not, what will the final determination be	DEQ has a staff member committed to determining a water budget from April-September 2003.
4) This TMDL seems incomplete	TMDLs are an iterative process and as more data is collected, that information will be incorporated into the TMDL and targets adjusted accordingly. The implementation plan which is typically completed 18 months after TMDL approval includes a timeline and milestones for meeting water quality goals.
Comments From: Elias Jaca Jaca Land and Livestock Co. Received via mail: February 28, 2003	**DEQ Response:**
1) Pg. 13, Table 2 "We question whether the fish are native or planted."	IDEQ has located sucker *sp.*, redside shiners, dace *sp.*, and adult and juvenile redband trout in Succor Creek above the Reservoir. IDFG does not stock fish species other than trout nor do they stock juvenile or young-of-the-year trout. Additionally, the trout stocked in the reservoir are sterile. Based on this information, the young trout located above the reservoir are most likely native.
2) Pg. 14, Table 2, "Where is the supportive data for this. We know there are few, if any, fish from the headwaters of Succor Creek to Granite Creek."	IDFG, BLM and DEQ generated the data used to populate this table. DEQ agrees that the fish population in Succor Creek from its headwaters to Granite Creek is sparse. However, fish were present.
3) Pg. 27-40, "DEQ needs identify upper and lower Succor Creek on their own merit separate from each other - not together."	Upper and Lower Succor Creek will be identified as separate segments by adding an additional figure into the document.
4) Pg. 41 The last paragraph, "from the third sentence should be documented with data. These are bold statements that can be disputed. Where are the facts to make these statements."	References will be added.
5) Pg. 115, "Says there are few major diversions on Upper Succor Creek. This is inaccurate. There are four major diversions with adjudicated water rights in 5 miles above the Succor Creek Reservoir."	The document will be changed to reflect the fact that there are four adjudicated diversions above Succor Creek Reservoir.

6) Pg. 116, Table 30, "The figures about the flows in Upper Succor Creek are not accurate. i.e 9.7 miles upstream from reservoir 5-20-02 19.6 is excessive. How was this measure this? And why are these reading taken mostly in June when the critical time for fisheries is much earlier in the year."	DEQ believes the flows shown in Table 30 are accurate. The flows were determined following the standard set-interval method using a calibrated Marsh-McBirney flow meter. The date the measurements are taken is based on two factors; 1) availability of field personnel, and 2) availability of flow. DEQ also believes June to be a critical period for fisheries due to increased temperature and continuation of spawning.
7) Pg. 117, How are you distinguishing between lower and upper Succor Creek in Figures 2.43, 2.44 and 2.45. It is impossible to know what, where or how the data was specifically collected. How can you say this is best available data, it appears to have been manufactured from somewhere else.	Additional text will be added below the "Succor Creek" header to further clarify Upper Succor Creek as – headwaters to Oregon Line, and Lower Succor Creek as – Oregon Line to Snake River. The majority of the data used in the subbasin assessment and TMDL were generated by those entities outlined in Appendix C. These data represent the best information available to DEQ when the subbasin assessment and TMDL was prepared.
8) Pg. 125, "Sediment does not flow straight to the river, it is deposited on point bars as it travels. Where is the hard data to prove streambank stability or instability?"	DEQ agrees that sediment is not transported directly to the river. The particle size distribution data shown in Table 32 indicate such. Appendix H shows the streambank erosion inventory data for the streams in which bank erosion driven sediment TMDLs are prepared (Table 46).
9) Pg. 129 Figure 2.53, "Where is the data before 6-6-95? More assumptions?"	As noted in Table 35 and the following text, no data are available prior to 6-6-95. The assumption that all temperatures prior to 6-6 (back to 3-1) are below the temperature criteria is used.
10) Pg. 133, Table 35 should be removed because it is irrelevant and there is very limited data.	Table 35 shows the percent exceedence values for the temperature data. This table is critical in determining whether the criteria are met.
11) Pg. 136 Last paragraph, first sentence, "Please define and document."	Further definition of the method to fill data gaps will appear as part of the TMDL implementation plan.
12) "This document has too much reference to lack of data and too many inaccuracies to make it credible"	The subbasin assessment and TMDL was developed with the best available physical, chemical and biological data. DEQ is legally compelled complete the Mid Snake River/Succor Creek TMDL by December 2002. Given the short time frame, DEQ collected as much additional data as possible to aid in development of the subbasin assessment and TMDL.
Comments From: Jerry Hoagland Wilson ID Received via fax: February 28, 2003	**DEQ Response:**
1) Page 46 Table 4. Define IRU as an acronym	IRU will be added to the acronym list.

2) Page 12 vegetation: Junipers are also an invasive species. Juniper encroachment causes both water quality and quantity problems. The BLM-ORMP plans to remove or burn at least 7500 acres per year or a maximum of 15,000 acres annually for the next 20 years simply to maintain control of the encroachment.	Additional narrative on juniper encroachment will be added.
3) Page 13 DEQ's recognition that redband trout have developed a tolerance for higher water temperatures found in the Owyhee desert is appreciated.	DEQ acknowledges that redband trout have a tolerance for higher water temperatures.
4) Page 13 The loss of riparian habitat that cools stream temperatures can also be attributed to natural causes such as fire or extreme high flow events	DEQ agrees that riparian habitat loss can be attributed to natural causes.
5) Page 14 Table 2. Succor Creek (headwaters to reservoir) Are the fish in the creek, the reservoir or both. This needs to be clarified.	Table 2 will be clarified to show that the listed species are present in the creek.
6) Page 20 and 64. Maps show Rabbit Creek and West Rabbit Creek between Reynolds and Sinker Creeks. Only the 303(d) listed Rabbit Creek should appear on the map.	All of the appropriate figures will be corrected so that only the §303(d) listed Rabbit Creek is shown.
7) Page 21. The highest elevation is more than 8000 feet not 6500 feet.	DEQ will correct the elevation error.
8) Page 22. The movement of groundwater and water on the south-side moves in a northwesterly direction to the river.	This error will be corrected.
9) Page 24 A 1997 aerial photograph interpretation showed that vegetation was 20% forest. This forest includes mostly russian olive and tamarisk both invasive species and listed as noxious weeds in Idaho.	This information will be added into the TMDL.
10) Page 27. De-watering effects-flow alteration is not a pollutant. Agricultural water diversion is as Idaho DEQ has described on page 50.	Comment noted.
11) Page 27 Toy Mountain is more than 8000 feet in elevation	A correction will be made to clarify at what elevation Castle creek begins.
12) Page 32 & 103 & 104 There is no "town of Reynolds." Reynolds or community of Reynolds is more appropriate.	The document will be changed to reflect the comment.
13) Page 33 & 101 Figure 1.11 and 2.34 Maps show only Salmon Creek drainage and Reynolds Creek from outlet weir northeast toward the Snake River. Maps should include entire watershed of Reynolds Creek.	The maps will be modified to show the entire Reynolds Creek drainage.

14) Page 35 Sinker Creek originates at over 8000 feet elevation	This correction will be made.
15) Page 41 History and Economics, "historic placer mining activities contributed large amounts of sediment to the creeks and eventually to the Snake River." There may have been some placer mining in the Jordan Creek drainage. Almost all the mining in this Lower Snake River/Succor Creek watershed was from tunneling. There was some gold dredging along the Snake River up river from the mouth of Squaw Creek.	This information will be added to the TMDL.
16) Page 41. " "The introduction of cattle resulted…..soil compaction.:" Where? "The change in plant composition resulted in a greater frequency of fires in the area.: No. Prior to the Taylor Grazing Act, large numbers of cattle and sheep grazed the rangelands eliminating any fuels to carry a fire. The traditional natural fire frequency was stopped. Junipers are very intolerant of heat and thrived in the areas now not burned by the natural fire frequency. Since cattle and sheep introduction, there was no frequency of fire. We are working with USDA Agricultural Research Service to research fire effects and to restore fire frequency as a natural control of juniper, landscape and to improve water quality and quantity.?	Additional narrative about the Taylor Grazing act and a clarification of fire frequency will be added.
17) Page 42 The Swan Falls dam was built to provide power for the Trade Dollar Mine. The extra power was distributed to Silver City and other mines and camps.	This information will be added to the TMDL.
18) Page 42 Land Ownership, approximately 17.2% is private land in Owyhee County. The rest is federal and state land. The land is not 98% publicly owned.	The land ownership numbers will be corrected.
19) Page 44. Table 3 Verify your 2000 population numbers. Explain what the Murphy division encompasses	Population numbers were obtained from city clerks and the US Census website. The Murphy Division refers to a census division. This table will be corrected.
20) Page 51. Temperature: The boiling pot narrative is specious. In Owyhee desert streams refuge exists as evidenced by the fish populations in these streams. The "pot" was probably heated from the bottom in order to get an even temperature for the mortality test. That is unnatural since stream pools have varying temperatures with the bottom being the coolest due to springs and subsurface flows.	Additional narrative will be added to both explain the study and more clearly explain that streams do have refuge areas, varying temperatures and different mechanisms of heating. The intent of the Table was to show the mechanism of thermally induced coldwater fish mortality. The time to death column will be removed for clarification.
21) Page 98 Re: instantaneous BURP data	DEQ will add additional text to the document

collected. The 1998 flows are not normal and were due to a major storm event. Usually the creek is entirely diverted except for seepage at the diversions or limited return flows from the fields above the highway.	indicating that these flow were likely due to a storm event. DEQ agrees that most of the water in the stream is diverted, as noted in the text directly above Table 20.
22) Page 99. The 1998 BURP notes indicate that 75% of the water is being diverted. That might be the case for that particular date, but generally, almost all of the water is diverted except during spring run-off.	This statement will be remove from the document.
23) Page 105 Sinker Creek. The effect of beavers on Sinker Creek was inadequately addressed. " There is a severe beaver problem a short distance above highway 78 and for some distance below the highway and again above the Nahas Ranch. BLM has recognized the damage done by the beaver in their stream surveys and recommended "the use of a D-8 cat with some creative or even uncreative stream channel work to get rid of the beaver dams". The beaver consume the desirable shading plants, muddy the waters which attract more solar heat and burrow into the stream banks causing more erosion. This TMDL needs to include a narrative analysis of the beaver problem in this area.	A narrative on the effects of beaver will be added.
24) Page 109. Sediment/PFC: A stream segment can only be satisfactory or unsatisfactory in BLM's categories. This stream may have been rated as unsatisfactory because it was at risk but possibly on an upward trend, meaning that it might eventually meet the satisfactory rating. A further explanation of PFC data analysis is necessary.	A sentence will be added regarding the fact that PFC conditions have an upward, downward and static trend associated with them. The statement that the majority of streams in these upper reaches were found to be in unsatisfactory condition is valid.
25) Page 111. The de-watered section is below the Nahas Reservoir	DEQ staff found no water below the road crossing just downstream of the diversion.
26) Page 116. Table 30, This chart shows a wide variation in flows that occur from year to year and even within a year. This is typical for all streams in Owyhee County.	Comment noted.
27) Page 117 Succor Creek Reservoir: Active withdrawal of irrigation water creates an unnatural stream below	The document will be changed to reflect this comment.
28) Page 134 Beneficial Uses: Please explain what substrate is.	Additional text will be added to the document describing what is meant by "substrate sediment".
29) Page 149 and 150 Temperature. "Best achievable temperature" is a reasonable target given the desert environment and extreme air temperatures in this basin	DEQ agrees that the use of "Best Achievable Temperature" is a reasonable approach for developing temperature TMDLs in this basin.

30) Page 166 Temperature Allocations: DEQ recognizes that the SSTEMP model provides a gross estimate of heat lost or gained. There are too many unknowns when determining effects of inputs.	DEQ agrees that SSTEMP provides a gross estimate of heat lost of gained. Appendix G outlines the input values for the model. Of the 28 input parameters, the default value is used twice. The model validation work in Appendix G shows that in fact, the model was quite reliable at calculating the actual stream temperature.
Comments From: Ted and Glenda Gammett Winston Gammett Will and Brett Gammett Jordan Valley OR Received via mail: March 3, 2003	**DEQ Response:**
1) This TMDL has a lack of supporting data, numerous assumptions and inaccurate or unsubstantiated statements involving Succor Creek. This TMDL lacks credibility. 2) Succor Creek above the reservoir should be de-listed due to the lack of substantiating evidence to show any water quality problems. 3) Succor Creek does not always have continuous stream flow in the upper reaches. 4) Lower Succor Creek studies should be site specific and should be separate from Upper Succor Creek studies. 5) The following examples substantiate concerns about the lack of data used in this TMDL: Page 115 "Below the reservoir, the stream flows continuously due to discharge from the reservoir.". During the drought year of 1992 there was not a continuous flow even below the reservoir. 6) Page 115. "there is not a significant amount of flow data for lower Succor Creek to accurately characterize the stream's seasonal flow fluctuation" What then, is the basis for stating that there is a typical flow pattern. 7) Page 117, "regarding the Succor Creek Reservoir maintaining a 40-ft minimum pool throughout the year in all year" --The Succor District Improvement Company has had to drain the reservoir to work on the head gate and the Idaho Fish and Game has shocked the fish as they	Comment noted. The water temperature and sediment data outlined in the subbasin assessment show that both are in excess of the Idaho Water Quality Standards. DEQ agrees that continuous stream flow data does not exist in the upper reaches. Due to cost constraints, it is unusual to have continuous data, even on large water bodies. Additional text and maps will be added to the document to clarify Upper Succor Creek data and Lower Succor Creek data. DEQ will add additional text to the document to reflect that Succor Creek was dry below the reservoir in 1992. However, 1992 was the driest year on record in many areas of the state, and does not represent normal conditions. The DEQ statement "there is not a significant amount of flow data for lower Succor Creek, but enough exists to accurately characterize the stream's seasonal flow fluctuation" is based on our belief that enough data exists to develop a hydrograph for 4-00 to 4-01. This hydrograph clearly shows the effects of the irrigation season on the flow pattern. DEQ acknowledges that a 40-foot minimum pool may not have been left when head gate maintenance was performed, and will add text to the document to reflect the comment. However, this maintenance is not part of the reservoirs normal operational procedure. In most years a 40-foot minimum pool

were draining the reservoir and transplanted them to other locations. We are not certain that a 40 ft. pool was left, it was not a very large pool of water remaining.	is maintained.
8) Page 117 and 120, No water column data collected for upper Succor Creek—Data was collected primarily below the Oregon Line.	As indicated in the document, this is correct. Water column data is of less utility when bank erosion is the primary source of sediment.
9) Page 120, No water column data was taken for Upper Succor Creek but visual surveys indicated it is good. All the data was taken from lower Succor Creek.	This is correct.
10) Page 123, "No numeric value on TSS conditions for Succor Creek…"	This is correct. The Idaho Water Quality Standard for sediment is narrative, meaning there is no numeric value with which to compare results.
11) Page 123, "There is not a numeric value against which TSS conditions in Succor Creek can be compared…" Again site specific conditions need to be assessed for accuracy.	See above comment.
12) Page 124, "due to the small data set, these relative percentages have a low level of statistical rigor". "best available data"	DEQ agrees that additional data would increase the statistical rigor and certainty of the information presented in Table 32. However, the presented information corresponds closely with the bank stability information presented in Appendix H (ie. low bank stability in areas where fine material is high). As such, additional data would likely confirm the information in Table 32.
13) Page 125, Re: Temperature "The period of record was dictated by accessibility to the sites (or lack thereof due to snow) and vandalism." How can criteria be determined if you did not have access to the sites?"	Tables 34 and 35 show that assumptions were made to extent the period of records such that the critical periods for cold water aquatic life and salmonid spawning are accounted for. Documenting and following these assumptions allows for the criteria to be used.
14) Page 126, "Additionally, above the reservoir, data were not available during the spawning period."	DEQ agrees that there were insufficient temperature data to assess salmonid spawning at the monitoring site directly above reservoir. This is reflected in Table 35. As such, a temperature TMDL for the segment extending from the end of Chipmunk Meadows to the head of the reservoir is not being performed at this time. This is reflected in Table 53.
15) Page 133, "However, again due to insufficient data, the entire critical period cannot be evaluated. Actual data…" Then **assumptions are made**..	This is correct. See response for comment # 13.
16) Page 134, In the first paragraph "Therefore, DEQ **assumes** that this segment of stream also exceeds the criteria. In the second paragraph "**Again data are not available** for the entire	Given that the remaining three segment of Upper Succor Creek exceed the salmonid spawning criteria, it is reasonable to assume that the segment between the end of Chipmunk Meadows and the

salmonid spawning critical period. **If it is assumed**…”	head of the reservoir also exceeds the criteria. However, DEQ acknowledges that the lack of any temperature measurements during the spawning season disallows a conclusive determination. As such, DEQ is not developing a temperature TMDL at this time, as shown in Table 53.
17) Page 136, The “DEQ acknowledges there are additional data that would be helpful to increase the accuracy of the analysis” How can a TMDL be created with so little accurate data?	DEQ is legally compelled to develop the Mid Snake River/Succor Creek TMDL by December 2002. DEQ disagrees that the data used to develop the TMDL are not accurate. However, DEQ does agree that additional data would increase the accuracy.
The following are comments on specifics of the TMDL:	
18) Page 41 “The introduction of cattle resulted in…” “Grazing has had long-term effects on stream hydrology and vegetation.” What documentation do you show for these statements? They could be considered defamatory to the cattle industry.	References will be added for documentation.
19) Page 115, “there are relatively few major diversions” In reality there are four major diversions with adjudicated water rights on Upper Succor Creek above the reservoir.	The document will be changed to reflect the fact that there are four adjudicated diversions above Succor Creek Reservoir.
20) Page 142, Under the Temperature heading “…and a loss of riparian vegetation (shading).” What substantiation do you have to show for this statement?	DEQ has shown in the document (Page 167), and the WAG has agreed, that 55% riparian shading represents a preliminary estimate of the riparian potential for Upper Succor Creek. Current conditions range from 13-16% (Table 53). An increase in the surface area of a stream exposed to sunlight leads to an increase in water temperature. This information substantiates that “a loss of riparian vegetation (shading)” increases water temperature.
21) Page 153, In the last sentence “Lack of access to private property prevented DEQ from monitoring throughout a subwatershed in some instances.” If the DEQ did not ask private property owners if they could have permission to monitor on private land then access was neither approved or denied.	The document will be revised to reflect the comment.
Comments From: Brenda Richards Reynolds Creek Received via mail: March 3, 2003	**DEQ Response:**
1) Overall, throughout this document there are references to “lack of data” and “assumptions”, which weakens the credibility of TMDL	Comment noted.

determinations and makes one question the credibility of the data used in making determinations.	
2) The TMDL should include more local weather data such as that available from the Reynolds Creek Agricultural Research Station.	Where possible, local climate and weather data were used to populate the SSTEMP model. This includes data from the Reynolds Creek Agricultural Research Station and the Sheaville, Oregon weather station. Boise Climate data was used in instances where Owyhee County specific data were not available.
3) Page 13, Refers to redband trout in the tributaries and the question arises as to whether or not redband trout is a proven native species to these waters or if they were a planted species by IDFG for fishing enjoyment. History of this species in this area needs to be further researched including asking some of the landowners if they have observed fish or known of streams being planted since they have been on the ground for over thirty years.	The Federal Clean Water Act and the Idaho Water Quality Standards require DEQ to protect *existing uses* as well as those used designated in the standards. As such, if fish were planted by IDFG and are naturally flourishing, DEQ is required to protect the resource. The natural and historic presence of redband trout in the watershed is well documented in the scientific literature.
4) Page 20 Figure 1.6, chart at the top of this table is illegible. Needs clarification or to be omitted if it cannot be read.	The table will be omitted from the figure.
5) Page 14 Table 2, In the reference at the back of the TMDL, there is documentation of correspondence between IDFG and DEQ. Would be more valuable if three was a history of data and how and when it was collected.	A footnote will be added to Table 2 indicating the method(s) by which the data were collected. In most instances, the data were collected using a backpack electrofisher.
6) Page 27-40 Subwatershed Characteristics—In this TMDL, DEQ has maps of each subwatershed except for Upper Succor Creek and Lower Succor Creek. These sections should be mapped and treated separately since the uses and terrain varies between the two.	Upper and Lower Succor Creek will be identified as separate segments by adding an additional figure into the document.
7) Page 41. History and Economics—"Grazing has had long-term effects on stream hydrology and vegetation" and "The introduction of cattle resulted in a decrease of native perennial grasses and an increase in soil compaction because of trampling by concentrated numbers of livestock." Where is the validity of these statements? There have been other anthropogenic sources that may have been contributing factors. Must have reference for credability.	References will be added.
8) Page 44 "5th paragraph, 1st sentence states "The Owyhee Natural Resources Committee formed in 2001 to address environmental issues facing watersheds in the Owyhee County area" This statement is incorrect. I am a member of the	These errors will be corrected in the final version using information provided by the Owyhee Natural Resources Committee.

Owyhee Natural Resources Committee and have been a member since 1998 and know that this committee was in place before that. Please check with Jim Desmond at Owyhee County for an accurate date.	
9) Page 44, "5th paragraph 2nd sentence states " "Another group, the Owyhee Initiative, is made up of a diverse membership of ranchers, environmentalists, and growers who are working towards a management plan for the proposed Owyhee wilderness area."" I am a member of the Owyhee Initiative work group and as a member of this group feel this statement is presumptuous and should be left out if this is all the explanation that will be given. The Owyhee Initiative is far more than ranchers, environmentalists and growers. There is a far more diverse representation that this. It is also doing much more than just discussing a management plan for the "proposed Owyhee wilderness area". It does the group much injustice to give reference as limited as this one sentence "Water quality issues are pertinent to streams that are within boundaries of the proposed wilderness area." There is no "formal" proposed wilderness area as of yet tied to this initiative and your sentence leads the reader to believe a proposed wilderness has been reached by this group. Several different interests involved in the Initiative have brought their ideas for proposals forward, but none has come forward from the entire Owyhee Initiative work group. Statements in the TMDL should not be misleading.	See above response.
10) Page 50 1st paragraph below Table 6, last sentence in the paragraph reads "Because of these practical limitations, TMDLs will not be developed to address habitat modification or flow alteration." In the tables in the back of the document there is an estimated increase requirement in shading along the riparian areas of 41-52%. This is significant habitat modification and may not even be a feasible achievement for the climate, soil type, etc.	DEQ does not consider the necessary increase in riparian shading a habitat modification as defined by the Idaho Water Quality Standards. However, DEQ agrees that the shading increases shown in Table 53 may not be achievable due to climate, soil type, etc. The achievable amount will be further determined during development of the TMDL implementation plan.
11) Page 51 3rd paragraph, 1st sentence. Change steam to stream	This typo will be corrected in the final version.
12) Page 51 Table 7, Modes of thermally induced coldwater fish mortality. This test is questionable in its application to natural stream temperature. This test is conducted in a lab by thermally inducing temperature increases much like boiling water in a pot. Natural streams do not increase their temperature in this same way. If Table 7 is included in the TMDL there needs to be more	Additional narrative regarding study methods will be added and Table 7 modified.

reference and description as to how this experiment was conducted.	
13) Page 65. Figure 2.4 July 14, 2002: Fish kill on the Snake River at Walters Ferry. This picture should be omitted from the document. Sentences 6 and 7 in the first paragraph on this page give adequate information regarding the fish. The picture is not essential in making the point and furthermore it could create a bias and/or negative impression. It is recommended to include sentences 6 and 7 but remove the picture.	Figure 2.4 serves as documentation of the fish kill and beneficial use impairment due to elevated temperature.
14) Page 99 1st paragraph after Table 20, second sentence reference to Brandau 2002. The reference to historical events that have affected the stream is good. It would be beneficial to have this kind of reference on Succor Creek.	Comment noted.
15) Page 117 Under Bacteria (E. coli), The last sentence states "There are no data available for upper Succor Creek" Note: no data available.	Comment noted. Upper Succor Creek is not 303(d) listed for bacteria and no data were available. As such, bacteria were not evaluated.
16) Page 120, Under Sediment, fifth sentence states, "There are no water column sediment data available from upper Succor Creek." Note no data available	Comment noted.
17) Page 124 & 125, In regards to Substrate Particle Size Distribution it should be noted that in these streams much of the substrate particles deposit on the numerous bars located within the stream before it travels very far downstream. Also there is no hard data to support this data assessment method.	The assessment method is documented in the text on page 124 and in the 'References Cites' section as Wolman (1954). The Wolman (1954) pebble count procedure is a well know and often used (by many states) method of determining particle size distribution. The method calls for particle sizes to be measured in riffles, where the effects of deposition caused point bars are minimized.
18) Page 129, Temperatures are assumed before 6-6-95 with no data.	No *specific* temperatures were assumed before 6-6-95. DEQ assumed that in general, all water temperatures are below the criterion.
19) Page 132 1st paragraph, last two lines, "Hence assumptions were made to accommodate for this lack of data. These assumptions are described below." Note the assumptions made and the lack of data.	Comment noted.
20) Page 134 1st paragraph, first sentence, "data not available directly above the reservoir during the critical period to assess salmonid spawning." Note data not available	Comment noted.
21) Page 136 1st paragraph, line three, "However DEQ acknowledges there are additional data that would be helpful. Additional data should be collected to determine accuracy. It is questionable	The model validation work in Appendix G shows that in fact, the model was quite reliable at calculating the actual stream temperature. DEQ feels that enough data were collected to develop the

with this statement as to whether enough data was gathered to plug into the models used for temperature. In the paragraph below Table 37 it is stated that efforts will be made to fill those data gaps. It could be questionable as to whether enough data was gathered to validate the TMDL. Furthermore, it could be questioned that without enough data, how can recommendations for the TMDL Implementation plan take place without collecting more information?	TMDL, but acknowledges that additional data would improve the accuracy of the allocations. It terms of TMDL implementation, the ensuing plan will take an adaptive management approach. This means that progress toward meeting the TMDL goals will be tracked as control measures are implemented. As such, data gaps do not preclude moving forward with implementation.
22) Page 142 Under *Temperature,* the third sentence: "The anthropogenic factors include agricultural return water, agricultural withdrawals, dams and a loss of riparian vegetation (shading)." Need reference documentation to say that there is a loss of riparian vegetation for credibility of this statement.	An increase in the surface area of a stream exposed to sunlight leads to an increase in water temperature. This information substantiates that "a loss of riparian vegetation (shading)" increases water temperature.
23) Page 149 Under Temperature, the first sentence, "Temperature targets are established on a stream-by-stream bases and are based upon the lowest possible temperature that can be expected given practical stream shading, width/depth conditions and monitored atmospheric conditions." I agree stream temperature targets should be established on a stream-by-stream basis and all aspects of that individual stream should be taken into consideration."	DEQ acknowledges your support of individual stream temperature targets.
24) Page 153 Under *Monitoring Points*, "There would be a question as to whether sufficient data was collected at enough monitoring points on Upper Succor Creek."	The subbasin assessment and TMDL was developed with the best available physical, chemical and biological data. DEQ is legally compelled to complete the Mid Snake River/Succor Creek TMDL by December 2002. Given the short time frame, DEQ collected as much additional data as possible to aid in development of the subbasin assessment and TMDL.
25) Page 169—Table 53, "in regards to the percentage increases required in shading. Are these numbers feasible and is it realistic to expect that they can be achieved?"	The "Estimated System Potential Shade" column in Table 53 shows preliminary estimates of the riparian potential for Sinker Creek and Succor Creek. These system potentials will serve as the starting points for best management practice implementation and may be adjusted appropriately as implementation continues.
Comments From: Mark Filipinni Environmental Protection Agency, Office of Water, Watershed Restoration Unit Received via fax: February 28, 2003	**DEQ Response:**
<u>Executive Summary</u> 1) Several of the landmarks referenced and	 Figure 1 will be changed accordingly to show these

discussed in the document are not shown on any of the maps presented making review difficult. A map showing CJ Strike dam, Swan Falls, Homedale, and Marsing should be included.	landmarks.
2) Table C indicates that a bacteria TMDL was developed for Jump Creek. This appears to be an error.	This is an error and will be corrected in the final document.
3) The final document or cover letter should discuss for the record the level of public participation including the dates of the public comment period and the dates and locations of public meetings.	The final TMDL will document the exemplary level of effort by Mid Snake River/Succor Creek WAG as well as the public comment information.
Chapter 2	
4) The TMDL must present the designated uses for each water body (Table 5) and the specific relevant water quality criteria that apply to each use. Table 6 does not indicate to which use designation each of the criteria apply. Further, for designated uses with differing criteria, such as temperature for Cold Water Biota and Salmonid Spawning, the separate criteria must be specified. Table 6 should be revised accordingly. The specific IDAPA section defining each use designation and each criteria should also be presented or referenced in the document.	Table 6 will be adjusted accordingly.
5) Since some of the use designations for several waterbodies have been revised based on the SBA, a revision of Table 5 presenting the new use designations should be provided. This information could also be presented on Table 38, if desired.	DEQ will clarify this statement. The intent of the correspondence between DEQ and IDFG is to show that while it may be appropriate for an entire stream (headwaters to mouth) to be designated for salmonid spawning, spawning does not actually exist throughout the entire stream. Very low gradient response reaches, such as those described in Appendix F may never have been spawning reaches. They do, however, remain important migration corridors. As such, DEQ does not intend to remove the salmonid spawning designation.
6) Section 2.3, Intermittent Streams. EPA will provide comments on the proposed delistings for the intermittent streams within the next several months under separate correspondence. As this is a recommended delisting action, this should not affect the TMDLs presented.	Comment noted.
7) The proposed delistings for the Snake River, Reynolds, south fork Castle, and Squaw creeks appear supportable based on staff review. Delistings are subject to final agency	Comment noted.

determination under a separate administrative process.	
8) Section 2.3, Castle Creek. The proposed delisting for temperature on the mainstem of Castle Creek is not supported and cannot be approved. We agree that additional data is needed to determine stream conditions and sources. Only after such data is obtained can a determination regarding delisting be made.	The proposed de-listing was a typographical error. DEQ has delayed development of this TMDL until more temperature data is gathered in 2003.
9) Section 2.4, Data Gaps. Table 37 presents data gaps identified during development of the SBA. Jump, Reynolds, Sinker, and Squaw creeks have range and grazing uses within the watersheds. Based on this land use, is there a reason bacteria was not considered a data gap for these streams as it was for Succor Creek? This should be explained in the document. Was temperature considered as a data gap for the mainstem Castle Creek and Jump Creek?	Unless a conclusive amount of data existed (as in the case of sediment for Jump Creek and bacteria for Lower Succor Creek), DEQ only evaluated the §303(d) listed pollutants. As such, additional pollutants were not considered as data gaps in the assessment.
Chapter 5	
10) Sections 5.1 to 5.4 present parameter-specific information regarding water quality targets, loading capacity, existing pollutant loads, and load allocations. However, bacteria is missing from the discussions in each of these sections. For clarity, either bacteria should be included in these sections, or an explanation provided as to why it is discussed separately and where. (see also Bacteria Allocation below)	A discussion of bacteria as it relates to section 5.1-5.4 will be added to the document.
11) For clarity, the use of surrogates should be discussed in Section 5.1. It should also be specified for which waterbodies they will be used. Though discussed in subsequent sections, a statement regarding each of the following under 'Target Selection' would be helpful:	Additional text regarding the use of surrogates will be added to section 5.1.
12) Temperature is the pollutant, but effective shade is used as the surrogate for meeting the temperature criteria.	Similar text will be added to the document.
13) Percent stream bank stability is used as the surrogate for sediment in upper Succor, Castle, and Sinker creeks.	Similar text will be added to the document.
14) Total phosphorous is used as the surrogate and indicator for the narrative nutrient criteria.	Similar text will be added to the document.
15) Section 5.4, Load Allocations. Although critical period is discussed in this section and the critical periods for each of the waterbodies is presented in Table 43, the text should include a	Text stating that critical conditions were considered in development of the TMDLs will be added to the document. Additionally, Table 43 will be modified to explicitly show the time of year when TMDLs

statement that critical conditions were considered in development of the TMDLs. The document must also state explicitly for each listed water body and parameter whether the TMDL will apply year-around or only during a specific time of year, and why. Sections 5.1 or 5.2 may be a good place for this discussion including the basis for selection of the applicable time period. Table 43 could also be revised to add "Time of Year Applicable" to a column.	are applicable.
16) The seasonal loading of phosphorous is discussed in Section 5.2. It appears DEQ would apply the nutrient TMDL only from May to September. However, in other watersheds in the northwest TMDLs for nutrients have been applied year around. Nutrient loads during winter can deposit in sediments and later be released during the critical season, creating a significant source. Unless this is not believed to occur in the Snake, applying the nutrient TMDL year round should be considered.	The SR-HC TMDL established this target based on a rigorous analysis of when algal growth impaired beneficial uses. More than 70% of organic loading comes from nutrient loading during that time frame. The Mid Snake River/Succor Creek watershed is similar. Nutrients released during the critical season should be entrained by BMPs. Since all tributaries and drains need to meet the 0.07 mg/L target, the specific BMPs will need to account for build-up of nutrients outside of the critical period that might be released during the critical period. Further, nuisance aquatic growths are primarily seen during the critical season. Finally, many of the BMPs implemented will likely be effective outside of the critical period, and will reduce nutrient concentrations. If the Snake River is not meeting the milestones during the implementation period then the critical period will be reevaluated.
<u>Sediment, Bacteria, Nutrient, and Temperature Allocations</u>	
17) The last four sections of Chapter 5 present the official TMDL for each water body. Each section should summarize and present all required elements of the TMDL. Each section should show the relationship between the loading capacity and the load and wasteload allocations for each water body.	Comment noted. Additional discussion below.
18) For example, in each of these sections the loading capacity for each parameter and water body must be explicitly identified in the text in quantitative or surrogate terms. [i.e. 'The loading capacity for Succor Creek is ___.'] The text in these sections should discuss the derivation of the loading capacity (or reference where in the document it is derived) and summarize its relationship to the targets. Loading capacities should also be presented in the allocation tables when appropriate. The temperature TMDL does a good job of explaining the loading capacity, where it is derived in the appendices, and presents and identifies the values in Table 53. This approach would work well for the other sections.	Comment noted. Additional discussion below.

<u>Sediment Allocations</u>	
19) Per the discussion above, the derivation of the loading capacity and its relationship to the targets and load allocations must be provided. The derivation of the sediment load allocations for Succor and Jump creeks from the targets of 16 mg/l and 65 mg/l respectively, to tons/day (or vice versa) is unclear. If there is a formula for the mass balances in figures 5.1 and 5.2, the formula or worksheets should be presented. The loading capacity for each water body should also be identified in tables 44 and 45.	The methods by which the sediment load capacities were developed are located in the Section 5.2. However, additional text will be added to the document to clarify the capacities in terms of tons/day. The loading capacities will also be integrated into Tables 44 and 45. The mixing equation formula on which the mass balanced are based will be added to the document.
20) It is assumed that the derivation of the loading capacity for Sinker, upper Succor, and Castle creek is presented in Appendix H as the 'Target Erosion Rate'. However, this is not specifically identified in the appendix. This identification should also be made in the text and Table 46.	The loading capacity values will be better defined in Table 46.
21) An explicit statement that no point sources are present within the watershed must be included in the text. Also state that no future growth has been accounted for in the load allocations. Therefore, all future point sources would receive a zero waste load allocation. Since there are no point sources in the watershed, reasonable assurances are not necessary. The times of year the TMDL will be applicable should also be stated.	This information will be added to the "sediment allocation" portion of the document. The time of year the sediment TMDLs will be applicable will appear in a revised Table 43.
<u>Bacteria Allocations</u>	
22) As bacteria was excluded from the discussions of targets, loading capacities, existing loads, load allocations, seasonal variations, critical conditions, etc. earlier in this chapter, each of these elements must be discussed in this section. Explicit statements as to the loading capacity and targets must be presented. It is assumed that both the loading capacity and target are set at the water quality criteria. It should be explained that the loading capacity was chosen to be the criteria concentration (in colonies/ml) because calculation of a load in terms of total colonies per river segment per day (in the classic definition of TMDL) was not practical given the difficulty in translating such a load into meaningful terms and the limits of available data.	Discussions of target selection, loading capacity determination, etc. will be added to the document where appropriate.
23) An explicit statement that no point sources are present within the watershed must be included in the text. Also state that no future growth has been accounted for in the load allocations. Therefore, all future point sources would receive a zero waste load allocation. Since there are no point sources in	This information will be added to the "bacteria allocation" portion of the document. The time of year the bacteria TMDLs will be applicable will appear in a revised Table 43.

the watershed, reasonable assurances are not necessary. The times of year the TMDL will be applicable should also be stated.	
<u>Nutrient Allocations</u>	
24) The fifth paragraph on page 164 which discusses the current wasteloads and wasteload allocations from the two point sources is unclear. The current discharges for the WWTPs (2 kg/day and 3 kg/day) are below their permitted limits (4 kg/day and 5 kg/day) which is their design capacity. The wasteload allocations assigned to them are these permitted limits. Any expansion beyond their permitted limits (design capacity) would require the WWTPs to find other means of meeting the limits. If this is the situation, it is unclear from the current reading of the paragraph.	This paragraph will be rewritten.
25) Also in this paragraph include a statement that any future point sources would receive a wasteload allocation of zero. State that a discussion regarding reasonable assurances is provided in Chapter 4.	This correction will be made.
26) The next paragraph regarding implementation should include a more explicit statement regarding effluent trading. We would suggest: 'The wasteload allocations and load allocations presented in this TMDL may be adjusted under a state-approved effluent trading program as long as the loading capacity is not exceeded.'	This correction will be made.
27) How the loads presented in Table 49 were calculated and how they relate to the loads presented in Table 51 is unclear. Their sum does not equal any of the values in the table. The derivation of the values in Table 51 should be explained.	2000/2001 year data was used for Jump and Succor Creek data instead of using '95/00 flows. This error was made because DEQ had recent data available. The table will be corrected.
28) Table 51 is also not presented correctly. Table 51 does not identify the wasteload allocations for the WWTPs as such, they are listed under the load allocations. The total sum of the load and wasteload allocations equaling a loading capacity is also not shown.	The tables will be corrected.
29) State that seasonal variations and critical conditions were considered in development of this TMDL and specify the times of year the TMDL will be applicable.	This statement will be added.
<u>Temperature Allocations</u>	
30) The TMDL in this section is well presented and includes the specific elements required for	Comment noted.

approval including the derivation of the loading capacity, the relation to the surrogates, and the loading capacity and load allocations are presented in Table 53.	
31) An explicit statement that no point sources are present within the watershed must be included in the text. Also state that no future growth has been accounted for in the load allocations. Therefore, all future point sources would receive a zero wasteload allocation. Since there are no point sources in the watershed, reasonable assurances are not necessary. The times of year the TMDL will be applicable should also be stated here.	This information will be added to the "temperature allocation" portion of the document. The time of year the temperature TMDLs will be applicable will appear in a revised Table 43.
Comments From: John Cossel Marsing ID Received via fax: February 28, 2003	**DEQ Response:**
1) DEQ has insufficient information to determine a TMDL for the upper reach and related segments of Succor Creek. Upper and Lower Succor Creeks need to be separated and treated differently because listings are different.	The subbasin assessment and TMDL were developed with the best available physical, chemical and biological data. DEQ is legally compelled to complete the Mid Snake River/Succor Creek TMDL by December 2002. Given the short time frame, DEQ collected as much additional data as possible to aid in development of the subbasin assessment and TMDL. An additional map showing Lower Succor Creek will be added to the document.
2) Pages 27-40 Subwatershed Characteristics, In this section DEQ has maps of all of the subwatersheds except for lower Succor Creek. Lower Succor Creek should be differentiated from upper Succor Creek. These need to be treated as separate subwatersheds.	An additional map delineating Lower Succor Creek from Upper Succor Creek will be added to the document.
3) Page 209, The DEQ statement" As per DEQ WBAG II guidance (Grafe et al. 2002), the Mid Snake/Succor Creek subbasin assessment uses the site-specific spawning period for redband trout. "The basin-specific spawning period is March 1 through June 15." But we note that DEQ does not have site-specific data pertaining to Upper Succor Creek. If site specific data were used pertaining to spawning periods, and those periods occurred at an earlier date than the basin specific periods, as could easily happen in this semi-arid climate characterized as hot and dry in the summer and cold and dry in the winter perhaps it would not be listed for temperature. Fish here under existing conditions….."	The temperature data displayed on pages 127-131 are in fact basin/site specific (to the Mid Snake/Succor Creek basin). However, DEQ agrees that in most cases data were not available for the extent of the spawning period. To account for that data gap, DEQ assumed that all temperatures prior to the date when data became available were BELOW the criteria. Using this assumption, greater than 10% of the data still exceeded the spawning daily average criterion (as shown in Table 35). Hence, the stream would indeed be listed for temperature.
4) "I am in complete agreement with DEQ statement 'where viable, steps should be taken to fill the data gaps.' Table 37 page 136 Data Gaps	Comment noted.

Identified prepared by TMDL authors acknowledges areas that need to be addressed.”	
a. Pg. 116, Flow data available for upper Succor Creek is limited	Comment noted.
b. Pg. 117, Monitoring data consists only of instantaneous temperature data used to populate SSTEMP used to develop the temperature TMDL	Comment noted.
c. Pg. 117, pertaining to bacteria-there are no data available for upper Succor Creek	Comment noted.
d. Pg. 120 there are no water column sediment data available from upper Succor Creek	Comment noted.
e. Pg. 123 There is not a numeric value against which TSS conditions in Succor Creek can be compared – site specific conditions must be assessed to determine an appropriate sediment target.	Comment noted.
f. Pg. 123, reasonable assumption that if 15 mg/L TSS was not causing impairment of aquatic life in Boise River, 16 mg/L TSS will support aquatic life beneficial uses in lower Succor. Why is that same assumption not being applied to upper Succor?	The same assumption is in fact being applied to Upper Succor Creek, but water column data do not exist for Upper Succor Creek. This is noted in the “Data Gaps” portion of the document. Additionally, As opposed to Lower Succor Creek, salmonid spawning is a beneficial use in Upper Succor Creek (see appendix F). Due to the importance of stream bottom material (substrate) for salmonid spawning, particle size distribution is also assessed in Upper Succor Creek. It is this component that is impairing the spawning beneficial use.
g. Pg. 124, re: Wolman Pebble Count—due to small set of data these have low level of statistical rigor, however until additional data can be collected they represent best available data	Comment noted.
h. Pg. 125, There is no hard data to support the statement “Data Assessment Methods section describe linkage etc.	Comment noted.
i. Pg. 125, temperature—period of record was dictated by accessibility to sites and vandalism twice	Comment noted.
j. Pg. 126, Data were not available during spawning period	Comment noted.
k. Pg. 132, Temperature data were not available during spawning period	Comment noted.
l. Pg. 133, due to insufficient data the entire critical period cannot be evaluated	Comment noted.
m. Pg. 133, Data are not available for period between 8/22 and 9/21—it is assumed…	Comment noted.
n. Pg. 133, however, again due to insufficient data	Comment noted.
o. Pg. 133, actual data are only available from 6/19 thru 7/15…..it is assumed	Comment noted.
p. Pg. 133, difficult to determine due to lack of data	Comment noted.

q. Pg. 134, data were not available directly above the reservoir during critical period	Comment noted.
r. Pg. 134, logger was vandalized...therefore DEQ assumes	Comment noted.
s. Pg. 134, timing of-criterion- is difficult to determine due to limited data	Comment noted.
Status of Beneficial Uses	
5) If data were broken out into two stream reaches, Upper and Lower Succor Creek and the lack of data were incorporated into this portion the status of beneficial uses for Upper Succor Creek would look like this:	
a. E. coli-there are no data available for Upper Succor creek pertaining to bacteria: Pg 117	Bacteria conditions were not assessed for Upper Succor Creek.
b. Sediment—states that "data indicate that excess substrate sediment is impairing	Comment noted.
c. there is no water column sediment data available from Upper Succor Creek.	Comment noted.
d. there is not a numeric conditions against which TSS conditions in Succor Creek can be compared, site specific condition must be assessed to determine an appropriate sediment target, pg. 123	Comment noted.
e. if it is a reasonable assumption that "if 15 mg/L TSS was not causing impairment of aquatic life beneficial uses in Lower Succor" why is that same assumption not being applied to Upper Succor, pg. 123	Upper Succor Creek, but water column data do not exist for Upper Succor Creek. This is noted in the "Data Gaps" portion of the document. Additionally, As opposed to Lower Succor Creek, salmonid spawning is a beneficial use in Upper Succor Creek (see appendix F). Due to the importance of stream bottom material (substrate) for salmonid spawning, particle size distribution is also assessed in Upper Succor Creek. It is this component that is impairing the spawning beneficial use.
f. re: Wolman Pebble count, due to small set of data these have low level of statistical rigor, however until additional data can be collected they represent the best available data, pg. 124	Comment noted.
g. in reviewing Table 32, Chad Gibson pointed out…fax becomes unreadable.	Comment noted.
6) "The only concrete piece of data that DEQ present pertaining to sediment is a photo on page 121 which is literally noted on page 120 as "Figure 2.46 shows a dated photograph of the water column and substrate near Berg Mine. Note the good water clarity and good distribution of substrate material."	Comment noted.
7) Temperature-pertaining to both cold water	

aquatic life and salmonid spawning:	
a. flow data available for Upper Succor Creek is limited pg 116	Comment noted.
b. monitoring data consists only of instantaneous temperature data used to populate SSTEMP used to develop the temperature TMDL pg 117	Comment noted.
c. period of record was dictated by accessibility, pg. 125	Comment noted.
d. period of record was dictated by vandalism	Comment noted.
e. data were not available during spawning period, pg. 126	Comment noted.
f. temperature data were not available for full extent of critical period, pg. 132	Comment noted.
g. assumptions were made to accommodate lack of data, pg. 132	Comment noted.
h. due to insufficient data the entire critical period cannot be evaluated, pg. 133	Comment noted.
i. data are not available for period between.. it is assumed, pg. 133	Comment noted.
j. however, again due to insufficient data, pg. 133	Comment noted.
k. ambient air temperature data seems to have been collected from.	Comment noted.
8) The above statements made by DEQ in this draft TMDL pertaining to Upper Succor Creek exhibit the need to expand on the DEQ statement (pg. 136) "where viable, steps should be taken to fill the data gaps."	DEQ agrees that the aforementioned statements exhibit the need to fill data gaps. The process by which this will happen will be further defined in the TMDL implementation plan.
9) Perhaps in the first phase of the next step, implementation, we should emphasize data collection first, a uniform consistent monitoring plan and schedule second, all prior to implementing costly, expensive projects that may or may not be effective.	DEQ feels that the TMDL shows a necessity for some level of best management practice implementation. However, DEQ agrees that additional data collection following a consistent monitoring plan should be placed as a task item in the implementation plan.
10) The meeting on December 23, 2002 between the landowners in the Succor Creek watershed and DEQ was very beneficial. Landowners have shown a willingness to work with DEQ. Several areas of contention were discussed and solutions offered. With resolution of the trespass/access issue DEQ will be able to establish a more complete and accurate database for this segment of the TMDL document, if they so choose. I hope that we have all learned that by contacting and including the landowners from the beginning there is a wealth of information that can be accessed, sometimes through entities that DEQ is unaware of (ARS, onsite weather/gauging stations, IDWR flow data, etc).	DEQ agrees that the December 23, 2002 between the landowners in the Succor Creek watershed and DEQ was beneficial and productive. DEQ appreciated very much the effort made by the landowners to bring forth concerns with the draft document. Additionally, in the near future, DEQ will be making efforts to fill the temperature data gaps on Upper Succor Creek. Landowners will be given every opportunity to participate in this process.

Comments From: John Romero Murphy ID Received via fax: February 28, 2003	**DEQ Response:**
1) "Throughout this document there is reference to "lack of data" and due to this lack of data the words "assumptions were made" are used repeatedly. Basing determinations on lack of data or assumptions lacks credibility." There are specific notations of places where this occurs in the following comments.	The subbasin assessment and TMDL were developed with the best available physical, chemical and biological data. DEQ is legally compelled to complete the Mid Snake River/Succor Creek TMDL by December 2002. Given the short time frame, DEQ collected as much additional data as possible to aid in development of the subbasin assessment and TMDL.
2) "Natural resource users have a long history of dealing with both state and federal government agencies. Sometimes these experiences are forthright, however many times they are unpleasant and burdensome. Lives have suffered from the almost continuous demand of time and money required to meet the increasing requirements of the business of "new" environmentalism. The last few years, resource users have been confronted with endangered species listing petitions, EPA imposed hazardous materials cleanup, federally mandated grazing restrictions, private property rights decisions and 303(d) water quality standards. Clearly, the general public does not begin to understand the effect "new" environmentalism is having on the private sector, particularly those of us involved with natural resources."	Comment noted
3) "The environment should not take precedence over man at any costs. Our country's economic foundation is based on the economies of mining, fishing, agriculture, and logging. We import a large percentage of these products to the detriment of our local producers because it is cheaper for the American consumer, which in large part is due to the strict environmental standards increasingly demanded from our produces. The American public does not or cannot demand these same environmental standards from producers outside our borders, yet willingly accepts this double standard."	Comment noted.
4) "Natural resources are of utmost importance. Certainly, the ecological condition on both the private and public sector have improved in the last fifty years. To be successful in the ranching industry our rangeland must remain sustainable, and we are proud of the improvements we have made. People who have chosen to live and work on the land they love and care for, have an intimate knowledge of the environment that surrounds	Comment noted.

them. Protecting our country's producers should be the cornerstone from which we commonly strive to protect our environment."	
5) Private property rights are the single most important value to landowners: Private property rights must be respected. It is inconceivable that any government agency would conduct research on private ground without asking permission first and notifying landowners of their presence.	Comment noted.
6) Research:	
a. Sufficient research should be conducted to support any finding. Sufficient research may be proportionally defined by the potential time and money required to rectify a negative finding. Since landowners would be knowledgeable of the practical factors involved in recovery, they should be included in formulating costs of recovery efforts, which would aid in establishing adequacies of research.	Comment noted.
b. If research is lacking consideration should b given to abandoning further action."	DEQ is legally compelled to complete the Mid Snake River/Succor Creek TMDL by December 2002.
c. Recovery efforts must include well-defined, achievable results.	DEQ agrees. This information will be further defined in the implementation plan.
d. The DEQ has the responsibility to provide sufficient data and provide for a legitimate recovery plan if warranted. Suggesting a recovery effort without first providing an adequate basis or demonstrating an achievable result would irresponsibly place undue burden on the landowner.	DEQ agrees. A recovery plan has yet to be developed. It will be the responsibility of the landowners and the designated agencies (DEQ, BLM, SCC, IDL, etc) to develop the implementation/recovery plan.
e. While the DEQ may not legally impose a recovery effort on private ground, our experience is that agenda-driven environmental groups may impose the recovery through court order.	Comment noted.
7) Landowners have intimate knowledge of their land:	
a. All landowners affected by the Mid-Snake River/Succor Creek SBA and TMDL should be notified	DEQ has made every attempt to provide notification thus far. DEQ also relies on the WAG to disseminate information.
b. Landowner's local expertise and knowledge should be included in developing recovery efforts on private ground	DEQ agrees. This cooperation will be critical when developing the implementation plan.
c. Recovery efforts should have full cooperation from the landowner	DEQ agrees.
8) Funding	

a. All funding for research and recovery efforts should come from state and federal government. Current 303(d) standards for water quality have been raised as deemed appropriate by the government while not necessarily providing increased protection for the environment or in consideration for adequate protection of the landowner. For example, according to current 303(d) standards, the limiting sampling data available for temperature in Upper Succor Creek indicates stream temperatures are inadequate for salmonid spawning, yet many people enjoy fishing this stretch of stream for trout ever year. If in accordance to the current 303(d) standards, this stretch of stream needs recovery to sustain trout populations that are already occurring, what burden if any should be placed on the landowner?	The subbasin assessment and TMDL were developed using privately and publicly generated data. The privately generated data were willingly shared with DEQ. In terms of recovery efforts, local participation is critical. Without it, recovery, where needed, will most likely not occur. Other than in areas where implementation measures are to meet the water quality standards, no burden should be placed on the landowner, and even in such cases actions remain voluntary.
9) On the ground implementation—Recovery Efforts should be flexible:	
a. As more information is gathered, recovery efforts should be flexible enough to assimilate new information	DEQ agrees. The adaptive management approach will build this type of flexibility into the implementation process.
b. Natural occurrences such as fire, flooding, insect damage and disease may have a profound effect on recovery efforts.	DEQ agrees.
10) Page 13-paragraph 4: "The loss of desert riparian habitat that cools stream temperatures…" Where is the documentation to validate the statements made in this paragraph?	DEQ has shown in the document (Page 167), and the WAG has agreed, that 55% riparian shading represents a preliminary estimate of the riparian potential for Upper Succor Creek. Current conditions range from 13-16% (Table 53). An increase in the surface area of a stream exposed to sunlight leads to an increase in water temperature. This information substantiates that "a loss of riparian vegetation (shading)" increases water temperature.
11) Page 13, paragraph 4, regarding fisheries data for tributaries in Table 2: We question whether redband trout is a native or an introduced species. Idaho Department of Fish and Game have repeatedly planted fish at Chipmunk Meadows.	The Federal Clean Water Act and the Idaho Water Quality Standards require DEQ to protect *existing uses* as well as those used designated in the standards. The natural and historic presence of redband trout in the watershed is well documented in scientific literature.
12) Page 14, Table 2, In the back of the TMDL documents reference is made to the data collected regarding fish. There are copies of the correspondence between the IDEQ and IDFG. No hard data is shown to document this chart.	A footnote will be added to Table 2 indicating the method(s) by which the data were collected. In most instances, the data were collected using a backpack electrofisher.

Historically, information given by the members of the Chipmunk Grazing Association states that in over thirty five years, there have been very few, if any, fish observed from the headwaters of Succor Creek to Granite Creek.	
13) Pages 27-40 Regarding Subwatershed Characteristics. Pertaining to the above pages, DEQ has maps of all the subwatersheds except for Lower Succor Creek. The lower portion of Succor Creek is included in this TMDL, but is 'lumped' together in the watershed. DEQ needs to identify Upper Succor Creek and Lower Succor Creek as different subwatersheds. The data for Upper Succor Creek and the data for Lower Succor Creek should be addressed for each subbasin individually.	An additional map delineating Lower Succor Creek from Upper Succor Creek will be added to the document.
14) Page 41, History and Economics- "The introduction of cattle resulted in … soil compaction." "The change in plant composition resulted in a greater frequency of fires in the area." This is not true. Before the Taylor Grazing Act, large numbers of cattle and sheep grazed the rangelands and this reduced the fuel loads that would carry fire. The last paragraph on page 41 states "Grazing has had long-term effects on stream hydrology and vegetation. The introduction of cattle resulted in a decrease of native perennial grasses and an increase in soil compaction because of trampling by concentrated numbers of livestock." There is no reference to the actual facts of this statement. If these statements are to remain in the TMDL they must be documented for credibility.	Additional narrative regarding the Taylor Grazing Act will be added and references added.
15) Page 51 Table 7, In regards to the fish mortality study cited in this chart, there is question to the practicality of applying this model to a real stream. This test is done by thermally induced temperatures, similar to a "boiling pot". Streams do not naturally increase in temperature in this same fashion. If Table 7 is included in this TMDL a reference and description of how this experiment was conducted should be included.)	Clarification of the study and modification of the table will be incorporated into the TMDL.
16) Page 58-59 Date Assessment Methods - It would be beneficial to also use the Proper Functioning Condition (PFC) as an assessment tool. The BLM has reference manuals for this and there is a Standard Stream Riparian PFC Checklist that can be used as another tool for data assessment. In addition, if through this data assessment method a stream is determined to be in proper functioning condition, it may then be beneficial to determine if there is a need for further	DEQ agrees that the Proper Functioning Condition protocol is a valuable tool and intends to integrate it into the TMDL implementation plan as one option for tracking and documenting management actions. Unfortunately, PFC is not designed to calculate sediment loading nor determine if all the designated uses associated with water quality are met. As such, it was not used in TMDL development.

TMDL development on that stream. PFC would prove to be an additional tool to help in the Stream Bank Erosion Inventory addressed on page 59.	
17) Page 65- Figure 2.4 July 14, 2002. Fish kill on the Snake River at Walters Ferry. The statements made in the first paragraph in sentences five and six are enough explanation without a picture of this magnitude. The picture is not crucial in making the point. This picture could very well create bias and/or a negative impression. It is recommended to leave the statements in but remove the picture.	This picture is evidence of impairment of beneficial uses due to high temperature. Additional narrative is included to indicate that this is not representative of all parts of the watershed and indeed occurred in response to a combination of very high elevated air temperatures and low summer flows.
18) Page 115, Surface Hydrology—The statement within this paragraph “There are relatively few major diversions or other modifications on Upper Succor Creek.” This is an inaccurate statement. There are four major diversions with adjudicated water rights on Upper Succor Creek above the Succor Creek Reservoir.	The document will be changed to reflect the fact that there are four adjudicated diversions above Succor Creek Reservoir.
19) Page 117, Pertaining to bacteria: there are no data available for Upper Succor Creek	Bacteria conditions were not assessed for Upper Succor Creek.
20) Page 117, In reference to Succor Creek Reservoir—The Succor Creek Improvement Co. has drained the reservoir several times to work on the head gate. The Idaho Fish and Game Department shocked the fish as they were draining the reservoir and transplanted them elsewhere.	DEQ will add text to the document to reflect the comment. However, this maintenance is not part of the reservoirs normal operational procedure.
21) Page 120, There are no water column sediment data available for Upper Succor Creek	Water column data is of less utility when bank erosion is the primary source of sediment.
22) Page 123, There is not a numeric value against which TSS conditions in Succor Creek can be compared. Site-specific conditions must be assessed to get accuracy.	The Idaho Water Quality Standard for sediment is narrative, meaning there is no numeric value with which to compare results.
23) Page 124, Re. Wolman Pebble Count—there is insufficient hard data to support the “data assessment methods sections describe linkage etc.)	The assessment method is documented in the text on page 124 and in the ‘References Cites’ section as Wolman (1954). The Wolman (1954) pebble count procedure is a well know and often used (by many states) method of determining particle size distribution.
24) Page 125, Paragraph two below Table 33. Regarding the Data Assessment Methods there is no hard data to support the statement “data assessment methods section describe linkage that has been developed between bank stability and fine substrate material.”	Other TMDLs developed by DEQ have used similar linkages (see Referenced Cited, DEQ 2001 a,b). Additionally, this TMDL supports the linkage. In segments of Upper Succor Creek where banks were <80% stable, the percentage of fine material (particles <6mm in diameter) exceeded 28%. In segments where banks were >80% stable, the percent fine material was less than 28%.

25) Page 125, regarding temperature the period of collection is questionable due to access and vandalism.	Comment noted.
26) Page 126, There is no data available during the spawning period	Comment noted.
27) Page 129, Figure 2.53 and Figure 2.54, Assumed temperatures are used before 6-6-95	Comment noted.
28) Page 132 First paragraph, last four lines- "However, due to insufficient data, the entire critical period for cold water aquatic life cannot be evaluated. Data not available for the period between August 22 and September 21.	To account for the data gap, DEQ assumed that all temperatures prior to the date when data became available were BELOW the criteria, which may not be the case. Using this assumption, greater than 10% of the data still exceeded the spawning daily average criterion (as shown in Table 35).
29) Page 133, due to insufficient data the entire period cannot be evaluated as necessary for accurate results.	DEQ acknowledges that data for the entire critical period would increase the accuracy of the document.
30) Page 133, During the period of August 22 to September 21 there is no data available and therefore "assumptions" were made. There is also reference on this page to "However, again due to insufficient data…"	Comment noted.
31) Page 133, Actual data collected was from June 19-July 15 and then "assumptions" were again made.	Comment noted.
32) Page 134, In the first paragraph it refers to no data being available above the reservoir and then goes on to explain that because of that DEQ assumes that segment to also exceed the criteria. Assumptions on Upper and Lower Succor Creek being the same should not be made. The statement made in the second paragraph on this page, next to the last sentence, "… a determination is difficult to make due to limited data…"	The assumption being made is that since daily average temperatures in the stream from the headwaters to end of Chipmunk Meadows are above the criterion, it is likely that temperatures from Chipmunk Meadows to above the reservoir are also above the criterion. No comparison is being made to Lower Succor Creek, which extends from the Oregon line to the Snake River.
33) Page 136 Paragraph one, line three ".. DEQ acknowledges there are additional data that would be helpful to increase the accuracy of the analyses. "this in regards to the data gaps. Again it is questionable whether there is enough basic data to make assumptions or to plug into the models for temperature. In the paragraph right below Table 37, this paragraph addresses that efforts will be made to fill the data gaps, however it is questionable with the amount of data collected whether it validates the TMDL. It is questionable as to how recommendations for TMDL Implementation can be made if more data is needed.	The model validation work in Appendix G shows that in fact, the model was quite reliable at calculating the actual stream temperature. DEQ feels that enough data were collected to develop the TMDL, but acknowledges that additional data would improve the accuracy of the allocations. It terms of TMDL implementation, the ensuing plan will take an adaptive management approach. This means that progress toward meeting the TMDL goals will be tracked as control measures are implemented. As such, data gaps do not preclude moving forward with implementation.

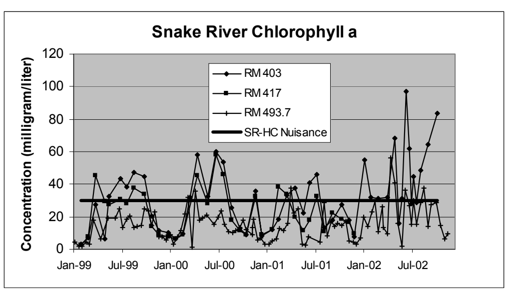
34) Page 142, Fourth paragraph, third sentence under the Temperature heading "…and a loss of riparian shading.: Is this a substantiated statement and if so, by what source, or is this an assumed statement that there has been a loss of riparian shading. There should be reference data and/or pictures to support his statement or else that portion of the statement should be removed.	The geomorphology of Upper Succor Creek is such that there should be greater than 13-16% shading, which is where the stream lies currently (Table 53). DEQ has shown in the document (Page 167), and the WAG has agreed, that 55% riparian shading represents a preliminary estimate of the riparian potential for Upper Succor Creek. Given that current shading ranges between 13-16%, movement toward the potential is appropriate.
35) Page 153, Monitoring Points—In regards to this paragraph, it is questionable as to whether sufficient data has been collected on Upper Succor Creek to get accurate data from enough segments of the stream to produce recommendations for the TMDL. There is reference at the end of this paragraph that this was due to lack of access to private property. It should be noted there was never any written request to the Chipmunk Grazing Association of which I am a member, for access to these private properties, therefore access was never approved or denied.	DEQ feels that the best available physical, chemical and biological data were used to develop the subbasin assessment and TMDL. DEQ is legally compelled to complete the Mid Snake River/Succor Creek TMDL by December 2002. Given the short time frame, DEQ collected as much additional data as possible to aid in development of the subbasin assessment and TMDL. Regarding access to private properties in Upper Succor Creek, the comment that access was never approved or denied is noted.
36) Page 209, The statement referring to the Mid Snake/Succor Creek subbasin assessment uses the site-specific spawning period for redband trout. The basin specific spawning period is March 1 through June 15. There is not site specific data pertaining to Upper Succor Creek. Readings were taken mostly in June. The critical time stated for spawning is earlier in the year.	The temperature data displayed on pages 127-131 are in fact basin/site specific (to the Mid Snake/Succor Creek basin). However, DEQ agrees that in most cases data were not available for the extent of the spawning period. To account for that data gap, DEQ assumed that all temperatures prior to the date when data became available were BELOW the criteria. Even with this assumption, greater than 10% of the data still exceeded the spawning daily average criterion (as shown in Table 35).
37) In reference to the chart on page 116, Table 30. Flows in Upper Succor Creek—these flows are not accurate. For thirty-five years the members of Chipmunk Grazing Association have never witnessed these excessive flows at that time of year. Where is the documentation to support this chart?	It is DEQ's belief the flows shown in Table 30 are accurate. The flows were determined following the standard set-interval method using a calibrated Marsh-McBirney flow meter. The documentation to support this chart is located in the Boise Regional Office files.
Comments From: Brian Hoelscher, Biologist II, Environmental Affairs Idaho Power Company Received via e-mail: February 28, 2003	**DEQ Response:**
1) "IDEQ continues to address water temperature issues in an inconsistent manner. In the introductory portions of the Succor TMDL, IDEQ explains that TMDLs are plans developed to improve water quality by reducing pollutant loads and that EPA considers certain "unnatural conditions," such as flow alteration and habitat	DEQ's approach to temperature in the Mid Snake-Succor TMDL is consistent with past efforts and EPA approved TMDLs. The SSTEMP model has been used a variety of TMDLs (Rio Chamita, New Mexico; Upper Ponil Creek, New Mexico; Navarro River, California). All TMDLs mentioned are approved, and thus DEQ believes the approach used

modification, to be pollution and not pollutants. This distinction between "pollution" and "pollutants" is subtle, but important, under the Clean Water Act. TMDLs are not required for water bodies impaired by pollution, but not by specific pollutants that are recognized under the Clean Water Act (*Id.* pg. 7, see also: I.C. §39-3611). "Heat" is a pollutant when discharged to a water body (I. C. §39-3602(19)), but water temperature is not, it is the condition resulting from the imposition of the heat pollutant. The Succor TMDL attributes changes in water temperature to various sources of heat: Increases and decreases in water temperature are due to the amount of heat reaching the water. There are several factors that contribute to the amount of heat reaching the water in the Mid Snake River/Succor Creek watershed. The anthropogenic factors include agricultural return water, agricultural withdrawals, dams, and a loss of riparian vegetation (shading). Natural factors include seasonal air temperature changes, natural dams, and naturally warm springs that feed water to the stream. Only those anthropogenic sources (of heat) that are directly controllable are addressed in this TMDL. (*Id.* pg. 142.) In the Succor TMDL, IDEQ assigns temperature load allocations only to stream shading (*Id*. pg. 166) in an attempt to address the loss of riparian habitat. All other anthropogenic sources of heat, while acknowledged, are disregarded.	is appropriate as described in 40 CFR 130.2(g).
In the U.S. Environmental Protection Agency approved Payette TMDL, IDEQ found that water temperatures in the watershed exceeded temperature water quality standards for cold water aquatic life and salmonid spawning, and, as in the Succor TMDL, attributed those temperature exceedances to various factors, including the anthropogenic influences of habitat modification, flow alteration and warm water temperatures originating from Black Canyon Reservoir. However, unlike the Succor TMDL, IDEQ recommended that a temperature TMDL not be developed in the Payette TMDL "due to external sources of warm water temperatures and habitat modification."	A temperature TMDL was not prepared for the Lower Payette River because water entered the study area at temperatures above the water quality standard due to its tenure in Black Canyon Reservoir. It is DEQ's belief that this situation is not similar to the Snake River and its tributaries from CJ Strike Dam to the Oregon Line. It is also DEQ's belief that temperature TMDLs were performed for the appropriate streams in the watershed.
In the initial development of the draft Snake River–Hells Canyon TMDL, IDEQ took a similar approach, identifying various anthropogenic sources of heat, which influenced water temperature, but generally ignoring them. IPC concurred with this approach because, as in the	Comment noted.

Payette TMDL, IDEQ treated all anthropogenic temperature influences in the watershed equally and did not attempt to make-up for the ignored effects of some influences by allocating additional, disproportional load allocations to other specific anthropogenic influences, such as the Hells Canyon Complex.	
The Succor TMDL illustrates that IDEQ has yet to settle on a uniform approach to the development of temperature TMDLs. For instance, many waters in the Succor TMDL are listed as impaired for exceeding applicable temperature standards because of natural and anthropogenic influences. However, IDEQ disregards all anthropogenic influences except for riparian shading. Moreover, IDEQ recommends that several waters that are listed as impaired by temperature be delisted because flows are less than one cubic foot per second. IDEQ's policy choice to disregard the impact of low flow tributaries is undeveloped in the record and fails to recognize the cumulative impact of the disregarded anthropogenic sources of heat on overall temperature conditions of the watershed.	Comment noted.
The development of a temperature TMDL, which is a plan or budget intended to guide improvements to water quality, in a unified watershed like the Snake River basin cannot be done in an inconsistent patchwork manner. Disregarding some anthropogenic influences or heat sources and addressing temperature conditions through only those anthropogenic sources that are "controllable" results in disproportionate load allocations to some sources and none to others. The question of whether an anthropogenic influence can be "controlled" should not be determinative of whether the level of impact of the influence should be assessed. IDEQ stresses that flow alteration is not a pollutant and thereafter concludes that the effects of flow alteration should not be considered in the Succor TMDL. IPC concurs with the underlying premise but not with IDEQ's conclusion. I. C. § 39-104 prohibits IDEQ from abrogating, injuring or otherwise affecting the beneficial use, including the diversion and storage, of water pursuant to a vested water right. As such, IDEQ cannot "control" those anthropogenic influences, such as flow alteration, that result from the beneficial use of water pursuant to a valid water right. But, to ignore that such uses affect water temperature and fail to assess the level of that impact in comparison to other thermal impacts in a basin inequitably increases the load allocations to those	DEQ recognizes that flow alteration may result in higher water temperatures. However, DEQ has never had statutory authority to influence water rights.

anthropogenic sources that IDEQ considers to be controllable.	
IPC submits that the only equitable approach to the development of temperature TMDLs in the Snake River basin is to initiate a broad watershed temperature analysis and then, after all sources of anthropogenic thermal impacts in the interdependent watersheds have been identified and assessed, attempt to allocate loads over the entire region fairly. If it is IDEQ's choice to address temperature TMDLs water-by-water within the Snake River basin, please provide IDEQ's policy on whether the effects of flow alteration are considered in the development of temperature loads and allocations in TMDLs."	Flow alteration is not considered in the development of a TMDL because by the EPA's definition, it is not a pollutant.
2) "We have noted a couple minor errors in the Succor TMDL as it relates to IPC projects. The upper river mile for the Swan Falls Reservoir pool is incorrectly identified as mile 457 (*Id.* pg. 24). This is below the dam. IDEQ identifies specifically a C.J. Strike Reservoir TMDL (*Id.* pg. 153). It is IPC's opinion the development of TMDLs is to occur by hydrologic unit and not water body specific. Please correct or clarify the statements."	These errors will be corrected.
3) "The Succor TMDL mentions (*Id.* pg. 73) the occurrence of the listed endangered Idaho spring snail. It does not discuss consultation with the U.S. Fish and Wildlife Service. Please discuss any consultation the IDEQ has had with the agency and how the Succor TMDL complies with the Endangered Species Act regulations."	Consultation is the responsibility of the EPA. Part of the recovery plan from USFWS states, " Ensure state water quality standards for cold-water biota and habitat conditions so that viable, self-reproducing snail colonies are established in free-flowing mainstem and coldwater spring habitats within specified geographic ranges or recovery area." Snake River Aquatic Species Recovery Plan, December 1995, USFWS, Idaho. This section of the Snake River is not in the recovery area. However, this TMDL does ensure that water quality standards for cold-water biota are being met. The Idaho Spring Snail habitat includes mud or sand associated with gravel-boulder size substrate. BMPs implemented for nutrients/temperature/sediment on the tributaries will result in a decrease in sediment loading to the mainstem Snake river, potentially improving habitat.
4) "Castle Creek and North Fork Castle Creek are listed for temperature. The Succor TMDL conclusions (*Id.* pg. 88) are not consistent with either the reported findings (*Id.* pg. 82 and pg. 87; Figure 2.24) nor the recommended load allocations and delistings (*Id.* pg. 4). It appears there was confusion whether the Succor TMDL was	Both Castle Creek and North Fork Castle Creek need additional data collected in order to determine whether or not a TMDL is necessary. This error will be corrected. North Fork Castle Creek is not being recommended for de-listing. The temperature TMDL is delayed

discussing Castle Creek or North Fork Castle Creek. Please clarify on which of these streams temperature TMDLs will be required.”	due to insufficient data.
5) “IDEQ has identified as one of their data assessment methods the *DEQ-Water Body Assessment Guidance-Second Edition*. This guidance further provides a revised *Temperature Frequency of Exceedance Calculation Procedure.* It states (*Id.* pg. D-1), “For cold water aquatic life the summer period of June 21st through September 21st shall be considered the period of interest…” and (*Id.* pg. D-2) “…the critical time period is from July 15th through August 15th ...” It further states (*Id.* pg. D-2), “For purposes of evaluating a frequency of exceedance partial data records that do not include the critical period are inadequate...and can not be used to determine compliance with Idaho’s temperature criteria.” It appears IDEQ is recommending North Fork Castle Creek and Squaw Creek for delisting based on temperature data, as provided in Figure 2.24 (*Id.* pg.87) and Figure 2.41 (*Id.* pg. 113), below the maximum daily average temperature criteria. The uses in both North Fork Castle Creek and Squaw Creek are the presumed uses of cold water aquatic life and primary or secondary contact recreation. Additionally, Cottonwood Creek is listed for temperature. It is being recommended for delisting because numeric criteria are exceeded less than 10% of the time (*Id.* pg. 132). Its uses are similar to those of the other tributaries. As provided in the Succor TMDL, there were no data available for any of these tributaries during the critical period and relatively little data during the period of interest: only about 21 d (June 21 through July 11) in North Fork Castle Creek; only about two days (June 21 through June 22) in Squaw Creek; and only about 19 d (June 21 through July 9) in Cottonwood Creek. According to Idaho’s guidance and procedures, it appears these data were inadequate for determining compliance with Idaho’s temperature criteria. Please provide IDEQ’s interpretation of these guidelines and procedures as they were relate to the Succor TMDL.”	Squaw Creek and Cottonwood Creek are being proposed for delisting primarily due to the intermittent nature of the stream. By late June, flows were below 1 cfs or the stream was dry throughout the listed reach. State water quality standards do not apply in those periods where flows are below 1 cfs. Prior to that period, Squaw and Cottonwood Creeks met the temperature standard. Initially, DEQ did not do an intermittence evaluation of these streams but the data shows that they are intermittent and meet water quality standards when water is present. Thus, this determination to de-list is both reasonable and defensible.
6) “Total suspended sediment targets are proposed for two streams: 65 mg/L in Jump Creek and 16 mg/L in Succor Creek. Each is stated to be necessary to protect similar uses. The Jump Creek target was based on regression analyses relating total suspended sediment concentrations to turbidity measures. The target was established at the turbidity criteria. This target corroborates with that of other researchers (*Id.* pg. 53). The Succor	As stated in the document, the TSS targets for Lower Succor Creek and Jump Creek differ due to the different methods by which they were determined. The target of 65 mg/L in Jump Creek is linked via regression analysis to maintaining 25 NTU turbidity. Maintaining 25 NTU in Jump Creek will satisfy the Idaho Water Quality Standards. The target of 16 mg/L (which has been changed to 22 mg/L in the final document) is the irrigation season

Creek total suspended sediment target was set at 16 mg/L. This is representative of concentrations at the Oregon/Idaho line. Please provide rationale why there is such a discrepancy in the targets. It appears the Succor Creek target is established at a level more reflective of system potential and not at a level that (*Id.* pg. 150) "is the opinion of DEQ…will be protective of both aquatic life and water quality."	concentration in Succor Creek above Sage Creek. Twenty-two (22) mg/L (previously 16) is linked to conditions in the Lower Boise River where the Idaho Water Quality Standards are met. As such, the Succor Creek target is **both** system potential and protective of both aquatic life in Succor Creek.
7) "IPC agrees 0.07 mg/L total phosphorus is a reasonable target for the Succor TMDL and that equal concentration allocation is a reasonable approach. We do not however believe application of this target solely during the critical period of May through September will reasonably assure protection of the uses. IDEQ states, "(*Id.* pg. 154) Transport and deposition of phosphorus, and the resulting algal growth within the reach, is seasonal in nature," and "(*Id.* pg. 155) Generally, water temperature precludes nuisance blooms from occurring in early spring and late fall." A nuisance threshold of (*Id.* pg. 76) between 25 and 30 µg/L of chlorophyll-a have been established as the chlorophyll-a targets for this TMDL." Figure 1 shows that nuisance levels of chlorophyll-a can occur as early as January and frequently occur in March. Please clarify how the nutrient critical period of May through September reasonably assures protection of the uses."  Figure 1. Chlorophyll-a concentration in the Snake River from C.J. Strike Reservoir to the Idaho/Oregon line with reference to the proposed Mid Snake-Succor Creek TMDL target of 30 µg/L.	As nutrient loading decreases to the system, total phosphorus retained in the system will also decrease (i.e. sediment bound phosphorus levels will decrease as less phosphorus enters system and this phosphorus is flushed out of the system). In concert with reductions from TMDLs implemented upstream, this reduction in entrained phosphorus will result in a decrease in Chl-a concentrations seen outside the critical period. If the Snake River does not meet its target milestones during the implementation period, the critical period will be reevaluated.
Comments From: Amy Woodruff, P.E. City of Marsing, City Engineer Received via e-mail: February 27, 2003	**DEQ Response:**
1) "As the City Engineer of the City of Marsing, and at the request of the City of Marsing Mayor and City Council, I am requesting the permit discharge levels for the City of Marsing wastewater treatment plant not be changed."	Currently, the TMDL allows for the city of Marsing to remain at current discharge levels. Given that the city is well below their design capacity, an adequate amount of time has been given to the city to determine other treatment possibilities and funding

	mechanisms to meet nutrient targets.
2) "The wastewater treatment plant was designed to treat the sewage of approximately 1300 individual homes. The wastewater treatment plant currently serves the equivalent of 500 homes, more or less. Also, the excess capacity allows for better treatment of the effluent. The lower (actual) discharge, coupled with the higher quality effluent, may make the impact to the watershed less than projected in the TMDL."	See above.
3) "Altering the permit discharge levels could lead to a very negative economic impact to the residents of the City of Marsing."	See above.
4) "The City of Marsing wastewater treatment plant operates safely and efficiently. The wastewater treatment plant is well maintained and the operations are well documented."	See above.
Comments From: Hilarie Engle Committee for the High Desert Received via e-mail: February 28, 2003	**DEQ Response:**
1) "CHD believes that this document has a long way to go before any of the decisions can be put into place."	Comment noted.
2) "CHD requests that the DEQ review data collected by the BLM that documents the harmful livestock grazing impacts to the watersheds covered in this document. The overwhelming body of evidence in the BLM documents point directly to livestock grazing as the cause of watershed-level devastation here."	The Idaho Rangeland Standards and Health Guidelines outline the Bureau of Land Management's range management goals. One of these goals is the compliance with Idaho Water Quality Standards, of which is addressed by the TMDL. However, these EA's offer no new water quality data that would alter the SBA/TMDL conclusions.
3) "For ALL data discussed or analyzed in your assessment, please provide information on whether livestock grazing was occurring during the period when the data was collected."	This type of information is generally not available. Livestock grazing is a land use in the watershed.
4) "CHD contends that the new process (WBAG II) developed by DEQ for identifying whether a water body supports its beneficial uses or is impaired and the associated process (BURP) for collecting, analyzing and managing the data used in making these determinations do not comply with the requirements of the Clean Water Act, its implementing regulations, nor EPA guidance."	DEQ took several steps to ensure that WBAG II complies with the Clean Water Act and related EPA guidance. First, DEQ coordinated extensively with EPA throughout the WBAG development process. Although EPA does not have the authority to approve or disapprove DEQ's assessment methodology, DEQ wanted to ensure EPA's understanding and satisfaction with the WBAG before using it. With this in mind, DEQ asked EPA for an in-depth review of the draft WBAG II before it was released for public comment.

	EPA reviewed the WBAG II and provided DEQ with comprehensive comments from technical and policy perspectives. The EPA reviewers possessed a wide range of expertise including fish biology, ecology, monitoring, program policy and legal (Grafe et. al 2002). The review included EPA Region 10 Idaho Operations office (Boise, Idaho): Leigh Woodruff. Also, from EPA Region 10 office (Seattle, Washington): Kerianne Gardner, Gretchen Hayslip, Lilian Herger, Curry Jones, Marcia Lagerloef, Theresa Pimentel and Steve Ralph. Lastly, from EPA Headquarters (Washington, D.C.): Susmita Dubey (Office of General Council); Susan Holdsworth, Mike Haire, Chris Faulkner, Christine Ruf (Office of Wetlands, Oceans and Watersheds); Sue Gilbertson, Ed Hanlon, Jennifer Wigal (Office of Science and Technology). The second step DEQ took was to participate in and follow closely the development of EPA's national monitoring and assessment guidance, the Consolidated Assessment and Listing Methodology (CALM) (EPA 2002). The overall goal of CALM is to both strengthen and streamline the water quality monitoring, assessment and listing process for purposes of both sections 305(b) and 303(d) of the Clean Water Act. CALM encompasses components such as making decisions on attainment/non-attainment of state water quality standards and designing comprehensive state monitoring networks that support attainment decisions. To the extent possible, DEQ drafted WBAG II to closely follow CALM guidance. Finally, DEQ used several different approaches to ensure the public had an opportunity to learn about the assessment process and provide valuable input. Some of the extra steps DEQ took included holding an extensive 120-day public comment period, sending individual invitations to interested parties and providing educational workshops. Feedback from the different public process approaches strengthened WBAG II and verified it met Clean Water Act requirements. Using the combined approaches described above, DEQ is confident that WBAG II complies with the requirements of the Clean Water Act, its implementing regulations, and EPA guidance. Literature cited: EPA. 2002. Consolidated Assessment and Listing Methodology – Toward a Compendium of Best Practices. U.S. Environmental Protection Agency, Office of

	Wetlands, Oceans, and Watersheds, Washington, D.C. pp. [various pagination] Grafe, C.S., D.A. Essig, M.J. McIntyre, D.H. Brandt, C.A. Mebane, and M.R. Edmonson. 2002. Public Involvement and Response to Comment Summary –The Water Body Assessment Guidance, Second Edition. Idaho Department of Environmental Quality; Boise, Idaho. 232 pp.
5) "By implementing WBAG II and BURP in the development of the Mid Snake River/Succor Creek Subbasin Assessment and TMDL, the DEQ failed to consider all of the readily available data, did not collect or consider a substantial amount of available data, failed to conduct adequate monitoring and inappropriately de-listed or failed to list streams on the 303(d) list, and therefore a TMDL will not be developed. When developing the Subbasin Assessment and TMDL, DEQ failed to consider all readily available data. The result is that many streams that are not, or are not expected to be, supporting their beneficial used were not added to the list, and many streams that are not currently supporting their beneficial uses were de-listed."	The best available data were used to develop the subbasin assessment and TMDL. If additional data exist, DEQ encourages stakeholders to submit the data as part of the §303(d) listing process.
6) "Sediment- The streams in this document need to be examined during periods of the year when they are loaded with sediment, not just at low-flow periods of the summer or before livestock are grazed in the area."	One of the goals of the SBA was to determine the water quality status with regard to the listed pollutants. The available data was used to establish load reductions where applicable. The state water quality standards have provisions that preclude sediment in quantities, which may impair designated beneficial uses. Improved bank stability and riparian vegetation, as is recommended in the document, will decrease sediment loads during high flow events.
7) "The DEQ should pay particular attention to the BLM data that shows ongoing failures by the livestock industry in nearly all Owyhee Resource Area grazing allotments to meet stubble height and trampling standards. Stubble heights were put in place to protect ongoing irreparable livestock damage to streams. Violations of these standards means that streams suffer widespread erosion during runoff periods. This runoff sweeps soils and abundant livestock waste into waters of the TMDL area. It is essential that the DEQ examine and collect data on sediment and other pollutants during runoff for all streams in the watersheds."	The intent of the subbasin assessment and TMDL is to determine if the water quality standards are met and if not, develop a mechanism to meet them. In areas where additional control measures are necessary to meet the standards, and grazing appears to be contributing to the problem (as determined by the appropriate designated agency), the BLM will be involved if necessary. Regarding collecting data during runoff, due to the nature of the flow regimes in the Mid Snake/Succor Creek basin, much of the data is in fact collected during the runoff period.
8) "This assessment inadequately addresses the role of intermittent streams in carrying sediment and other livestock caused pollution into the	As indicated in Appendix E, if one of the streams being evaluated for intermittence "is a large pollutant contributor to downstream waters (such as

streams assessed. Many of these streams are intermittent because of livestock damage; during spring runoff periods they can carry high volumes of sediment and other pollutants (livestock waste) in their waters."	the Snake River), the development of a pollutant management plan will be considered."
9) Bacteria- We request that before the DEQ prepares a Final Assessment/TMDL for these watersheds, bacterial data should be collected in all the streams. As bacteria and livestock fecal matter can contribute to algal growth, brownness, murkiness and other factors that cause turbidity and sediment impairment, it is essential that you do this- even on streams that have not been listed for bacteria so that you can better understand the contribution of these pollutants."	Unless a conclusive amount of data existed (as in the case of sediment for Jump Creek and bacteria for Lower Succor Creek), DEQ only evaluated the §303(d) listed pollutants for each stream. Comment noted.
10) We also request that the Final Assessment/TMDL more adequately address the bacteria caused by livestock grazing on public lands. Livestock use these waters as their private toilets, polluting the water extensively. Yet in this TMDL the words livestock and pollution rarely come up."	See above comment.
11) "Aesthetics- We ask that an analysis of livestock-caused water quality impacts be discussed. Any person recreating on public lands has witnessed the destruction left behind after a season of livestock grazing. The waters are disgusting- polluted beyond a level of tolerance. This is not an appropriate site for the wild lands of the area. The DEQ has failed to assess these for impaired aesthetic values."	To date, we have not received complaints concerning the aesthetic quality of the wadable streams evaluated in the Mid Snake/Succor Creek watershed. However, DEQ encourages public input such as this during the §303(d) listing process. Any other data submitted to DEQ will be evaluated through the Water Body Assessment Guidance to determine support of beneficial uses and future listing on the §303(d) list.
12) "Temperature- Again we ask that the DEQ recognize that lack of shading has resulted from prolonged over-grazing. The devastating effects to the riparian areas can be seen on almost any water body that is visited. Grazing is rarely brought up in this Assessment/TMDL, yet grazing is the root cause for much of the riparian damage."	The temperature TMDLs establish current shading conditions and preliminary shading potentials. The method(s) by which the shading potentials can be reached will evaluate current management actions (including grazing practices if applicable) to determine the necessary solutions.
13) "In order to fully consider and assess the appropriate controls and develop appropriate pollution control actions to limit pollutant loads in the watershed, the DEQ must first recognize and address the causes of the pollution."	DEQ agrees. This information will be gathered during development of the TMDL implementation plan.
14) "CHD would like to request that you analyze water samples from small streams, reservoirs, and springs and seeps for hormones and other chemicals stemming from growth implants in cattle. This is necessary for the simple fact that even in small concentrations the hormones/chemicals can affect aquatic	Investigation of hormones and other chemicals stemming from growth implants in cattle was not within the scope of this document. If data exists which indicates streams are impaired from these types of substances, DEQ encourages public input with appropriate data to support this position during the §303(d) listing process.

organisms."	
15) PG. 4-5, "We do not support these de-listings and believe that the DEQ has not considered all readily available data as required by the Clean Water Act when making these de-listing determinations. These de-listings cannot happen until the livestock issue is address by all agencies dealing with the area. DEQ cannot de-list for temperature until the riparian areas are allowed to re-establish themselves, and this will not happen until the livestock are removed from the area. The same is true for bacteria and sediment. DEQ must address the root causes for these problems and address those before any action can be taken to de-list."	The subbasin assessment and technical appendices show that the streams in Table B being proposed for de-listing are meeting the Idaho Water Quality Standards for the §303(d) listed pollutant(s), regardless of landuse. As such, de-listing for those pollutants is justified.
16) Pg. 57, "When talking about the link between sediment and sediment-bound nutrients, the USDA stated, "the best and most efficient method of controlling growth is by reducing surface erosion and sedimentation". Most of the erosion in the area is caused by over-grazing of livestock. These areas are so heavily used, the land never has a chance to re-grow and stabilize. When the DEQ addresses over-grazing issues then you will be able to address sediment and nutrients."	As indicated on page 57, the USDA statement "the best and most efficient method of controlling growth is by reducing surface erosion and sedimentation" is in reference to the control of aquatic macrophytes. Aquatic macrophytes do not present a water quality problem in the streams assessed.
17) Pg. 59, "You say that for "streams listed for temperature, the pollutant is heat. Streams that have increased width/depth ratios and decreased riparian shading are more susceptible to elevated stream temperatures". Again, the DEQ does not state that both of these problems are associated with livestock grazing."	The intent of the discussion on page 59 is to introduce how SSTEMP will be used in the TMDL to develop "heat" based allocations.
18) Pg. 60, "DEQ states that four stream segments contain erroneous salmonid spawning beneficial use designations. If DEQ is changing the designated beneficial use for these four stream segments, then they must first conduct a Use Attainability Analysis, as required by the Clean Water Act and its implementing regulations. 40 C.F.R. § 131. This is required for any changes to beneficial uses being made. What will be the beneficial uses and criteria of these streams if they are no longer designated for salmonid spawning?"	DEQ will clarify this statement. The intent of the correspondence between DEQ and IDFG is to show that while it may be appropriate for an entire stream (headwaters to mouth) to be designated for salmonid spawning, spawning does not actually exist throughout the entire stream. Very low gradient response reaches, such as those described in Appendix F, may never have been spawning reaches. They do, however, remain important migration corridors. As such, DEQ does not intend to remove the salmonid spawning designation.
19) Pg. 65, "You found that an Idaho Power study on the habitat of the Snake River Plain states that white fish kills are common in the Swan Falls area in the summer and are primarily due to elevated temperatures. We appreciate and support your decision to list the Snake River for Temperature. However, we are concerned with the failure to immediately develop the Temperature TMDL.	The statement "While the DEQ is de-listing streams immediately, it is not immediately listing streams…" is not correct. The process of §303(d) delisting and listing of streams is simultaneous. The actual delisting and listing of streams will most likely not occur until 2005.

While the DEQ is de-listing streams immediately, it is not immediately listing streams found to be violating water quality standards. It would be more efficient and effective to list and develop the TMDL immediately. Especially given the drought conditions which are sure to contribute to more fish kills this summer."	
20) Pg. 70-73, "White Sturgeon, a threatened species are found in the river below CJ Strike Dam and Swan Falls Dam. Unfortunately, it appears that there are few sturgeon to have shown up in your 2000 electrofishing results (p.71). In addition, the Idaho spring snail is located in the Assessment/TMDL area. It is not clear from the Subbasin Assessment/TMDL document whether the water quality standards are protective of these species, and how the TMDL's being developed will enhance these species' habitat. We would like additional information on macroinvertebrate and what conclusions can be drawn from the information. Was your office expecting to find more Idaho Spring Snails? Are populations increasing? How will TMDL's protect and restore these species?	Sturgeon are commonly found over a wide range of substrate although their preferred spawning areas are in turbulent areas of a river. This reach is low gradient with riffles but no significant rapids, limiting the amount of spawning areas. Idaho Power Company studies of sturgeon in this reach have not shown sturgeon mortality and did not result in significant movement changes. In addition, the authors of the report state that no reduction in fish condition was evident based on comparison to sturgeon populations below the Bliss Dam. As tributary streams/drains meet the TMDL targets the habitat of the spring snail and sturgeon will in all likelihood improve. The data-set that DEQ received on the Spring Snail was small and we could not draw conclusions on expected population dynamics of the spring snail.
21) Pg. 75, "CHD believes that it is important to complete a DO TMDL at this time. If the water bodies are violating water quality standards and not supporting beneficial uses because of low DO and for excessive nutrients and algae, then a TMDL should be developed immediately. We are concerned that this failure to develop a TMDL at this time. Again, it would be more efficient and effective to develop a TMDL immediately."	Insufficient DO data was available. Data provided by Idaho Power showed that DO standards were met by IPC below Swan Falls Dam and CJ Strike dam. DO will improve in concert with nutrient reductions.
22) Pg. 84, "You state that "the Castle Creek sample was collected in the middle section of the listed reach and indicates poor diversity within the aquatic insect community". What does this mean and what could cause such poor diversity of aquatic insects? How will the TMDL address this?"	Poor diversity is usually indicative of degraded habitat conditions. TMDL implementation should reduce sediment inputs to the stream, which in turn improves habitat conditions.
23) Pg. 87, "S. Fork Castle Creek Bacteria: The DEQ is de-listing the S. Fork Castle Creek for Bacteria despite their inability to re-sample the stream. However, DEQ claims that their water body assessment process shows this research to be fully supporting its beneficial use. CHD does not support this de-listing, especially since it is not based on any recent sampling of water quality. We would like to see DEQ's assessment for the S. Fork Castle Creek and a detailed discussion of how DEQ made this de-listing determination.	DEQ will delay the TMDL until bacteria data can be obtained in 2003.

What are the other uses of the S. Fork Castle Creek? DEQ is de-listing based on meeting recreational uses, however, what about all of the other designated and beneficial uses for these streams?"	
24) Pg. 134, "CHD supports DEQ's determination to conduct Temperature, Bacteria and Sediment TMDL's for Succor Creek to the Snake River."	Comment noted
25) Pg. 138-139, "CHD supports the TMDL's that will be done for the Snake River, Castle Creek, Jump Creek, North Fork of Castle Creek, Sinker Creek, and Succor Creek. Is there a specific timeline for these TMDL's to be completed?"	The TMDLs for these streams are presented in section 5 of the document. The TMDL implementation plan will be prepared upon TMDL approval.
26) "CHD does not believe that sediment and temperature should be de-listed from the water bodies that are mentioned on pages 138-139. There has not been enough research by your office to warrant these actions. Temperature cannot be de-listed until the root cause, grazing, has been addressed and a plan has been implemented to fix the problem."	The subbasin assessment and technical appendices show that the streams in Table 38 being proposed for de-listing are meeting the Idaho Water Quality Standards for the §303(d) listed pollutant(s). As such delisting is appropriate.
27) Pg. 148, "What "other appropriate measures" will be used when developing the TMDL's? Please list and explain each of the measures. How flexible are these other measures going to be? DEQ provides no cite to their claims that the Federal Rules allow annual or seasonal loads. TMDL means Total Maximum Daily Load, and this is how the load allocations should be developed."	The use of other measures primarily refers to the use of surrogates. For example, percent shading is used as a surrogate for heat (joules). Another example is the use of a 70 µg/l TP target as the nutrient surrogate for narrative water quality standard. The use of surrogates is necessary and practical, otherwise, TMDLs would appear in terms that are difficult to understand and monitor. The use of each surrogate measure is described in the TMDL. Regarding the use of annual or seasonal loads, as opposed to daily loads. Many pollutants cannot be meaningfully described as a daily load. As such, seasonal or annual loads are used.
28) Pg. 152, "Again, no mention of grazing as a cause to the down cut and vertical erosive banks. You state that the improvement of riparian vegetation density and structure would reduce the potential for temperature and bacteria loading in the future. This is good but how is this going to be achieved if grazing is not addressed? These areas are never going to be allowed to re-grow as long as grazing continues."	The appropriate management action to achieve compliance with water quality standards and restoration of beneficial uses will be addressed in the TMDL implementation plan.
29) Pg. 154, "Load Capacity should be monitored at all times of the year, not just during the critical conditions. If you base the amount just on these time periods, you may be missing some important violations."	One of the goals of the SBA was to determine the water quality status with regard to the listed pollutants. The available data was used to establish load reductions where applicable. The state water quality standards have provisions that preclude sediment in quantities, which may impair designated beneficial uses. Improved bank stability and riparian vegetation, as is recommended in the

	document, will decrease sediment loads during high flow events.
30) Pg. 163, "CHD would like to know who will be responsible for the monitoring of the LAs for bacteria in the flood plains and feeding operations? Will there be a specific monitoring schedule? What will be the consequence if the LAs are not met? The DEQ should determine, in developing the TMDL, what role pasture lands and feeding operations are contributing pollutants. The feeding operations must have permits. Are they complying with these permits?"	Load allocations (LAs) are developed for nonpoint sources, Wasteload Allocations (WLAs) are developed for point sources. We are assuming you are referring to nonpoint sources when flood plain is mentioned and point sources when feeding operation is mentioned. Designated management agencies (including DEQ) will use existing authority to regulate nonpoint sources on private, state and federal land (see reasonable assurance section of the document). For feeding operations, (those that meet the definition of CAFO) the facility must have a NPDES permit from the EPA. Currently, the Idaho Department of Agriculture administers the CAFO program in Idaho.
31) Pg. 173, "What is the time period for the general implementation?"	Development of the implementation plan will begin immediately upon approval of the TMDL. The time period for implementation will differ for every water body, but will be outlined in the plan.
32) "This TMDL should calculate time frames for recovery, removing impairment, based on no grazing, limited grazing, removal of livestock from most damaged watersheds, etc. scenarios. What will recovery time frames be under various levels of relief from livestock grazing? The publics is simply not willing to wait your estimated 20-100 years for achievement of water quality standards in these nationally significant public wildlands."	This is the type of information that would be helpful to have in the TMDL implementation plan. DEQ will rely on the affected stakeholders and the designated agencies to develop this kind typo of information.
Comments From: James Desmond Owyhee County Natural Resources Committee Received via e-mail: February 28, 2003	**DEQ Response:**
1) Page xiv: Abbreviations, Acronyms and Symbols: "IRU is not defined but is used on Table 4, page 46."	IRU will be added to acronym list.
2) Pages 4 & 5, "The TMDL summary Table B, shows the final decisions as to those streams for which a TMDL will be completed and the pollutant(s) that are the subject of the TMDL. The table does not specifically identify the stream segment to which the TMDL(s) are applied, leaving the public to believe that an entire stream is subject to the TMDL. For example the TMDL for sediment on Jump Creek applies only to that portion from Mule Creek to the Snake River but the table indicates the entire stream fails to meet the sediment standard. Table B should specifically identify the segment(s) of each stream to which the TMDL applies."	The specific stream segment for which TMDL(s) are applied is located in Table C, on page 5.

3) Page 12: "Vegetation: Junipers are also an invasive species. Juniper invasion is a problem to water quality and quantity. The BLM's Owyhee RMP established plans to remove or burn at least 7,500 acres per year or a maximum of 15,000 for the next 20 in its attempts to control this invasion."	Additional narrative will be added regarding juniper encroachment.
4) Page 13: "DEQ's recognition that redband trout have developed a tolerance for the higher water temperatures found in the Owyhee desert is appreciated."	Comment noted.
5) Page 13: "Regarding "The loss of riparian habitat that cools stream temperatures…" as stated in the draft: DEQ does not seem to recognize or distinguish that this loss may not have been as the result of human activity and therefore an action that can be mitigated by human effort. Natural activity such as fire or extreme high flow water events are known causes of alteration of riparian habitat that must be recognized and addressed in the draft."	Additional narrative will be added to address riparian degradation due to extreme high flow events and fire.
6) Page 14, table 2: "Succor Creek: The table indicates that in the segment including headwaters to reservoir there are a variety of fish species present and seems to indicate all species present in the entire defined reach of the stream. We question this and ask that the locations of the various species be more accurately defined in the table."	Table 2 will be modified to better define the locations at which these fish were found.
7) Pages 20 and 64: "Maps show Rabbit Creek and West Rabbit Creek between Reynolds and Sinker Creeks. There is a creek by the same name but not the one DEQ used for their Assessment and TMDL work. The erroneous Rabbit Creek segments should be removed from the two maps."	All of the appropriate figures will be corrected so that only the §303(d) listed Rabbit Creek is shown.
8) Page 21: "The draft indicates the highest elevation in the area as being 6,500 feet which is not correct. The highest elevation in the area is actually more than 8,000 feet."	This error will be corrected.
9) Page 22, "There is an error in the paragraph regarding movement of ground water. As written the paragraph states, "Water on the north side of the Snake River moves in a southwesterly direction to the river and water on the north side moves in a northwesterly direction to the river. The rate of water movement is dependent on hydraulic head, which varies throughout the watershed." The second reference to "north" in the paragraph, which is depicted above in red, is incorrect and should be corrected to read, "south."	This error will be corrected.

10) Page 24, "The second paragraph of the page contains reference to interpretation of a 1997 aerial photo indicating a 20% forest component. That forest component includes mostly Russian Olive and Tamarisk, both of which are listed as noxious weed species in Idaho. The forest component reference should be eliminated or significantly modified to show the true nature of the "forest" component and with an indication that the two species will ultimately become targets of weed eradication programs."	This will be addressed in the narrative.
11) Page 27, "Regarding the reference in the third paragraph to "dewatering effects": Flow alteration is not a pollutant. Agricultural water diversion is as Idaho DEQ has described on page 50. The reference on page 27 should be made correct and consistent with that description."	This sentence will be remove from the document. While the statement is true in terms of how low flows effects pollutant dynamics, it is inconsistent with DEQs current interpretation of flow and habitat alteration.
12) Pages 32, 103, and 104: "Pages make numerous references to the "town of Reynolds." There is no such town. References should be amended to indicate the "community of Reynolds" or simply "Reynolds."	The document will be changed to reflect the comment.
13) Pages 33 and 101: "Figures 1.11 and 2.34: Maps show only Salmon Creek drainage and Reynolds Creek from outlet weir northeast toward the Snake River. Maps should include the entire watershed of Reynolds Creek."	The maps will be modified to show the entire Reynolds Creek drainage.
14) Page 41: "Fourth paragraph refers to "historic placer mining activities contributed large amounts of fine sediments to the creeks and eventually to the Snake River…" While there were some placer mining operations in the area on the Jordan Creek drainage, almost all the mining in the Lower Snake/Succor Creek watershed was from tunneling. There was some gold dredging along the Snake River upriver from the mouth of Squaw Creek."	These clarifications will be made.
15) Page 41: "The last paragraph makes reference to the effects of grazing on soil compaction and fire frequency and notes a cause and effect connection to water quality. As written, the paragraph provides a false picture of the fire situation and leads to an incorrect inference on the effect of grazing to water quality. As written, the paragraph might reflect the nature of the grazing operations in the county up to the 1920's and the period that began the movement that resulted in the Taylor Grazing Act. However, it is not accurate for the 70 year period leading to the present and does not also consider the government's policies of immediate fire	Clarification will be provided about fire frequency and practices prior to the Taylor Grazing Act.

suppression/elimination that continued to the very recent past. The disruption of fire frequency and methods to return to a natural fire regime is currently a major study project of the USDA Agricultural Research Service that is supported by Owyhee County, BLM, and landowners in the watershed. As the final paragraph on this page attempts to provide a brief history of grazing in the area, it should go beyond describing only those historic grazing impacts occurring on the low elevations of the subbasin and not on the area as a whole. The current focus on the low elevation lands where fire frequency has increased to an unnatural cycle unnecessarily focuses on lands that are not the primary focus of the document and is not a particularly relevant exercise for the TMDL. At higher elevations, fire frequency has been exactly the opposite of what is purported by the TMDL. The discussion also errs by implying that livestock grazing was the only cause of changes in plant communities and fire frequency. In addition there have been major changes in grazing use including reduced numbers, controlled season of use and changes in the kind and class of livestock."	
16) Page 42: "The second paragraph indicates, incorrectly, that Swan Falls dam was constructed to supply power to Silver City. It was constructed, as stated correctly in the draft by the Trade Dollar Mining Company, specifically to provide power for the Trade Dollar Mine. Excess power produced by the mine was distributed to Silver City and other mines and camps."	This error will be corrected.
17) Page 42, "Regarding the last paragraph, land ownership. Since 17.2% of the total land of the county is privately owned, we question the accuracy of the statement that 98% of the land in the watershed is publicly owned."	This error will be corrected
18) Page 44, Regarding Table 3: "We question the population numbers presented within the table, in particular the numbers presented for Murphy and Melba. The numbers appear high for Murphy. Regarding the numbers provided for Melba, the numbers presented do not indicate if the 439 residents indicated are those persons with a residence actually located within Owyhee county and a Melba mailing address or those persons who actually reside within Canyon county. In addition, what is encompassed within the "Murphy Division?"	This table is confusing because the Murphy Division represents a large census division. The population numbers will be clarified. The Melba numbers were obtained from the city clerk.
19) Page 44: "The TMDL lists several water resource activities in the subbasin that are	The Snake River Basin Adjudication will be discussed in the TMDL and information regarding

associated with TMDL-related issues. However, there is no mention of the Snake River Basin Adjudication, which will result in a determination of water right ownership. The final determination of ownership could significantly impact potential actions to implement the TMDL and should at the least be mentioned in the TMDL document. This same section contains references to both the Owyhee County Natural Resources Committee (NRC) and the Owyhee Initiative that are incorrect. Regarding the NRC, the draft incorrectly states that it was formed in 2001 to address watershed issues. In reality, the NRC was formed in 1992 to address a variety of natural resource issues and the effects that management of the state and federal lands located within the county have on the custom, culture and economy of the county. Perhaps DEQ intended this reference to be to the Owyhee Watershed Council? That organization is focused on watershed issues. Regarding the reference to the Owyhee Initiative, the draft states, "The Owyhee Initiative, is made up of a diverse membership of ranchers, environmentalists, and growers who are working towards a management plan for the proposed Owyhee wilderness area." That statement is correct in part. The segment highlighted in red print is incorrect and should be changed to read, "…certain federal lands located within Owyhee County."	the water resource activities in the watershed will be corrected.
20) Page 51: "The second paragraph under Temperature on this page should be reduced to the first two sentences. There is no evidence in the subbasin assessment indicating the occurrence of acute high temperatures and nothing to indicate that instantaneous lethal limits are exceeded. Therefore, the description of instantaneous lethal and acute high temperature impacts should be removed. Similarly, Table 7 should not be included in the TMDL. The study information is for coldwater fish in general. By including the table, the TMDL implies that the data are applicable to Redband Trout within this subbasin, which they are not. Absent specific information relative to the cold water species found in this subbasin it is better not to include data that will significantly mislead the public. The discussion in the second paragraph on page 52 verifies that Redband trout are adapted to different temperature regimes than other salmonids or coldwater species in general."	The table will be modified so that time to death is not included. High temperatures do occur in the watershed and this section describes the mechanism of injury/death to fish. There are fish in the watershed, particularly the mainstem, Snake River susceptible to these lethal mechanisms. Narrative in the TMDL clearly states that Redband Trout have adapted to higher temperatures. However, adaptation does not mean that populations are as fit as they would be at a lower temperature nor does it mean that these impacts do not occur to these fish. They do occur, albeit at higher temperatures than other coldwater fish.
21) Pages 86 and 87: "The narrative for the North Fork of Castle Creek on page 86 indicates that the actual flow level of the stream was unknown.	The narrative is intended to indicate that flow measurements were taken but only near the headwaters. Thus, while the headwaters could be

However, Figure 2.24 on page 87 indicates that the temperature data was based on flow rates > 1 cfs. This contradiction needs to be corrected or fully explained."	characterized, a data gap existed for the downstream reaches of the stream. Further, more flow measurements at the headwaters would be desirable to determine when flows are less than 1 cfs.
22) Pages 98 and 99: "Regarding instantaneous BURP data collected on Reynolds Creek: Those flows measured in 1998 are not normal flows at those points. There was a major storm event that caused the high flow at the highway. Usually the creek is entirely diverted except for seepage at the diversions or limited return flows from the fields above the highway. Regarding the reference on page 99 to the percentage of water being diverted (stated at 78%), that reference has also been skewed by the storm event. Without the effect of the storm event, in general almost all water is being diverted except during spring run-off."	DEQ will add additional text to the document indicating that these flow were likely due to a storm event. DEQ agrees that most of the water in the stream is diverted, as noted in the text directly above Table 20. Regarding the reference to 78% of the water being diverted, the statement will be remove from the document.
23) Page 105: "Regarding the paragraph on surface hydrology and beavers: There is a severe beaver problem a short distance above Highway 78 and for some distance below the highway and again above the Nahas Ranch. BLM has recognized the damage done by the beaver in their stream surveys and recommended drastic action to correct the problem associated with the beaver dams. The beaver consume the desirable shading plants, muddy the waters (which increases the solar gain), and burrow into the stream banks causing more erosion. This TMDL needs to include a narrative analysis of the beaver problem in this area."	A narrative section on beavers will be added into the Sinker Creek section.
24) Page 109: "The TMDL should not use any reference to riparian data from the BLM-Owyhee RMP 1999 because the information in that document is highly subjective and much of it is not based on properly conducted evaluations. For example, most BLM reports of PFC are based on evaluations conducted by a single individual rather than by a team of evaluators as specified in BLM's own manuals. Furthermore, the evaluations do not consider stream potential, as in the case of Scotch Bob Creek that is closely paralleled by the main road to Silver City. The determination of whether a stream is satisfactory is solely a subjective judgment because even properly conducted PFC evaluations do not result in a determination of suitability."	DEQ attempts to use information that will assist in the assessment process. PFC surveys along with streambank inventories are used to identify potential areas of excessive erosion. This type of information will be used during the implementation of sediment reductions in Sinker Creek.
25) Page 111: "In the first paragraph of the section regarding Status of Beneficial Uses the sentence regarding dewatering of the creek should show that the de-watered section is below the Nahas Reservoir."	DEQ staff found the stream de-watered below the road crossing at the Nahas ranch.

26) Page 115: "The first paragraph under Surface Hydrology states, "There are relatively few major diversions or other modifications on upper Succor Creek." However, if even one diversion no matter what size results in the dewatering of the stream it should not be passed off as insignificant as the statement implies. DEQ has been made aware of irrigation diversions that do take all of the water from the stream."	The document will be changed to reflect the fact that there are four adjudicated diversions above Succor Creek Reservoir.
27) Page 116: "Regarding table 30, it should be noted and stated in the TMDL that the wide variation in flows that occur from year to year, and even within the year, is the typical water situation for the streams found within Owyhee County."	DEQ agrees and will add a similar statement to the document.
28) Page 117: "Regarding Succor Creek Reservoir, the TMDL should note that active withdrawal of irrigation water creates an unnatural stream below the reservoir."	The document will be changed to reflect this comment.
29) Page 135: "The data in Table 36 should be depicted on a map to make it more identifiable relative to the drainage area involved."	Figure 2.43 will be geo-referenced to that the monitoring segments shown in Table 36 can be readily identified.
30) Pages 138 and 139: "Table 38 should specifically identify (include a map if necessary) the segments of each stream where the TMDL applies. For example, Succor Creek is listed from the headwaters to the Oregon line for temperature and sediment. However, the information on pages 115 to 135 indicate that a number of segments are not impaired and would not be subject to load reduction requirements. The information appears to be entirely inconsistent and should be corrected and or fully explained."	An additional footnote will be added to Table 38 explaining that in many cases the entire segment of a given water body does not require a TDML. The footnote will refer to Chapter 5 (the TDML Section), where the segments requiring TMDLs are located.
31) Page 142: "Under Temperature, the TMDL states that one anthropogenic factor contributing to heat reaching the water is "loss of riparian vegetation (shading)". This wording purports that shading is being lost and the loss is due to human activity. However, this is not necessarily true and generally does not reflect the current situation. In most cases shading is not being lost but is increasing and the true concern is the amount of shading that currently exists not that it is being lost. Secondly, the historic loss of shading cannot be tied directly and solely to human activity. The great winter flood of 1964 virtually eliminated all shrub and tree components on many streams in this subbasin and many of those are still in a recovery stage because of the simultaneous loss of substrate. The narrative also fails to acknowledge that climatic events such as the 1964 floods are natural	Comment noted. Loss of riparian shading is occurring in some cases and it <u>is</u> an anthropogenic factor. In other cases shade is increasing but that is not a factor in heat reaching the water which is what the discussion was focused on. Additional narrative will be added regarding extreme flood events as well as, in the Sinker Creek section, the effect of heavy pressure by beavers.

factors within this subbasin."	
32) Pages 149 and 150: "Regarding Temperature, the narrative recognizes that this basin exists in a desert environment that subjects the streams to extreme heat during the late spring and summer months. We agree with and appreciate the establishment of the "best achievable temperature" as the appropriate target value."	DEQ acknowledges support of best achievable temperature.
33) Page 156: "We have been unable to find where the sediment contribution (or reduction) relative to estimates of lateral recession have accounted for sediment deposition associated with natural stream function. As long as the procedures identify bare bank contributions of sediment and fail to account for deposition, the estimates of change required to achieve sediment standards will be higher than is the actual case. Since the MOS is based on reference conditions of 85% bank stability instead of 80% there is an excessive MOS for in stream channel erosion because there is already a MOS built into lateral recession estimates that do not account for sediment deposition."	DEQ acknowledges that the stream bank erosion inventory method does not readily account for the fluvial transfer of sediment and it's deposition potential. As such, DEQ agrees that there is an additional, unaccounted for, MOS built into the TMDL. However, note that within each stream segment requiring a TMDL, the particle size distribution measurements are performed in riffles, where scouring, not deposition, is expected to occur. Even so, the percentage of fine material (particles <6mm in diameter) in riffles is high (>30%). This indicates that the additional, unaccounted for, MOS due to in-stream fluvial sediment movement does not negate the need for a TMDL.
34) Various pages including 136, 137, 166, 167: "Various references in the draft refer to the need for collection or verification of data or the validation of proposed methodologies. The draft indicates the intent to commit to a process of adjustment that is intended to provide for changes in approach as new data is acquired, old data is found to be less accurate than previously believed and/or methodologies or models are determined to fall short of predicted accuracy. We appreciate this approach and support it in that we believe that the monitoring and subsequent adjustment of incorrect or incomplete data is a very necessary and critical part of this process."	DEQ agrees. Adaptive management will be an important component of the TMDL implementation plan.
Comments From: Elias Jaca, President Chipmunk Grazing Association Received via mail: February 28, 2003	**DEQ Response:**
1) Page 13, paragraph 4, "The loss of desert riparian habitat that cools stream temperatures…Where is the documentation to validate the statements made in this paragraph."	DEQ has shown in the document (Page 167), and the WAG has agreed, that 55% riparian shading represents a preliminary estimate of the riparian potential for Upper Succor Creek. Current conditions range from 13-16% (Table 53). An increase in the surface area of a stream exposed to sunlight leads to an increase in water temperature. This information substantiates that "a loss of riparian vegetation (shading)" increases water temperature.

2) Page 13, paragraph 4, "regarding fisheries data for tributaries in Table 2: We question whether redband trout is a native or introduced species. Idaho Dept. of Fish and Game have repeatedly planted fish at Chipmunk Meadows."	The Federal Clean Water Act and the Idaho Water Quality Standards require the state of Idaho to protect *existing uses* as well as those used designated in the standards. The natural and historic presence of redband trout in the watershed is well documented in scientific literature.
3) Page 14, Table 2, "In the back of the TMDL document reference is made to the data collected regarding fish. There are copies of correspondence between IDEQ and the IDFG. No hard data is shown to document this chart. Historically, information given by the members of Chipmunk Grazing Association states that in thirty five years there have been very few, if any, fish observed from the headwaters of Succor Creek to Granite Creek."	A footnote will be added to Table 2 indicating the method(s) by which the data were collected. In most instances, the data were collected using a backpack electrofisher.
4) Pages 27-40, Regarding Subwatershed Characteristics, "Pertaining to the above pages, DEQ has maps of all of the subwatersheds except for Lower Succor Creek. The lower portion of Succor Creek is included in this TMDL, but is "lumped" together in the watershed. DEQ needs to identify Upper Succor Creek and Lower Succor Creek as different subwatersheds. The data for Upper Succor Creek and the data for Lower Succor Creek should be addressed for each subbasin individually."	An additional map delineating Lower Succor Creek from Upper Succor Creek will be added to the document.
5) Page 41, History and Economics, "The introduction of cattle resulted in…soil compaction." "The change in plant composition resulted in plant composition resulted in a greater frequency of fires in the area." This is not true. Before the Taylor Grazing Act, large numbers of cattle and sheep grazed the rangelands and this reduced the fuel loads that would carry fire. The last paragraph on page 41 states "Grazing has had long-term effects on streams hydrology and vegetation. The introduction of cattle resulted in a decrease of native perennial grasses and an increase in soil compaction because of trampling by concentrated numbers of livestock." There is no reference to the actual facts of this statement. If these statements are to remain in the TMDL they must be documented for credibility."	Additional narrative and references will be added to address this comment.
6) Page 51 Table 7, In regards to the fish mortality study cited in this chart, there is question to the practicality of applying this model to a real stream. This test is done by thermally induced temperatures, similar to a "boiling pot". Streams do not naturally increase in temperature in this same fashion. If Table 7 is included in this TMDL a reference and description of how this experiment	Additional narrative will be added. Also Table 7 will be modified.

was conducted should be included.)	
7) Page 58-59 Date Assessment Methods – It would be beneficial to also use the Proper Functioning Condition (PFC) as an assessment tool. The BLM has reference manuals for this and there is a Standard Stream Riparian PFC Checklist that can be used as another tool for data assessment. In addition, if through this data assessment method a stream is determined to be in proper functioning condition, it may then be beneficial to determine if there is a need for further TMDL development on that stream. PFC would prove to be an additional tool to help in the Stream Bank Erosion Inventory addressed on page 59.	DEQ agrees that the Proper Functioning Condition protocol is a valuable tool and intends to integrate it into the TMDL implementation plan as one option for tracking and documenting management actions. Unfortunately, PFC is not designed calculate sediment loading. As such, it was not used in TMDL development.
8) Page 65- Figure 2.4 July 14, 2002. Fish kill on the Snake River at Walters Ferry. The statements made in the first paragraph in sentences five and six are enough explanation without a picture of this magnitude. The picture is not crucial in making the point. This picture could very well create bias and/or a negative impression. It is recommended to leave the statements in but remove the picture.	The picture is evidence of beneficial use impairment.
9) Page 115, Surface Hydrology—The statement within this paragraph "There are relatively few major diversions or other modifications on Upper Succor Creek." This is an inaccurate statement. There are four major diversions with adjudicated water rights on Upper Succor Creek above the Succor Creek Reservoir.	The document will be changed to reflect the fact that there are four adjudicated diversions above Succor Creek Reservoir.
10) Page 117, Pertaining to bacteria: there are no data available for Upper Succor Creek	Bacteria conditions were not assessed for Upper Succor Creek.
11) Page 117, In reference to Succor Creek Reservoir—The Succor Creek Improvement Co. has drained the reservoir several times to work on the head gate. The Idaho Fish and Game Department shocked the fish as they were draining the reservoir and transplanted them elsewhere.	DEQ will add text to document to reflect the comment. However, this maintenance is not part of the reservoirs normal operational procedure.
12) Page 120, There are no water column sediment data available for Upper Succor Creek	As indicated in the document, this is correct. Water column data is of less utility when bank erosion is the primary source of sediment.
13) Page 123, There is not a numeric value against which TSS conditions in Succor Creek can be compared. Site-specific conditions must be assessed to get accuracy.	This is correct. The Idaho Water Quality Standard for sediment is narrative, meaning there is no numeric value with which to compare results.
14) Page 124, Re. Wolman Pebble Count—there is insufficient hard data to support the "data assessment methods sections describe linkage etc.)	The assessment method is documented in the text on page 124 and in the 'References Cites' section as Wolman (1954). The Wolman (1954) pebble count

	procedure is a well know and often used (by many states) method of determining particle size distribution.
15) Page 125, Paragraph two below Table 33. Regarding the Data Assessment Methods there is no hard data to support the statement "data assessment methods section describe linkage that has been developed between bank stability and fine substrate material."	Other TMDLs developed by DEQ have used similar linkages (see Referenced Cited, DEQ 2001 a,b). Additionally, this TMDL supports the linkage. In segments of Upper Succor Creek where banks were <80% stable, the percentage of fine material (particles <6mm in diameter) exceeded 28%. In segments where banks were >80% stable, the percent fine material was less than 28%.
16) Page 125, regarding temperature the period of collection is questionable due to access and vandalism.	Comment noted.
17) Page 126, There is no data available during the spawning period	Comment noted.
18) Page 129, Figure 2.53 and Figure 2.54, Assumed temperatures are used before 6-6-95 28) Page 132 First paragraph, last four lines- "However, due to insufficient data, the entire critical period for cold water aquatic life cannot be evaluated. Data not available for the period between August 22 and September 21.	To account for the data gap, DEQ assumed that all temperatures prior to the date when data became available were BELOW the criteria, which may not be the case. Even with this assumption, greater than 10% of the data still exceeded the spawning daily average criterion (as shown in Table 35).
19) Page 133, due to insufficient data the entire period cannot be evaluated as necessary for accurate results.	DEQ acknowledges that data for the entire critical period would increase the accuracy of the document.
20) Page 133, During the period of August 22 to September 21 there is no data available and therefore "assumptions" were made. There is also reference on this page to "However, again due to insufficient data…"	Comment noted.
21) Page 133, Actual data collected was from June 19-July 15 and then "assumptions" were again made.	Comment noted.
22) Page 134, In the first paragraph it refers to no data being available above the reservoir and then goes on to explain that because of that DEQ assumes that segment to also exceed the criteria. Assumptions on Upper and Lower Succor Creek being the same should not be made. The statement made in the second paragraph on this page, next to the last sentence, "… a determination is difficult to make due to limited data…"	The assumption being made is that since daily average temperatures in the stream from the headwaters to end of Chipmunk Meadows are above the criterion, it is likely that temperatures from Chipmunk Meadows to above the reservoir are also above the criterion. No comparison is being made to Lower Succor Creek, which extends from the Oregon line to the Snake River.
23) Page 136 Paragraph one, line three ".. DEQ acknowledges there are additional data that would be helpful to increase the accuracy of the analyses. "this in regards to the data gaps. Again it is	The model validation work in Appendix G shows that in fact, the model was quite reliable at calculating the actual stream temperature. DEQ feels that enough data were collected to develop the

questionable whether there is enough basic data to make assumptions or to plug into the models for temperature. In the paragraph right below Table 37, this paragraph addresses that efforts will be made to fill the data gaps, however it is questionable with the amount of data collected whether it validates the TMDL. It is questionable as to how recommendations for TMDL Implementation can be made if more data is needed.	TMDL, but acknowledges that additional data would improve the accuracy of the allocations. It terms of TMDL implementation, the ensuing plan will take an adaptive management approach. This means that progress toward meeting the TMDL goals will be tracked as control measures are implemented. As such, data gaps do not preclude moving forward with implementation.
24) Page 142, Fourth paragraph, third sentence under the Temperature heading "…and a loss of riparian shading.: Is this a substantiated statement and if so, by what source, or is this an assumed statement that there has been a loss of riparian shading. There should be reference data and/or pictures to support his statement or else that portion of the statement should be removed.	The geomorphology of Upper Succor Creek is such that there should be greater than 13-16% shading, which is where the stream lies currently (Table 53). DEQ has shown in the document (Page 167), and the WAG has agreed, that 55% riparian shading represents a preliminary estimate of the riparian potential for Upper Succor Creek. Given that current shading ranges between 13-16%, movement toward the potential is appropriate.
25) Page 153, Monitoring Points—In regards to this paragraph, it is questionable as to whether sufficient data has been collected on Upper Succor Creek to get accurate data from enough segments of the stream to produce recommendations for the TMDL. There is reference at the end of this paragraph that this was due to lack of access to private property. It should be noted there was never any written request to the Chipmunk Grazing Association of which I am a member, for access to these private properties, therefore access was never approved or denied.	DEQ feels that the best available physical, chemical and biological data were used to develop the subbasin assessment and TMDL. DEQ is legally compelled to complete the Mid Snake River/Succor Creek TMDL by December 2002. Given the short time frame, DEQ collected as much additional data as possible to aid in development of the subbasin assessment and TMDL. Regarding access to private properties in Upper Succor Creek, the comment that access was never approved or denied is noted.
26) Page 209, The statement referring to the Mid Snake/Succor Creek subbasin assessment uses the site-specific spawning period for redband trout. The basin specific spawning period is March 1 through June 15. There is not site specific data pertaining to Upper Succor Creek. Readings were taken mostly in June. The critical time stated for spawning is earlier in the year.	The temperature data displayed on pages 127-131 are in fact basin/site specific (to the Mid Snake/Succor Creek basin). However, DEQ agrees that in most cases data were not available for the extent of the spawning period. To account for that data gap, DEQ assumed that all temperatures prior to the date when data became available were BELOW the criteria. Even with this assumption, greater than 10% of the data still exceeded the spawning daily average criterion (as shown in Table 35).
27) Throughout this document there is reference to "lack of data" and due to this lack of data the words "assumptions were made" are used repeatedly. Basing determinations on lack of data or assumptions lacks credibility."	Comment noted.
28) In reference to the chart on page 116, Table 30. Flows in Upper Succor Creek—these flows are not accurate. For thirty-five years the members of Chipmunk Grazing Association have never	It is DEQ's belief that the flows shown in Table 30 are accurate. The flows were determined following the standard set-interval method using a calibrated Marsh-McBirney flow meter. The documentation

witnessed these excessive flows at that time of year. Where is the documentation to support this chart?	to support this chart is located in the Boise Regional Office files
Comments From: Richard and Connie Brandau Wilson ID Received via fax: February 28, 2003	**DEQ Response:**
1) xiv, The acronym IPC is used as a reference, please include it at xiv: Abbreviation, Acronyms, and Symbols. 2) Page 10, paragraph 3, Pertaining to climate --- The statement that the "closest climate station... is located in Boise" and "the climate in Boise is also semi-arid and thus, relatively similar" is totally ludicrous. This DEQ assessment staff chose to use the climatic gauging station information from Western Regional Climate Center at http://www.wrcc.dri.edu/climsum.html (page 248) when there are two weather reporting stations located within the boundaries of this watershed, one near Oreana and one at Reynolds Valley. One phone call resulted in the following information: In response to your request about data availability at the Reynolds Creek Experimental Watershed: We recently published a data summary in Water Resources Research (2001, volume 37, pages 2817-2861) that describes the watershed data collection efforts and data that is available over the web at our anonymous ftp site (ftp.nwrc.ars.usda.gov in the directory "databases/rcew"). We can also put the entire database on a CD for anyone that does not have web access. This site does not contain all of the data that we collect and only covers 1962 to 1996. We are planning to update the on-line database in the next year or so. In the mean time, we can provide more recent data in response to individual requests. Our precipitation network is the most extensive. We have collected continuous precipitation data since 1962 from 12 sites and records of various lengths for an additional 41 sites. We are currently monitoring about 28 precipitation sites and have been upgrading all of these to full meteorological status (wind speed and direction, relative humidity, air temperature, solar radiation etc.). We also collect meteorological data at 4 sites out in the Snake River Plain, two sites in the Boise foothills and at one of our remote field locations near Denio, NV. We are hoping to deploy an additional 6 met sites out in the South Mountain area of Owyhee County in conjunction with our Juniper hydrology project. Just let us know if you need any specific data. Thanks....	IPC (Idaho Power Company) will be added as an abbreviation The statement on Page 10, paragraph 3 says "The closest climate station **that gives percent possible sunshine** is located in Boise, which is the adjoining watershed." The Reynolds Creek Experimental Station or any of the other local weather stations do not provide percent sunshine. The paragraph goes on to say "The **climate** in Boise is also semi-arid and thus, relatively similar. This is a true statement. Factors such as the movement of air masses across pressure ridges, the proximity of an area to the ocean, and the angle of the sun at certain times of year dictate a region's climate. Owyhee County and Ada/Canyon Counties are certainly in the same region and thus, have the same climate. Having said that, DEQ acknowledges that the Mid Snake River/Succor Creek basin and the Boise area often do not have the same weather. Weather is described as daily or seasonal fluctuations in temperature, precipitation and winds. For purposes of populating the SSTEMP temperature model, DEQ always used data from the nearest weather station that provided the necessary data.

(copy of letter attached)	
2) With such a wealth of onsite information at hand why use climate data from outside (Boise and Grand View) the watershed?	See above comment. Grandview is within the watershed.
3) Page 21, paragraph 1, Topography Please explain the statement and define terminology "overall relief ratio - is 0.02"	This term will be removed from the document.
4) Page 21, paragraph 1, The general characterization that all of the streams in the watershed flow north is false and presents a basis for discounting the "azimuth" related conditions which definitely affect the temperature of east/west streams flowing through narrow basalt canyons: ie: Castle Creek, Sinker Creek, Upper Succor Creek,.	DEQ acknowledges the comment and will remove the word "north" from the sentence. Regarding the use of azimuth in the SSTEMP temperature model, the stream-segment specific azimuth was always used. Thus, the effect of sun angle on stream temperature is accounted for.
5) Page 21, paragraph 2, The statement "The highest elevation of 6,500 feet is found in the Silver City Range bounding the southern edge of the watershed" shows lack of attention to detail. A higher elevation is on Squaw Butte, located near the heart of the watershed, which is 6,740 feet. Three subbasin watersheds form off of the immediate peak of Squaw Butte (McBride, Squaw, and Cottonwood) and within one mile of the Butte are the basin heads of Hardtrigger and the Reynolds Creek tributaries of Salmon, Fart, Cottle and Macks Creeks.	This correction will be made.
6) Pages 29 through 40 Maps: The TMDL Report Glossary defines STREAM in part as "a natural water course containing flowing water, at least part of the year." Yet the maps include dry sand washes and gulleys under the Legend as streams. If I were to use this as a reference I would expect to be able to go to those "streams" shown on the maps and find water. At sometime in the future will this be used as a reference to "historically watered areas"? I would suggest removal of the normally dry wash and gulley locations or perhaps reference them differently in the map legends because they definitely DO NOT "normally support communities of plants and animals within the channel and the riparian vegetation zone."	DEQ agrees with the comment. Additional clarification will be made on the legends of each map.
Page 41 1.3 Cultural Characteristics	
7) Page 41, paragraph 5, If you would delve a little deeper into the history of Owyhee County you would find that the inference to placer mining in the creeks of the Succor Creek Subbasin actually took place on the streams flowing into the Owyhee River. None of the "north slope" creeks	These corrections will be made.

we are dealing with in this document ever yielded up gold or silver. The statement that "Mining sources were nearly depleted by the late 1800s" is made in error. Mining continued to prosper well into the 1900's and the mines still come back into production when gold prices rise above a certain level.	
8) Page 41, paragraph 6, The paragraph on cattle a sheep grazing reflects that "by 1869 there were several thousand head of cattle in Owyhee County." The Owyhee County, Idaho "Blue Book" published in 1898 on page 13 states " In 1882 the number of cattle assessed in the county was 24,559" and " in 1885 it was estimated that there were over 60,000 head of cattle within the confines of Owyhee County" and also " in 1888-9 the cattle interest in the county reached their maximum and there was at that date over 100,000 head of cattle in the county". It then states that due to severe conditions "the cattle trade gradually shrank to its present condition, there not being over 15,000 head in the county" but "the sheep industry has risen to - over 150,000 head."	Corrections will be made in TMDL.
9) Page 41 & 42, It would lend more credibility to this document to correct some of the statements pertaining to the history and economics. Also some of the remarks to fire frequency in relation to plant composition need to either be referenced or if a matter of opinion - deleted.	References will be added.
10) Page 42, paragraph 1, Irrigated agriculture in the Succor Creek Subbasins dates back, not to the 1880's, but prior to the 1860's. Five SRBA water rights in Reynolds Creek Basin 57-R alone have priority dates of June 1, 1864.	Correction will be made.
11) Page 42, paragraph 2, As Swan Falls is closer to Murphy than it is to Kuna I would suggest this paragraph begin "Located between Kuna and Murphy, at river mile" etc.	Clarification will be made.
12) Page 42, paragraph 3, The first sentence of paragraph three makes more sense if it is included with the information in Paragraph 4, while the second sentence takes on more meaning when included within the context of Paragraph 5. Rather than saying the watershed is "sparsely populated" (by whose definition) this paragraph would make more sense reading something like: Ninety-eight percent of the land in the watershed is publicly owned creating a wide dispersal of the population on the remaining two percent of privately owned land. The primary economic activities of the more populated privately owned	Comment noted: will incorporate parts of suggested wording.

land areas consist of farming, ranching, livestock production, dairies, and related agricultural industries. The economic activities are the supporting structure/base for the towns and communities of Oreana, Murphy, Reynolds, Guffy, Wilson, Givens, Marsing and Homedale and their businesses, located within the Succor Creek Subbasin.	
13) Page 42, Paragraph 4, Please include as crops that are farmed: alfalfa hay, grass hay and pasture. These you state later in the document are the main crops in some areas.	These crops will be included.
14) Page 44, Table 3, Mid Snake River/Succor Creek Watershed Demographics: I highly doubt that any census will confirm the numbers used for the population of Murphy under the Town listing. At least be consistent in the listings; don't use "Murphy Division" without explaining what the difference in meaning is. According to the Owyhee County Clerk Charlotte Sherburn, the "population of Murphy varies between 70 and 80" with 77 currently listed on the water billings. Quite a difference from the 1,512 this Draft lists as the 2000 population.	The census information is confusing because the Murphy Division is a census division not actual town population. This section will be rewritten to provide clarification.
15) Page 44, Paragraph 1, Swan Falls dam is better described as located between Kuna and Murphy (as it is closer to Murphy than it is to Kuna)	Clarification will be made.
16) Page 44, Paragraph 3, The Owyhee Natural Resource Committee was formed prior to 1994, originally as the Owyhee County Natural Resource Planning Committee. Its name was changed by the Owyhee County Board of Commissioners in 2001 to Owyhee Natural Resource Committee to avoid being confused with the Owyhee County Planning and Zoning Commission. The purpose of the committee is to keep the Board of County Commissioners informed and advised of any and all issues related to the natural resources issues within Owyhee County, and which may include TMDL related issues. You may contact the Director of the Owyhee County Natural Resource Committee (Jim Desmond) for verification of these facts.	Corrections will be made.
17) Page 44, paragraph 5, The reference to the Owyhee Initiative group and the statements made in this draft document should be verified with the Chairman of that group before these assumptions are committed to print. It is presumptuous of DEQ to make statements as to the focus and goals of this group whose actions will be dictated by the	This statement will be rewritten.

passage of (as yet unproposed) legislation.	
18) Page 45, Tables 4 & 5, The footnotes under both Table 4 and Table 5 "refers to a list created in 1998". Please explain how streams came to be on this list that was created, and by whom.	This information will be added to the footnotes.
19) Page 46, 48, 82, and 249, "Attainability" is briefly mentioned on these pages. Has a "detailed evaluation of the attainability of uses" been done for streams in this watershed? If so where is that information located. Page 82, Will "use attainability analysis" be included as a part of the implementation stage or should it have been addressed in this, the assessment stage?	An evaluation of the attainable uses has not been performed for the streams in the Mid Snake/Succor Creek watershed. All practical control measures must be put into place before the Federal Clean Water Act allows beneficial uses to be changes. That is not the case in this watershed. Preferably, and if warranted, as may be the case with Castle Creek, a use attainability analysis is performed prior to the assessment stage. DEQ is in the process of determining whether a UAA is warranted for Castle Creek.
20) Page 51, Table 7, Please take the time to explain in detail the method of heating the water that resulted in the "thermally induced coldwater fish mortality. It is my understanding that this is the infamous "boiling pot" method whereby water is artificially heated from the bottom up. Streams (other than those with geothermal water sources) do not heat from the bottom up, but rather are heated by solar radiation from the top down, with cooler water pooling at the bottom. Using the Oregon DEQ 2002 mode of thermally induced mortality is about as comparative as making sun tea versus boiling up a strong pot of the hot English brew.	Additional narrative will be added to explain the study methods.
21) Page 65, Figure 2.4, Please move the fish kill photo to its appropriate location immediately below Temperature, between Paragraph 1 and Paragraph 2. It can and will be viewed out of context in any but its appropriate location. This photo may have more negative and/or detrimental impacts than are warranted by its inclusion in this document.	The photo will be moved to the suggested location.
22) Page 87, Table 2.24, Even though the Mid Snake River and its surrounding watersheds are part of the most active geothermal areas in the state of Idaho, this TMDL does not address the effect of geothermal activity on water temperature. Hot wells, both artesian and pumped, abound in this watershed. There is extensive data pertaining to geothermal activity available at IDWR. Underground springs provide a continual source of thermal heating in the Snake River in the Wilson area. Visual evidence of thermal activity can be observed any cold morning by simply looking for an exceptional amount of steam rising from the	Thermal activity will be addressed as part of the thermal site potential study of the Snake River. Geothermal heating is being investigated as part of the temperature study on Castle Creek.

water body, be it the river, creek, spring or well. Temperature in relation to geothermal heating needs to be addressed where appropriate.	
23) Page 151, these conclusions were drawn using empirical derived characteristics and concepts. There are numerous statements of "no available data" "insignificant data", "assumptions" "is difficult to determine due to limited data" scattered through this document. The terms "EMPERICAL characteristics" and "EMPIRICALLY derived" are used. Please include the definition of "empiric" and/or "empirical" in the glossary. The New World Dictionary of the American Language Second College Addition defines them as: empiric em.pir.ic 1. a person who relies solely on practical experience rather than on scientific principles 2. (Archaic) a practitioner without proper qualifications and regular training; charlatin; quack empirical em.pir.i.cal 1. relying or based solely on experiment and observation rather than theory (the empirical method) 2. relying or based on practical experience without reference to scientific principles (an empirical remedy) empiricism em.pir.i.cism 1. experimental method; search for knowledge by observation and experiment 2.a) a disregarding of scientific methods and relying solely on experience b) quackery 3. the theory that experience is the only source of knowledge	The word "empirical" will be added to the glossary. It is important to understand the context in which the word empirical is used on page 151. The sentence says, "This sediment analysis characterizes sediment loads using average or seasonal rates determined from **empirical characteristics that developed over time within the influence of peak and base flow conditions.**" The sediment loads are calculated mathematically, but the characterictis that cause those loads are empirically derived due to flow conditions. In other words, nature is empirical. DEQ uses mathematics to describe nature.
24) Page 227, Appendix Photographs, I think that it would be appropriate to include the photographs provided to DEQ of the Upper Succor Creek reach (from Horse Thief upstream to Big Cottonwood) that were taken on October 19, 2003. I have the originals and the negatives if they are required.	Two of the photographs provided to DEQ will be inserted into the document to help describe flows in Upper Succor Creek.
25) Page 271, Appendix I. SSTEMP Model Inputs and Outputs - Model Run Sheets, There is an extensive amount of data available from the Agricultural Research Service by which the accuracy of the SSTEMP Model used for this TMDL can be checked. The proofing would be very beneficial, especially in face of the fact that ALL of the base meteorological information	There are 152 weather stations for Idaho on the Western Regional Climate Center web site. One of the stations is located in Reynolds. The link is: http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?idreyn The Reynolds data was used to populate nearly all of the meteorological information for SSTEMP (Succor Creek). Data from Boise was only used when local data were not available. Additionally,

plugged into the SSTEMP Model is taken from a source located over 50 miles from, and thousands of feet in elevation below, the site on Succor Creek (does this also apply to Diamond Creek?). <u>Reynolds Creek</u>	the data were corrected for elevation where applicable.
26) Page 21, Paragraph 2 , The statement "The highest elevation of 6,500 feet is found in the Silver City Range Bounding the southern edge of the watershed" shows lack of attention to detail. One location with a higher elevation is Squaw Butte, located near the heart of the watershed, which is 6,740 feet. Three subbasin watersheds form off of the immediate peak of Squaw Butte (McBride, Squaw, and Cottonwood) and within one mile of the Butte are the basin heads of Hardtrigger and the Reynolds Creek tributaries of Salmon, Fart, Cottle and Macks Creeks.	This correction will be made.
27) Page 99, The statement "The 1998 BURP notes indicate that on July 1, 1998, approximately 75% of the water was being diverted" is incorrect and implies a condition/situation that did not exist. The Reynolds Creek Watermaster's diary attachment CB1) notes that on July 2, 1998 there is about 200 inches (4.00 cfs) of water going past the last ditch diversion" That amounted to 2% of the 8,252 inches (41.26 cfs) that was being diverted/used for irrigation (attachment CB2). So 98% of the waters of Reynolds Creek were being diverted for irrigation, NOT 75 % as stated. The only reason that water was going past Highway 78 at that point was because on 6/24/95 the immediate area received approximately .75" of rainfall, creating high water which took out some of the diversion dams. By July 8th the diversion dams had been repaired and/or replaced and all of the adjudicated waters of Reynolds Creek were again being diverted. As noted by the watermasters diary for 1998 this was an extraordinary year for rainfall and late water. For verification this information including the water measurement for June/July 1995 is part of the permanent records of the Idaho Department of Water Resources-Western Region. Please correct the original statement to reflect more accurately the conditions at that time, 1995. The correction may help to avoid future false assumptions that there is normally excess water available during that time of year.	This statement will be removed from the document.
28) Page 99, Table 20, An additional footnote (2) should indicate that Brandau Farms 1.57 cfs is also included in the combined R.I.D. Lateral (Bernard Ditch) 17.24 cfs (it can be diverted at either location). I don't know if it would be appropriate	An additional footnote will be added to Table 20 reflecting this information.

at this point, or time, to acknowledge or address the "high flow" water rights as recognized in the Snake River Basin Adjudication.	
29) It may be of value to note that during the March 15 to November 15 irrigation season, the total Snake River Basin Adjudication decreed water rights for Reynolds Creek Basin total 104.56 cfs.	This information will be added to the document for informational purposes only.
30) Page 99, Table 21, For future reference it might be beneficial to also include an additional table listing the highest flow events chronologically. This would clearly show that some of the highest events occurred within the same season and also emphasize the extreme variation in timing and volume of runoff from year to year: 01-31-63 2,331 12-23-64 3,850 01-28-65 1,113 06-11-65 1,113 01-21-69 899 01-27-70 728 03-02-72 667 06-11-77 1,119 01-11-79 1.662 02-25-82 2,082 04-11-82 861	DEQ agrees. Table 21 will be changed to show the flow events chronologically.
31) I would like to complement the staff at IDEQ on doing a good job given the limited time and funding parameters they had to work within. Personally we had three years of professionally collected data to offer, historical anecdotes from Henry Brandau a lifetime resident on Reynolds Creek, and a wealth of photographic documentation of "events" on Reynolds Creek. Thank you for analyzing and utilizing that information pertaining to the Reynolds and Hardtrigger Creek portions of this Draft TMDL.	Comment noted.
32) One suggestion I would offer to DEQ in establishing future Watershed Advisory Groups would be to contact property owners within the watershed at the onset. It is much more productive for DEQ if landowners can be informed and included from the onset than it is to try to placate at the end of a process. This could be done by way of an informative letter at the beginning of the TMDL process, letting them know what type of data or information would be most beneficial to them and/or DEQ and could perhaps include an access agreement. You know your job best and need to inform stakeholders of what your job is. Your job will become more effective by utilizing	DEQ agrees and intends to do so in upcoming TMDLs.

the wealth of information that can be provided by those who live with the land and the water on an intimate, everyday basis.	
Comments From: A compilation of comments from: Craig Baker, Richard Brandau, Connie Brandau, John Cossel, Kent Frisch, Mark Frost, Ted Gammett, Winston Gammett, Jerry Hoagland, Elias Jaca, Inez Jaca, Duane LaFayette, Gwen Miller, Paul Nettleton, William H. Parker, Brenda Richards, Robert Thomas. Submitted by Connie Brandau Received via fax: February 28, 2003	**DEQ Response:**
1) These comments are not intended to denigrate the efforts of the DEQ staffers who put the Draft TMDL document together. We applaud their efforts given the time and funding constraints under which they labored. These comments are made to address (and hopefully correct) the more obvious areas of inadequacy and factual error, which as drafted make this document unable to stand the test of accuracy. Some of the inaccurate information may be of a minor issue, but serves to show the unfamiliarity of the authors with even the basic historic, cultural and economic issues of the area. Accuracy lends credibility. When this document cannot supply even credible basic background information, the limited amount of data upon which the conclusions of this document are based, become extremely questionable. For the sake of future reference by whomever uses this document we point out/emphasize that this is the first stage of an extremely long term and continually ongoing planning process. The goals can only be met through continued cooperation and communication, by establishing uniform monitoring practices and guidelines, and continually updating that information/data in an understandable productive way. The staff has done a good job considering the fact that they have limited resources, personnel and time in which to accomplish the task at hand. I would like to state that I realize the need for this process, I'm only a little disappointed in the seemingly incompleteness of the finished product. We would like to thank the members of the WAG and DEQ for all the time and effort that went toward the completion of this Subbasin Assessment. After reviewing the Mid	Comment noted. Comment noted Comment noted Comment noted Comment noted

Snake/Succor Creek Sub-basin Assessment and TMDL, we feel it was a good Assessment and TMDL, but we do have a few concerns and recommendations.	
2) Page xiv, Abbreviations, Acronyms, and Symbols, IRU is not defined, but used on Table 4, page 46	IRU will be added to the Abbreviations, Acronyms, and Symbols list.
3) Pages 6 - 44, When describing the watershed characteristics, there is no mention of the effects that wildlife may have in respect to water quality issues. Please be sure to note that concentrations of wildlife such as elk and wild horses may have negative effects on riparian areas, thus effecting water quality.	A discussion of BLM's management objectives for wild horse populations will be integrated into the subbasin assessment.
4) Page 10, paragraph 3, Pertaining to climate --- The statement that the "closest climate station... is located in Boise" and "the climate in Boise is also semi-arid and thus, relatively similar" is totally ludicrous. There are two weather stations located within the boundaries of this watershed, one near Oreana and one at Reynolds Valley. One phone call resulted in the following: In response to your request about data availability at the Reynolds Creek Experimental Watershed: We recently published a data summary in Water Resources Research (2001, volume 37, pages 2817-2861) that describes the watershed data collection efforts and data that is available over the web at our anonymous ftp site (ftp.nwrc.ars.usda.gov in the directory "databases/rcew"). We can also put the entire database on a CD for anyone that does not have web access. This site does not contain all of the data that we collect and only covers 1962 to 1996. We are planning to update the on-line database in the next year or so. In the mean time, we can provide more recent data in response to individual requests. Our precipitation network is the most extensive. We have collected continuous precipitation data since 1962 from 12 sites and records of various lengths for an additional 41 sites. We are currently monitoring about 28 precipitation sites and have been upgrading all of these to full meteorological status (wind speed and direction, relative humidity, air temperature, solar radiation etc.). We also collect meteorological data at 4 sites out in the Snake River Plain, two sites in the Boise foothills and at one of our remote field locations near Denio, NV. We are hoping to deploy an additional 6 met sites out in the South Mountain area of Owyhee County in conjunction with our Juniper hydrology project. Just let us know if you need any specific data. Thanks.... (copy of letter attached)	The statement on Page 10, paragraph 3 says, "The closest climate station **that gives percent possible sunshine** is located in Boise, which is the adjoining watershed." The Reynolds Creek Experimental Station or any of the other local weather stations do not provide percent sunshine. The paragraph goes on to say "The **climate** in Boise is also semi-arid and thus, relatively similar. This is a true statement. Factors such as the movement of air masses across pressure ridges, the proximity of an area to the ocean, and the angle of the sun at certain times of year dictate a region's climate. Owyhee County and Ada/Canyon Counties are certainly in the same region and thus, have the same climate. Having said that, DEQ acknowledges that the Mid Snake River/Succor Creek basin and the Boise area often do not have the same weather. Weather is described as daily or seasonal fluctuations in temperature, perception and winds. For purposes of populating the SSTEMP temperature model, DEQ always used data from the nearest weather station that provided the necessary data.

5) With such a wealth of onsite information at hand why use climate data from outside (Boise and Grand View) the watershed?	Local data were used where possible. See response above.
6) Page 10 "Closest weather station" The closest weather station to Grand View and Oreana is located south of Grand View and is operated by the US Bureau of Reclamation. http://mac1.pn.usbr.gov/agrimet	See DEQ response above, comment #4
7) Page 10, Reference to "the climate is Boise is also semi-arid and thus, relatively similar." I live in Oreana, situated just off highway 78 between Murphy and Grand View. Using the rainfall figure 1.1, the difference between Boise and Grand View is an astonishing 60%. Listening to the weather reports on Boise television and radio, I've become aware of differences in even which direction our storm fronts approach.	DEQ agrees that weather patterns are different. However, the climates are the same. See DEQ response above, comment #4.
8) Page 12, Vegetation, Junipers are also an invasive species. Juniper invasion is a problem to water quality and quantity. The BLM-ORMP plans to remove or burn at least 7,500 acres per year or a maximum of 15,000 for the 20 years just to maintain control of their invasion.	Narrative about juniper encroachment will be added.
9) Page 13, DEQ's recognition that redband trout have developed a tolerance for higher water temperatures found in the Owyhee desert is appreciated.	Comment noted.
10) Page 13, The loss of riparian habitat that cools steam temperatures... the loss may not have been anthropogenic, but natural as in fire or extreme high flow events.	DEQ agrees that at times the loss of riparian habitat may be due to fire or extreme high flow events. However, the loss of riparian area, regardless of how it happens, will contribute to the heating of water.
11) Page 13, 14, 178 Concerning redband trout. The DEQ needs to be aware that reference material used in this document, concerning redband trout, Allen D.B., B.J. Flatter and K. Fite 1995 and 1997, were collected and complied in part by an individual who has since been involved in lawsuits to remove livestock grazing entirely from the Western landscape, namely Katie Fite. You may think that this is a frivolous statement but I assure it is not. It has cost hundreds of thousands of dollars in court costs which could have been spent much more productively on improvement on the land and to the water itself. The groups that she belongs to (Land and Water Fund of the Rockies, Idaho Watersheds Project, Northwest Watersheds Project, and Idaho's Committee for High Desert) have continually brought suit against individuals,	The person to whom you are referring was an employee of IDFG at the time the data were collected. Additionally, the primary author (Allen) and the secondary author (Flatter) remain IDFG employees. The sole intent of the referenced studies was to collect fish distribution and abundance data.

groups and government agencies. These lawsuits reference 303(d) listings most of which have proven to be unfounded. These groups will continue their frivolous harassment, using any means available. This is why it is mandatory that the data and information used in TMDL assessments be true, defensible and of the highest quality.	
12) Page 14, Table 2, Succor Creek (headwaters to Reservoir) Are all those different fish present? Or, are they only in the Reservoir? Needs clarification.	Table 14 will be clarified to better delineate where the fish were located.
13) Page 20 and 64, Maps show Rabbit Creek and West Rabbit Creek between Reynolds and Sinker Creek. There is a creek by the same name, but not the one DEQ did their Assessment and TMDL on. Those Rabbit Creek names should be removed from these two maps.	All of the appropriate figures will be corrected so that only the §303(d) listed Rabbit Creek is shown.
14) Page 21, paragraph 1, Topography Please explain the statement and define what "overall relief ratio - is 0.02"	This term refers to overall watershed slope is being removed because it is confusing and does not have much bearing on a subwatershed basis.
15) Page 21, paragraph 1, The general characterization that all of the streams in the watershed flow north is false and presents a basis for discounting the "azimuth" related conditions which definitely affect the temperature of east/west streams flowing through narrow basalt canyons: ei: Castle Creek, Sinker Creek, Upper Succor Creek,.	DEQ acknowledges the comment and will remove the word "north" from the sentence. Regarding the use of azimuth in the SSTEMP temperature model, the stream-segment specific azimuth was always used. Thus, the effect of sun angle on stream temperature is accounted for.
16) Page 21, paragraph 2, The statement "The highest elevation of 6,500 feet is found in the Silver City Range Bounding the southern edge of the watershed" shows lack of attention to detail. A higher elevation is on Squaw Butte, located near the heart of the watershed, which is 6,740 feet. Three subbasin watersheds form off of the immediate peak of Squaw Butte (McBride, Squaw, and Cottonwood) and within one mile of the Butte are the basin heads of Hardtrigger and the Reynolds Creek tributaries of Salmon, Fart, Cottle and Macks Creeks.	This correction will be made.
17) Page 21, The highest elevation is more than 8,000 feet. Not 6,500 feet.	This correction will be made.
18) Page 22, The movement of ground water... and water on the <u>south</u> side moves in a northwesterly direction to the river. Not north side.	This correction will be made.
19) Page 24, A 1997 aerial photograph	Additional narrative will be added for clarification

interpretation... vegetation was 20% forest. That forest includes mostly Russian olive and tamarisk, both invasive species and listed as noxious weeds in Idaho.	
20) Page 27, De-watering affects... flow alteration is not a pollutant. Agricultural water diversion is as Idaho DEQ has described on page 50.	This sentence will be remove from the document. While the statement is true in terms of how low flows effects pollutant dynamics, it is inconsistent with DEQs current interpretation of flow and habitat alteration.
21) Page 27, Toy Mountain is more than 8,000 feet elevation.	A correction will be made to clarify at what elevation Castle creek begins.
22) Pages 27-40 Subwatershed Characteristics In this section DEQ has maps of all of the subwatersheds EXCEPT LOWER SUCCOR CREEK. If the lower reach is included in this TMDL it should be identified and defined as clearly as the other subbasins. If DEQ is identifying Upper Succor Creek and Lower Succor Creek (which are further segmented for purposes of this TMDL by flowing out of Idaho - the upper reach - and into Oregon before coming back in to Idaho - the lower reach) then it is my opinion as a member of this WAG that the data for the Upper and Lower Succor Creek reaches should be treated and addressed as any other separate subbasin is.	An additional map delineating Lower Succor Creek from Upper Succor Creek will be added to the document.
23) Page 27, I would like to reference page 27 in the draft proposal; Sub watershed Characteristics first paragraph, first sentence, "...almost 75% of total stream lengths are classified as intermittent (Montana State University, 2002). I referenced the link on page 183 in the attempt to find the exact names and locations of the "75%" of streams and after an extensive search of the site could not locate any type of list or criteria for this type of listing at all. I feel it is imperative to be able to look up the data that is being quoted as a determining factor.	DEQ apologizes for the fact that the website no longer has a current link to that data and will correct that reference.
24) Pages 29 through 40 Maps, The TMDL Report Glossary defines STREAM in part as "a natural water course containing flowing water, at least part of the year." Yet the maps include dry sand washes and gulleys under the Legend as streams. If I were to use this as a reference I would expect to be able to go to those "streams" shown on the maps and find water. At sometime in the future will this be used as a reference to "historically watered areas"? I would suggest removal of the normally dry wash and gulley locations or perhaps reference them differently in the map legends because they definitely DO NOT "normally support communities of plants and	DEQ agrees with the comment. Additional clarification will be made on the legends of each map.

animals within the channel and the riparian vegetation zone."	
25) Page 32 & 103 & 104, "... the town of Reynolds is located in this valley." "Surveys performed in 1997... above the town of Reynolds." "1995 data collected near the town of Reynolds." There is no "town of Reynolds". I suggest just Reynolds, or community of Reynolds.	The document will be changed to reflect the comment.
26) Page 33 & 101, Figure 1.11 & 2.34, Maps show only Salmon Creek drainage and Reynolds Creek from outlet weir northeast toward the Snake River. Maps should include entire watershed of Reynolds Creek.	The maps will be modified to show the entire Reynolds Creek drainage.
27) Page 35, Sinker Creek originates at over 8,000 feet elevation.	This correction will be made.
28) Page 35, 105 & 270, DEQ should have reached the conclusion in this listed section (SINKER CREEK) that temperature standards and sediment/bank stability goals are unattainable unless beaver activity is controlled. The total listed reach of Sinker Creek is only a human controlled conveyance for irrigation and has not been a natural stream ever since the construction of the dam more than 25 years ago. Flow rates are strictly controlled by releases from the dam. Therefore the erosion rates inventoried on page 270 are inaccurate and irrelevant because there are no naturally occurring high lows that would cause such erosion except the occasional infrequent desert cloudburst in the dry gullies THAT ENTER THE SYSTEM below the dam. The only other possible erosion source is the washout of abandoned beaver dams. DEQ definitely needs to reexamine its old data, collect new data, and revisit its conclusions on Sinker Creek.	Additional narrative on beavers will be added. DEQ inventories only actively eroding sections of the stream that would be affected by the high flows that occur presently. DEQ found that the banks are in relatively good shape as evidenced by the small reduction in bank erosion necessary to meet the requirements of the sediment TMDL (8%). There are areas of banks where there is slumping, sloughing, and these areas deliver sediment directly into the creek. Also, water does periodically go over the dam, evidence that high flows do occur. The Sinker Creek system does have its own high/lows albeit not to as great an extent as it had before becoming a regulated system.
29) Page 35 & 105, On page 35 and page 105 the draft assessment says that the stream (SINKER) is dewatered below the diversion for Nahas Reservoir. In actuality it is also frequently dewatered through a section of the old Tyson Ranch which is currently called the Edwards Ranch. Twice in my tenure here I have seen it bone dry at the Nahas diversion in August and most every year it falls below 1 cfs for periods in the month of August	Comment noted. This information will be incorporated into the TMDL.
30) Page 41, History and Economics, "historic placer mining activities contributed large amounts of sediment to the creeks and eventually to the Snake River." There may have been some placer mining in the Jordan Creek drainage. Almost all the mining in this Lower Snake River/Succor	This correction will be made.

Creek watershed was from tunneling. There was some gold dredging along the Snake River up the river from the mouth of Squaw Creek.	
31) Page 41, "The introduction of cattle resulted... soil compaction," Where? "The change in plant composition resulted in the greater frequency of fires in the area." No. Prior to the Taylor Grazing Act, large numbers of cattle and sheep grazed the rangelands eliminating any fuels to carry a fire. The traditional natural fire frequency was stopped. Junipers are very intolerant of heat and thrived in the areas not burned by the natural fire frequency. We are working with USDA Agricultural Research Service to research fire effects and to restore fire frequency as a natural control of juniper, landscape, and to improve water quality and quantity.	Narrative on the Taylor Grazing Act will be incorporated, references added and the frequency of fire information clarified and corrected.
32) Page 41, paragraph 5, If you would delve a little deeper into the history of Owyhee County you would find that the inference to placer mining in the creeks of the Succor Creek Subbasin actually took place on the streams flowing into the Owyhee River. None of the "north slope" creeks we are dealing with in this document ever yielded up gold or silver. The statement that "Mining sources were nearly depleted by the late 1800s" is made in error. Mining continued to prosper well into the 1900's and the mines still come back into production when gold prices rise above a certain level.	Correction will be made.
33) Page 41, paragraph 6, The paragraph on cattle a sheep grazing reflects that "by 1869 there were several thousand head of cattle in Owyhee County." The Owyhee County, Idaho "Blue Book" published in 1898 on page 13 states " In 1882 the number of cattle assessed in the county was 24,559" and " in 1885 it was estimated that there were over 60,000 head of cattle within the confines of Owyhee County" and also " in 1888-9 the cattle interest in the county reached their maximum and there was at that date over 100,000 head of cattle in the county". It then states that due to severe conditions "the cattle trade gradually shrank to its present condition, there not being over 15,000 head in the county" but "the sheep industry has risen to - over 150,000 head."	Information will be added into TMDL. This correction will be made.
34) Page 41 & 42, It would lend more credibility to this document to correct some of the statements pertaining to the history and economics. Also some of the remarks to fire frequency in relation to plant composition need to either be referenced or if a matter of opinion - deleted.	Corrections will be made and references added.

35) Page 42, paragraph 1, Irrigated agriculture in the Succor Creek Subbasins dates back, not to the 1880's, but prior to the 1860's. Five SRBA water rights in Reynolds Creek Basin 57-R alone have priority dates of June 1, 1864.	Correction will be made.
36) Page 42, paragraph 2, As Swan Falls is closer to Murphy than it is to Kuna I would suggest this paragraph begin "Located between Kuna and Murphy, at river mile" etc.	Clarification will be made.
37) Page 42, paragraph 3, The first sentence of paragraph three makes more sense if it is included with the information in Paragraph 4, while the second sentence takes on more meaning when included within the context of Paragraph 5. Rather than saying the watershed is "sparsely populated" (by whose definition) this paragraph would make more sense reading something like: Ninety-eight percent of the land in the watershed is publicly owned creating a wide dispersal of the population on the remaining two percent of privately owned land. The primary economic activities of the more populated privately owned land areas consist of farming, ranching, livestock production, dairies, and related agricultural industries. The economic activities are the supporting structure/base for the towns and communities of Oreana, Murphy, Reynolds, Guffy, Wilson, Givens, Marsing and Homedale and their businesses, located within the Succor Creek Subbasin.	Comment noted. Part of these comments will be incorporated into TMDL.
38) Page 42, Paragraph 4, Please include as crops that are farmed: alfalfa hay, grass hay and pasture. These you state later in the document are the main crops in some areas.	These crops will be added.
39) Page 42, The Swan Falls Dam was built to provide power for the Trade Dollar Mine. The extra power was distributed to Silver City and other mines and camps.	Correction will be made.
40) Page 42, Land Ownership, Approximately 17.2% is private land in Owyhee County. The rest is federal and state land. Not: "98% of the land is publicly owned in this watershed."	Land ownership figures will be rechecked and corrected accordingly for the Mid Snake Watershed (numbers may differ since the watershed does not contain all of Owyhee County and also has in addition, Canyon, Elmore and Ada counties).
41) Page 44, Table 3, I question your 2000 population numbers. Explain what the Murphy Division encompasses.	The census information is confusing because the Murphy Division is a census division not actual town population. This section will be clarified.

42) Page 44 "Local Governments" They left out Ada County.	Ada County will be added.
43) Page 44, Table 3 Mid Snake River/Succor Creek Watershed Demographics, I highly doubt that any census will confirm the numbers used for the population of Murphy under the Town listing. At least be consistent in the listings; don't use "Murphy Division" without explaining what the difference in meaning is. According to the Owyhee County Clerk Charlotte Sherburn, the "population of Murphy varies between 70 and 80" with 77 currently listed on the water billings. Quite a difference from the 1,512 this Draft lists as the 2000 population.	The census information is confusing because the Murphy Division is a census division not actual town population. This section will be rewritten to provide clarification.
44) Page 44, Paragraph 1, Swan Falls dam is better described as located between Kuna and Murphy (as it is closer to Murphy than it is to Kuna)	Clarification will be made.
45) Page 44, Paragraph 3, The Owyhee Natural Resource Committee was formed prior to 1994, originally as the Owyhee County Natural Resource Planning Committee. Its name was changed by the Owyhee County Board of Commissioners in 2001 to Owyhee Natural Resource Committee to avoid being confused with the Owyhee County Planning and Zoning Commission. The purpose of the committee is to keep the Board of County Commissioners informed and advised of any and all issues related to the natural resources issues within Owyhee County, and which may include TMDL related issues. You may contact the Director of the Owyhee County Natural Resource Committee (Jim Desmond) for verification of these facts.	This information will be corrected.
46) Page 44, paragraph 5, The reference to the Owyhee Initiative group and the statements made in this draft document should be verified with the Chairman of that group before these assumptions are committed to print.	Corrections will be made regarding these statements.
47) Page 44, paragraph 5, It is presumptuous of DEQ to make statements as to the focus and goals of a group whose actions will be dictated by the passage of (as yet unproposed) legislation.	DEQ did not intend to be presumptuous and thus, will correct their error.
48) Page 45, Tables 4 & 5, The footnotes under both Table 4 and Table 5 "refers to a list created in 1998". Please explain how streams came to be on this list that was created, and by whom.	This information will be added to the footnotes.
49) Page 46, 48, 82, and 249, "Attainability" is briefly mentioned on these pages. Has a "detailed	An evaluation of the attainable uses has not been performed for the streams in the Mid Snake/Succor

evaluation of the attainability of uses" been done for streams in this watershed? If so where is that information located. Page 82, Will "use attainability analysis" be included as a part of the implementation stage or should it have been addressed in this, the assessment stage?	Creek watershed. All practical control measures must be put into place before the Federal Clean Water Act allows beneficial uses to be changes. That is not the case in this watershed. Preferably, and if warranted, as may be the case with Castle Creek, a use attainability analysis is performed prior to the assessment stage. DEQ is in the process of determining whether a UAA is warranted for Castle Creek.
50) Page 47 "Strike to Castle Creek domestic water supply" Whose domestic water supply?	This segment is designated as suitable for domestic water supply in the Idaho Water Quality Standards. No specific user is identified.
51) Page 51, Temperature, I disagree with the "boiling pot" narrative and Table 7. I'm sure that those fish had instantaneous death when dumped into the pot of 90 plus degree water. But in the real world, there is refuge for or escape as is evident by fish survival in the hot Owyhee desert streams. The thermally induced "pot" was probably heated from the bottom in order to get an even temperature for the mortality test. That is not natural. The pools have varying temperatures the further from the surface you go. Springs and sub-surface flows cool the bottoms of those pools creating refuge.	Additional narrative regarding the study methods will be added. Also, narrative will be added addressing the natural temperature variability found in a stream.
52) Page 51, Table 7, Please take the time to explain in detail the method of heating the water that resulted in the "thermally induced coldwater fish mortality. It is my understanding that this is the infamous "boiling pot" method whereby water is artificially heated from the bottom up. Streams (other than those with geothermal water sources) do not heat from the bottom up, but rather are heated by solar radiation from the top down, with cooler water pooling at the bottom. Using the Oregon DEQ 2002 mode of thermally induced mortality is about as comparative as making sun tea versus boiling up a strong pot of the hot English brew.	Additional narrative regarding the study methods will be added. Also, narrative will be added addressing the natural temperature variability found in a stream. The table will also be modified.
53) Page 57 & 163, In some areas of the TMDL the nutrient target level is described as 0.07 mg/L TP, (page 57), rounded and reported to the nearest 100th. On table 48 page 163, TP is reported as 0.071 mg/L TP rounded to the nearest 1/1000th. This gives the impression that Table 48 shows it exceeds the target. The WAG does not think it does. The WAG also questions the loads for TP upstream. The Bruneau/Jacks Creek TMDL goal for TP is 0.08 mg/L. The Snake River at King Hill is 0.075 mg/L. The Strike Reservoir TMDL is yet to be written. Will it be the responsibility of the Strike Reservoir TMDL to "clean up" the water	This watershed will not be responsible for loads originating upstream. In general, in an average water year, the water entering the upstream section of the watershed comes in at the target.

they receive? It is apparent that the DEQ had a short time frame and limited budget to gather data and accepted whatever data was available. Was any data excluded as unreliable?	
54) Page 60 "Intermittent Streams" DEQ failed to accept verbal comments from WAG member on "DRY' streams.	DEQ made every attempt to affirm at the WAG meetings as well as at the public comment meetings that such comments need to be in writing. Furthermore, DEQ stated that specific data showing that perennial pools did not exist must be submitted. None were received.
55) Page 60 & 221, My foremost comment would be that I believe Sinker Creek should be designated as an intermittent stream. I do not find it listed on page 60 or on page 221. Even the historic name by which it is known (SINKER) indicated that it is naturally dewatered in some sections and then rises again in another area.	Sinker Creek is not listed as intermittent because overall there are perennial pools that can be used as refuge by fish. DEQ acknowledges that there are sections where Sinker Creek is dry.
56) Page 65, Figure 2.4, Please move the fish kill photo to its appropriate location immediately below Temperature between Paragraph 1 and Paragraph 2. It can and will be viewed out of context in any but its appropriate location. This photo may have more negative and/or detrimental impacts than are warranted by its inclusion in this document.	The photo will be moved to the suggested location.
57) Page 82, In reference to Castle Creek (pg 82) regarding artesian (hot) water , I am wondering about whether a "water budget" will ever be completed and if not, what the final determination will be.	DEQ is gathering additional information this summer and will determine a water budget by September 2003.
58) Page 87, Table 2.24, Even though the Mid Snake River and its surrounding watersheds are part of the most active geothermal areas in the state of Idaho, this TMDL does not address the effect of geothermal activity on water temperature. Hot wells, both artesian and pumped, abound in this watershed. There is extensive data pertaining to geothermal activity available at IDWR. Underground springs provide a continual source of thermal heating in the Snake River in the Wilson area. Visual evidence of thermal activity can be observed any cold morning by simply looking for an exceptional amount of steam rising from the water body, be it the river, creek, spring or well. Temperature in relation to geothermal heating needs to be addressed where appropriate.	Thermal activity will be addressed as part of the thermal site potential study of the Snake River. Geothermal heating is being investigated as part of the temperature study on Castle Creek.
59) Page 98, Instantaneous BURP data collection... those flows measured in 1998 are not normal at those points. There was a major storm event that caused that much flow at the highway. Usually the	DEQ will add additional text to the document indicating that these flow were likely due to a storm event. DEQ agrees that most of the water in the stream is diverted, as noted in the text directly

Creek is entirely diverted except for seepage at the diversions or limited return flows from the fields above the highway.	above Table 20.
60) Page 99, The 1998 BURP notes that 75% of the water is being diverted. Maybe on that instantaneous date, generally, almost all the water is being diverted except during spring run-off.	This statement will be remove from the document.
61) Page 99, Table 20, An additional footnote (2) should indicate that Brandau Farms 1.57 cfs is also included in the combined R.I.D. Lateral (Bernard Ditch) 17.24 cfs (it can be diverted at either location). I don't know if it would be appropriate at this point, or time, to acknowledge or address the "high flow" water rights as recognized in the Snake River Basin Adjudication.	An additional footnote will be added to Table 20 reflecting this information.
62) It may be of value to note that during the March 15 to November 15 irrigation season, the total Snake River Basin Adjudication decreed water rights for Reynolds Creek Basin total 104.56 cfs.	This information will be added to the document for informational purposes only.
63) Page 99, Table 21, For future reference it might be beneficial to also include an additional table listing the highest flow events chronologically. This would clearly show that some of the highest events occurred within the same season and also emphasize the extreme variation in timing and volume of runoff from year to year: 01-31-63 2,331 12-23-64 3,850 01-28-65 1,113 06-11-65 1,113 01-21-69 899 01-27-70 728 03-02-72 667 06-11-77 1,119 01-11-79 1.662 02-25-82 2,082 04-11-82 861	DEQ agrees. Table 21 will be changed to show the flow events chronologically.
64) Page 105, Pertaining to temperature on Sinker Creek... probably the biggest unaddressed cause is the 30 or so beaver dams on this stream SEGMENT. As stated on page 105 they do act as sediment sinks, which should help that situation, but as for temperature goals they work against us. By pooling the water, slowing it down, and exposing is longer to the sunlight and hot air the temperature is raised.	A narrative on the effects of beavers will be added. DEQ did not summarize the particular effect that beaver activity has had on sections of Sinker Creek.
65) Page 105, Sinker Creek, Beavers. There is a severe beaver problem a short distance above	A narrative on the effect of beavers will be added.

highway 78 and for some distance below the highway and again above Nahas Ranch. BLM has recognized the damage done by the beaver in their stream surveys AND recommended the "the use of a D-8 Cat with come creative, or even uncreative stream channel work to rid the beaver dams". The beaver consume the desirable shading plants, muddy the waters which attract more solar heat, and burrow into the stream banks causing more erosion. This TMDL needs to include a narrative analysis of the beaver problem in this area.	
66) Page 105, Pertaining to Sinker Creek, The conclusions of DEQ personnel about aquatic life beneficial uses not being fully supported may or may not be true since much of the data used to make this determination is more than six years old or has been "extrapolated" from other areas. This could explain why DEQ has failed to take into account the devastation that has occurred from extensive beaver activity in the middle area of the 303d listed section. This beaver activity has destroyed a large majority of the woody vegetation in the past four years and caused extensive bank instability from lost root systems. Washouts have occurred when dams were abandoned because wood supplies were depleted. Few areas of this six mile section of stream between the Sinker 1 thermograph site and the Sinker 3 site have been unaffected by beavers. While the document briefly mentions beaver ponds on page 105 and correctly attributes an increase in water temperatures, DEQ has certainly not given this activity the importance it deserves. This is especially true considering that no livestock grazing occurs in this middle section for 11 months out of the year, whereas the upper area of the listed section which met water quality standards (at Sinker 1 three. site) is grazed year round. At the present time the only control on beavers is the fur market and whoever landowners can get to trap them.	A narrative on the effects of beaver will be added. DEQ staff did use current temperature data, which showed that temperature exceedances occurred. In addition, the bank surveys were done this year and showed areas of unstable actively eroding banks. However, it is important to note that DEQ did find that only an 8% decrease in bank erosion rate was necessary, indicating that this system is close to supporting beneficial uses.
67) Page 109, Sediment, The BLM collected properly functioning Data... indicated an unsatisfactory condition. A stream segment can only be satisfactory or unsatisfactory in BLM's categories. This stream may have been rated as unsatisfactory because it was at risk, put possibly on an upward trend. Eventually meeting the satisfactory rating. This PFC data analysis needs further explanation.	An additional statement regarding the different trends associated with PFC will be added.
68) Page 111, Status of Beneficial Uses, the de-watered section is below the Nahas Reservoir.	Comment noted.

69) Page 116, Table 30, This chart shows a wide variation in flows that occur from year to year, and even during the year. This is typical for all the streams in Owyhee County.	Comment noted.
70) Page 117, Succor Creek Reservoir, Active withdrawal of irrigation water creates an unnatural stream below.	The document will be changed to reflect this comment.
71) Page 134, Beneficial Uses,... excess substrate sediment...What is 'substrate'?	Additional text will be added to the document describing what is meant by "substrate sediment".
72) Page 136, the Bruneau River SCD Board would like to see more concrete data compiled before the TMDL makes specific recommendations and requirements on specific sections of the Snake River and other streams within the watershed. In the TMDL, we are provided with conclusions with little or no data to back it up. We need to know where the samples were taken, how they were taken, what time of the day they were taken, were they representative samples, etc. The data must stand up to scientific standards in order to be valid. We understand that there is a time factor, but we want the TMDL to be as accurate as possible in order to effectively write a TMDL Implementation Plan that will properly address the water quality issues within the watershed.	Comment noted.
73) The Bruneau River SCD will be supporting further evaluation of perennial stream segments and upland condition in 2003. This will include development of a TMDL Implementation Plan on stream segments with perennial flow and documented problems. The District would like to work with DEQ, watershed landowners and partner agencies to properly evaluate these streams in 2003.	DEQ acknowledges the willingness of the Bruneau River SCD to develop implementation measures and work with agencies and landowners alike.
74) Page 137, The Bruneau River SCD feels that DEQ should not try to set the practices required to meet TMDL problems in the TMDL, as that is the function of the TMDL Implementation Plan, not the Sub-basin Assessment and TMDL process. Beyond the implementation plan itself, more specific conservation planning with individual landowners will occur. We will help them choose and apply Best Management Practices that will address the specific issues involved.	While DEQ may list potential BMPs, DEQ recognizes that the actual measures are determined as part of the implementation process.
75) Page 136, The one concern that I do have is the lack of scientific data to back up some of the conclusions in the TMDL. I would like to see more specific data to support the conclusions reached by IDEQ. I feel that it is unfair to put a	DEQ feels that the best available physical, chemical and biological data were used to develop the subbasin assessment and TMDL. DEQ is legally compelled to complete the Mid Snake River/Succor Creek TMDL by December 2002. Given the short

stream on the 303d list without having enough data to prove that it should be listed. Unless it is proved without a doubt that a stream is water quality impaired, it should not be 303d listed. It is very hard to get ranchers and farmers to voluntarily cooperate and implement best management practices on their land when they don't have scientific proof of water quality impairment.	time frame, DEQ collected as much additional data as possible to aid in development of the subbasin assessment and TMDL.
76) Page 136, How imperfect the science of assessing water quality must be. For example, how can a person and/or agency base as assessment of such a limited amount of data? To my knowledge, only two steams (Reynolds and Hardtrigger) possessed data that spanned more than one year. It seems difficult to me, to base the performance of a watershed on such a limited time frame, particularly when that time frame happens to be one of the three driest since the end of the 19th Century.	DEQ agrees that additional data would increase the accuracy of the document. However, DEQ feels that the best available physical, chemical and biological data were used to develop the subbasin assessment and TMDL. DEQ is legally compelled to complete the Mid Snake River/Succor Creek TMDL by December 2002. Given the short time frame, DEQ collected as much additional data as possible to aid in development of the subbasin assessment and TMDL.
77) Page 136, Table 37, I am in complete agreement with DEQ statement "Where viable, steps should be taken to fill the data gaps." Table 37 page 136 Data Gaps Identified prepared by TMDL authors acknowledges areas that need to be addressed are confirmed by DEQ statements made on the following pages:	Comment noted.
a. pg 116 flow data available for upper Succor Creek is limited	Comment noted.
b. pg 117 monitoring data consists only of instantaneous temperature data used to populate SSTEMP used to develop the temperature TMDL	Comment noted.
c. pg 117 pertaining to Bacteria - there are no data available for upper Succor Creek	Comment noted.
d. pg 120 there are no water column sediment data available from upper Succor Creek	Comment noted.
e. pg 123 there is not a numeric value against which TSS conditions in Succor Creek can be compared -- Site specific condition must be assessed to determine an appropriate sediment target	Comment noted.
f. pg 123 reasonable assumption that if 15mg/L TSS was not causing impairment of aquatic life in Boise River, 16mg/L TSS will support aquatic life beneficial uses in lower Succor why is that same assumption not being applies to upper Succor	The same assumption is in fact being applied to Upper Succor Creek, but water column data do not exist for Upper Succor Creek. This is noted in the "Data Gaps" portion of the document. Additionally, As opposed to Lower Succor Creek, salmonid spawning is a beneficial use in Upper Succor Creek (see appendix F). Due to the importance of stream bottom material (substrate) for salmonid spawning, particle size distribution is also assessed in Upper Succor Creek. It is this component that is impairing the spawning beneficial use.

g. pg 124 re: Wolman pebble count -- due to small set of data these have low level of statistical rigor -- however until additional data can be collected they rep. best avail data	Comment noted.
h. pg 125 there is no hard data to support the statement "Data Assessment Methods section describe linkage etc.	Comment noted.
i. pg 125 -- temperature -- period of record was dictated by accessibility to sites and vandalism twice	Comment noted.
j. pg 126 data were not available during spawning period.	Comment noted.
k. pg 132 temperature data were not available for full extent of critical period -- assumptions were made to accommodate lack of data	Comment noted.
l. pg 133 due to insufficient data the entire critical period cannot be evaluated.	Comment noted.
m. pg 133 data are not available for period between 8/22 & 9/21 -- it is assumed....	Comment noted.
n. pg133 however, again due to insufficient data	Comment noted.
o. pg 133 actual data are only available from 6/19 thru 7/15 ... it is assumed	Comment noted.
p. pg 133 difficult to determine due to lack of data	Comment noted.
q. pg 134 data were not available directly above the reservoir during critical period	Comment noted.
r. pg 134 logger was vandalized ... therefore DEQ assumes	Comment noted.
s. pg 134 timing of - criterion - is difficult to determine due to limited data	Comment noted.
78) Page 134, Status of Beneficial Uses If data were broken out into two stream reaches, Upper and Lower Succor Creek, and the lack of data were incorporated into this portion the status of beneficial uses for Upper Succor Creek it would look like this:	
a. E. Coli - there are no data available for Upper Succor Creek pertaining to bacteria pg 117	Bacteria conditions were not assessed for Upper Succor Creek.
b. Sediment - states that "data indicate that excess substrate sediment is impairing CWAL and SS in two segments of Upper Succor Creek." Yet these are DEQ statements about that data:	Comment noted.
c. there is no water column sediment date available from Upper Succor Creek pg 120	Comment noted.
d. there is not a numeric target against which TSS conditions in Succor Creek can be compared, site specific condition must be assessed to determine an	Comment noted.

appropriate sediment target pg 123 e. If it a reasonable assumption that "if 15mg/L TSS was not causing impairment of aquatic life in Boise River, 16mg/L TSS will support aquatic life beneficial uses in Lower Succor" why is that same assumption bot being applies to Upper Succor? pg 123	Upper Succor Creek, but water column data do not exist for Upper Succor Creek. This is noted in the "Data Gaps" portion of the document. Additionally, As opposed to Lower Succor Creek, salmonid spawning is a beneficial use in Upper Succor Creek (see appendix F). Due to the importance of stream bottom material (substrate) for salmonid spawning, particle size distribution is also assessed in Upper Succor Creek. It is this component that is impairing the spawning beneficial use.
f. re: Wolman pebble count, due to small set of data these have low level of statistical rigor, however until additional data can be collected they represent the best available data pg 124	Comment noted.
g. in reviewing table 32 Dr. Chad Gibson pointed out that there is no hard data to support the statement "data assessment methods section describe linkage that has been developed between bank stability and fine substrate material pg 125	Comment noted.
h. The only concrete piece of data that DEQ presents pertaining to sediment is a photo on page 121 which is literally noted on page 120 as "Figure 2.46 shows a dated photograph of the water column and substrate near Berg Mine. Note the good water clarity and good distribution of substrate material."	Comment noted.
79) Temperature - pertaining to both cold water aquatic life and salmonid spawning:	
a. flow data available for Upper Succor Creek is limited pg 116	Comment noted.
b. monitoring data consists only of instantaneous temperature data used to populate SSTEMP used to develop the temperature TMDL PG 117	Comment noted.
c. period of record was dictated by accessibility pg 125	Comment noted.
d. period of record was dictated by vandalism	Comment noted.
e. data were not available during spawning period pg 126	Comment noted.
f. temperature data were not available for dull extent of critical period pg 132	Comment noted.
g. assumptions were made to accommodate lack of data pg 132	Comment noted.
h. due to insufficient data the entire critical period cannot be evaluated pg 133	Comment noted.
i. data are not available for period between - - it is assumed pg 133	Comment noted.
j. however, again due to insufficient data pg 133	Comment noted.

k. Ambient air temperature data seems to have been collected from	Comment noted.
80) These statements made by DEQ in this Draft TMDL, pertaining to Upper Succor Creek, exhibit the need to expand on the DEQ statement (pg 136) "Where viable, steps should be taken to fill the data gaps."	DEQ agrees that the aforementioned statements exhibit the need to fill data gaps. The process by which this will happen will be further defined in the TMDL implementation plan.
81) Perhaps in the first phase of the next step, implementation, we should emphasize data collection first, a uniform consistent monitoring plan and schedule second, all prior to implementing costly, expensive projects that may or may not be effective.	DEQ feels that the TMDL shows a necessity for some level of best management practice implementation. However, DEQ agrees that additional data collection following a consistent monitoring plan should be placed as a high priority in the implementation plan.
82) Page 137, My concern is in the "Implementation Process" with the oversight and follow-up committee having the scientific data specific to this area in regard to making changes that are necessary for the TMDL.	The implementation plan will be developed cooperatively by the affected stakeholders, the WAG, and the designated agencies (including DEQ). All of these entities will have access to the scientific data necessary the update the TMDL.
83) Page 138, Table 38, under proposed action the Snake River from CJ Strike to Castle, you have listed TDG. TDG (Total Dissolved Gases) is not listed in the glossary. Please add it to the glossary.	TDG will be added to the glossary.
84) Page 149, I believe that the temperature goals are unattainable by your definition on page 149. By this definition in the draft I believe the temperature listing should be dropped at least in the section between the Edwards Ranch and the Nahas Ranch. This section is basically inaccessible to all but the most dedicated hiker and some occasional wildlife. Leslie Freeman attempted a short section above our diversion but turned back because of the difficult almost impenetrable terrain. This area has been virtually unaffected by any influence other than nature for many, many years. If ever a place could be called pristine this would surely qualify. As such it has a very narrow stream channel and almost total shading in many areas. If a cool temperature goal were attainable it should be attainable here. I feel that the affects of the narrow, very rocky canyon on the ambient temperature has been overlooked.	The intermittent stream classification used in this TMDL is for those streams where perennial pools do not exist. Sinker Creek appears to have perennial pools throughout the summer in this reach. However, the stretch below the diversion for Nahas Reservoir is dewatered and does not have perennial pools. This stretch was not considered for the TMDL allocations. The section below the Edwards Ranch and above the Nahas diversion does not have bank stability problems and is not subject to riparian shade increases beyond those which would occur from the existing vegetation increasing in size. This will be documented as part of the implementation process. Topographic shade as well as ground reflectivity was accounted for in the SSTEMP model. If additional information is gathered that suggests that other parts of Sinker Creek have natural factors that prevent target attainment, the temperature target will be adjusted accordingly.
85) Page 149 & 150, Temperature, Narrative recognized this basin is in the desert and is subject to extreme heat during the late spring and summer months. I agree, the "best achievable temperature" is a reasonable target	Comment noted.
86) Page 151, these conclusions were drawn using empirical derived characteristics and concepts.	DEQ agrees that additional data would increase the accuracy of the document. However, DEQ feels

There are numerous statements of "no available data" "insignificant data", "assumptions" "is difficult to determine due to limited data" scattered through this document.	that the best available physical, chemical and biological data were used to develop the subbasin assessment and TMDL. DEQ is legally compelled to complete the Mid Snake River/Succor Creek TMDL by December 2002. Given the short time frame, DEQ collected as much additional data as possible to aid in development of the subbasin assessment and TMDL.
87) Page 157 , Narrative on Nutrients from C. J. Strike down stream: The WAG is concerned about apparent inconsistencies in nutrient data on the Snake River from C. J. Strike down stream. Different agencies collected data including DEQ, Idaho Power and USGS. Different techniques were used i. e.: Collecting off of a bridge in mid stream, grab samples from the bank, and in the case of USGS at Murphy, a cross section with many samples combined and reported as one. It was also suggested that two different laboratory procedures may have been used. On page 157 of the TMDL it says the MOS for nutrients is 13%. Supportive data provided by DEQ, at a meeting in Caldwell, compared 2000 May-September data from USGS with DEQ data from the same time period. The July data was almost identical, but the May and June data varied by 35% and 29%. The WAG feels that this is but one example of confusing, incomplete, and questionable data.	Comment noted. DEQ is charged with writing TMDLs using available data. The TMDL is an iterative process, meaning that as more data becomes available, targets, allocations etc. can be refined to more accurately reflect the on-the ground conditions. This dataset will be reviewed again during the determination of whether or not a load allocation is necessary between CJ Strike and Swan Falls Dam. A correlation factor will be applied to the USGS data, if necessary. This would be similar to how Idaho Power Company utilized USGS data from the Boise River with their own in-house data.
88) Page 163, Under Nutrient Allocation in table 48, it shows that Snake River below C. J. Strike has a Phosphorus concentration of 0.07 and Snake River at mile 449.3 has a concentration of 0.071. We do not feel that this segment should have a nutrient allocation for such a small difference of .001, sine the degree of error (MOE) for the spread sheet that you used is 0.1 (100 times greater).	This difference represents a substantial monthly load of phosphorus. However, in response to how close the concentrations are, DEQ is deferring determination of an allocation until sources of phosphorus and trends in increasing concentration can be determined. This will allow DEQ to address any margin of error over or underestimation of phosphorus concentrations.
89) Page 166, Temperature Allocations, DEQ recognizes SSTEMP model provides a gross estimate of heat lost or gained. There are to many unknowns when determining effects of inputs	The model calibration work presented in Appendix G shows that the predicted water temperatures (as per SSTEMP) and the actual water temperatures were statistically similar. As such, DEQ feels that the temperature allocations are reliable.
90) Page 178, Data collected by a person with as much bias as Katie Fite is bound to be unreliable and slanted. Katie Fite is the "expert witness" used in lawsuits aimed at total removal of livestock grazing on both private and public lands.	The person to whom you are referring was an employee of IDFG at the time the data were collected. Additionally, the primary author (Allen) and the secondary author (Flatter) remain IDFG employees. The sole intent of the referenced studies was to collect fish distribution and abundance data.
91) Page 209, DEQ statement "As per DEQ WBAG II guidance (Grafe et al. 2002), the Mid Snake/Succor Creek subbasin assessment uses the site-specific spawning period for redband trout.	The temperature data displayed on pages 127-131 are in fact basin/site specific (to the Mid Snake/Succor Creek basin). However, DEQ agrees that in most cases data were not available for the

The basin-specific spawning period is March 1 through June 15." But we note that DEQ does not have site-specific data pertaining to Upper Succor Creek. If site specific data were used pertaining to spawning periods and those periods occurred at an early date than the basin specific periods, as could easily happen in this semi-arid climate characterized as hot and dry in the summer and cold and dry in the winter, it may preclude its listing for temperature. This is an area where DEQ's statement on page 136 "Where viable, steps should be taken to fill the data gaps" could be most appropriately and productively heeded.	extent of the spawning period. To account for that data gap, DEQ assumed that all temperatures prior to the date when data became available were BELOW the criteria. Even with this assumption, greater than 10% of the data still exceeded the spawning daily average criterion (as shown in Table 35). Hence, the stream would indeed be listed for temperature.
92) Page 241, The fisheries question has been addressed by the letter from Jeff Dillon on page 241 and SINKER should be considered not suitable for spawning in the reaches of interest. It is also quite difficult to have fish habitat in a dry streambed.	Comment noted.
93) The terms "EMPERICAL characteristics" and "EMPIRICALLY derived" are used. Please include the definition of "empiric" and/or "empirical" in the glossary. The New World Dictionary of the American Language Second College Addition defines them as: empiric em.pir.ic 1. a person who relies solely on practical experience rather than on scientific principles 2. (Archaic) a practitioner without proper qualifications and regular training; charlatin; quack empirical em.pir.i.cal 1. relying or based solely on experiment and observation rather than theory (the empirical method) 2. relying or based on practical experience without reference to scientific principles (an empirical remedy) empiricism em.pir.i.cism 1. experimental method; search for knowledge by observation and experiment 2.a) a disregarding of scientific methods and relying solely on experience b) quackery 3. the theory that experience is the only source of knowledge	The word "empirical" will be added to the glossary.
94) Page 248, Climatic gauging station locations used were Western Regional Climate Center at	Comment noted.

http://www.wrcc.dri.edu/climsum.html.	

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