South Fork Salmon River
Subbasin Assessment

May 29, 2002

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Abbreviations, Acronyms, and Symbols

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

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

BAG Basin Advisory Group

BLM United States Bureau of Land Management

BMP best management practice

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

CW cold water

CWA Clean Water Act

DEQ Idaho Department of Environmental Quality

DO dissolved oxygen

DWS domestic water supply

EPA United States Environmental Protection Agency

ESA Endangered Species Act

F Fahrenheit

FPA Idaho Forest Practices Act

FWS U.S. Fish and Wildlife Service

GIS Geographical Information Systems

HUC Hydrologic Unit Code

I.C. Idaho Code

IDAPA Refers to citations of Idaho administrative rules

IDFG Idaho Department of Fish and Game

IDEQ Idaho Department of Environmental Quality

IDL Idaho Department of Lands

IDWR Idaho Department of Water Resources

km kilometer

LA load allocation

LC load capacity

m meter

mi mile

mi^2 square miles

MBI macroinvertebrate index

mg/l milligrams per liter

MOS margin of safety

NA not assessed

PCR primary contact recreation

ppm part(s) per million

NPDES National Pollutant Discharge Elimination System

NRCS Natural Resources Conservation Service

NTU nephlometric turbidity unit

ORW Outstanding Resource Water

QA quality assurance

QC quality control

SBA subbasin assessment

SCR secondary contact recreation

SS salmonid spawning.

TES Threatened, Endangered or Sensitive species

TMDL total maximum daily load

USDA United States Department of Agriculture

USFS United States Forest Service

USGS United States Geological Survey

WAG Watershed Advisory Group

WBAG *Water Body Assessment Guidance*

WBID water body identification number

WLA waste load allocation

WQLS water quality limited segment

WQMP water quality management plan

WQS water quality standard

YOY Young of Year (fish)

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 South Fork Salmon River Subbasin that have been placed on what is known as the "303(d) list."

This subbasin assessment 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 South Fork Salmon River Subbasin located in southeast Idaho. The subbasin assessment is an important first step in determining whether a TMDL is necessary. The starting point for this assessment was Idaho's current 303(d) list of water quality limited water bodies. Eight streams in the South Fork Salmon River Subbasin are listed on this list. The subbasin assessment examines the current status of 303(d) listed waters, and defines the extent of impairment and causes of water quality limitation throughout the subbasin (Table 1). 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 South Fork Salmon River (SF Salmon) is a tributary to the Salmon River in central Idaho. Located east of Cascade, ID and McCall, ID, the SF Salmon joins the main Salmon River downstream of the confluence with the Middle Fork Salmon River, a predominately unmanaged subbasin which drains the Frank Church - River of No Return (FC-RNR) Wilderness (Figure 1). The northeast portion of the SF Salmon Subbasin is located within the boundaries of the FC-RNR Wilderness. Current land uses include recreation, timber harvest, mining, and grazing. Prior to 1831, land use in the sub-basin was by the Nez Perce and Shoshone Bannock tribes for hunting, gathering, fishing and spiritual activities.

The SF Salmon River system maintains nineteen fish species: three anadromous, ten native residents and six introduced. This Subbasin plays a key role for Chinook salmon, steelhead, Bull Trout and westslope cutthroat trout, which are all Threatened, Endangered or Sensitive (TES) species under the Endangered Species Act (ESA).

The SF Salmon Subbasin affords recreational opportunities such as hunting, fishing, berry and mushroom picking, sightseeing, camping, rafting, off road recreational vehicle use and hiking. Recreation rates have stayed stable, increasing slightly over the last 10 years (USDA Forest Service, 2000). In addition, there are resorts, lodges and summer homes in the Yellow

Pine, Johnson Creek, Secesh, Warm Lake, Warren and Burgdorf areas. Eleven different outfitters operate in the Subbasin offering actives such as horse packing, fishing and hunting (USDA Forest Service, 2000).

Timber harvest has occurred historically, but currently is not widespread. Historical timber harvest activity took place from 1950 to 1965 in the Subbasin. An estimated 147 million board feet were removed at that time. Concerns over sedimentation and fish habitat resulted in the Forest Service reducing all land disturbing activities in the upper SF Salmon drainage since 1965. While the reductions affects the amount of timber harvest within the subbasin, it is the roads built during harvest activities and retained for recreation and fire suppression that have been the dominant sources of sediment in the SF Salmon Subbasin.

Mining has played a significant role in the human history of the SF Salmon Subbasin. The alluvial deposits in and along the SF Salmon and the East Fork South Fork (EFSF) Salmon Rivers, the Upper Secesh River and Johnson Creek were explored and mined for placer gold during the latter portion of the nineteenth century and into recent years. Most of the activity was limited in scale. The most extensive mining in the Subbasin occurred in the Upper EFSF Salmon River at the Stibnite mine site. Stibnite is now closed and has been reclaimed through an administrative order of consent between Mobil Company, Idaho Department of Lands (IDL), Idaho Department of Environmental Quality (IDEQ), United States Environmental Protection Agency (USEPA) and the United States Forest Service (Griner and Woodward-Cyde, 2000).

Currently, grazing plays a very minor role in the SF Salmon Subbasin and is associated with permitted outfitter and guide activity on National Forest System lands. Limited grazing occurs on private land near Yellow Pine.

The approved 1998 303(d) list for the State of Idaho included eight water bodies located within the SF Salmon Subbasin. These water bodies include the SF Salmon River, the EFSF Salmon River, Johnson Creek, Rice Creek, Dollar Creek, Trail Creek, Trout Creek, and Tyndall Creek (i.e. upper Johnson Creek). The pollutant of concern is sediment for all of the listed waterbodies and metals for the East Fork of the SF Salmon. None of these water bodies had a full water body assessment completed prior to the submittal of the 1998 303(d) list. Therefore, this Subbasin assessment (SBA) is the first time the support status and attainment of water quality standards has been comprehensively reviewed.

The Idaho Administrative Procedures Act (IDAPA) 58.01.02.053 specifies that, when assessing whether a water body fully supports designated and existing beneficial uses, the IDEQ is to determine whether all of the applicable water quality standards are being achieved in addition to whether a healthy, balanced biological community is present. Currently, the initial screen by the IDEQ to determine whether a water body violates current water quality standards is based on available monitoring data for the numeric water quality standards and biologic life indicators within the water body. The 1996 Water Body Assessment protocol is used here to determine the current beneficial use support status for these water bodies. The IDEQ and the USEPA will use the results of the water body assessments contained within this document to update Idaho's 303(d) list. Also, under the current schedule, the State of Idaho is to re-visit, and possibly revise, the 1991 sediment TMDL approved by the USEPA.

The review of the available ambient numeric water quality monitoring data shows attainment of current water quality criteria for sediment and metals. Review of the biological data and sediment impacts to aquatic habitat indicates that the historical habitat conditions within the SF Salmon Subbasin are in the process of re-establishing. These results of the SF Salmon SBA indicate that the listed water bodies currently meet the Idaho water quality standards for sediment and metals. The TMDL approved by the USEPA in 1991 included two surrogate targets, percent depth fines and cobble embeddedness. Data included in the document suggest that the watershed has attained the target and has an improving trend for cobble embeddedness, but has not attained the target for percent depth fines. Therefore, the IDEQ is removing all water bodies currently listed for sediment and metals from the Idaho 303(d) list with the exception of the mainstem South Fork Salmon River.

This remaining uncertainty, combined with the highly valued TES beneficial uses, suggests that the 1991 TMDL should continue to be implemented. The SF Salmon Subbasin must be managed so that the existing roads and sediment sources do not cause water quality violations in the future. Therefore, the IDEQ will continue to work with the designated land management agencies to ensure water quality standards are attained and beneficial uses are supported in the future. Additional monitoring in the subbasin will occur over the next two years. The IDEQ will begin to review and assess all data collected during this time period and report on the additional data by December 31, 2002.

Review of the available stream temperature data, potential management impacts to stream temperature, and riparian conditions indicate that the Idaho water quality standards for stream temperature is not violated. However, it was found that the federal bull trout temperature standards for these same streams are exceeded. Therefore, these water bodies are placed on the Idaho 303(d) list. The water bodies include: Trout Creek, Sand Creek, Rice Creek, Trail Creek, Warm Lake Creek, Johnson Creek, SF Salmon River, Tyndall Creek, Profile Creek, Buckhorn Creek, Lick Creek, Grouse Creek, and Elk Creek.

Subbasin at a Glance

Table 1. Subbasin Assessment at a Glance

Hydrologic Unit Code	17060208
Assessed Water Bodies	Water Bodies 1 – 35 (according to the Idaho Water Body Identification system).
Beneficial Uses Present	Cold Water Biota, Salmonid Spawning, Primary Contact Recreation, Drinking Water Supply, and Special Resource Water
Pollutants Addressed	Turbidity, Sediment, and Metals
Land Uses	Forestry, Grazing, Recreation, Mining

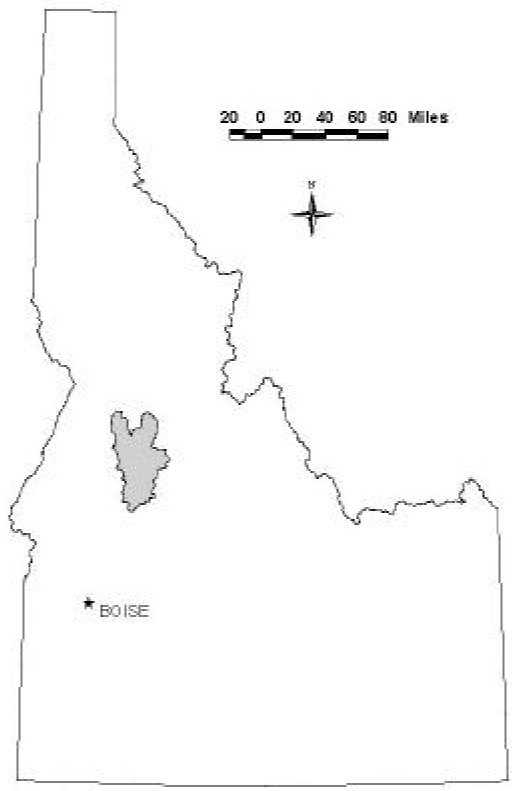

Figure 1. SF Salmon HUC Location Map

Key Findings

The 1996 Water Body Assessment protocol, plus other available data from cooperating agencies, is used here to determine the current beneficial use support status for these water bodies. The IDEQ and the USEPA will use the results of the water body assessments contained within this document to update Idaho's 303(d) list.

The review of the available ambient numeric water quality monitoring data shows attainment of water quality criteria for sediment and metals. Review of the biological data and sediment impacts to aquatic habitat indicates that the historical habitat conditions within SF Salmon Subbasin are in the process of re-establishing.

However, evidence remains that the existing road system contributes large quantities of sediment during storm events. These ongoing impacts to the water bodies, combined with the highly valued TES beneficial uses suggests that further implementation of the 1991 TMDL would be beneficial to prevent the existing roads and sediment sources from impacting current water quality. Therefore, the IDEQ is recommending additional actions be taken by the designated land management agencies to ensure the current water quality is protected and beneficial uses are supported in the future.

All of the larger water bodies within the SF Salmon Subbasin (e.g. SF Salmon, EFSF Salmon, Johnson Creek, and the Secesh River) are designated as Special Resource Waters (SRWs). SRWs are “those specific segments or bodies of water which are recognized as needing intensive protection to preserve outstanding or unique characteristics or to maintain current beneficial uses (IDAPA 58.01.02.002.96)”. The State of Idaho Antidegradation Policy (IDAPA 58.01.02.051) for “high quality waters” also states that, “where the quality of the water exceeds levels necessary to support propagation of fish, …that quality shall be maintained and protected.”

Review of available ambient stream temperature data and site conditions indicates that the federal standards for bull trout are exceeded. Therefore, the IDEQ will place several water bodies on the State of Idaho 303(d) list for temperature (Table 27).

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1. Subbasin Assessment – Watershed Characterization

The federal Clean Water Act (CWA) requires that states and tribes restore and maintain the chemical, physical, and biological integrity of the nation's waters (33 USC § 1251.101). States and tribes, pursuant to section 303 of the CWA are to adopt water quality standards necessary to protect fish, shellfish, and wildlife while providing for recreation in and on the waters whenever possible. Section 303(d) of the CWA establishes requirements for states and tribes to identify and prioritize water bodies that are water quality limited (i.e., water bodies that do not meet water quality standards). States and tribes must periodically publish a priority list of impaired waters, currently every two years. For waters identified on this list, states and tribes must develop a total maximum daily load (TMDL) for the pollutants, set at a level to achieve water quality standards. This document addresses the water bodies in the South Fork Salmon River Subbasin that have been placed on what is known as the "303(d) list."

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 county. The Idaho Department of Environmental Quality (DEQ) implements the CWA in Idaho, while the EPA oversees Idaho and certifies the fulfillment of CWA requirements and responsibilities.

Section 303 of the CWA requires DEQ to adopt, with EPA approval, water quality standards and to review those standards every three years. Additionally, DEQ must monitor waters to identify those not meeting water quality standards. For those waters not meeting standards, DEQ must establish TMDLs for each pollutant impairing the waters. Further, the agency must set appropriate controls to restore water quality and allow the water bodies to meet their 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 TMDL for water bodies on the 303(d) list. The *South*

Fork Salmon River Subbasin Assessment provides this summary for the currently listed waters in the South Fork Salmon River Subbasin.

Idaho's Role

Idaho adopts water quality standards to protect public health and welfare, enhance the quality of water, and protect biological integrity. A water quality standard defines the goals of a water body by designating the use or uses for the water, setting criteria necessary to protect those uses, and preventing degradation of water quality through antidegradation provisions.

The state may assign or designate beneficial uses for particular Idaho water bodies to support. These beneficial uses are identified in the Idaho water quality standards and include:

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

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

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

- Determine the degree of 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.

The SF Salmon River is a tributary to the Salmon River in Central Idaho. The Salmon River, as a tributary to the Snake River, represents a significant portion of the Columbia River system. The SF Salmon basin is part of the Idaho Batholith. This region is characterized as predominantly forested and mountainous, with steep slopes, variable topography and highly erosive soils.

The SF Salmon River Subbasin, encompasses an area of 840,000 acres on the Boise and Payette National Forests (USDA Forest Service, 2000). The basin contains approximately 875 road miles.

The Northern Rockies Ecosystem covers most of central and northern Idaho. The main characteristics of the ecosystem in the SF Salmon River drainage consists of several conifer cover types, shrubs typically alder, huckleberry, spiera, willows and grasses. Land uses include forestry, grazing, mining, and recreation. The dominant land management agency within the SF Salmon basin is the USDA Forest Service. Isolated private land holding and a few areas managed by the Idaho Department of Lands (IDL) and the Bureau of Land Management (BLM) are also present. A few grazing allotments are present within the basin and are administered by the USDA Forest Service. Mining activities primarily occur around the town of Yellow Pine and Stibnite. Recreation includes hiking, camping, rafting, backpacking, fishing and hunting.

The SF Salmon Subbasin is a 5th-order river system that flows predominately north into the main stem of the Salmon River (Figure 1). The State of Idaho has split the stream system within the SF Salmon HUC into 35 water bodies (Tables 2 and 3).

The approved 1998 303(d) list for Idaho included eight water bodies located within the SF Salmon Subbasin. The pollutants of concern for these water bodies are included in Table 4.

None of the water bodies listed on the 1998 303(d) list (Table 4) had a full water body assessment completed prior to the submittal of the 1998 303(d) list. Therefore, this SBA is the first time the support status and attainment of water quality standards has been comprehensively reviewed. Results of the water body assessments contained within this document are to be used by the Department of Environmental Quality and the USEPA to update the 303(d) list for the State of Idaho.

Table 2. SF Salmon Water Body Identification Numbers

Water Body	Water Body ID	Aquatic Life[1]	Recreation[2]	Other[3]
SF Salmon River - EF Salmon River to mouth	S-1	COLD SS	PCR	DWS SRW
Raines Creek - source to mouth	S-2	COLD SS	PCR	
Pony Creek - source to mouth	S-3	COLD SS	PCR	
Bear Creek - source to mouth	S-4	COLD SS	PCR	
Secesh River - confluence of Summit Creek and Lake Creek to mouth	S-5	COLD SS	PCR	DWS SRW
Lake Creek - source to mouth	S-6	COLD SS	PCR	
Summit Creek - source to mouth	S-7	COLD SS	PCR	

Loon Creek - source to mouth	S-8	COLD SS	PCR	
Lick Creek - source to mouth	S-9	COLD SS	PCR	
SF Salmon River - source to EF of the SF Salmon River	S-10	COLD SS	PCR	DWS SRW
Fitsum Creek - source to mouth	S-11	COLD SS	PCR	
Buckhorn Creek - source to mouth	S-12	COLD SS	PCR	
Cougar Creek - source to mouth	S-13	COLD SS	PCR	
Blackmare Creek - source to mouth	S-14	COLD SS	PCR	
Dollar Creek - source to mouth	S-15	COLD SS	PCR	
Six-bit Creek - source to mouth	S-16	COLD SS	PCR	
Trail Creek - source to mouth	S-17	COLD SS	PCR	
Rice Creek - source to mouth	S-18	COLD SS	PCR	
Cabin Creek - source to mouth	S-19	COLD SS	PCR	
Warm Lake	S-20	COLD SS	PCR	
Fourmile Creek - source to mouth	S-21	COLD SS	PCR	
Camp Creek - source to mouth	S-22	COLD SS	PCR	
EF of the SF Salmon River - source to mouth	S-23	COLD SS	PCR	DWS SRW
Caton Creek - source to mouth	S-24	COLD SS	PCR	
Johnson Creek - source to mouth	S-25	COLD SS	PCR	DWS SRW
Burntlog Creek - source to mouth	S-26	COLD SS	PCR	
Trapper Creek - source to mouth	S-27	COLD SS	PCR	
Riordan Creek - source to mouth	S-28	COLD SS	PCR	
Sugar Creek - source to mouth	S-29	COLD SS	PCR	
Tamarack Creek - source to mouth	S-30	COLD SS	PCR	
Profile Creek - source to mouth	S-31	COLD SS	PCR	
Quartz Creek - source to mouth	S-32	COLD SS	PCR	
Sheep Creek - source to mouth	S-33	COLD SS	PCR	
Elk Creek - source to mouth	S-34	COLD SS	PCR	
Prophyry Creek - source to mouth	S-35	COLD SS	PCR	

[1]COLD = Cold Water Biota, SS = Salmonid Spawning.
[2]PCR = Primary Contact Recreation.
[3]DWS = Drinking Water Source; SRW = Special Resource Water.

Table 3. Elevation and Drainage Areas of SF Salmon Tributaries

Water Body ID[1]	Water Body Name	Lowest Elevation (m)	Highest Elevation (m)	Mean Elevation (m)	Drainage Area (Ac)
2	Raines Creek	775	2525	2125	6938
3	Pony Creek	925	2475	2200	10111

4	Bear Creek	1050	2600	2325	9274
6	Lake Creek	1850	2675	2400	25610
7	Summit Creek	1850	2625	2375	8875
8	Loon Creek	1700	2850	2500	10219
9	Lick Creek	1250	2825	2425	19731
11	Fitsum Creek	1175	2750	2300	17927
12	Buckhorn Creek	1200	2750	2325	28161
13	Cougar Creek	1225	2675	2300	8861
14	Blackmare Creek	1300	2675	2350	10244
15	Dollar Creek	1500	2475	2225	9566
16	Six-Bit Creek	1550	2475	2250	7460
17	Curtis Creek	1575	2450	2200	15924
18	Rice Creek	1675	2700	2425	5802
20	Warm Lake	1625	2550	2225	5334
20	Warm Lake Creek	1550	2650	2175	13808
21	Fourmile Creek	1275	2800	2450	8885
22	Phoebe creek	1225	2300	2025	4008
24	Caton Creek	1350	2800	2500	15754
26	Burntlog Creek	1625	2800	2500	28277
27	Trapper Creek	1600	2600	2375	4816
28	Riordan Creek	1550	2775	2500	13062
29	Sugar Creek	1825	2850	2575	10418
30	Tamarack Creek	1700	2800	2525	10668
31	Profile Creek	1625	2825	2500	11335
32	Quartz Creek	1550	2725	2475	11042
33	Sheep Creek	1075	2700	2350	14709
34	Elk Creek	950	2800	2450	25350
35	Porphyry Creek	800	2750	2350	20035

[1]Water bodies 1, 5, 10, and 25 are mainstem sections of the SF Salmon River, EF SF Salmon River, and Johnson Creek and are not included here.

Table 4. Water Bodies and Pollutants of Concern Identified on the 1998 303(d) List

Stream	**Pollutant**
SF Salmon River	Sediment
EFSF Salmon River	Sediment and Metals (Unknown)
Johnson Creek	Sediment
Rice Creek	Sediment
Dollar Creek	Sediment
Trail Creek	Sediment
Trout Creek	Sediment
Tyndall Creek	Sediment

1.2 Watershed Characteristics

Climate

Mean annual temperature varies throughout the watershed. At the Big Creek Summit monitoring site (elevation 6,580 feet) average daily maximum temperature is 63 F, minimum is 14 F and mean average is 37 F (Figure 2). At Yellow Pine (elevation 5,070 feet) average daily maximum is 54.6 F, minimum is 23.6 F, and mean average is 39.1 F. Frost can occur any day of the year at elevations greater than 7,000 feet.

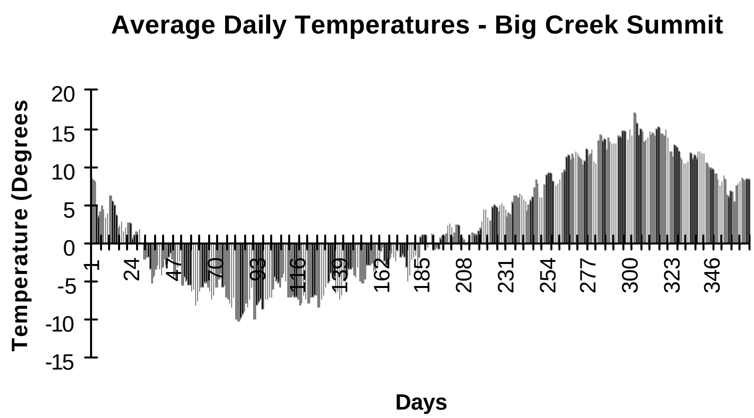

Figure 2. Average Daily Temperatures - Big Creek Summit*

*Day 1 beginning October 1st (water year).

Precipitation averages about 31 inches per year, falling mostly as snow (Figure 3). Heaviest precipitation usually falls as snow in November and December from maritime low-pressure systems. Occasionally, subtropical Pacific storms move over the area producing warm rainstorms in late fall or early winter (Kuzis, 1997). These storms can cause significant rain-on-snow events, resulting in high flows. The largest rain on snow event on record occurred from December 21, 1964 to mid-January 1965 when 4.53 inches of precipitation fell, mostly as rain. This event was similar to a 30-40 year storm event.

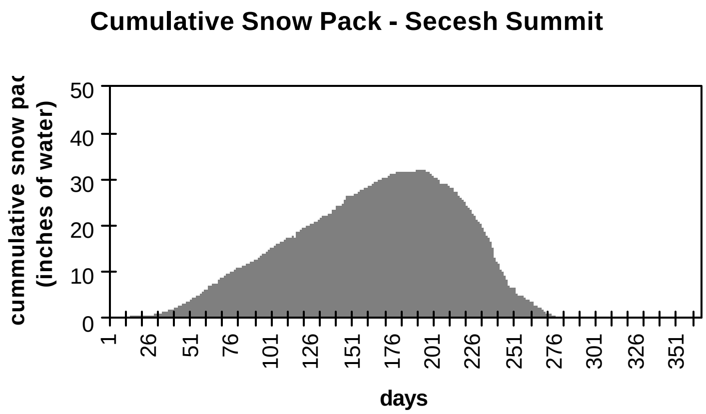

Figure 3. Cumulative Snow Pack - Secesh Summit*

*Day 1 beginning October 1st (water year).

During the summer, low-pressure systems from the Pacific can move into western Idaho, producing moderate rainfall events. These events are generally limited to sporadic thunderstorms, which may be associated with localized high intensity rainstorms of short duration over small areas. Mean annual precipitation increases with elevation and ranges from about 18 inches at lower elevations to 27.6 inches at Yellow Pine, 49 inches at Big Creek Summit (Figure 4) and 58.3 inches at Deadwood Summit (Kuzis, 1997).

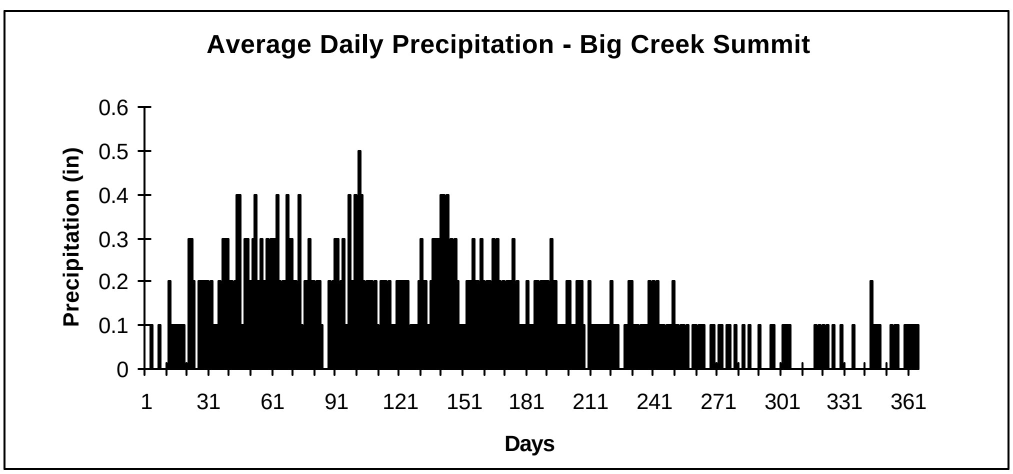

Figure 4. Average Daily Precipitation - Big Creek Summit*

*Day 1 beginning October 1st (water year).

Geology and Soils

The SF Salmon River basin is comprised of ancient sediments metamorphosed by magma introduced 80-100 million years ago. The basin is also located on the western edge of a 40 million-year-old volcanic center. Within this complex system there are three general lithologic units, metamorphic rocks, granite rocks and volcanic rocks (Figure 5).

Oldest in the basin is the metamorphic rock dating back several hundred million years. These rocks are thought to have been deposited as sedimentary or volcanic rock along an ancient ocean or river (USDA Forest Service, 2000). Over time the original sediments where changed into metamorphic rock by magma and deposition. The metamorphic rock is the most mineral rich type of rock in the basin, consisting of calcium-rich rocks, quartz-rich rock, mica-rich rocks and metamorphosed volcanic rocks. Volcanic rocks were formed by the Thunder Mountain Caldera 40 million years old. These rocks range from hard tuffs created by re-melted and re-crystallized lava to soft un-cemented ash and pumice (USDA Forest Service, 2000).

The ‘Idaho Batholith’ is comprised of granite rocks created by intrusions of magma 80-100 million years ago. The Batholith runs from the Idaho City area north to the Clearwater drainage. Within the watershed the rocks vary in composition, with three general types, true granites, granodiorites and tonalites. The ‘typical’ pink-colored granite is the predominate rock found. The granodiorites and tonalites are essentially the same being comprised of more calcium and magnesium (USDA Forest Service, 2000).

The soils of this basin are derived from the Idaho Batholith, which underlay approximately 16,000 square miles of central Idaho (USDA Forest Service, 2000). Soils from the batholith are in general poorly developed with low natural fertility and water-holding capacity. High erosion is due to low silt and clay content creating a sandy soil.

Erosion in this Subbasin is a combination of several factors including, geographic position, slope gradients, surface roughness and vegetation cover. Soils such as that found in the SF Salmon River basin have moderate to moderately high erosion due to shallow soils of 20 inches or less to bedrock. There are three types of erosion process occurring in the Subbasin, surface erosion, mass erosion/ mass failures and erosion associated with stream channel morphology (USDA Forest Service, 2000)

Soil particles that become detached from the land surface by water and gravity is surface erosion. Human disturbances such as mining and roads can increase erosion and sediment production. Soil Surface cover is a critical factor in the rate of surface erosion (USDA Forest Service, 2000). In areas where the vegetation has been removed such as fires erosion can increase in rate and severity. The ability of eroded material to move is a function of the energy available for sediment transport, the potential for storage on the slope, the volume of material, moisture content and the particle size distribution (USDA Forest Service, 2000).

Mass erosion/mass failure is when large masses of soil along with rock and organic material are displaced. Debris flows of this kind in granitic soil usually occur during high intensity rainstorms or seismic events. “Large-scale mass failures such as bedrock slumps and slides are often associated with geologic structures (faults, jointing) lithologic contacts and lithology (weathering conditions)” (USDA Forest Service, 2000). Seismic activity within the Subbasin has been on the moderate level in the Modified Mercalli scale.

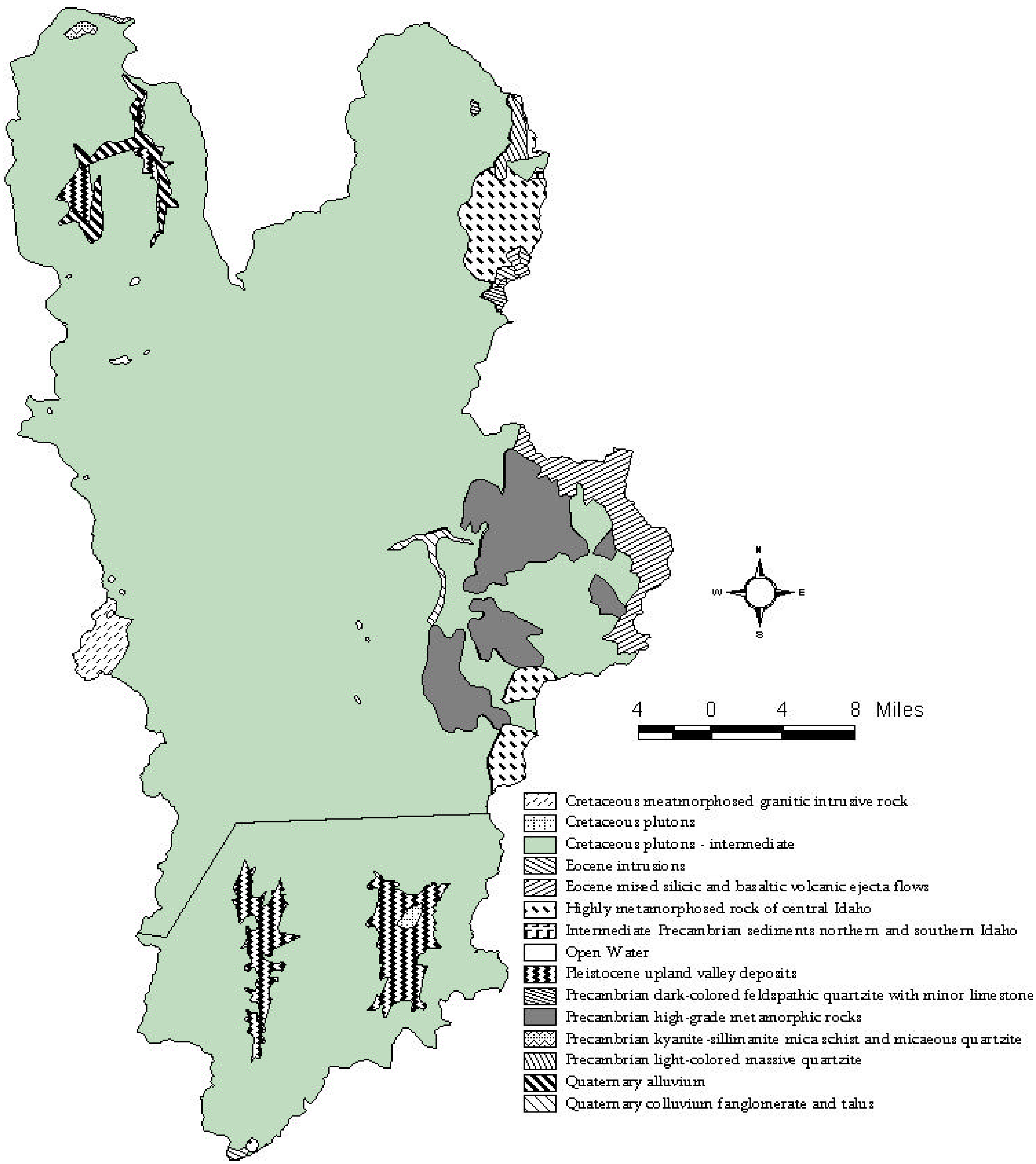

Figure 5. SF Salmon Geology

Land Use and Ownership

Land ownership in the SF Salmon River watershed is primarily public with less than 2% of the land in non-forest service ownership. The SF Salmon River Subbasin is largely made up of inventoried roadless areas, all of which have wilderness potential under the Wilderness Act of 1964. The US Forest Service principally administers the land uses within the SF Salmon Subbasin. The BLM administers the Marshall Mountain Mining District in the upper Secesh River. This district is only a small percentage of the total land in the Subbasin. The state lands are made up of the 'school' sections given to states and homesteads that the state has purchased. Private land is scattered throughout the watershed and includes working ranches, guest ranches, private residences, recreational facilities, villages and mining sites. Figure 6 and Table 5 shows land ownership throughout the SF Salmon Subbasin. Figure 7 shows land use throughout the SF Salmon Subbasin. Figure 8 shows wilderness areas within the SF Salmon Subbasin.

Current land uses falls mainly in the following categories: mining, timber harvest, grazing and recreation. Previous to 1831, land use in the sub-basin was by the Nez Perce and Shoshone Bannock tribes for hunting, gathering, fishing and spiritual uses. Table 6 shows a historical summary of human use.

Forestry

Timber harvest has occurred historically but is not currently widespread. Recent harvests include the 1996 helicopter harvest of a 250 acre parcel of private land on Profile Creek and post-1994 fire killed tree harvests from 1996-1999 (USDA Forest Service, 2000). Intense logging activity took place from 1950 to 1965 in the Subbasin. An estimated 147 million board feet was removed at that time. Concerns over sedimentation and fish habitat resulted in the Forest Service halting all land disturbing activities in the upper SF Salmon River drainage in 1965.

Between 1977 and 1982, timber harvest was allowed in the SF Salmon drainage as long as an annual review of monitoring results showed that fish habitat was continuing to improve. The Bear Creek, Roaring Creek, and part of the Cain Creek sales were harvested on the Cascade Ranger District during this period. However, another moratorium occurred from 1986-1988 due to no improvement in fish habitat. Although timber management activities occur within the Subbasin, timber sales have been limited to sales of utility poles, house logs, post and poles and fuel harvest.

While the moratorium affected timber harvest within the Subbasin, it is the roads built during harvest activities and retained for recreation and fire suppression that have been the dominant sources of erosion in the SF Salmon watershed. One analysis, for example, indicates that, cumulatively, roads have contributed 97% to management induced sediment in the SF Salmon River and 90% to Johnson Creek (USDA Forest Service, 1995).

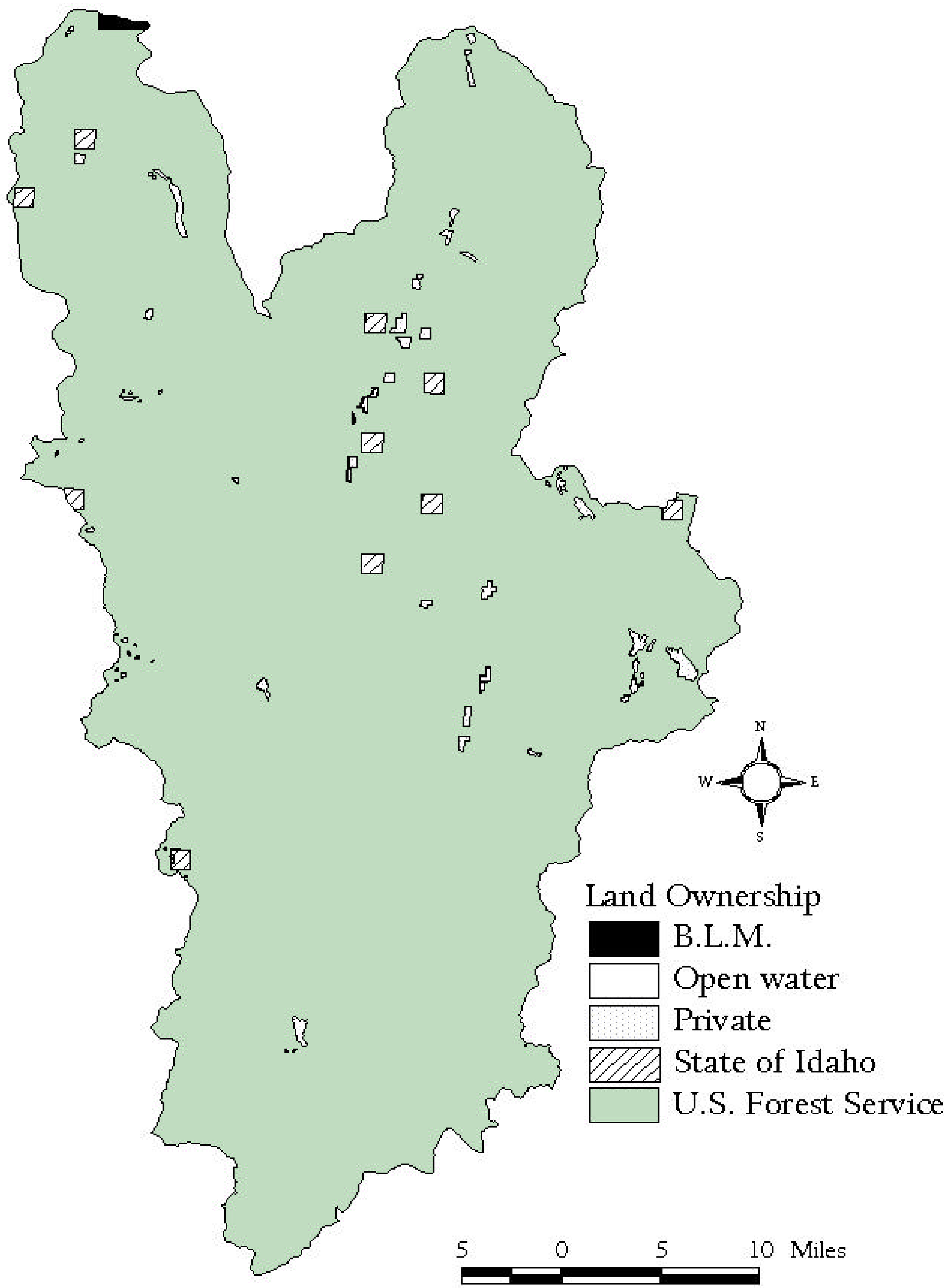

Figure 6. Land Ownership within the SF Salmon Subbasin

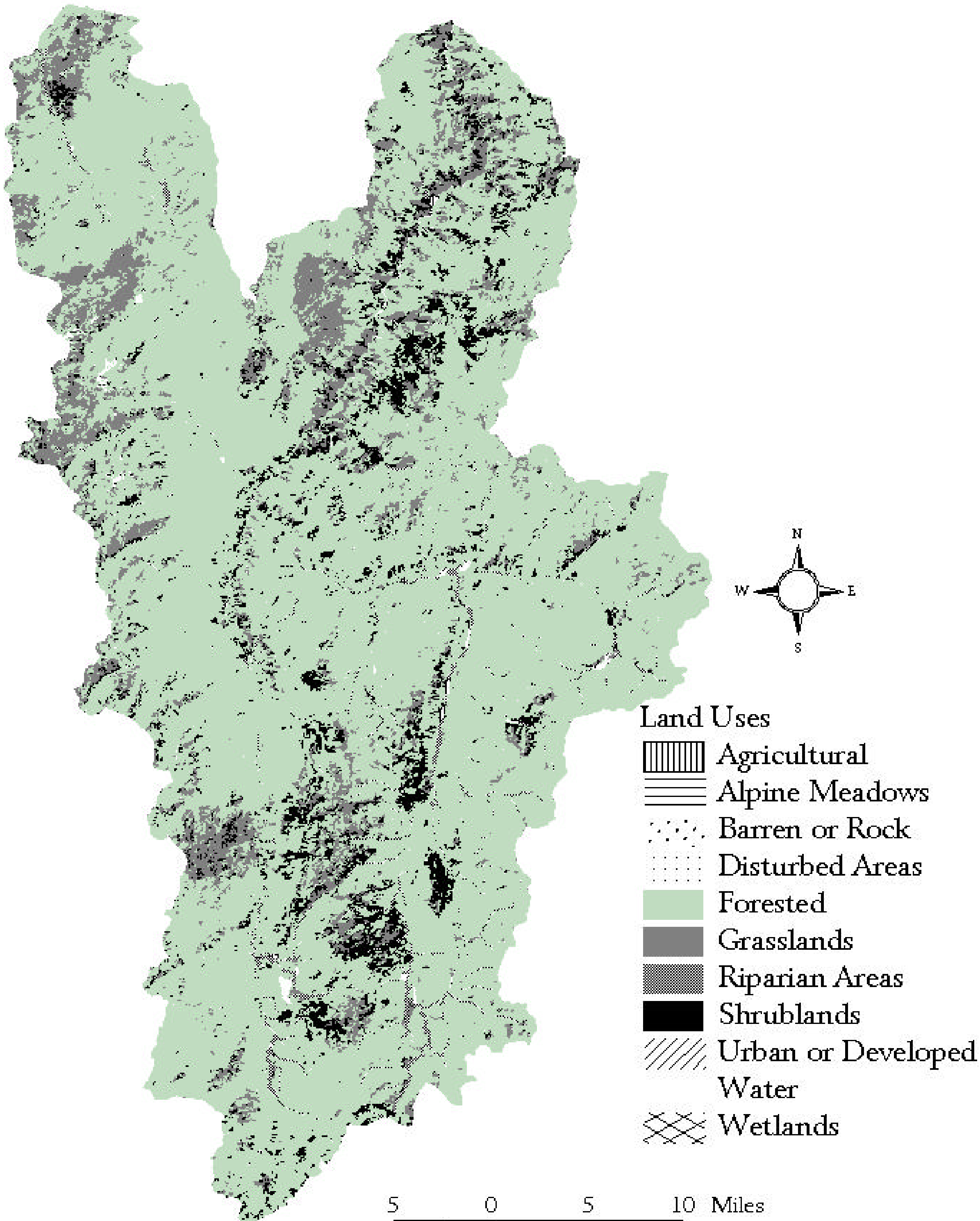

Figure 7. Land Use within the SF Salmon Subbasin

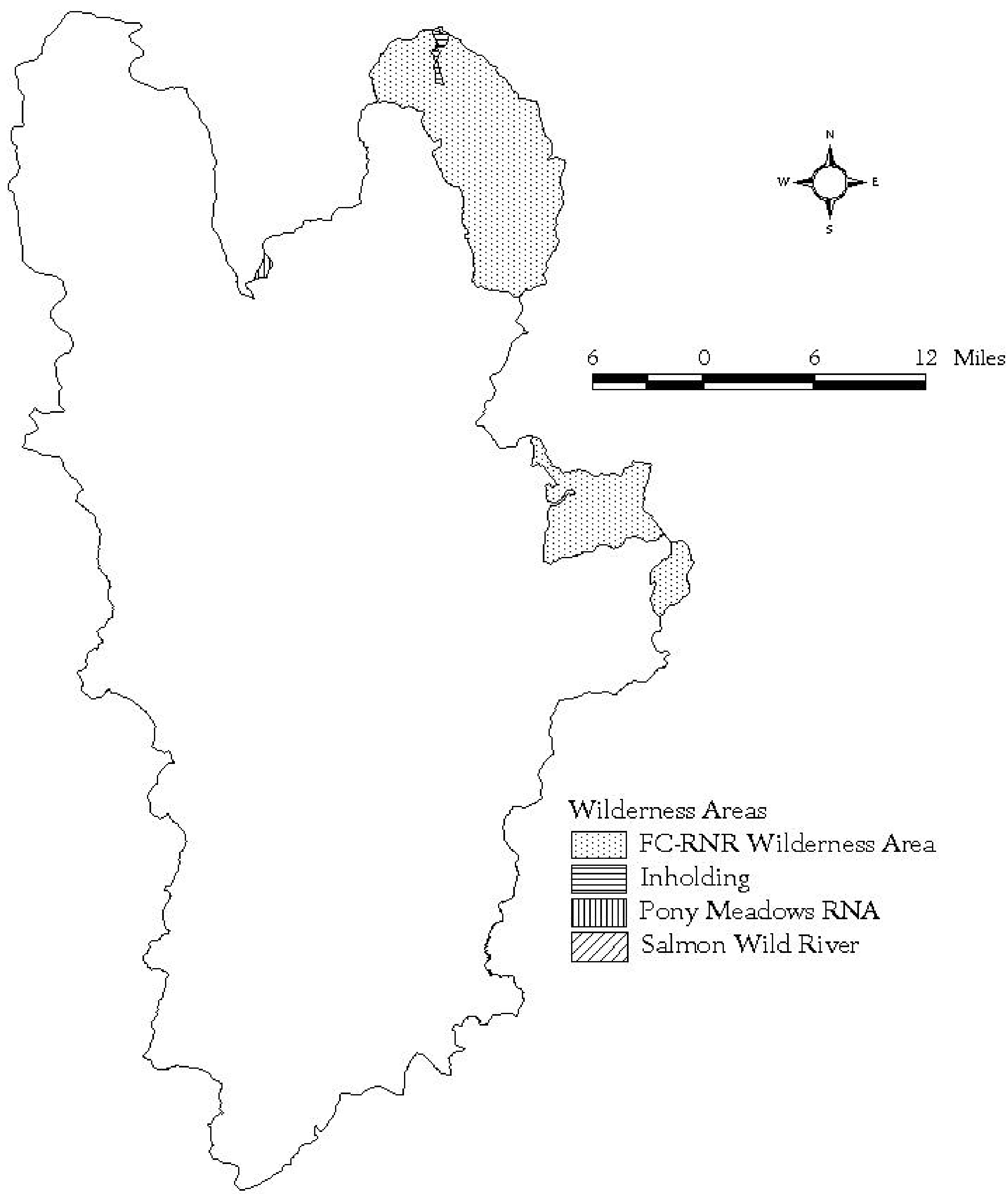

Figure 8. Wilderness Areas Located within the SF Salmon Subbasin

Table 5. Ownership in the SF Salmon River Watershed

Ownership	Acres	Percentage
Payette National Forest	544,038.2	64.8%
Boise National Forest	278,631.6	33.2%
State	8,736.4	1.0%
Private	6,116.1	0.7%
Lakes and Streams	976.5	0.1%
TOTAL ACRES	**840,053.6**	
Wilderness Area Acres*	69099	8.2%
Road Miles**	687.2	

* Wilderness area acres are already included in national forest totals.
** Road miles reflect only open roads and do not include non-system closed roads (USDA Forest Service, 2000).

Table 6. SF Salmon Timeline (USDA Forest Service, 2000)

Year	Event
1831	Trappers of the American Fur Company reach Long Valley
1855	First treaty signed with the Nez Perce
1862	Gold discovered at Warren, Idaho
1863	Idaho Territory created
1870	4,274 Chinese in Idaho Territory, 355 in Warren
1877	Nez Perce War
1878	Bannock War
1879	Sheepeater War
1889	5000 head of sheep grazed in Warm Lake Basin
1900	W. Stonebreaker and James Campbell build a road from Grangeville to Thunder Mountain--"The Three Blaze Trail"
1908	Idaho Forest Reserve created
1920	25000 sheep in Krassel Ranger District; 200,000-300,000 sheep in Johnson Creek
1920's	Road constructed from Johnson Creek to Stibnite, mining begins
1931	Idaho Primitive Area created
1933	First CCC camps established on the Weiser and Idaho Forests
1936	SF Salmon Road constructed to Krassel by CCCs
1940's-1950's	Stibnite/Yellow Pine supported a population of 1500
1944	Weiser and Idaho forests consolidated into the Payette National Forest
1950's	Sheep grazing numbers reduced
1960	Multiple Use- Sustained Yield Act directs the Forest Service to give equal consideration to outdoor recreation, range, timber, water, wildlife and fish
1970	Sheep grazing allotments closed
1977	Creation of Frank Church River of No Return Wilderness

One factor that influences the impacts a road may have on the volume of sediment delivered to water bodies is the "sediment/delivery" combination. Sections of roads that directly flow into water bodies are considered "connected" and tend to have a high potential for impact. For example, Reid (1981) found 73% of the road system in the Clearwater (Washington) drainage was connected. Wemple (1996) also found high connection rates. Surveys conducted by Luce (2000) in the coast range turned up a 32% connection rate consisting of about 90% connection along streams, 50% connection on mid-slope roads, and nearly no connection from roads on the very top of ridges. Some of the greatest sediment production/delivery combinations were from connected mid-slope roads because they tend to be steeper.

One of the key factors in assessing the impacts of sediment, from both anthropogenic and natural sources, within the SF Salmon Subbasin is that the sediment is mobilized during episodic storm events. How the morphology and aquatic habitat within these water bodies respond to the volume of flow and sediment delivered during these episodic events determines whether the beneficial uses are impacted. A summary of the episodic events within the SF Salmon Subbasin is present in the Stream Hydrology section below.

Mining

Mining has played a significant role in the human history of the SF Salmon Subbasin. The alluvial deposits in and along the SF and the EF SF Salmon Rivers, the Upper Secesh River and Johnson Creek were explored and mined for placer gold during the latter portion of the nineteenth century and into recent years. Most of the activity was limited in scale. The most extensive mining in the Subbasin occurred in the Upper EF SF of the Salmon River (EF SF Salmon). Antimony and tungsten were mined at Stibnite from the 1930s through the 1950s. During World War II, Stibnite produced 98 percent of the antimony and 60% of the tungsten for the allied war effort. Beginning in the 1970s and continuing until 1997, gold was produced from a moderately large surface mine at Stibnite using heap-leach techniques. Stibnite is located 19 miles east of Yellowpine. Stibnite is now closed and has been reclaimed through an administrative order of consent between Mobil Company, IDL, IDEQ, USEPA and the US Forest Service (Griner and Woodward-Cyde, 2000).

Mines at Cinnabar and Fern Creek produced significant quantities of mercury during the 1940s and 1950s. Discovered in 1902 during the Thunder Mountain Gold Rush, Cinnabar Mine is a 50-acre site located 21 miles east of Yellow Pine (i.e. four miles east of the Stibnite mine). The greatest amount of activity at Cinnabar Mine occurred during the forties and fifties.

The SF Salmon Subbasin is open to mineral activities and prospecting with certain exceptions. The SF Salmon River and its tributaries, including Johnson Creek and the Secesh River, are presently closed to recreational suction dredging due to concerns about fish habitat and water quality. The locatable mineral potential is high in the vicinity of Warren and Stibnite, and interest in exploration is high. Gold exploration on forest service and private lands is occurring in the Golden Gate area of Johnson Creek. Placer and lode claims exist in the Subbasin, although most of these are not actively mined at this time.

The lease-able mineral potential for geothermal resources in the upper SF Salmon River is high. Currently, there are no applications for geothermal leases in the area. The presence of other lease-able minerals such as oil and gas is low or nonexistent in the Subbasin. The demand for the common variety minerals such as gravel and landscaping rock is low. The Forest Service handles common mineral removal through a permit system. " (USDA Forest Service, 2000).

Grazing

Currently, grazing plays a very minor role in the SF Salmon watershed and is associated with permitted outfitter and guide activity on National Forest System lands. Limited grazing occurs on private land near Yellow Pine. Grazing allotments are summarized in Table 7. All of these allotments are currently utilized except Sand Creek and North Fork Lick Creek. The use in these allotments has decreased over the last ten years (USDA Forest Service, 2000).

Table 7. Grazing Allotments in the SF Salmon Subbasin

Allotment	Animal Grazing Units
Hanson Creek	15 horses
Sand Creek S&G	Cattle and horse (AGU not specified)
Johnson Creek near Landmark	Unspecified
North Fork Lick creek	One band of 1500 head, cattle
Josephine S&G	One band of 1000 head, cattle
Bear Pete S&G	One band of 835 head, cattle
Marshall Mountain S&G	One band of 835 head, cattle
Victor Loon S&G	One band of 1000 head, cattle

Historically, the SF Salmon River and Johnson Creek drainages were affected by sheep grazing that occurred from the turn of the century through the early 1960's. The first 5,000 head of sheep were introduced in the Warm Lake Basin in 1889. By 1920, 25,000 sheep grazed in the Blackmare drainage and the Buckhorn drainage. The number of grazing allotments reduced over the years to 1,988 head in the 1950's. Once the Forest Service realized the erosion on the steep slopes and the sheep market collapsed in the 1960's the allotments were closed. By 1970 the Forest Service waived all grazing allotments in the SF Salmon Subbasin (USDA Forest Service, 1995).

In the 1920's, large numbers of sheep (i.e. 200,000 in Johnson Creek, twice the estimated carrying capacity estimated) affected vegetation and soil conditions by increasing compaction, reducing re-vegetation potential, increasing bare soil, reducing organic matter, and reducing plant root volume, depth, cover, density and vigor. Sheep are adapted to grazing steep slopes and prefer forbes although they consume green grass in the spring and woody species such as Salix spp. in the fall (USDA Forest Service, 1995).

After the 1920's, allotment stocking was designated to deal with overuse issues. Erosion and poor vegetation recovery resulted in a reduction of sheep numbers in the 1950's. In the

1960's the sheep market crashed and sheep grazing ended. The allotments were shifted from sheep to cattle in the 1960's (USDA Forest Service, 1995).

Cattle tend to utilize and congregate on level areas (i.e. valley bottoms, ridge tops) as well as on rolling hillsides. Cattle prefer grass but will consume browse and some broad-leafed forbes later in the season. Impacts from cattle grazing include erosion and soil compaction as well as vegetation removal. Most areas impacted by cattle and sheep were left to recover naturally.

Recreation

The SF Salmon Subbasin affords recreational opportunities such as hunting, fishing, berry and mushroom picking, sightseeing, camping, rafting, off road recreational vehicle use and hiking. Recreation rates have stayed stable, increasing slightly over the last 10 years (USDA Forest Service, 2000). In addition, there are resorts, lodges, summer homes in the Yellow Pine, Johnson Creek, Secesh, Warm Lake, Warren and Burgdorf areas. Eleven different outfitters operate in the Subbasin offering actives such as horse packing, fishing guides, and hunting (USDA Forest Service, 2000).

Upland and Riparian Vegetation

Historically the primary disturbance in the SF Salmon Subbasin has been fires. Frequent low intensity fires every 5 to 25 years helped to maintain the mature pine stands. Douglas-fir and grand-fir were the dominate cover in the mid to upper slopes prior to settlement. Subalpine fir and lodgepole pine dominated the higher elevations. Fire severity and frequency occurring any where from 60 to 500 years produced a mosaic of age classes and species composition (USDA Forest Service, 2000). Whitebark pine grows in the Subbasin along the ridge tops above 7000 feet. Tables 8 and 9 show the historic upland cover and existing vegetation cover in the basin, respectively.

Table 8. Historic Upland Cover (USDA Forest Service, 2000)

Cover	Percent of Area in Entire Subbasin*
Non Forested Cover	1%
Lodgepole Pine	26%
Whitebark Pine	7%
Whitebark Pine/Alpine Larch	1%
Interior Ponderosa Pine	18%
Interior Douglas-fir	20%
Englemann Spruce/Subalpine Fir	26%

*Percentages <1% were not included in this table.

Table 9. Existing vegetation cover (USDA Forest Service, 2000)

Cover	Percent of Area in Entire Subbasin*
Non Forested Cover	
Upland Grass	2%
Montane/Subalpine Grassland	3%
Mesic Shrub	4%
Sagebrush	1%
Rock/Barren	4%
Forested Cover	
Aspen	1%
Lodgepole Pine	21%
Whitebark Pine	1%
Ponderosa Pine	5%
Douglas-fir	4%
Douglas-fir/Lodgepole Pine	2%
Douglas-fir/Grand Fir	2%
Douglas-fir/Ponderosa Pine	11%
Mixed Whitebark Pine Forest	7%
Mixed Subalpine Forest	16%
Mixed Mesic Forest	5%
Mixed Xeric Forest	4%
Mixed Broadleaf/Conifer Forest	3%
Moderate Intensity Burn (1994)	1%
High Intensity Burn (1994)	3%

*Percentages <1% were not included in this table.

In the bottomland meadow areas of the watershed the vegetation is of key importance. Vegetation provides surface run off filtration, organic matter for water holding capacity and surface water infiltration (USDA Forest Service, 1995). The composition of the riparian area of a meadow is a good indicator of the land-type's current hydrologic storage, buffer and regulation capabilities.

Overall, riparian vegetation extends along river and streams throughout the Subbasin and consists of moist soil vegetation types (USDA Forest Service, 2000). A stable riparian area provides protection, filtration and buffer to the stream. Along with depositing Large Woody Debris (LWD) the riparian provides shade to help regulate stream temperature. Karen Kuzis notes that "conifer Stands provide more long-term LWD than deciduous stands and that a stand must be well-stocked (i.e. greater than 60% canopy closure) to provide adequate long term LWD inputs." Disturbance factors affecting the riparian of the watershed include timber harvest, fire, flooding, drought, and grazing.

Hydrology and Stream Morphology

The surface water hydrology of the SF Salmon River is typical of the northern Rocky Mountains in Idaho (Kuzis, 1997). The Integrated Scientific Assessment for the Interior

Columbia River Basin Ecosystem Management Project (ICBEMP) found the hydrologic integrity of the Subbasin to be high. This judgment was based on a process that incorporated descriptive data, empirical models, trend analysis and expert judgment (USDA Forest Service, 2000). Anthropogenic activities have not significantly altered surface and groundwater flows (Kuzis, 1997).

The SF Salmon River watershed contains four major tributaries: the Secesh River, the EF SF Salmon River, Johnson Creek and the upper SF. In addition to stream channels the SF Salmon River watershed contains 37 lakes. The largest is Warm Lake (640 acres). Other alpine lakes range in size from 1-160 acres (Kuzis, 1997).

Groundwater is present mainly in alluvium and to a limited extent in fractured bedrock. Water bearing zones are primarily recharged from direct infiltration of precipitation and snowmelt. Recharge also occurs from seepage from losing reaches of streams and springs. Discharge is from springs, seeps and as base flow from gaining reaches of area streams (Kuzis, 1997).

Peak stream discharge typically occurs during a six week period in May and June following snow melt. Rain-on-snow events contribute to peak discharges at lower elevations at other times of the year. Base flows occur from September to January. For the period of record, 1928 to 1995 at the mouth of Johnson Creek near Yellow Pine, mean annual discharge ranged from 123 cfs to 622 cfs, with a peak of 6,300 cfs in 1974 (USGS, 1996). Low flows for the SF Salmon at the mouth are between 800-1200 cfs while high flow ranges from 15-20,000 cfs. (USDA Forest Service, 2000). Table 10 lists the USGS stream gages in the subbasin. Shorter periods of record are also available for EF SF Salmon River at Stibnite, the Secesh River near Burgdorf, the SF Salmon River near Warren, Circle End Creek, Tailholt Creek, Zena Creek, Buckhorn Creek, Dollar Creek, Blackmare Creek, and others (Kuzis, 1997).

Table 10. USGS Gaging Stations within the Salmon River Basin

Active/ Discontinued	Station No.	Location	Years Of Record	Drainage Area (MI^2)
A	17000	Salmon River @ White Bird	1919-1995	13,550
A	14300	SF Salmon River @ Mouth Near Mackay Bar	1993-1995	1,310
D	14000	SF Salmon River Near Warren	1931-1943	1,160
D	14500	Warren Creek Near Warren	1943-1950	37
D	13800	Tailholt Creek Near Yellow Pine	1959-1962	2.6
D	13500	Secesh River Near Burgdorf	1943-1952	104
A	13000	Johnson Creek @Yellow Pine	1928-1995	213
D	12500	Johnson Creek Near Landmark Ranger Station	1943-1949	54.7
D	12000	EFSFSR Near Stibnite	1928-1941	42.5
A	11000	EFSFSR @ Stibnite	1928-1941 1982-1995	19.6

Active/ Discontinued	Station No.	Location	Years Of Record	Drainage Area (MI^2)
A	10700	SFSR Near Krassel Ranger Station	1966-1982 1985-1986 1989-1995	330
D	10670	West Fork Buckhorn Creek Near Krassel Ranger Station	1990-1994	22.6
D	10660	Little Buckhorn Creek Near Krassel Ranger Station	1990-1994	5.99
D	10570	SFSR @ Poverty Flat Near Cascade	1990-1992	221.5
D	10565	Blackmare Creek Near Poverty Flat Near Cascade	1990-1992	17.8
D	10520	Dollar Creek Near Warm Lake Near Cascade	1990-1994	16.5
D	10500	SFSR Near Knox	1929-1961	92

The lower and middle SF Salmon River is defined as the portion of the SF Salmon River downstream from the confluence of the EF Salmon, excluding the Secesh River. Elevation ranges from 3,650 feet at the EF SF Salmon River confluence to 2,166 feet at the Salmon River confluence. The lower and middle SF Salmon River mainly flows through V-shaped canyon sections that are broken by only a few short, open U-shaped valley areas. The wider areas along the SF Salmon River occur near the mouths of Sheep, Elk, Smith and Knob Creeks. The mainstem SF Salmon River is predominately a B3c stream type (Rosgen, 1994). Stream gradients range from less than 1% in some short sections near Knob Creek to about 5% in the Rooster Creek area. Tributaries entering the SF Salmon River tend to be high gradient (5-10 %) streams (Rosgen type A), with sections of steep gradient that form fish passage barriers. Larger tributaries include Sheep, Elk, Pony, Smith, Porphyry, and Rooster Creeks. These streams drain relatively large areas and have gradients steeper than the SF Salmon River (Kuzis, 1997).

The SF Salmon River mainstem was examined for changes in stream channel characteristics caused by the high magnitude flood event that occurred during the winter of 1996-97 (Johnson, 2000). This rain on snow event was estimated to produce a 20-year flood event for the SF Salmon mainstem. Changes in meso-scale hydraulic features, sediment distribution, and geomorphic channel dimensions were compared using three separate flights of multi-spectral airborne imagery (MSAI) (July 1992; November 1993; and October 1997).

It was found that the SF Salmon River is largely stable and resistant to changes caused by large magnitude flooding. Observed changes during the study tended to be localized. One common occurrence was the evidence of flooding coming into the SF Salmon through tributary creeks. It was common to see areas of washed out riparian vegetation and the deposit of boulders, debris, or fine sediments at the mouth of the tributary or immediately downstream within the mainstem. The Elk Creek, Deer Creek, and Brewer Creek tributaries were identified as significant sources of sediment during this event.

Proceeding downstream from those areas with large sediment deposits from tributary input, sediments are sorted according to particle sizes. Finer sediments will be transported further downstream, thus changing the formation of sediments not only at the mouths of tributaries but any other formation downstream. As sediment is sorted and deposited, a change in gradient and a re-adjustment in channel hydraulics begins to take place. One typical channel hydraulic response is to widen and shallow, thus locally increasing the channel's sediment transport capacity. Study findings, however, indicate that the SF Salmon River has mostly maintained channel width between high-water marks from the headwaters near Stolle Meadows downstream to the confluence with the main Salmon River (Johnson, 2000).

Typically, high magnitude flood events tend to increase channel diversity and in turn will often increase the diversity of salmonid fisheries habitat available. With respect to the 20-year flood in 1997, it is suspected that it assisted the SF Salmon River in reaching a state of improving dynamic equilibrium (i.e. where the rate of change is largely stable and favorable to the health of fisheries habitat) (Johnson, 2000).

The Secesh River subwatershed encompasses approximately 170,000 acres. The Secesh River enters the main SF Salmon River about one mile downstream of the EFSF. Channel gradients range from less than one percent along Lake Creek and the upper Secesh Meadows to over ten percent in canyon sections. Summer discharge readings range from highs of several thousand cubic feet per second (cfs) in May and June to lows of about 100 cfs in September. The Secesh River originates at the confluence of Summit and Lake Creeks. Marshall Lake is the source for Lake Creek (USDA Forest Service, 1994).

The EF SF Salmon River watershed covers approximately 250,000 acres and enters the mainstem SF Salmon River near the confluence of the Secesh River. The EF SF Salmon River is confined in a deep V-shaped canyon for much of its length. Short stretches of low gradient channel, where the canyon widens for short distances, occur in patches downstream of Yellow Pine and upstream of Quartz Creek. In general, stream channels in the watershed have low LWD, bank stability and pool frequency based on Pacfish, Forest Plan, and Idaho Natural Conditions databases. The most significant natural processes affecting channels are mass wasting and erosion.

The upper EFSF has been affected by historic mining and displays subtle morphologic adaptations to those influences. With respect to sediment and LWD, the upper EFSF consists primarily of source and transport reaches. Despite impacts due to mining, the overall channel condition of the upper EFSF is good (Kuzis, 1997), although the upper stretch has a low number of pools and low number of large woody debris. Widened channels and excessive median and lateral bar formation are evidence of past sediment inputs. Historic pool filling from mining related inputs of sediment and the naturally unstable nature of the geologic units in the upper portion of Sugar and Tamarack Creeks in the area have contributed to this low pool number.

However, the stream channels have shown significant natural recovery (Kuzis, 1997). Certain channel modifications are worth noting due to their significance. These modifications include:

- Glory Hole – This is an old mining pit constructed mid-channel in 1955 that currently acts as a sediment trap. While the EF SF Salmon River flows through Glory Hole, the 4 acre site does not affect large flows due to its size, and only slightly affects low flows (Kuzis, 1997). Glory Hole supports a vigorous fish population and healthy benthic macroinvertebrate community. This feature also displays thermal stratification but re-suspension of sediments due to turnover is not expected. The bottom velocities necessary for turnover would not be high enough for re-suspension (Griner and Woodward-Cyde, 2000).
- Meadow Creek - as a result of the reclamation Meadow Creek was reconstructed on the south side of the tailings area (4,575 ft) and the old channel was lined to reduce seepage (Griner and Woodward-Cyde, 2000).
- EF SF Salmon River (between Johnson and Parks Creeks) – This is the most vulnerable section of the lower EF SF to changes in sediment supply and basin disturbance due to the relatively wide valley and low (0.75%) gradients present. These combine to form a section dominated by long riffles and shallow pools and there is deposition of sediment of all sizes. Overall, the channel is limited within this section and does not tend to form pools (Kuzis, 1997).
- Lower Sugar Creek – This creek drains into the Upper EF SF Salmon River, showing widened channels, excessive medial and lateral bar formation in response to past sediment inputs. In the 1940's approximately 1 million cubic yards of glacial overburden was removed from the EFSF channel and placed in both Sugar Creek and other parts of the EF SF Salmon River (Kuzis, 1997).
- West End Creek - A tributary to Sugar Creek, West End Creek displays fully embedded cobbles. While West End Creek has improved over time, as of 1997 it was still introducing fines to Sugar Creek (Kuzis, 1997).

Johnson Creek is the largest tributary of the EF SF Salmon River, covering approximately 136,320 acres. Johnson Creek is a fifth order stream. The main stream channel flows through an open valley with short steeper sections (Deadhorse Rapids). Discharge ranges from peak flows of 2,000 to 4,000 cfs to a winter low of 50 to 100 cfs (USDA Forest Service, 1994). Flow data is available from 1928 to present from the USGS gage. The Johnson Creek drainage has sustained heavy impacts from grazing, road construction/grading and fire. The most sensitive channel reaches are 6 miles and 25 miles upstream from Yellow Pine respectively (Nelson et al., 1996).

Tributary streams to the SF Salmon River, the Secesh River, the EF SF Salmon River, and Johnson Creek generally exhibit Rosgen Type A and B morphology. Type A are entrenched streams exhibiting low sinuosity and a low width/depth ratio. Type B streams are moderately entrenched, showing moderate width/depth ratio and moderate sinuosity (Kuzis, 1997).

The portion of the SF Salmon basin above the confluence of the EF SF Salmon River covers approximately 232,000 acres. Rosgen type C channels alternate between V-shaped canyon sections and open U-shaped valley reaches. Low gradient reaches occur at Stolle Meadows, Dollar Creek, Poverty Flats, Darling Cabin, Oxbow, and Glory areas. Tributary streams generally have steeper gradients.

Episodic Storm Event Summary for the SF Salmon Subbasin

Between 1958 and 1965, a series of intense storms and rain-on-snow events created numerous landslides and slumps triggered by logging and associated road construction, inundating the river and some of its tributaries with heavy sediment loads (Platts, 1972). A survey conducted in 1965 estimated about 1.5 million cubic yards (about 7 times normal) of sediment was stored in the upper 59 miles of the SF Salmon River and its tributaries (Arnold and Lundeen, 1968). Changes in channel profile and channel cross sections have documented a decrease in the channel bed elevation and percentage of fines, indicating that channel conditions improved over time (Megahan et al., 1980).

The rain on snow events in the winter and spring of 1965 caused over 100 landslides the majority of which were related to roads. These landslides introduced approximately 135,000 cubic yards of sediment to the SF Salmon River (Jensen and Cole 1965). In June of 1965 the dam on Blowout Creek (renamed after event) failed and an 8 foot surge of flood water, sediment and debris went into Meadow Creek, a tributary to the EF SF Salmon River. There was damage in the EF SF Salmon River all the way downstream to Yellow Pine.

In 1974, floods in the EF SF Salmon River drainage carried heavy loads of sediment into the EFSF. Johnson Creek registered a 100 year recurring flow (6300 cfs). The steep slopes and shallow soils found in the watershed combine to cause relatively rapid runoff. Discharge measurements range from peak flows of several thousand cfs during peak snowmelt in late May or early June to about 300 cfs or less during September (USDA Forest Service, 1994). Gaged records are available from the EFSF at Stibnite (Kuzis, 1997).

Management activities that remove forest cover (i.e. road construction, timber harvest, mining) have the potential to increase peak flows and water yield by reducing interception and evapotranspiration, with changes generally proportional to the canopy removed. Natural activities such as fire that affect forest cover also can change peak flows and water yield.

Areas impacted by these human activities include: Zena Creek, mainstem SF Salmon River upstream of Buckhorn Creek, Upper Johnson Creek, EFSF and tributaries around Stibnite and the area near Lake Creek in the Upper Secesh watershed. The 1950's and 1960's were the busiest in terms of timber harvest and road construction (USDA Forest Service, 1995). Mining activities were most intense in the 1940's and grazing impacts were greatest in the 1920's.

Fisheries

The SF Salmon River system maintains nineteen fish species; three anadromous, ten native residents and six introduced. This Subbasin plays a key role for chinook salmon, steelhead, bull trout and westslope cutthroat trout, which are all Threatened, Endangered or Sensitive

(TES) species. Table 11 outlines the fish species present and the status of populations in the SF Salmon River basin.

Table 11. Fish Presence and Status in the SF Salmon Subbasin

Anadromous Species	Distribution	Status
Spring Chinook salmon	Headwater areas	Depressed, ESA threatened
Summer Chinook salmon	Throughout watershed in mainstem and low-gradient tributary areas	Depressed, ESA threatened
Fall Chinook salmon (Ocean type)	Historically in lower portion of drainage	ESA threatened, (believed extirpated)
Sockeye Salmon	Historical runs into Loon and Warm Lake	Maybe occasional sighting
Steel head	Throughout watershed	Depressed, ESA threatened
Pacific lamprey	Uncommon	Depressed, IDFG state endangered species
Native Resident Species		
Redband trout	Throughout watershed	Common, USFWS species of special concern
Bull trout	Locally common in parts of watershed but overall depressed throughout range	Depressed, ESA threatened
Westslope cutthroat trout	Throughout watershed	Depressed, petitioned for ESA threatened, USFS R4 sensitive
Kokanee	Warm Lake and Loon Lake	Present
Mountain Whitefish	Mainstem river and larger tributaries	Present
Northern Pikeminnow	Lower SFSR below Secesh River, common in lower six miles	Locally common
Redside shiner	Uncommon in lower part of SFSR	Present
Suckers	Common	Present
Longnose dace	Throughout watershed	Present
Speckled dace	Unknown	Present
Sculpin	Spotty observation record	Present
Introduced Resident Species		
Cutthroat trout	High mountain lakes – mixed stock	Present
Rainbow trout	Throughout watershed	Present
Cutthroat x Rainbow	High mountain lake	Present

Anadromous Species	Distribution	Status
Brook trout	Common in some areas	Locally common
Lake trout	Warm Lake, 33 Lake	Limited
Golden trout	High mountain lakes	Limited
Arctic grayling	High mountain lakes	Limited

Historically, the SFSR was the single-most important summer chinook spawning stream in the Columbia River basin (Mallet, 1974). Chinook salmon are found distributed throughout the SF Salmon Basin with the highest numbers found in the Secesh River and mainstem of the SF Salmon River. All perennial streams in the watershed are designated as salmon critical habitat (USDA Forest Service, 2000).

Karen Kuzis' technical report (1997) on fish in the SF Salmon River notes the trend is decreasing numbers. The best long-term information on escapement are the annual fish counts over the uppermost dam on the Snake River (Apperson, 2000). Returns of steelhead and chinook past the uppermost dam have decreased from highs greater than 50,000 fish/year in the 1960's to less than 10,000 fish/year over the last three years. Although there are areas of degradation in each of the major tributaries each tributary supports suitable anadromous spawning and rearing habitat which is in good condition (USDA Forest Service, 1988; USDA Forest Service, 1995). Tables 12 through 15 outline the habitat requirements for Summer Chinook, Steelhead, Bull Trout and Cutthroat Trout, respectively.

Resent research indicates that the regional decreases in anadromous fish are in response to migration corridor modification due to hydroelectric development on the Columbia and Snake Rivers, over fishing of ocean stocks and habitat degradation (Lee et al, in review). A significant discrepancy between historical and current populations is exhibited throughout the system (USDA Forest Service, 2001). Therefore, all anadromous fish (chinook and steelhead remain at risk.

Table 12. Summer Chinook Habitat Requirements (Kuzis, 1997)

Activity	Conditions	Timing
Spawning	5.6-13.9 ^{o} C, .6 - 10.2 cm gravel, redd size 5.1m^{2}	Late August & September
Incubation	5.0-14.4 ^{o} C, survival drops off with > 30% fines (<6.35mm)	Late Aug. to May
Winter Habitat	Pools, interstitial spaces in cobble/ gravel substrate. Lower SF and main Salmon	Dec. - May (temps. <4 C)
Summer Habitat	grassy banks and deep pools; not found in channels over 10 % gradient, with 2 to 4 % optimum	May - Dec.

Steelhead, another of the aquatic uses listed under the Endangered Species Act, is present within the SF Salmon River basin. Only two other basins in Idaho besides the SF Salmon currently supports wild native steelhead (USDA Forest Service, 2000). The National Marine Fisheries Service (NMFS) has designated the SF Salmon River as critical habitat for Snake

River steelhead. The critical habitat is defined as all river reaches accessible to fish, and consists of the water, substrate, and riparian zone of the reaches. Accessible reaches are those that can still be occupied by any life stage of steelhead.

Table 13. Steelhead Habitat Requirements (Kuzis, 1997)

Activity	Conditions	Timing
Spawning	3.9 to 9.4 ^{o} C; 0.6 - 10.2cm gravel, redd sizes 4.4-5.4m^2	April - early June
Incubation	No redd scouring or siltation, survival drops off with > 25% fines (<6.35mm)	spring - midsummer
Winter habitat	Pools, interstitial spaces in cobble/ gravel substrate. Lower SFSR, main Salmon	water temps. <4 ^{o}C
Summer habitat	Age I pocket water and runs, age II pocket water, and age III utilized all three habitats; water temps. 10 -13^{o} C, (lethal temps. 23.9^{o} C)	May-Dec.

Bull trout, another ESA listed species, are distributed throughout the watershed. The historic population status is unknown but distribution is considered to be similar to historic. The SF Salmon supports both resident and migratory bull trout populations. Tributaries act as spawning and rearing areas for fluvial bull trout. Juveniles usually live in the tributaries for one to three years before migrating to mainstems in the spring and summer high flows (USDA Forest Service, 2000). Bull trout populations in Idaho are considered depressed due to over harvest and habitat modifications, which has limited the fluvial migratory component of their life history. Hybridization and competition with non-native species such as brook trout have also contributed to the depression of the species.

Table 14. Bull Trout Habitat Requirements (Kuzis, 1997)

Activity	Conditions	Timing
Spawning	loose gravels and cobble	Sept. - Oct.
Incubation	success increases with temperatures <10^{o}C, optimum 2 to 4^{o}C, stable substrate	September - June
Winter habitat	Pools, interstitial spaces in cobble/ gravel substrate. Lower SFSR, main Salmon	Water temperatures < 5^{o}C
Summer habitat	temps 9 - 15^{o} C, food and escape cover; Stream gradients of 6 to 9 %	Water temperatures > 5^{o}C

The distribution of cutthroat trout is considered to be wide and similar to historic distributions. Resident abundance has greatly decreased in the last 50 years due to angler harvest, declines in the number of fluvial fish, destruction of spawning and rearing habitat and introduced species that displace the cutthroat. Spawning occurs when water temperatures are optimal, young fish will stay in the tributaries for two to three years before migrating downstream in response to food or habitat needs (USDA Forest Service, 2000).

Table 15. Cutthroat Trout Habitat Requirements (Kuzis, 1997)

Activity	Conditions	Timing
Spawning	6.1 to 17.2 ^{o} C; 0.07-3.5 cm gravel, redd sizes .09-.9 m^2	March - June
Incubation	Stable substrate, no sedimentation, usually 50 - 100 days, survival drops off with > 10% fines (<6.35mm)	temperature dependent
Winter habitat	Pools, interstitial spaces in cobble/ gravel substrate. Lower SFSR, main Salmon	Water temperatures < 5^{o}C
Summer habitat	Pools and lateral habitats, water temperatures 10 -19^{o} C, food and escape cover (lethal temps. 22.8^{o} C); gradients .5 to 3.8 %	Water temperatures > 5^{o}C

Many of the past studies in the Subbasin did not record whitefish numbers. Studies in which whitefish were counted found low densities near the mouth of Sugar Creek and Tamarack Creek. Whitefish occur in the main EF SF Salmon River to the reach just above the Glory Hole. They were not observed in the 1994 IDFG snorkel surveys in Profile Creek. Their distribution in other tributaries is uncertain because the presence of whitefish has not been consistently recorded (Kuzis 1997).

2. Subbasin Assessment – Water Quality Concerns and Status

2.1 Water Quality Limited Segments Occurring in the Subbasin

As shown in Table 16, there are eight 303(d) listed water bodies in the SF Salmon River subbasin. These water bodies include the SF Salmon River, the EFSF Salmon River, Johnson Creek, Rice Creek, Dollar Creek, Trail Creek, Trout Creek, and Tyndall Creek (i.e. upper Johnson Creek). The pollutant of concern is sediment for all of the listed waterbodies and metals for the East Fork of the SF Salmon.

Table 16. 303(d) Water Bodies in the SF Salmon River Subbasin

Water Body Name	Segment ID Number	303(d)[1] Boundaries	Pollutants
SF Salmon River	2915-20	Headwaters to Salmon River	Sediment
EFSF Salmon River	2934-36	Headwaters to Salmon River	Sediment, Metals
Johnson Creek	2940-42	Headwaters to S Fk Salmon River	Sediment
Rice Creek	2959	Headwaters to S Fk Salmon River	Sediment
Dollar Creek	5066	Headwaters to S Fk Salmon River	Sediment
Trail Creek	5195	Headwaters to Curtis Creek	Sediment
Trout Creek	5199	Headwaters to Johnson Creek	Sediment
Tyndall Creek	5203	Headwaters to Johnson Creek	Sediment

[1]Refers to a list created in 1998 of 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.

The Federal Clean Water Act (CWA) requires restoration and maintenance of the chemical, physical, and biological integrity of the nation’s waters (Public Law 92-500 Federal Water Pollution Control Act Amendments of 1972). Each state is required to adopt water quality standards necessary to protect fish, shellfish, and wildlife while providing for recreation in and on the water whenever attainable.

Section 303(d) of the CWA establishes requirements for states to identify and prioritize water bodies that do not meet state water quality standards despite the application of technology based controls on point sources. States must publish a list (a.k.a. 303(d) list) of these waters, including priority ranking of such waters, every two years. The USEPA provides review and approval of the 303(d) list.

Either the USEPA or the state must develop Total Maximum Daily Loads (TMDLs) to achieve water quality standards for waters identified as impaired due to one or more pollutants on the 303(d) list. A TMDL documents the current load, the load capacity (i.e., the amount of a pollutant a water body can assimilate without violating a state's water quality standards), and allocates the load capacity to known point and non-point sources. If none of the existing data show that the water quality standards are violated due to a pollutant load, the USEPA and the state uses this information to update the current 303(d) list. In this case the USEPA and the state is not required to proceed with Steps 2 (the TMDL) or 3 (the implementation plan).

TMDLs are defined in 40 CFR Part 130 as the sum of the individual Waste Load Allocations (WLA) for point sources and Load Allocations (LA) for non-point sources, including a margin of safety and natural background conditions. Regulations implementing 303(d) are found at 40 CFR Part 130. Total maximum daily loads are defined in Part 130.2 as:

> *The sum of the individual WLAs for point sources and LAs for non-point sources and natural background. If a receiving water has only one point source discharger, the TMDL is the sum of that point source WLA plus the LAs for any non-point sources of pollution and natural background sources, tributaries, or adjacent segments. TMDLs can be expressed in terms of either mass per time, toxicity, or other appropriate measure...*

In essence, TMDLs and TMDL Implementation Plans are water quality management plans that allocate responsibility for pollution reduction with a goal of achieving water quality standards within a specified period of time.

It is the State's responsibility to develop their respective 303(d) list and establish a TMDL for the parameter(s) causing water body impairment (i.e. a violation of State water quality standards and failure to support beneficial uses).

In response to these responsibilities Idaho adopted Idaho Code sections 39-3601 through 39-3616, which establish state water quality law. In summary, these laws require:

- monitoring of all streams to establish designated uses and determine whether water bodies comply with state water quality standards;
- developing TMDLs for waters which do not comply with water quality standards or beneficial uses are not supported due to a pollutant; and
- establishing citizen advisory groups [Basin Advisory Groups (BAGs) and Watershed Advisory Groups (WAGs)], to advise DEQ on prioritizing impaired water bodies, how to properly manage impaired watersheds, and recommend pollution control activities in impaired watersheds.

Subsequent to adoption of Idaho Code 39-3601, et. seq., IDEQ adopted implementing regulations. Public participation requirements for BAGs and DEQ are outlined in the Idaho Administrative Procedures Act (IDAPA) 58.01.02.052. IDAPA 58.01.02.053 establishes a procedure to determine whether a water body fully supports designated and existing beneficial uses, relying heavily upon aquatic habitat and biological parameters, as outlined in the Water Body Assessment Guidance (IDEQ, 1996). IDAPA 58.01.02.054 outlines procedures for identifying water quality-limited (WQL) waters that require TMDL development, publishing lists of WQL water bodies, prioritizing water bodies for TMDL development, and establishing management restrictions, which apply to WQL water bodies until TMDLs are developed.

The 1991 SF Salmon Sediment TMDL

The eight-year schedule adopted by the State of Idaho established that the support status of listed water bodies within the SF Salmon fourth field hydrologic unit would be assessed by the end of 2000. Within this timeframe, the State of Idaho is also to re-visit, and possibly revise, the 1991 sediment TMDL approved by the USEPA.

This earlier TMDL was developed by a consensus team with members from the USDA Forest Service, the USEPA, and state representatives. The 1991 TMDL is located in Appendix B. Based on results of the USDA Forest Service surface erosion model, BOISED, fisheries trend data, and professional experience, the team developed the following sediment targets for the SF Salmon River:

1) A 5-year mean of 27 percent depth fines by weight with no single year over 29 percent;
2) A 5-year mean of 32 percent cobble embeddedness, with no single year over 37 percent; or
3) Acceptable improving trends in monitored water quality parameters that “re-establish” the beneficial uses of the SF Salmon River.

The team based their findings that the water body violated state standards under the narrative sediment standard only. During the development of the sediment targets, it was admitted that there was great uncertainty that the numeric targets selected would actually restore salmonid spawning in the river (i.e. to historic levels). Therefore, stated objectives were to provide habitat “sufficient to support fishable populations of naturally spawning and rearing salmon and trout”. Ultimate achievement of water quality standards under this framework was based on data that indicated that naturally producing populations of chinook and steelhead “tolerant of sustained recreational harvest” were present.

2.2 Applicable Water Quality Standards

Idaho water quality standards include criteria necessary to protect designated and existing beneficial uses. The standards are divided into three sections: General Surface Water Criteria, Surface Water Quality Criteria for Use Classifications, and Site-Specific Surface Water Quality Criteria (Figure 9) (IDEQ, 2000). All Idaho water quality criteria for surface waters are applicable within the SF Salmon Subbasin.

Surface water beneficial use classifications are intended to protect the various uses of the state’s surface water. Designated beneficial uses are listed in Idaho’s Water Quality Standards and Wastewater Treatment Requirements (IDEQ, 2000; 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 organism and populations of significant aquatic species. Aquatic life uses include cold water, salmonid spawning, seasonal cold water, warm water, and modified.

Recreation classifications are for water bodies that are suitable or intended to be made suitable for primary contact recreation and secondary contact recreation. Primary contact recreation, like swimming, entails prolonged and intimate contact by humans where ingestion of raw water is likely to occur. Secondary contact recreation, such as fishing or boating, entails recreational uses where ingestion is unlikely.

Water supply classifications are for water bodies that are suitable or intended to be made suitable for agriculture, domestic, and industrial uses. Wildlife habitat waters are those which are suitable or intended to be made suitable for wildlife habitat. Aesthetic criteria apply to all waters.

Table 2 in Section 1 of this assessment shows the beneficial uses for the 303(d) listed water bodies and other water bodies in the SF Salmon River basin.

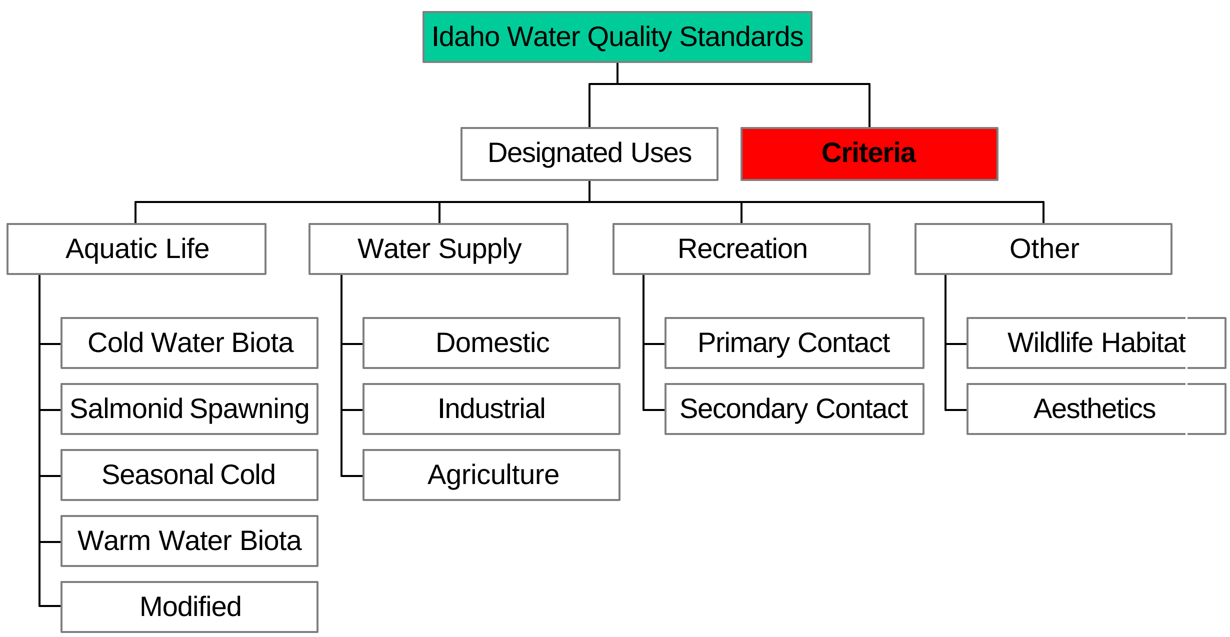

Figure 9. Idaho Water Quality Standard Framework

Water Quality Criteria – General

The general surface water criteria are usually referred to as the narrative criteria. These apply to all waters of the state in addition to other criteria that may apply. Generally, these narrative criteria state that waters shall be free from materials or matter in concentrations that impair beneficial uses. Sediment is among these materials. Numerous water bodies located within the SF Salmon fourth-field HUC are listed on the 1998 State of Idaho 303(d) list for impairment as a result of sediment. The general surface water criteria for sediment (IDAPA 58.01.02.200.08) from Idaho Water Quality Standards and Wastewater Treatment Requirements (IDEQ, 2000) is as follows:

> *Sediment shall not exceed quantities specified in Section 250, or, in the absence of specific sediment criteria, quantities which impair designated beneficial uses. Determinations of impairment shall be based on water quality monitoring and surveillance and the information utilized as described in Subsection 350.02.b.*

Numeric Water Quality Criteria for Surface Water Designated Uses

These criteria include specific concentrations for individual pollutants that are based on categories and individual beneficial uses. IDAPA 58.01.02.070 specifies how the water quality standards are to be applied to Idaho's water bodies. A "natural background conditions" clause is included in this section and states that: "Where natural background conditions from natural surface or ground water sources exceed any applicable water quality criteria…that background level shall become the applicable site-specific water quality criteria."

Recreation

Primary contact recreation criteria apply to waters where prolonged and intimate contact by humans when the ingestion of water is likely to occur. Secondary contact recreation criteria apply to waters other than those designated for primary contact recreation. The major constituent of concern under Idaho state water quality standards is E. coli. Water bodies for which primary contact recreation uses are supported must have amounts of E. coli that do not exceed: (1) 406 organisms per 100 ml (17/oz) at any time, or; (2) a geometric mean of 126 organisms per 100 ml (7/oz) based on a minimum of 5 samples taken over a 30 day period. All other water bodies (i.e. secondary contact recreation) should have amounts of E. coli that do not exceed: (1) 576 organisms per 100 ml (27/oz) at any time, or; (2) a geometric mean of 126 organisms per 100 ml (7/oz) based on a minimum of 5 samples taken over a 30 day period.

IDAPA 58.01.02.080.03 specifies that a single water quality sample exceeding an E. coli standard does not in itself constitute a violation of water quality standards. This section then specifies how additional samples are required for the purpose of comparing the results of the one time sample to the geometric mean criteria.

Aquatic Life

All streams with aquatic life use classifications (cold water biota, warm water biota, salmonid spawning) should have concentrations of:

- pH between 6.5 and 9.5;
- dissolved gas not exceeding 110%;
- total chlorine residual of less than 19 g/L/hr or and average of 11 g/L/4 day period;
- less than toxic substances criteria set forth in 40 CFR 131.36(b)(1) Columns B1, B2, D2.

Cold water biota are the life forms that inhabit cold water. These life forms include: game and non-game fish; aquatic macroinvertebrate; and aquatic periphyton. All streams with cold water biota use classifications should have concentrations of:

- Dissolved oxygen concentrations exceeding 6.0 mg/L;
- Temperatures less than 22 C (72^{o}F)(instantaneous), and 19 C (66^{o}F)(daily average);
- Low ammonia (formula/tables for exact concentration); or
- Turbidity less than 50 nephelometric turbidity units (instantaneous) or 25 nephelometric turbidity units (10 day average) greater than background.

Salmonids are all those fish that are classified in the family Salmonidae. The family Salmonidae contains the whitefish, salmons, trouts, chars and graylings. Salmonids are characterized by the presence of an adipose fin and a pelvic appendage. Spawning criteria apply during site specific time periods. The time periods used for water bodies within the SF Salmon fourth field HUC are based on the spawning and egg incubation period by each species of salmonid. The time periods applied within the SF Salmon HUC (Table 17) have been solicited by the DEQ from sister agencies and land management agencies.

Salmonid spawning numeric criteria apply to streams in the SF Salmon Subbasin with existing and designated salmonid spawning and rearing populations. According to the Idaho water quality standards, all streams with salmonid spawning use classifications, and in streams where spawning occurs, should not exceed the following:

- Intergravel dissolved oxygen of 5.0 mg/L (instant) or 6.0 mg/L (7-day average);
- Dissolved oxygen of 6.0 mg/L (same as cold water biota); or
- Low ammonia (same as cold water biota).

Numeric temperature criteria are specified in Table 17.

Table 17. Salmonid Spawning Periods within the SF Salmon HUC

Species	General Timing	Specific Timing		Temperature Criteria (^{o}C)		
		From	To	Daily Maximum	Daily Average	Seven Day Daily Maximum Average
Summer Chinook	Late August and September	8/10	9/30	13	9	NA
Steelhead	April to early June	4/1	6/10	13	9	NA
Westslope Cutthroat	March to June	3/1	6/30	13	9	NA
Bull Trout*	September and October	9/1	10/31	NA	9	12
Bull Trout**	June to September	6/1	9/30			10

*Applies to 4th-order streams located above fourteen hundred meters elevation.

**Federal standard

IDAPA 58.01.02.080.04 specifies that exceeding the temperature criteria will not constitute a violation of water quality standards when the air temperature exceeds the ninetieth percentile of the 7 day average daily maximum air temperature calculated in yearly series over the historic record measured at the nearest weather station. This exemption does not apply to the federal temperature standard for Bull trout.

Water Supply and Other Uses

Water supply use classifications include domestic drinking water, wildlife habitats, and aesthetics. The last two beneficial uses should generally be supported when more sensitive beneficial uses criteria (e.g., cold water biota) and general water quality criteria are met.

The IDEQ is the primary agency responsible for the protection of public drinking water in the State of Idaho. Idaho Rules for Public Drinking Water Systems include criteria necessary to protect all domestic water supplies. Requirements have been set forth for Treatment Techniques (IDAPA 10.01.08.500), Design Standards (IDAPA 10.01.08.550), and Operating Criteria for Public Drinking Water Systems (IDAPA 10.01.08.552).

Drinking water systems are classified according to whether they are public systems and the number of people usually served. As of 2001, there is one public water supply system within the SF Salmon Subbasin. The town of Yellowpine draws water from nearby Boulder Creek. No non-community (transient or non-transient) water systems within the sub-basin have been identified. If domestic uses occur then all surface sources of drinking water for public water systems must maintain filtration and disinfecting systems intended to maintain safe drinking water (IDAPA 58.01.08.550.05).

Numeric Criteria for Toxic Substances

IDAPA 58.01.02.210 incorporates the National Toxins Rule (40 CFR 131.36 (b)(1)). The incorporation of this rule identifies the following as the numeric criteria for all water bodies within the State of Idaho (Table 18).

Table 18. Water Quality Criteria for Metals and Cyanide (µg/L)

Toxic	**Acute Criteria**		**Chronic Criteria**	
Analytes	Idaho	USEPA	Idaho	USEPA
Aluminum (total)	--	750	--	87
Antimony (total)	--	88	--	30
Arsenic(dissolved)	360	340	190	150
Cadmium(dissolved)	1.7	2	0.7	1.3
Chromium III (dissolved)	310	320	100	40
Chromium IV (dissolved)	15	15	11	11
Copper (dissolved)	8.9	7	6.3	4.8
Iron (total)	--	--	--	1000
Lead (dissolved)	30	30	1.2	0.9
Magnesium	--	--	--	--

Toxic	Acute Criteria		Chronic Criteria	
Manganese	--	--	--	--
Mercury (dissolved for acute, total for chronic)	2.1	1.2	0.012	.77
Nickel (dissolved)	790	260	87	29
Selenium (total)	20	--	5	5
Silver (dissolved)	1	1	--	--
Zinc (dissolved)	64	65	58	66
Cyanide WAD	22	--	5.2	--
Cyanide Free	--	22	--	5.2

*Note: some of these standards are dependent upon hardness or pH. See original rule for clarifications.

2.3 Summary and Analysis of Existing Water Quality Data

None of the water bodies listed on the 1998 303(d) had a full water body assessment completed prior to the submittal of the 1998 303(d) list. Therefore, this SBA is the first time the support status and attainment of water quality standards has been comprehensively reviewed. Figure 10 shows a map of these waters. Results of the water body assessments contained within this document are to be used by the Department of Environmental Quality and the USEPA to update the 303(d) list for the State of Idaho.

Biological Indications of Water Body Support Status

The Idaho Administrative Procedures Act (IDAPA 58.01.02.053) specifies that, when determining whether a water body fully supports designated and existing beneficial uses, the IDEQ is to determine whether all of the applicable water quality standards are being achieved and whether a healthy, balanced biological community is present. It also specifies that the IDEQ is to utilize the Water Body Assessment Guidance, plus other available data from cooperating agencies (e.g. "WBAG+") (IDEQ, 1996) to assist in the assessment of beneficial use status. Current guidance from the IDEQ indicates that the initial screen used to determine whether a water body is in violation of current water quality standards is primarily based on available monitoring data for the numeric water quality standards and the biologic life indicators present within the water body.

Macroinvertebrates – Cold Water Biota

The Water Body Assessment Guidance (WBAG) was developed to provide a non-arbitrary water body assessment method using data collected by the Beneficial Use Reconnaissance Protocol (BURP) and other sources. It is designed as an analytical tool for determining if a water body is supporting or not supporting a beneficial use. It is used to prioritize water bodies for more stringent assessments and to recommend candidate beneficial uses. Under the BURP protocol, numeric water quality standards, biological indicators (i.e. macroinvertebrates and fish presence and absence) and habitat characteristics are evaluated.

The threshold values used for the macroinvertebrate index (MBI) indicate that anything above 3.5 receives a "full" support status call. Threshold values for habitat index (HI) have been identified for each ecological region of Idaho. The SF Salmon HUC, located in the Northern Rockies region, has a threshold value of 64 for an "impaired", 65-99 for a "needs verification", and 100 or greater for a "not impaired" support status. Table 19 shows each of the MBI and HI scores for water bodies located within the SF Salmon HUC.

As can be seen, most of the MBI scores are greater than 3.5, with the one exception being Upper Trout Creek. Also, all of the HI scores fall into either the "needs verification" or "not impaired" value range. When the HI scores fall within the "needs verification" range, current guidance indicates that the biological indicators (i.e. MBI and data regarding fish spawning and rearing) are to be used in making a final determination on the water body's support status.

Upper Trout Creek, along with a few other water bodies, were sampled during the summer of 2000 to verify that the low score was due to instream conditions and not sampling error. The results of this effort are presented in Table 20.

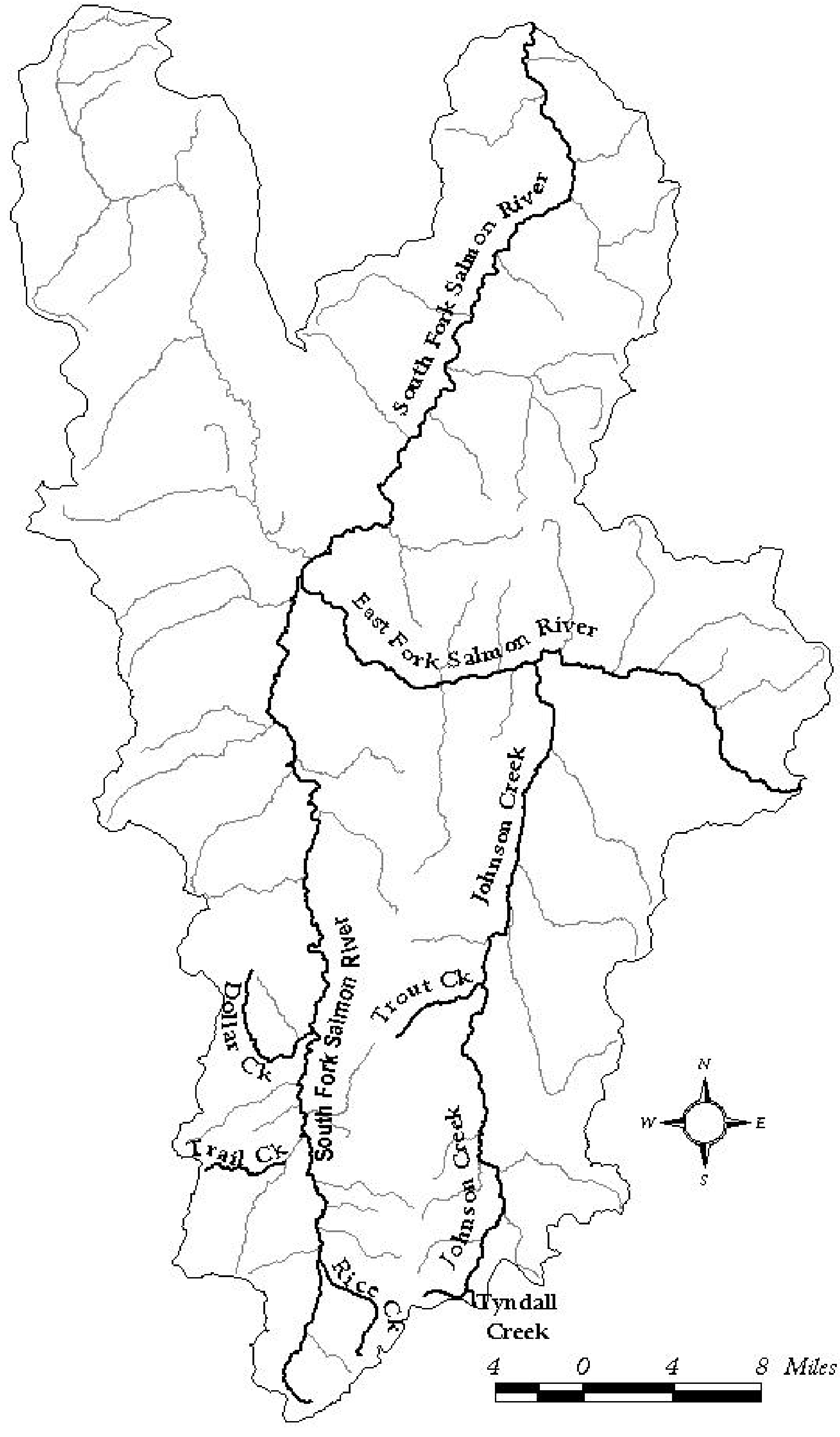

Figure 10. 1998 303(d) Listed Waters in the SF Salmon HUC

Table 19. Beneficial Use Reconnaissance Project Data (1993-1999)

BURP ID	Water Body	Water-body ID	Date	CWB[1]	MBI[2]	HI[3]
93SWIRO07	Burntlog Creek	26	93-08-19	2	4.89	M
93SWIRO17	Riodan Creek	28	93-08-13	4	4.39	M
94SWIROA46	WF Buckhorn	12	94-07-22	3	5.06	94
94SWIROA47	Buckhorn Cr	12	94-07-22	5	3.96	91
94SWIROA58	Six Bit (U)	16	94-08-16	14	5.64	122
94SWIROA59	Six Bit (L)	16	94-08-16	13	5.69	119
94SWIROA60	Curtis (L)	17	94-08-16	11	4.53	101
94SWIROA61	Curtis (U)	17	94-08-17	12	5.2	98
95SWIROC12	Secesh River (L)	5	95-08-03	2	4.62	89
95SWIROC13	Secesh River (U)	5	95-08-03	2	3.64	84
95SWIROC24	Six Bit (L)	16	95-08-11	9	4.95	105
95SWIROC25	Curtis (L)	17	95-08-14	M	M	91
95SWIROC32	Six Bit	16	95-08-14	9	5.24	109
96SWIROB79	Summit Creek (L)	7	96-08-19	4	4.81	103
96SWIROB80	Summit Creek (U)	7	96-08-19	6	4.61	115
97SWIROA20	Dollar Creek (L)	15	97-07-07	3	3.81	111
97SWIROA21	Trout Creek (U)	25	97-07-08	4	**2.01**	90
97SWIROA22	Trout Creek (L)	25	97-07-08	7	4.68	91
97SWIROA23	Dollar Creek (U)	15	97-07-08	10	5.18	82
97SWIROA24	Bear Creek (U)	4	97-07-09	13	5.48	95
97SWIROA25	Bear Creek (L)	4	97-07-09	4	4.88	98
97SWIROA38	Ellison Creek	31	97-07-21	10	5.25	90
97SWIROA39	Missouri Creek (U)	31	97-07-22	8	4.28	90
97SWIROA40	Missouri Creek (L)	31	97-07-22	8	4.47	90
97SWIROA41	Profile Creek (L)	31	97-07-22	6	4.8	92
97SWIROA42	Boulder Creek	25	97-07-23	11	5.17	74
97SWIROA43	Salt Creek	23	97-07-23	10	4.16	91
97SWIROB42	Ryan Creek	31	97-07-21	10	4.96	96
97SWIROB43	Camp Creek	22	97-07-22	10	5.13	91
97SWIROB44	Profile Creek (U)	31	97-07-22	10	5.16	82
97SWIROB45	Tamarack Creek	30	97-07-23	7	5.01	100
97SWIROB46	Spring Creek	31	97-07-23	6	4.75	97
97SWIROB47	Vibitka Creek	23	97-07-24	9	4.84	98
97SWIROB48	Double A Creek	23	97-07-24	9	4.47	79
97SWIROB49	Johnson Creek (M)	25	97-07-28	0	4.88	74
97SWIROB50	Johnson Creek (U)	25	97-07-28	5	4.13	97
97SWIROB51	Sand Creek (U)	25	97-07-29	4	4.58	104
97SWIROB52	Sand Creek (L)	25	97-07-29	2	4.38	86
97SWIROB53	Johnson Creek (L)	25	97-07-29	4	4.64	91

BURP ID	Water Body	Water-body ID	Date	CWB[1]	MBI[2]	HI[3]
97SWIROB54	Lunch Creek (L)	25	97-07-29	6	4.78	117
97SWIROB55	Lunch Creek (U)	25	97-07-30	12	4.33	94
97SWIROB56	Lodgepole Ck (L)	10	97-07-30	12	5.31	98
97SWIROB57	Lodgepole Ck (U)	10	97-07-30	5	4.67	96
98SBOIA63	Rice Creek (U)	18	98-08-03	14	5.24	104
98SBOIA64	Rice Creek (L)	18	98-08-03	9	5.22	110
98SBOIA65	Tyndall Ck	25	98-08-04	13	5.47	100
98SBOIA66	Trail Creek (U)	17	98-08-04	13	5.38	104
98SBOIA67	Trail Creek (L)	17	98-08-05	7	5.23	115
98SBOIA68	Johnson Creek (U)	25	98-08-05	3	4.89	107
98SBOIA69	Johnson Creek (L)	25	98-08-06	M	M	112
98SWIROQ12	Warm Lake	20	98-07-27	M	M	M
99SBOIA020	Warm Lake Cr	20	99-08-04	9	5.19	127
99SBOIA021	Trapper Cr	27	99-08-04	9	5.38	108
99SBOIA022	Quartz Cr	32	99-08-05	15	5.72	122
99SBOIA031	Fourmile Cr	21	99-08-30	12	5.4	101
99SBOIA032	Camp Cr	10	99-08-30	6	4.89	109
99SBOIA033	Fitsum	11	99-08-31	7	5.4	108
99SBOIA034	Caton Cr	24	99-08-31	M	M	M
99SBOIA035	EF SF Salmon	23	99-08-31	M	M	120
99SBOIA036	Lick Cr	9	99-09-01	13	5.77	113
99SBOIA045	Loon Cr	8	99-09-14	3	5.3	99
99SBOIA046	Pony Cr	3	99-09-15	8	5.72	100
99SBOIA047	Elk Cr	34	99-09-15	11	5.09	113
99SBOIA048	Blackmare Cr	14	99-09-16	10	5.61	97
99SBOIA049	Buckhorn Creek	12	99-09-16	7	5.23	108
99SBOIA058	Bear Creek	4	99-09-29	9	5.88	102

[1]CWB = # of Cold water biota species present within the sample.
[2]MBI = Macroinvertebrate Score
[3]HI = Habitat Index

Table 20. Summer 2000 Macroinvertebrate Scores[1]

Stream	MBI[2]	CWI[3]
Upper Trout	*5.84*	*11*
Lower Trout	*3.91*	*2*
Middle Sand	*5.20*	*7*
Lower Sand	*5.42*	*2*
Upper Bear	*5.95*	*9*
Lower Bear	*4.20*	*6*
Upper Dollar	*6.33*	*11*
Lower Dollar	*5.67*	*9*

Stream	MBI[2]	CWI[3]
Burntlog	*4.12*	*8*
EF Burntlog	*5.33*	*10*
Buck	*5.44*	*8*

[1]Italic = MBI Calculator Version 3.1 used pending availability of the most recent MBI calculator.
[2]MBI = Macroinvertebrate Score
[3]CWB = # of Cold water biota species present within the sample.

As can be seen, the MBI scores for these streams, including Trout Creek, obtained during the summer of 2000 are above the 3.5 threshold value and are therefore considered "not impaired".

Idaho Rivers Ecological Assessment

Rivers listed on the 1998 Idaho 303(d) list are to have the beneficial use support assessed using a "Large Rivers Protocol" (LRP). The SF Salmon River was utilized as a pilot site in the development of this protocol. Although still in draft form, preliminary findings for the SF Salmon River are presented to assist the IDEQ in determining the support status of these water bodies.

Data collected under the LRP for the SF Salmon River includes fish species presence and absence surveys, macroinvertebrate metrics, periphyton assemblages, and diatom assemblages. While the "a priori" classification for the SF Salmon River was "degraded", each of the tools used to evaluate the current beneficial use support status within this water body showed "good" biological indicators. In fact, the results consistently indicate that the inputs of inorganic sediment to the SF Salmon River may not have impacted the aquatic macroinvertebrates (Royer et al., in review). Results of the LRP, therefore, indicate that the support status of the SF Salmon River hinges upon whether the river is able to support salmonid spawning and rearing.

Fish Species Presence and Absence - Salmonid Spawning and Rearing

Current IDEQ guidance for determining whether salmonid spawning and rearing is "impaired" vs "not impaired" depends upon either (1) a determination by IDFG that the water body either does or does not have a self-sustaining salmonid fishery, or, if no definitive finding has been reported, (2) data on salmonid populations. In the second case, the IDEQ is to evaluate the length frequency distribution data and determine if a minimum of three size classes are present. However, in the case of chinook salmon, young of year (YOY) and juvenile salmon provide an adequate indication that the spawning and some limited rearing is occurring, due to the transient nature of their stay within the SF Salmon drainage.

The IDFG and several cooperating agencies have conducted snorkel counts of chinook salmon, steelhead, cutthroat trout, bull trout, brook trout, and other fish species in the SF Salmon drainage. Referred to as the "parr" database, this data set was used to determine whether at least 3 size (i.e. age) classes of a salmonid species was present within each sampled water body. Results of this data inventory are presented in Table 21.

Table 21. Parr Presence and Absence Data for the SF Salmon Subbasin

Stream	Chinook	Steelhead	Cutthroat	Bull Trout	Brook Trout	White fish	Redband
SF Salmon River	yoy + juvenile	yoy + 5	yoy + 5	4	yoy + 4	yoy + 6	
EF SF Salmon River	yoy + juvenile	yoy + 6	5	yoy + 6	yoy +1	yoy + 5	1
Secesh River	yoy + juvenile	yoy + 4	yoy + 3	5	yoy + 4	yoy + 6	1
Johnson Creek	yoy + juvenile	yoy + 4	3	1	yoy + 3	yoy + 4	2
Dollar	yoy + juvenile	yoy + 3	3	2	4		
Lake	yoy + juvenile	yoy + 4	yoy + 1	4	yoy + 5	yoy + 5	2
Lick	yoy + juvenile	yoy + 4	yoy + 3	yoy + 2	yoy + 2	5	
Rock	yoy + juvenile	yoy + 1	yoy + 5	4	yoy + 4	yoy + 6	
Sand	yoy + juvenile	yoy + 2			yoy + 3		
Whisky	yoy + juvenile	1			yoy + 2		

Additional data collected by the USDA Forest Service was also examined for evidence of spawning and rearing support. Table 22 presents the results of this data review.

Table 22. Forest Service Presence / Absence Data for the SF Salmon Subbasin[1]

Stream	Chinook	Steelhead	Cutthroat	Bull Trout	Brook Trout	Redband
Johnson Creek	yoy + juvenile		yoy + 3	yoy + 3	1	yoy + 3
SF Salmon River	yoy + juvenile	yoy + 3	2			
Buckhorn	yoy + juvenile	yoy + 2	yoy + 1	yoy + 3	yoy + 3	
Rice				yoy + 2		
Trib to Curtis				yoy + 2	2	
Pony	juvenile	yoy + 3	present	1		
Elk	juvenile	yoy + 3	present	2		
Trail		yoy + 3				
Warm Lake	yoy + juvenile		1	yoy + 3	1	yoy + 3

[1]Numbers indicate the number of age classes found during survey.

As can be seen in Tables 21 and 22, all of the water bodies with existing fish presence/absence data meet IDEQ guidance criteria for full support for salmonid spawning and rearing.

Numeric Water Quality Data Indications of Support Status

The Idaho Administrative Procedures Act (IDAPA) 58.01.02.053 specifies that, when determining whether a water body fully supports designated and existing beneficial uses, the IDEQ is to determine whether all of the applicable water quality standards are being achieved in addition to whether a healthy, balanced biological community is present. Current guidance from the IDEQ indicates that the initial screen used to determine whether a water body is in violation of current water quality standards is primarily based on available monitoring data for the numeric water quality standards and the biologic life indicators present within the water body.

Turbidity

Idaho's numeric sediment standard for cold water biota place limits for water column turbidity to be 25 NTU above background for over a ten day period or 50 NTU at any time. Unfortunately, most of the sediment data that has been collected within the SF Salmon HUC only represents the total suspended sediment (TSS) or bedload. Also, rarely were the turbidity and the TSS data collected concurrently, thus limiting the IDEQ's ability to determine whether the TSS data indicated exceedances of the turbidity standards. Only a handful of samples with both turbidity and TSS analyzed were obtained. These data, from the Stibnite mine monitoring effort, were random grab samples collected during 1997 and 1999. These are presented in Table 23.

Table 23. Available Turbidity Data for the EF SF Salmon River, 1997 and 1999

TSS	Turbidity
7	41.6
9	49.1
1	9.3
3	70
65	78.1
4	43.5
11	113

A linear regression of these data results in the following relationship:

Turbidity (NTU) = 1.654(TSS) (mg/l); p-value = 0.086

Using this relationship, the available ambient TSS data was analyzed (Table 24). Note that, of the water bodies with available TSS data, only Johnson Creek is currently listed on Idaho's 303(d) list.

Table 24. Turbidity Estimates based on Available TSS Data

Johnson Creek		Johnson near Yellowpine		WF Buckhorn		Little Buckhorn	
Date	Turbidity (NTU)	Date	Turbidity (NTU)	Date	Turbidity (NTU)	Date	Turbidity (NTU)
4/19/1993	12	4/19/1993	12	4/10/90	7	4/10/90	6
4/19/1993	12	4/19/1993	12	4/12/90	11	4/12/90	1
4/20/1993	21	4/20/1993	21	4/14/90	29	4/14/90	2
4/20/1993	21	4/20/1993	21	4/17/90	49	4/17/90	4
4/28/1993	10	4/28/1993	10	4/20/90	20	4/20/90	2
4/28/1993	10	4/28/1993	10	4/21/90	23	4/21/90	6
4/29/1993	12	4/29/1993	12	4/25/90	20	4/24/90	38
4/29/1993	12	4/29/1993	12	4/25/90	17	4/25/90	23
5/3/1993	3	5/3/1993	3	4/27/90	31	4/27/90	42
5/3/1993	3	5/3/1993	3	4/28/90	28	4/28/90	39
5/4/1993	5	5/4/1993	5	5/3/90	21	5/2/90	8
5/4/1993	5	5/4/1993	5	5/3/90	6	5/2/90	7
5/10/1993	30	5/10/1993	30	5/5/90	3	5/5/90	6
5/10/1993	30	5/10/1993	30	5/8/90	5	5/8/90	11
5/11/1993	20	5/11/1993	20	5/16/90	2	5/17/90	2
5/11/1993	20	5/11/1993	20	5/23/90	6	5/23/90	6
5/15/1993	7	5/15/1993	7	5/31/90	30	5/31/90	32
5/15/1993	7	5/15/1993	7	6/2/90	12	6/2/90	45
5/17/1993	3	5/17/1993	3	6/7/90	25	6/7/90	35
5/17/1993	3	5/17/1993	3	4/10/91	2	4/4/91	1
5/18/1993	5	5/18/1993	5	4/16/91	2	4/10/91	13
5/18/1993	5	5/18/1993	5	4/24/91	5	4/24/91	15
5/24/1993	5	5/24/1993	5	5/1/91	2	5/1/91	5
5/24/1993	5	5/24/1993	5	5/2/91	7	5/7/91	43
5/25/1993	5	5/25/1993	5	5/9/91	6	5/9/91	52
5/25/1993	5	5/25/1993	5	5/10/91	5	5/10/91	24
6/1/1993	5	6/1/1993	5	5/14/91	1	5/14/91	4
6/1/1993	5	6/1/1993	5	5/16/91	7	5/15/91	5
6/2/1993	5	6/2/1993	5	5/18/91	4	5/16/91	6
6/2/1993	5	6/2/1993	5	5/21/91	1	5/18/91	6
6/8/1993	3	6/8/1993	3	5/22/91	7	5/21/91	17
6/8/1993	3	6/8/1993	3	5/24/91	4	5/22/91	14
6/14/1993	3	6/14/1993	3	5/29/91	4	5/24/91	21
6/14/1993	3	6/14/1993	3	5/30/91	6	5/29/91	19
				5/31/91	2	5/30/91	9
				6/5/91	9	5/31/91	10
				6/12/91	5	6/5/91	31
				4/1/92	8	6/12/91	19
				4/8/92	13	4/8/92	1

Johnson Creek	Johnson near Yellowpine	WF Buckhorn		Little Buckhorn	
		4/15/92	18	4/15/92	26
No Data	No Data	4/21/92	16	4/21/92	20
		4/23/92	62	4/23/92	19
		4/28/92	3	4/28/92	45
		5/5/92	18	5/5/92	30
		5/7/92	20	5/7/92	45
		5/12/92	6	5/12/92	33
		5/14/92	3	5/14/92	4
		5/15/92	3	5/15/92	7
		5/21/92	3	5/21/92	21
		5/27/92	1	5/22/92	11
		5/29/92	1	5/27/92	13
		6/1/92	0	5/29/92	2
		4/14/93	3	4/22/93	7
		4/21/93	7	4/28/93	14
		4/22/93	18	5/7/93	10
		4/28/93	6	5/13/93	13
		5/7/93	2	5/19/93	26
		5/13/93	10	6/3/93	118
		5/19/93	19		
		6/10/93	2		
		6/16/93	20		
		6/17/93	3		

Assuming that the background levels of turbidity are approximately 20% of the measured values (especially during high flow and high turbidity time periods) the available data do not indicate any violations of the Idaho water quality standards for turbidity (Table 25).

Table 25. Turbidity Standard Attainment Summary

	Johnson Creek	Johnson near Yellowpine	WF Buckhorn	Little Buckhorn
Number of consecutive days above 25 NTU + Bkgd	0	0	0	8
Percent Above 50 NTU	0%	0%	0%	3%

Based on this limited amount of ambient TSS and turbidity data, the IDEQ does not consider turbidity as a pollutant of concern within the SF Salmon River HUC. Possible narrative sediment criteria violations for these and other water bodies are evaluated in a later section.

Metals and Toxins

As mentioned, mining has played a significant role in the human history of the SF Salmon Subbasin. The most extensive mining within the SF Salmon Subbasin occurred at the Stibnite mine located in the Upper EF SF Salmon River (Griner and Woodward-Cyde, 2000). The EF SF Salmon River, located adjacent to the Stibnite mine, was listed on the 1998 303(d) list for the State of Idaho.

The bulk of the monitoring data for mining impacts in the Subbasin is from Stibnite. Monitoring data exists from 1978 and an intensive site characterization was done in 1997 and 1999 as part of the reclamation effort. Long-term monitoring was implemented in 1999. The site characterizations included surface and ground water sampling; benthic invertebrate and fish sampling and soil sampling. Physical habitat was characterized during the aquatic sampling phase of the site characterization. As part of the Stibnite Characterization study from 1997-1999, Stibnite was divided into three sections (e.g. areas) based on geographical and operational history. The three areas are as follows:

<u>Area 1: The Meadow Creek Valley;</u>
Meadow Creek Mine
Historic Meadow Creek Mine Processing facilities
Historic Bradley tailing impoundments
Meadow Creek Mine hillside
Neutralized ore disposal area
Waste rock in valley floor
SMIT leach pads and cyanide plant
Hecla heap leach operations
Smelter stack ruins

<u>Area 2: The EF SF Salmon River</u>
Historic Bradley tailing below confluence with Meadow Creek
Former primary and secondary camps
Garnet Creek Pit
Defense Materials Exploration Administration dump

<u>Area 3: Glory Hole</u>
Historic Yellow Pine Mine (The Glory Hole pit) Historic Bradley waste rock dumps on the EFSFSR above and below the Glory Hole and on Sugar Creek
West End, Homestake and Midnight Pits
Historic Bradley Tunnel Outlet (BTO) on Sugar Creek

As part of the site characterization, three rounds of surface water sampling were performed in 1997 and four rounds were performed in 1999. In 1997, 29 stations were sampled and in 1999 24 stations were sampled. Table 26 lists and described the sample sites, and Figure 11 displays the sample site locations.

Table 26. Stibnite Monitoring Sample Sites

Site Location	Site ID	Site Description
Area 1		
Meadow Creek	Station 320	Meadow Creek reference station
Meadow Creek	Station 368	Historic Meadow Creek streambed below the Keyway but above the confluence with old Meadow Creek Diversion Channel In 1999 due to relocation of Meadow Creek this station effectively located in mainstem of Meadow Creek
Meadow Creek	Station 322	Below Meadow Creek Diversion Channel
Blowout Creek	Station BL-1	Blowout Creek, 25 feet upstream of confluence with Meadow Creek
Meadow Creek	Station MC-2A	Meadow Creek approximately 100 feet below the confluence with Blowout Creek
Meadow Creek	Station MC-2B	Meadow Creek near former location of Hecla Office
Meadow Creek	Station 319	Meadow Creek above the confluence with EFSFSR
Meadow Creek	Station MC-1A	Meadow Creek at the inlet from the upgradient wetland to the new Meadow Creek Diversion Channel
Meadow Creek	Station MC-1C	Meadow Creek Diversion Channel upstream of drainage from Keyway and near the plunge pool in the new Meadow Creek Diversion Channel.
Keyway	Station KW-1	Off-channel from Meadow Creek and directly downstream of the keyway in the Keyway Wetland./low flow
Upgradient Wetland by BT/No Disposal Area	Station UW-1	Stagnant area of the upgradient wetland at remnant tailing above the BT/No disposal area
Area 2		
EFSFSR	Station 315	EFSFSR approximately 1 mile above the confluence with Meadow Creek near the Site boundary. Reference station
EFSFSR	Station EF-2	EFSFSR above confluence with Meadow Creek.
EFSFSR	Station 313	EFSFSR at USGS gaging station
Garnet Creek	Station GC-1	Garnet Creek above Garnet Creek Pit. Reference station.
Garnet Creek	Station 318	Lower reach of Garnet Creek below pit.
EFSFSR	Station 310	EFSFSR below confluence with Garnet Creek
Fiddle Creek	Station FC-1	Fiddle Creek upstream of North Tunnel. Reference Station.
Fiddle Creek	Station FC-2	Fiddle Creek above confluence with the EFSFSR
EFSFSR	Station 324	EFSFSR below confluence with Fiddle Creek
Area 3		
Midnight Creek	Station MI-1	Midnight Creek above Upper Haul Road. Reference station.
Midnight Creek	Station 321	Midnight Creek above confluence with EFSFSR
EFSFSR	Station 369	EFSFSR downstream of Midnight Creek
Hennessey Creek	Station HC-1	Hennessey Creek reference station
Hennessey Creek	Station HC-2	Hennessey Creek above confluence with EFSFSR
EFSFSR	Station EF-7	EFSFSR near outlet from Glory Hole
EFSFST	Station 308	EFSFSR below Glory Hole
Sugar Creek	Station 309	Sugar Creek above confluence with West End Creek. Ref. Sta.
West End Creek	Station 317	West End Creek above confluence with Sugar Creek
Sugar Creek	Station 307	Sugar Creek downstream of West End Creek
Bailey Tunnel Outlet	Station BTO	Outlet of historic Bailey Tunnel on Sugar Creek/low flow
Sugar Creek	Station 316	Sugar Creek above confluence with EFSFSR
EFSFSR	Station 314	EFSFSR downstream of Sugar Creek

Surface water quality was evaluated by comparing the chemical analytical results from 1996 compliance monitoring, 1997 and 1999 site characterization with Idaho and USEPA water quality criteria. Criteria for metals are based on dissolved concentrations except for aluminum, antimony, iron, mercury, and selenium. These criteria are based on the total amount present.

Monitoring results are extensively summarized in the 2000 Stibnite Report. A short summary of the monitoring data follows:

- In 1999, following the completion of the Bradley Tailing Diversion and Reclamation Project, concentrations of antimony and arsenic at each Meadow Creek and EFSFSR station were one to two thirds lower than 1997 levels. Mean concentrations ranged from 7-26 ug/l for total antimony and 32-60 ug/l for total arsenic.
- Some stations showed a 50% or greater decrease in these analytes. All sample results for dissolved arsenic were below the USEPA criterion.
- Hennessey Creek, Midnight Creek and the EFSF Salmon River below the Glory Hole had exceedances of the total antimony criteria. Also, there were exceedances at UW-1, KW-1 and BTO. Please note that these are all low flow sites adjacent or flowing into monitored creeks.
- Mercury levels were exceeded in Sugar Creek both at the reference station and stations in the mining activity area. Arsenic levels were only exceeded at the Keyway in 1999.
- Groundwater quality was shown to affect surface water quality in lower Meadow Creek. This is the area where the Bradley tailing is saturated or intermittently in contact with the water table.
- The study of seeps and springs showed similar results in that those seeps and springs in contact with the Bradley tailings had elevated levels of arsenic and antimony.

In spite of these exceedances, the trend since the 1997 site characterization is improved water quality at impaired sites based on water chemistry and benthic macroinvertebrate results. The most recent water quality samples, for example, were analyzed for comparison against the criteria for each metal. Dissolved metals indicative of impacts due to mining (antimony, arsenic, mercury and WAD Cyanide), while still present, have mainly been found at levels below state and federal acute criteria standards. In general, total and dissolved metals were below USEPA and state criterion and are declining with each year of sampling (Griner and Woodward-Cyde, 2000).

The 1999 bioassessment scores improved over the 1998 scores, and were in the moderate to high range of aquatic habitat complexity and integrity. Further, mayfly abundance and taxa richness were high indicating that metals levels were low since mayflies are metals sensitive. Since the reclamation is complete, sediment and metal concentrations should continue to decline. Long-term water quality monitoring is continuing (Griner and Woodward-Cyde, 2000).

Therefore, the current water body assessment for the EF SF Salmon River indicates that the aquatic environment in the majority of the creeks and streams that drain the Stibnite Site shows little or no evidence of current impairment from mining activities.

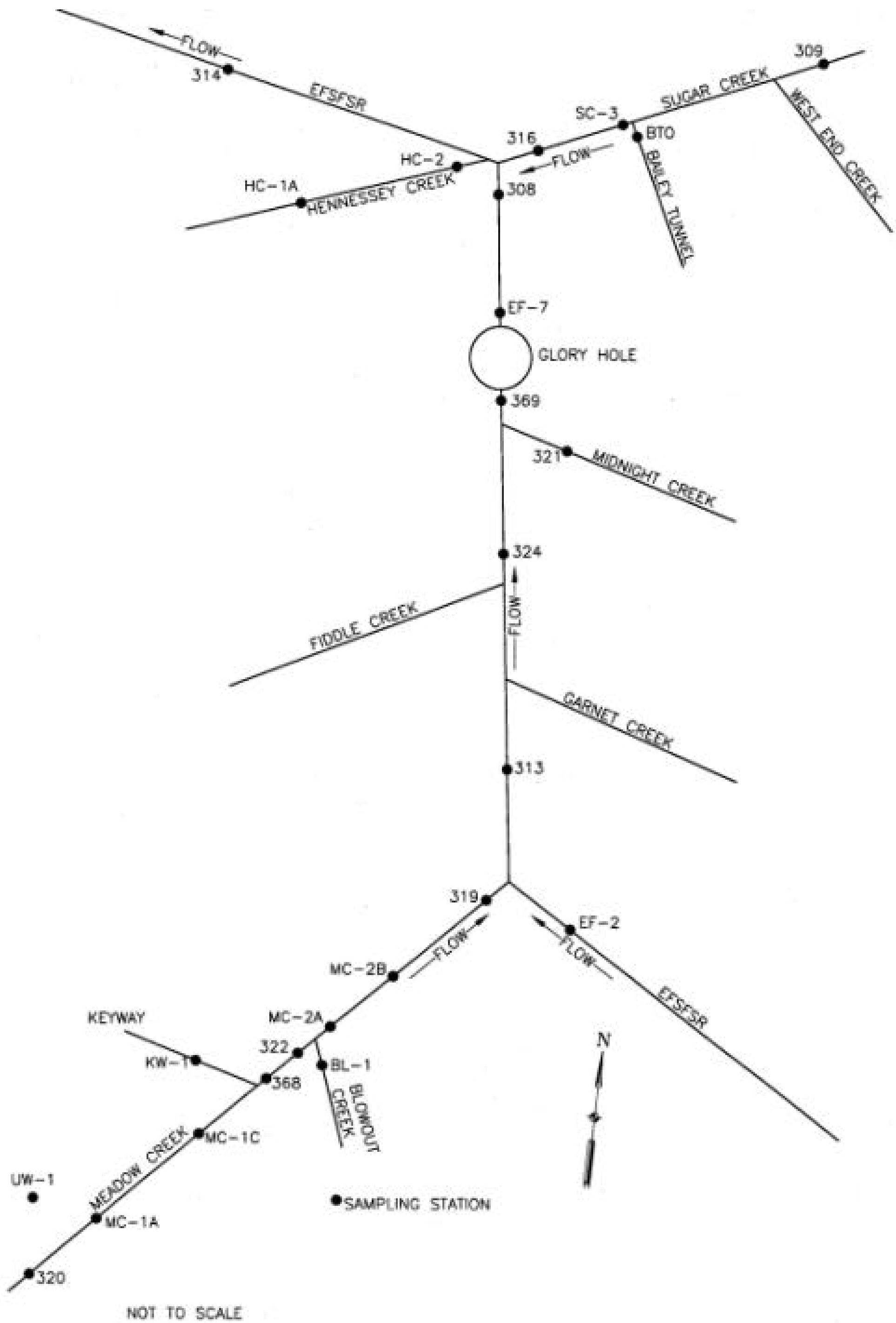

Figure 11. Stibnite Water Quality Monitoring 1999 Sample Stations

Stream Temperature

Numeric stream temperature criteria apply to streams in the SF Salmon Subbasin with existing and designated cold water or salmonid spawning and rearing populations. According to the IDAPA, all streams with these uses should not exceed the applicable state standards.

As also noted, however, a "natural background conditions" clause is to be used in the application of Idaho water quality standards. This clause states that: "Where natural background conditions from natural surface or ground water sources exceed any applicable water quality criteria as determined by the Department, that background level shall become the applicable site-specific water quality criteria. Natural background means any physical, chemical, biological or radiological condition existing in a water body due only to non-human sources. Natural background shall be established according to procedures established or approved by the Department consistent with 40 CFR 131.11. The Department may require additional or continuing monitoring of natural conditions." The existing criteria are the applicable standard until such time as a "natural condition" or other criteria is established by the Department

None of the water bodies located within the SF Salmon HUC have been listed for temperature on Idaho's 303(d) list. However, available stream temperature data from the USDA Forest Service show exceedances of both the State of Idaho and the federal stream temperature criteria for the beneficial use bull trout. All of the exceedances fall within the month of September. These exceedances and possible impacts to the riparian areas due to road encroachment are presented in Table 27. Other possible impacts to riparian conditions within the SF Salmon Subbasin are harvest methods that haul across the stream, high intensity fires within the riparian areas, and grazing.

Table 27. Summary of Available Stream Temperature Data and Possible Violations

Stream[1]	Forest	Listed for Sediment?	Temp Data?	Temp Excds?[2]	Roads Located within RHCA?	Encroachment Found?
Trout	BNF	y	none	unk	y	y
Sand	BNF	n	97	y	y	y
Rice	BNF	y	none	unk	y	y
Trail	BNF	y	96; 99	y	y	y
Warm Lake	BNF	n	none	unk	y	y
Lower Johnson	*BNF*	*y*	*97; 99*	*y*	*y*	*y*
Upper Johnson	*BNF*	*y*	*97; 99*	*y*	*y*	*y*
Upper SF Salmon	*BNF*	*y*	*97; 99*	*y*	*y*	*y*
Tyndall	BNF	y	97	y	y	n

Stream[1]	Forest	Listed for Sediment?	Temp Data?	Temp Excds?[2]	Roads Located within RHCA?	Encroachment Found?
Profile	PNF	n	94: 98	y	y	y
Buckhorn Creek	PNF	n	94; 98; 99	y	y	y
Lick Creek	PNF	n	93; 94; 98; 99	y	y	y
Summit Creek	PNF	n	none	unk	y	y
EF SF Salmon River	*PNF*	*y*	*93: 94; 97; 98*	*y*	*y*	*y*
Middle SF Salmon	*PNF*	*y*	*94; 97; 98; 99*	*y*	*y*	*y*
Grouse Creek	PNF	n	98; 99	y	y	n
Elk Creek	PNF	n	98: 99	y	y	m
Pony	PNF	n	98; 99	y	n	n
Sugar Creek	PNF	n	97; 98	y	n	n
Upper Secesh	PNF	n	94; 95; 96	y	n	n
Lake Creek	PNF	n	97; 98; 99	y	n	n

[1]Italic = River, non-italic = Tributary
[2]unk = unknown

Of the possible management practices that may impact the riparian areas, and subsequent stream temperatures, only the possibility of road encroachment was evaluated. Other possible impacts were not evaluated due to the following reasons:

- The disturbance created by hauling timber across a water body impacts a limited stream length. Recent harvests include the 1996 helicopter harvest of a 250 acre parcel of private land on Profile Creek and post-1994 fire killed tree harvests from 1996-99. Only those impacts longer than 1000 feet (about 300 meters) were evaluated during the development of this SBA.
- Whether a current fire regime, or fire occurrence, is within or outside a natural disturbance pattern is an overly complex question to be addressed by the IDEQ at this time. This is especially true for riparian area burn intensities and occurrence under current management actions.
- Impacts from current grazing practices within the SF Salmon Subbasin are limited to the streams adjacent to the Hanson, Landmark, Josephine, Bear Pete, Marshal Mountain, and Victor Loon allotments. Data indicating Idaho water quality standard exceedances were not obtained for these water bodies during the development of this SBA.

An energy balance model (SSTemp) was used to evaluate the impacts road encroachment currently has on the stream shade quality and quantity, and subsequently stream temperature for those water bodies with a risk of “non-natural” riparian conditions (IDEQ, 2000b). Results of the model runs are presented in Tables 28 and 29. Stream temperature differences presented are the differences between impacted (current) and un-impacted (natural) stream reaches under the same climatic conditions.

Table 28. Results for SSTEMP Analysis for Tributary Streams

	Differences in Outflow Stream Temperatures			
	24 Hour		Equilibrium	
Stream	**Mean**	**Maximum**	**Mean**	**Maximum**
Rice Creek	0.08	0.34	0.17	0.30
Trail Creek	0.10	0.34	0.17	0.28
Buckhorn Creek	0.05	0.53	0.21	0.37
Summit Creek	0.01	0.05	0.03	0.04
Lick Creek	0.06	0.34	0.14	0.24
Profile Creek	0.07	0.55	0.22	0.42
Warm Lake Creek	0.05	0.23	0.11	0.19
Trout Creek	0.41	0.99	0.54	0.94
Trib to Sand	0.17	0.39	0.20	0.34

Table 29. Results for SSTEMP Analysis for Rivers

	Differences in Outflow River Temperatures			
	24 Hour		Equilibrium	
Stream	**Mean**	**Maximum**	**Mean**	**Maximum**
Lower Johnson	0.03	0.27	0.33	0.60
Middle Johnson	0.25	0.57	0.29	0.49
Upper Johnson	0.32	0.70	0.37	0.64
Middle SF Salmon	0.05	0.22	0.17	0.32
Upper SF Salmon	0.02	0.24	0.31	0.55
EF SF Salmon River	0.04	0.10	0.07	0.10

These results indicate that increases in stream temperatures to the evaluated water bodies are either at or less than 1 ^{o}C during the time of criteria exceedances. These low increases in stream temperature fall within the possible error associated with estimated and measured parameters used in the SSTemp model (i.e. base flow, shade quality and quantity, etc.). Therefore, the stream temperatures obtained for these water bodies are considered to be reflective of natural conditions, and the Idaho water quality standards for streams with bull trout are not violated. However, the federal temperature standard for bull trout is exceeded. Therefore, the IDEQ places the evaluated water bodies listed in Table 27 on the 303(d) list for the State of Idaho based on federal bull trout stream temperature standard violations (i.e. no Idaho water quality standards are currently violated).

Support Status Under the Narrative Sediment Standard

The Idaho Administrative Procedures Act (IDAPA 58.01.02.053) specifies that, when determining whether a water body fully supports designated and existing beneficial uses, the IDEQ is to determine whether all of the applicable water quality standards are being achieved in addition to whether a healthy, balanced biological community is present. Current guidance from the IDEQ indicates that the initial screen used to determine whether a water body is in violation of current water quality standards is primarily based on available monitoring data for the numeric water quality standards and the biologic life indicators present within the water body.

However, under the current schedule, the State of Idaho is to re-visit, and possibly revise, the 1991 sediment TMDL approved by the USEPA. This earlier TMDL was developed by a consensus team with members from the USDA Forest Service, the USEPA, and state representatives. The team based their findings that the SF Salmon violated state standards under the narrative sediment standard. Under this TMDL the following sediment targets were established:

1) A 5-year mean of 27 percent depth fines by weight with no single year over 29 percent;
2) A 5-year mean of 32 percent cobble embeddedness, with no single year over 37 percent; or
3) Acceptable improving trends in monitored water quality parameters that “re-establish” the beneficial uses of the SF Salmon River.

During the development of these sediment targets, it was admitted that there was great uncertainty that the numeric targets selected would actually restore salmonid spawning in the river (i.e. to historic levels). Therefore, the stated objectives were to provide habitat “sufficient to support fishable populations of naturally spawning and rearing salmon and trout”. Ultimate achievement of water quality standards under this framework was based on data that indicated that naturally producing populations of chinook and steelhead “tolerant of sustained recreational harvest” were present.

Depth fines and cobble embeddedness data have been collected by the USDA Forest Service for sites within the SF Salmon Subbasin and within the Chamberlain Creek basin (Nelson et al., 1999a; Nelson et al., 1999b). Chamberlain Creek has been used to represent an “unmanaged” condition for comparison purposes. Five-year mean data for both of these targets are presented in Figures 12 and 13.

As can be seen in these figures, the apparent trend in depth fines (i.e. < 6.33 mm) is that they are increasing within the SF Salmon Subbasin, while decreasing within the Chamberlain Creek basin. The cobble embeddedness data show that embeddedness is nearly static at the EFSF Salmon site but is increasing slightly at the Chamberlain Creek sites.

One of the key factors in assessing the impacts of sediment, from both anthropogenic and natural sources, within the SF Salmon Subbasin is that the sediment is mobilized during episodic storm events. How the morphology and aquatic habitat within these water bodies respond to the volume of flow and sediment delivered during these episodic events determines whether the beneficial uses are impacted, and possibly impaired. Additionally, evaluating the relative magnitude of natural sources of flow and sediment within these water bodies compared to management sources is critical in evaluating whether the Idaho water quality standards are violated or not (i.e. under the "Natural Conditions" exemption in IDAPA 58.01.02.070.06).

Additional analysis of the depth fines for the smaller size particles (i.e. <0.85 mm) by Nelson (1999a) leads to the conclusion that, overall, progress has been made in restoring a great deal of resiliency to the systems. Supporting this conclusion is that the subbasin has experienced some potentially destabilizing events since 1994, but none have resulted in obvious deposition of fine sediments at the monitoring stations as occurred in 1965. However, the preliminary nature of these findings suggest that the third target (i.e., improved trends in monitored water quality parameters) and the overall target (i.e., to provide habitat "sufficient to support fishable populations of naturally spawning and rearing salmon and trout") of the 1991 TMDL need to be included in the analysis of water quality standard and target attainment in this SBA.

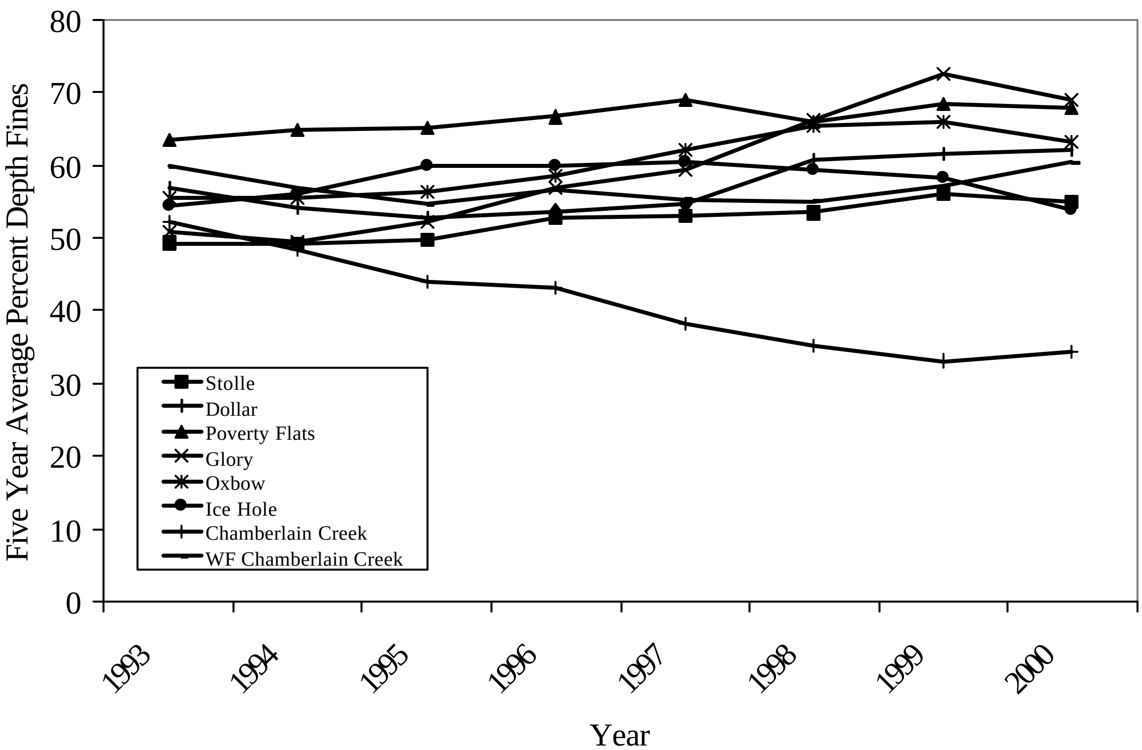

Figure 12. Five-Year Mean Percent Depth Fines for the SF Salmon and Chamberlain Basins

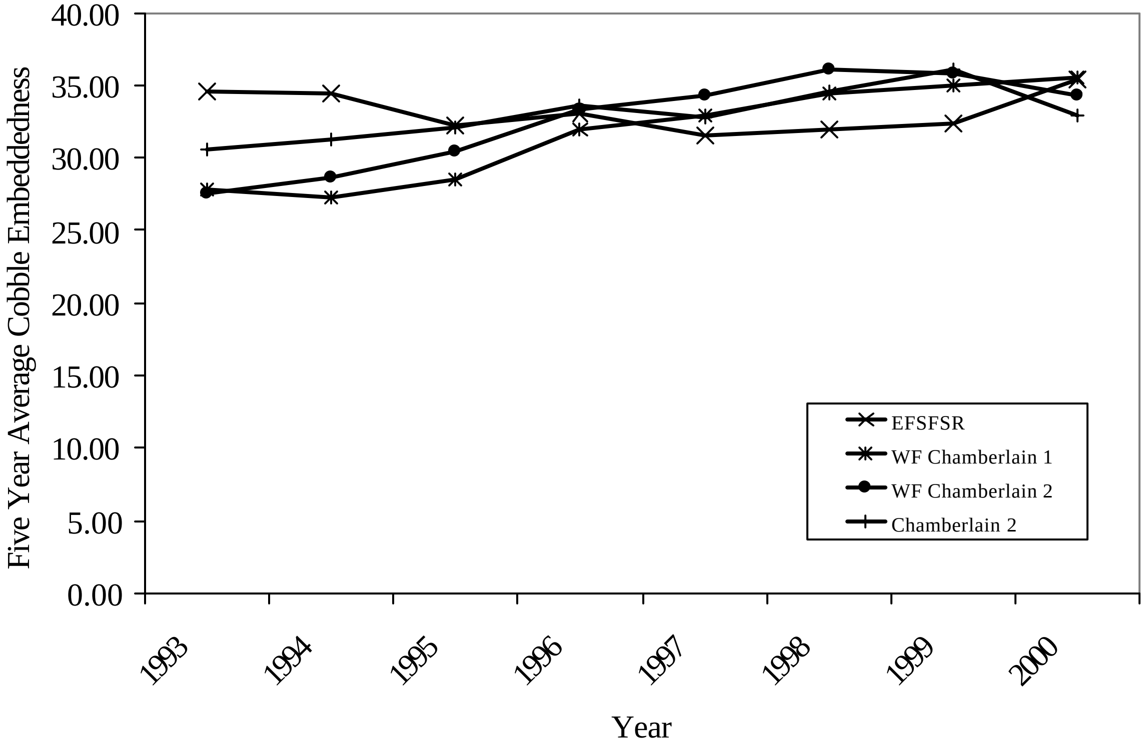

Figure 13. Five-Year Mean Cobble Embeddedness for the SF Salmon and Chamberlain Basins

In addition to these data, trends in Chinook productivity within the SF Salmon Subbasin is also useful. One available study compared the relative effects of the freshwater habitat available verses the migration corridor and ocean conditions on productivity of Chinook salmon (Lee et al, in review). The thrust of this study compared the return rates and productivity of Chinook salmon within the Middle Fork Salmon River (a largely un-managed basin) with the SF Salmon River. Preliminary results of this study indicate that the downstream stresses are the dominant cause of declining redd counts in the Salmon River system regardless of land use activities in the watersheds.

The study also found that the sedimentation in the SF Salmon Subbasin, due to land disturbance from 1949 to 1965, has been reduced since the initiation of the watershed restoration program in 1966. And, while this sediment reduction has met with moderate success in restoring productivity of the SF Salmon Chinook population, the analysis also suggested that roughly twice as many redds would have been observed in the SF Salmon between 1962 and 1989 had the habitat conditions been maintained at 1957 levels.

During another study the SF Salmon River mainstem was examined for changes in stream channel characteristics caused by the high magnitude flood and sediment delivery event that occurred during the winter of 1996-97 (Johnson, 2000). This rain on snow event was estimated to produce a 20-year flood event for the SF Salmon mainstem. Changes in meso-scale hydraulic features, sediment distribution, and geomorphic channel dimensions were compared using three separate flights of multi-spectral airborne imagery (MSAI) (July 1992; November 1993; and October 1997).

It was found that the SF Salmon River remained resistant to changes caused by this large magnitude flood and sediment delivery event, with observed changes tending to be localized. With respect to the event examined, it is suspected that it assisted the SF Salmon River in reaching a state of improving dynamic equilibrium (i.e. where the rate of change is largely stable and favorable to the health of fisheries habitat) (Johnson, 2000).

Under the current guidance framework the IDEQ is to rely on available biological data to indicate the status of the water quality within these water bodies. And, as presented above, the BURP for streams and LRP for rivers indicate full support for these water bodies. Also, all of the recent studies available for the SF Salmon indicate that the historical habitat conditions are slowly re-establishing.

Water Body Assessment Summary

The 1996 Water Body Assessment protocol, plus other available data from cooperating agencies, is used here to determine the current beneficial use support status for these water bodies. The IDEQ and the USEPA will use the results of the water body assessments contained within this document to update Idaho's 303(d) list.

The review of the available ambient numeric water quality monitoring data shows attainment of water quality criteria for sediment and metals. Review of the biological data and sediment impacts to aquatic habitat indicates that the historical habitat conditions within SF Salmon Subbasin are in the process of re-establishing.

However, evidence remains that the existing road system contributes large quantities of sediment during storm events. These ongoing impacts to the water bodies, combined with the highly valued TES beneficial uses suggests that further implementation of the 1991 TMDL would be beneficial to prevent the existing roads and sediment sources from impacting current water quality. Therefore, the IDEQ is recommending additional actions be taken by the designated land management agencies to ensure the current water quality is protected and beneficial uses are supported in the future.

All of the larger water bodies within the SF Salmon Subbasin (e.g. SF Salmon, EFSF Salmon, Johnson Creek, and the Secesh River) are designated as Special Resource Waters (SRWs). SRWs are "those specific segments or bodies of water which are recognized as needing intensive protection to preserve outstanding or unique characteristics or to maintain current beneficial uses (IDAPA 58.01.02.002.96)". The State of Idaho Antidegradation Policy (IDAPA 58.01.02.051) for "high quality waters" also states that, "where the quality of the water exceeds levels necessary to support propagation of fish, …that quality shall be maintained and protected."

Review of available ambient stream temperature data and site conditions indicates that the federal standards for bull trout are exceeded. Therefore, the IDEQ will place those water bodies on the State of Idaho 303(d) list (see Table 27 above).

2.4 Summary of Past and Present Pollution Control Effects

Point Sources

The only point source located within the SF Salmon Subbasin is the Stibnite mine along the EF SF Salmon River. Reclamation efforts at this site have been ongoing since the early eighties. As part of their operation in the Stibnite Area from 1982-1984,Canadian Superior reconstructed the Meadow Creek Diversion Channel around the Bradley Tailing impoundment. By building the keyway (earthen dam) at the base of the tailing impoundment they added structural stability, realigned lower Meadow Creek and covered the tailing in lower Meadow Creek with waste rock and other materials. These projects were designed to decrease the sediment load to Meadow Creek.

In 1996 and 1997, the discharge from Meadow Creek Ponds, behind the tailing impoundment was redirected and the diversion of Meadow Creek began but was not finished

Work done as part of the 1998 administrative order of consent included construction of a barrier against particulate migration; stabilization of Meadow Creek channel; stabilization of the exposed tailing and reduction of infiltration into the tailing.

In 1996, USEPA dealt with the tailings and landfill sites at Cinnabar Creek to minimize the amount of tailings and hydrocarbon contaminated soils coming into contact with surface water and surface water runoff. Cinnabar Creek was rip-rapped where it flowed through the south tailings impoundment.

Non-point Sources

The state has responsibility under Sections 401, 402 and 404 of the Clean Water Act 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 Clean Water Act, each state is required to develop and submit a non-point source management plan. Idaho’s Non-point Source Management Program (currently in final draft September 1999) has been submitted to the USEPA for approval. The plan identifies programs to achieve implementation of BMPs, includes a schedule for program milestones, is certified by the state attorney general to ensure that adequate authorities exist to implement the plan and identifies available funding sources.

The Idaho water quality standards refer to existing authorities to control non-point pollution sources in Idaho. Some of these authorities and responsible agencies are listed in Table 30.

Table 30. State of Idaho's Regulatory Authorities for Non-Point Sources

Authority	IDAPA Citation	Responsible Agency
Idaho Forest Practice Rules	58.01.02.350.03(a)	Idaho Department of Lands
Rules Governing Solid Waste Management	58.01.02.350.03(b)	Idaho Department of Environmental Quality
Rules Governing Subsurface and Individual Sewage Disposal Systems	58.01.02.350.038	Idaho Department of Health
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) or IDAPA 02.04.14	Idaho Department of Agriculture

The USDA Forest Service is responsible for administration, management and protection of approximately 98% of the land in the SF Salmon HUC. This agency has authority to regulate, license and enforce land use activities that affect non-point source pollution control from the following legislation:

- Taylor Grazing Act,
- Federal Clean Water Act,
- Federal Land and Policy Management Act,
- Public Rangelands Improvement Act,
- National Environmental Policy Act,
- Emergency Wetlands Resource Act,
- Agricultural Credit Act,
- Land and Water Conservation Act, and
- Executive Orders for Floodplain Management and Protection of Wetlands

The Forest Service has been addressing sediment load reductions in order to comply with the 1991 sediment TMDL. A list of identified sediment reduction projects yet to be completed within the SF Salmon HUC was recently presented in the SF Salmon Subbasin Review (USDA Forest Service, 2000). Original opportunity lists developed after the approval of the 1991 TMDL were largely based on the SF Salmon River Restoration Strategy (USDA Forest Service, 1992). A list of sediment reduction projects implemented within the SF Salmon HUC is presented in Table 31.

Table 31. Sediment Reduction Projects Since the 1991 TMDL

Project	Forest	Area	TMDL Table 1	TMDL Table 2	SF Restoration Strategy	SF/JC Watershed Analysis	Forest Plan, WINI, EWP, TS	Status
Jakie Creek Face	Payette	Upper SFSR		1		1		Completed
Martin Creek Face	Payette	Upper SFSR		2		2		Completed, 1992
Poverty Burn	Payette	Upper SFSR		3	2	3		Ongoing
Indian Creek Trail	Payette	Upper SFSR		4		4		Completed, 1991
Fitsum Creek	Payette	Upper SFSR		5		5		Completed, 1992
Cougar Creek	Payette	Upper SFSR		6		6		Completed, 1997
Blackmare Creek Trail	Payette	Upper SFSR		7	15	7		Ongoing
White's Gully	Payette	Upper SFSR		8		8		Completed
Fitsum Creek Road	Payette	Upper SFSR		9		9		Completed
Cougar Creek Trail	Payette	Upper SFSR		10		10		Completed, 1991
Camp Creek	Payette	Upper SFSR		11				Completed
Jakie Creek Road Closure	Payette	Upper SFSR		12	18			Completed
Oxbow Breech	Payette	Upper SFSR		13				Pending
Remove 75,000 - 150,000 yards of sediment from SFSR using dredge or shovel loader	Payette/Boise	Upper SFSR		14	45			Pending
Spot Slide and Gully Stabilization	Payette	Upper SFSR		15		11		Completed
Bank Failure Below Jakie Creek Bridge	Payette	Upper SFSR		16		12		Completed
Salmon Point Slide	Payette	Upper SFSR		17		13		Completed, 1992
SFSR Road Reconstruction	Payette/Boise	Upper SFSR	1			14		Ongoing
Close Miner's Peak Road (Amended by Trail Conversion EA)	Payette	Upper SFSR	2		18	15		Completed, 1994
Temporary Closure of Buckhorn Rd.	Payette	Upper SFSR	3		19	16		Completed
Curtis Creek Drainage Spot Stabilization - Spur Road Obliteration	Boise	Upper SFSR	4		29	17		Completed, 1994
Two-Bit, Six-Bit Loop Rd. Stabilization	Boise	Upper SFSR	5			18		Completed
Upper SFSR Rd. (Kline Mt. Section) Obliteration/Spot Stabilization	Boise	Upper SFSR	6		27			Pending
NF Dollar Creek Road Obliteration/Spot Stabilization	Boise	Upper SFSR	7		32	19		Completed, 1993
Forest highway 22 Fill Stabilization	Boise	Upper SFSR	8		28			Pending
Road Closures in Upper SFSR	Payette & Boise	Upper SFSR	9			20		Completed, 1993
Basin Road Stabilization	Boise	Upper SFSR	10					Pending
Road Stabilization on Scotty Mine Rd.	Boise	Upper SFSR			31	21		Completed, 1992
Lunch Creek Road Closure	Boise	Johnson Cr.			36	22		Completed, 1991
Sheep Creek Road Closure	Boise	Johnson Cr.				23		Completed, 1991
SF Rice Creek Road Closure	Boise	Upper SFSR				24		Completed, 1993

Project	Forest	Area	TMDL Table 1	TMDL Table 2	SF Restoration Strategy	SF/JC Watershed Analysis	Forest Plan, WINI, EWP, TS	Status
SFSR Campground Stream Bank Stabilization	Boise	Upper SFSR			50	25		Completed, 1992
Rice Creek Stock Driveway Rehabilitation	Boise	Upper SFSR			5	26		Completed, 1993
Vulcan Springs/Trail Rehabilitation	Boise	Upper SFSR				27		Completed, 1993
Cabin Creek Campsite Rehabilitation	Boise	Upper SFSR				28		Completed, 1993
Molly Springs Trail Closure	Boise	Upper SFSR				29		Completed, 1993
Dollar Creek Road Closure	Boise	Upper SFSR				30		Completed, 1993
Golden Gate Road Area Gully Stabilization	Boise	Upper SFSR				31, JC-6,9		Completed, 1994
Closure of Road 409I, and 409J	Boise	Upper SFSR				32		Completed, 1994
Construct jetty or rip-rap stream bank above Oxbow to stop bank cutting	Payette	Upper SFSR			1			Ongoing
US Antimony abandoned mine site: improve drainage from open pit and reshape slopes	Boise	Johnson Cr.			7	JC-7		Pending
Improve side slopes of SF Salmon River at the Plunge	Boise	Upper SFSR			9			Ongoing
McCall-Yellowpine Road	Payette	Secesh / EFSR			11, 12, 13			Pending
Gravel 6 mile of Zena Creek Road	Payette	Secesh			14			Pending
Convert Hamilton Bar Road to Trail	Payette	Upper SFSR			16			Pending
Improve Road 340, Pony Cr.	Payette	Lower SFSR			17		TS	Ongoing
Rehabilitate Grouse Creek Road 325 near Sand Creek	Payette	Secesh			20			Pending
Improve Warren Wagon Road 21	Payette	Secesh			21, 22		TS	Completed
Improve Johnson Creek Road 674	Boise	Johnson Cr.			24, 25	JC-8		Ongoing
Obliterate E. Fork Burnt Log Road	Boise	Johnson Cr.			26	JC-10		Completed
Stabilize Cut/Fill on Tyndall Road 483	Boise	Johnson Cr.			30	JC-2		Ongoing
Improve Paradise and Power Line Road 448 & 467	Boise	Upper SFSR			33			Ongoing
Improve drainage and stabilize cut banks on road to Roaring Creek landing pad.	Boise	Upper SFSR			34			Completed
Stabilize and close Road 444 and improve 445, 449, 449B, 449C	Boise	Upper SFSR			35	JC-1		Completed
Improve & Obliterate portions of Thunder Mountain Road	Boise	Johnson Cr.			37, 38			Pending
Stabilize Hernessey Meadow Road	Boise	Johnson Cr.			39			Pending
Clean Spawning gravel in Lake and Summit Creek	Payette	Secesh			41			Pending
Stabilize stream banks and install fish rearing structures along Lake Creek and Upper Secesh River	Payette	Secesh			42			Pending
Remove debris from Summit, Lake and Grouse Creek	Payette	Secesh			43			Pending
Rip spawning gravels in SFSR with rock rake	Payette & Boise	Upper SFSR			44			Pending
Construct water-retaining structures in side channels of Lake Cr.	Payette	Secesh			46			Pending
Remove sediment from Rice Creek and Curtis Creek using a suction dredge	Boise	Upper SFSR			49			Completed
Stabilize Johnson Creek Stream banks	Boise	Johnson Cr.			51, 52			Ongoing
Stabilize old fish trap in Stolle Meadows	Boise	Upper SFSR			53			Ongoing

Project	Forest	Area	TMDL Table 1	TMDL Table 2	SF Restoration Strategy	SF/JC Watershed Analysis	Forest Plan, WINI, EWP, TS	Status
Thunderbolt KV cut/fill stabilization	Boise	SFSR / Johnson Cr.					TS	Completed
Pony Cr. KV/SI projects	Payette	Lower SFSR					TS	Ongoing
Big Flat KV/SI projects	Payette	Lower SFSR					TS	Ongoing
Elk Creek Road Reconstruction	Payette	Lower SFSR					TS	Ongoing
Ruby Meadows Road to Trail conversion	Payette	Secesh					Forest Plan	Ongoing
Bear Creek Road 359 improvements	Payette	Lower SFSR					WINI	Pending
Stabilize Davis Ranch Road	Payette	Lower SFSR					EWP	Ongoing
SFSR EWP	Payette	Upper SFSR					EWP	Ongoing
Stibnite	Payette	EFSFSR					EIS	Ongoing
Buckhorn EWP	Payette	Upper SFSR					EWP	Ongoing
Gully Stabilization Tyndall Meadows	Boise	Johnson Cr.				JC-3		Completed
McClure and Burntlog Trailhead relocation	Boise	Johnson Cr.				JC-4,5		Completed
Livestock Control in Sand Creek (C&H allotment)	Boise	Johnson Cr.				JC-11		Ongoing
Sand Creek	Boise	Johnson Cr.						Ongoing

2.5 Data Gaps

This assessment has identified data gaps that limit full assessment of beneficial use support status (Table 32). While the best available data was used to develop the current assessment, DEQ acknowledges that additional data would be helpful to validate or invalidate conclusions.

Table 32. Data Gaps Identified During the SF Salmon Subbasin Assessment

Portion of Assessment	Data Gap
Sediment	Additional turbidity data to validate the turbidity / TSS linear regression.
Fish	Additional data to validate the distribution and status of the fish species listed in Table 11.
Temperature	Additional temperature data for the streams (Table 27) exceeding the Federal Bull Trout temperature criteria.

3. Additional Management Actions

The review of the available ambient numeric water quality monitoring data shows attainment of current water quality criteria for sediment and metals. Review of the biological data and sediment impacts to aquatic habitat indicates that the historical habitat conditions within SF Salmon Subbasin are in the process of re-establishing. These results of the SF Salmon SBA indicate that the listed water bodies currently meet the Idaho water quality standards for sediment and metals. The TMDL approved by the USEPA in 1991 included two surrogate targets, percent depth fines and cobble embeddedness. Data included in the document suggest that the watershed has attained the target and has an improving trend for cobble embeddedness, but has not attained the target for percent depth fines. Therefore, the IDEQ is removing all water bodies currently listed for sediment and metals from the Idaho 303(d) list with the exception of the mainstem South Fork Salmon River.

However, evidence remains that the existing road system contributes large quantities of sediment during storm events. These ongoing impacts to the water bodies, combined with the highly valued TES beneficial uses suggests that further implementation of the 1991 TMDL would be beneficial to prevent the existing roads and sediment sources from impacting current water quality. Therefore, the IDEQ is recommending additional actions be taken by the designated land management agencies to ensure the current water quality is protected and beneficial uses are supported in the future.

3.1 Existing USDA Forest Service Policies

The IDEQ intends the further TMDL implementation to be guided primarily by the existing and future policies adopted by the USDA Forest Service (FS). These policies include:

- National Forest Service Road Management Policy
- FS/BLM Protocol for Addressing Clean Water Act (CWA) 303(d) Listed Waters
- Clean Water Action Plan
- National Forest Service Total Maximum Daily Load Policy (date?)
- Water and The Forest Service
- Natural Resources Agenda
- Inner Columbia Basin Ecosystem Management Plan
- Pacfish/Infish Interim Strategies
- Intermountain West Water Initiative
- State Specific Requirements (i.e., Memorandums of Understanding)

National Forest Service Roads Policy

The National Forest Service Roads Policy (September 2000) requires the FS to undertake a scientifically based road analysis procedure, at appropriate scales and coordinated with other ecosystem analyses, to make better decisions regarding road management.

Key features of the policy are:
1. Conduct and complete extensive analysis and public involvement at the local level, resulting in a forest road system that serves resource objectives and public uses of national forest lands as identified in forest plans (e.g., the SW Idaho 3 Forest Plan for the Payette, Boise, and Salmon Forests).
2. Carefully consider and screen proposals to build new roads. Decisions to build new roads will consider available funds for maintenance and operation and the latest scientific information on the effects of roads on ecosystems.
3. Maintain and reconstruct needed roads. Give funding and management priority to most heavily used roads to provide safe travel and reduce adverse environmental impacts.
4. Following analysis and public involvement at the local level, decommission or convert unneeded roads to other uses.

Until a science based road analysis is incorporated into forest plans, the following transition criteria shall apply:
- Roadless and un-roaded areas: proposals for road construction or reconstruction must demonstrate a compelling need…and will be shaped by a roads analysis and EIS.
- Roaded areas: Projects currently underway are exempt from roads analysis, but will be subject to typical analysis under NEPA, ESA, CWA, and other laws and regulations.

One example of an acceptable process is the "Roads Analysis: Informing Decisions About Managing the National Forest Transportation System" (see: www.fs.fed.us/news/roads).

FS / BLM Protocol for Addressing CWA 303(d) Listed Waters

It is the responsibility of the Forest Service and Bureau of Land Management through implementation of the Clean Water Act, to protect and restore the quality of public waters under their jurisdiction. The purpose of the FS/BLM Protocol for Addressing CWA 303(d) Listed Waters (May 1999) is to provide a consistent mechanism for the FS and BLM to meet this responsibility, bring waters into compliance within a reasonable timeframe, and support State development of TMDLs. Signatures include FS, BLM, and EPA executives for Idaho, Oregon, Montana, and Washington. Additional letters clarifying applicability of the Protocol for Idaho and Montana were written in late summer and fall of 1999. The protocol includes 4 main sections: (1) two goals, (2) a seven component overarching strategy, (3) a four-step decision framework, and (4) linkages to other planning and analysis processes.

Clean Water Action Plan

The Clean Water Action Plan (CWAP; February 1998) was signed into policy by nine Federal departments, including the Department of Agriculture. The FS is a primary signatory and much of the implementation involves or includes FS actions. There are 10 primary implementation principles, and 110 action items. Some of the main actions that parallel and re-enforce direction and policy in the Protocol, and Natural Resources Agenda include: The Unified Watershed Assessment process, the Watershed Restoration Action Strategies, the

Unified Federal Policy. The Forest Service is actively working to develop a prioritization process that will fulfill commitments under the CWAP.

National Forest Service TMDL Policy

The National Forest Service TMDL Policy (August 1999) provides the guidance for fulfilling FS responsibilities for Key Action 100 of the CWAP. The FS was originally chartered to protect and improve watersheds to achieve favorable conditions of water flow (Organic Act, 1897). Through science-based experience the FS considers the most effective means for controlling the generation of nonpoint source pollution is by applying preventative and restorative watershed management practices, these practices are designed and adapted as needed to increase their effectiveness in achieving water quality goals. Under this policy, the FS is to participate with states, tribes, private land owners, and the USEPA in the preparation and implementation of TMDLs and to encourage and assist States, tribes, and the USEPA to develop and implement effective programs for controlling nonpoint sources of pollution.

Water and the Forest Service

The Water and the Forest Service report (January 2000) focuses on the role of forests in water supply, including quantity, quality, timing, etc. This report re-enforces the need to collaboratively protect and restore watershed condition. The report states that the Forest Service will play a major role in improving the ability of policymakers, managers, and citizens, to develop options, anticipate consequences and implications, and fashion responsive, informed programs.

Boise and Payette Forest Biological Assessment, June 2001

The biological assessment was developed to determine the effects of federal actions in the South Fork Salmon River on chinook salmon and their designated critical habitat, steelhead and their designated critical habitat, and bull trout. Such actions include, but are not limited to, timber sales, bridge relocation, road construction, grazing and prescribed burning. The biological assessment addresses direct and indirect effects as well as the cumulative effects of the proposed actions. Appendix C outlines the proposed actions and their effects in the upper and lower SF Salmon River.

Natural Resources Agenda

The Natural Resources Agenda (1998) refocuses the Forest Service on its original purpose, established under the Organic Act. This agenda, adopted by the Chief of the Forest Service, is highly parallel and re-enforces the policy in the CWAP.

Interior Columbia Basin Ecosystem Management Plan

The Interior Columbia Basin Ecosystem Management Plan (ICBEMP; DSEIS, Spring 2000; FEIS, Fall 2000) is the largest, most comprehensive ecosystem management plan in the country. It would replace Pacfish/Infish, and be the basis for all forest plan revisions in

Idaho. It has been over six years in the making. It includes direction for subbasin and watershed assessment, prioritization, protection and restoration, in collaboration with other agencies and stakeholders.

Pacfish Interim Strategy, Infish, and Biological Opinions for TES

The Pacfish Interim Strategy (February, 1995), Infish, and Biological Opinions for TES were to be interim until the completion of ICBEMP. Goals and direction in Pacfish, and its companion document Infish and subsequent Biological Opinions and agreements with NMFS and FWS, apply to areas that support anadromous and inland fisheries. Goals and direction include water quality and roads as well as riparian management prescriptions. Specifically, this strategy is intended to maintain or restore stream channel integrity, channel processes and the sediment regime under which the riparian and aquatic ecosystems developed. Direction aimed at road management includes standards that avoid adverse effects on listed anadromous fish.

Intermountain West Water Initiative

The Intermountain West Water Initiative (IWWI) was initiated to gather and use information about resource conditions, water rights, and social patterns to make strategic decisions that will best protect and restore watershed, aquatic, and riparian resources on FS lands in the Inland West. The IWWI information is needed to answer four strategic questions identified by the Regional Foresters in the inland west (Forest Service Regions 1-4):

- Where are the critical resource values we need to protect?
- Where are the damaged resource values we need to restore?
- Where should we act first?
- With whom should we act in partnership?

This process is similar to direction issued under the Northwest Forest Plan (NWFP) for Oregon, Washington, and Northern California. Specifically, the NWFP identifies a process called an "Ecosystem Analysis at the Watershed Scale" (EAWS). This process is used to assess watershed condition, capabilities, and prioritize ecosystem risks and opportunities for protection and restoration.

State Specific Requirements

As a designated Land Management Agency the Forest Service has entered into a Memorandum of Understanding (MOU) between the EPA and various State of Idaho agencies (IDHW, 1993). Within the Forestry Practices Appendix to this MOU, federal agencies have agreed to comply with the water quality protection provisions of the Idaho Forest Practices Act Rules and Regulations.

Additional federal agency responsibilities are also defined in 40 CFR Part 130 as needing to comply with State requirements to control water pollution to the same extent as private entities. Existing authorities and programs for assuring implementation of BMPs to control nonpoint sources of pollution in the State of Idaho include:

State Agricultural Water Quality Program	Non-point Source 319 Grant Program
Wetlands Reserve Program	Conservation Reserve Program
Environmental Quality Improvement Program	Resource Conservation and Development
Idaho Forest Practices Act	Agricultural Pollution Abatement Plan
Water Quality Certification for Dredge and Fill	Stream Channel Protection Act

3.2 1991 TMDL Implementation

The current water quality assessment for the SF Salmon Subbasin indicates that additional actions must be taken by the designated land management agencies to ensure water quality standards are attained and beneficial uses are supported in the future. In addition, water quality monitoring must occur on a basis deemed appropriate to gauge further movement toward the 1991 TMDL targets.

Additional steps to ensure continued water quality improvement through implementation include:

- A detailed summary of the current status of the road system (or a schedule for obtaining this information);
- Specific road management activities to ensure storm drainage through the road system that utilizes natural hill-slope drainage features;
- A schedule and prioritization for accomplishing any required inventories and specific reconstruction or obliteration activities necessary to re-construct natural hill-slope drainage features;
- A discussion of the funding sources; and
- Document ongoing attainment of water quality standards.

These additional steps are the responsibility of stakeholders and the designated land management agencies.

4. Public Participation

4.1 Southwest Basin Advisory Group

Idaho Code Title 39, Chapter 36 and IDAPA 58.01.02.052 provides requirements for public participation in TMDL development and water quality decisions. Basin Advisory Groups (BAGs) and, if formed, Watershed Advisory Groups (WAGs) are to review the development of the SBAs and TMDLs, advise the state on impaired Water Bodies, the management of impaired watersheds, and recommend specific pollution control activities.

The Southwest Basin Advisory Group (SWBAG) was appointed by the Administrator of the Idaho Division of Environmental Quality in 1996 to fulfill the public participation requirements of Idaho Code 39-3601 *et seq.* Under Idaho Code 39-3615, the SWBAG is charged with providing advice to the IDEQ on the specific actions needed to control point and non-point source pollution impacting SF Salmon Subbasin water quality. Members selected for the SWBAG were recommended from nominations obtained from the local community to represent specific stakeholder groups within the watershed.

4.2 Public Notification

To meet the public review and participation requirements, the IDEQ completed the following steps:

- A 45 day comment period extends between December 22, 2000 and February 9, 2001.
- Public informational meetings to present the main findings of the draft document and to answer questions from the community include the IDEQ State Offices on January 9th, and Legion Hall in Cascade on January 10th, 2001
- Presentation of the Draft Subbasin Assessment to the SWBAG on January 4th, 2001 at the IDEQ Boise Regional Office.
- Published public notices provide information on the draft document findings, locations of available draft copies, directions for submitting written comments, IDEQ agency contacts, and notification of the public informational meetings in Boise and Cascade, ID. These notices were published in the Idaho Statesman, the Star News, the Valley Advocate, and the Salmon Recorder Herald.
- Copies of this document are available for review at IDEQ's Boise Regional Office; The State Public Library (Boise); the Boise National Forest (Boise); the Cascade Ranger District (Cascade); the Payette National Forest (McCall); and the Krassel Ranger District (McCall); or on IDEQ's web page: *www2.state.id.us/deq*.

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References Cited

33 USC § 1251-1387. Federal water pollution control act (Clean Water Act).

40 CFR 130. Water quality planning and management.

American Geologic Institute. 1962. Dictionary of geologic terms. Doubleday and Company: Garden City, NY. 545 pp.

Apperson, K., 2000. personal communication. Idaho Department of Fisheries, Boise, Idaho.

Armantrout, N. B. (compiler). 1998. Glossary of aquatic habitat inventory terminology. American Fisheries Society: Bethesda, MD. 136 pp.

Arnold, J. F., Lundeen, L., 1968. South Fork of the Salmon Special Survey- Soils and Hydrology. USDA Forest Service, Intermountain Region, Ogden, Utah. 195 p.

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

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

EPA. 1997. Guidelines for preparation of the comprehensive state water quality assessments (305(b) reports) and electronic updates: supplement. EPA-841-B-97-002B. U.S. Environmental Protection Agency: Washington, DC. 105pp.

Grafe, C. S., M. J. McIntyre, C. A. Mebane, and D. T. Mosier. 2000. The Idaho Department of Environmental Quality water body assessment guidance, second edition. Idaho Department of Environmental Quality: Boise, ID. 114 pp.

Greenborg, A. E., L. S. Clescevi, and A. D. Eaton (editors). 1992. Standard methods for the examination of water and wastewater, 18th edition. American Public Health Association: Washington, DC.

Griner, Woodward-Cyde, 2000. Stibnite Area Site Characterization Report. URS, Boise, Idaho.

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

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

Idaho Code § 3615. Creation of watershed advisory groups.

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

IDEQ, 1999. Idaho Rivers Ecological Assessment Framework, Draft Version 2. Idaho Department of Environmental Quality, Boise, Idaho.

IDEQ, 2000. Idaho Water Quality Standards and Waste Water Treatment Requirements. Idaho Administrative Procedures Act, Boise, Idaho.

IDEQ, 2000b. SSTEMP Input Data for the South Fork Salmon. Internal data file. Idaho Department of Environmental Quality , Boise, Idaho.

IDEQ, 1996. Water Body Assessment Guidance: a Stream to Standards Process. Idaho Department of Environmental Quality, Boise, Idaho

IDEQ, 1991. South Fork Salmon Total Maximum Daily Load for Sediment. Idaho Department of Environmental Quality, Boise, Idaho.

IDEQ, 1996. Memorandums of Understanding Between the State of Idaho and Federal Agencies. Idaho Department of Environmental Quality, Boise, Idaho.

Jensen, F.R., Cole, G.F., 1965. South Fork Salmon of the Salmon River storm and flood report. Unpublished report on file at: USDA Forest Service, Intermountain Region, Payette National Forest, McCall, Idaho.

Johnson, L.J., 2000. The Application of Multi-spectral Airborne Imagery for the Detection of Temporal Changes in Stream Channel Characteristics. Institute of Natural Systems Engineering, Utah Water Research Laboratory, Utah State University, Logan, Utah.

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

Kuzis, K. 1997. Watershed Analysis of the Upper East Fork South Fork of the Salmon River.

Lee, D.C., Megahan, W.F., McIntyre, J.D., 2000. Relative Effects of Freshwater Habitat Versus Migration Corridor and Ocean Conditions on Productivity of Chinook Salmon – A Case Study from Idaho’s Salmon River. draft research paper, USDA Forest Service, Southwest Research Station.

Luce, C.H., 2000. personal communication. USDA Forest Service, Rocky Mountain Research Station, Boise, Idaho.

Mallet, J., 1974. Inventory of salmon and steelhead resources, habitats, use and demands. Job Completion Report. Idaho Dept. Fish and Game. Boise, ID 212 p.

Megahan, W.F., Platts, W.S., Kulesza, B., 1980. Riverbed improves over time: South Fork Salmon. Pages 380-395 in Proceedings of the watershed management symposium, irrigation and drainage division. American Society of Civil Engineers, Boise, Idaho.

Nelson R.L., Burns, D.C., Newberry, D.D., Faurot, M., 1999a. Deposition of Fine Sediment in the South Fork Salmon River and Chamberlain Creek Watersheds, Payette and Boise National Forests, Idaho: Intragravel Conditions in Spawning Areas, Report of Sediment Trends from Core Sampling, 1966-1998. USDA Forest Service, Payette National Forest, McCall, Idaho.

Nelson R.L., Burns, D.C., Newberry, D.D., Faurot, M., 1999b. Deposition of Fine Sediment in the South Fork Salmon River Watershed, Payette and Boise National Forests, Idaho: Interstitial Conditions in Salmon River Tributaries, Report of Sediment Trends from Cobble Embeddedness and Free Matrix Sampling, 1981-1998. USDA Forest Service, Payette National Forest, McCall, Idaho.

USDA Forest Service and USDA Bureau of Land Management. 1995. Decision Notice, finding of no significant impact, environmental asessment for the interim strategies for managing anadromous fish producing watersheds in eastern Oregon, Washington, Idaho, and portions of California. (PACFISH).

Platts, W.S. 1972. Sediment in a steelhead spawning environment. Progress report II. November. USDA, Forest Service.

Public Law 92-50. Federal water pollution control act (Clean Water Act).

Public Law 100-4. Water quality act of 1987.

Rand, G. W. (editor). 1995. Fundamentals of aquatic toxicology: effects, environmental fate, and risk assessment, second edition. Taylor and Francis: Washington, DC. 1125 pp.

Reid, 1981. Sediment Production from Gavel-Surfaced Roads, Clearwater Basin, Washington: Final Report. University of Washington College of Fisheries, Fisheries Research Institute, Seattle, Washington. FRI-UW-8108.

Rosgen, D. 1996. Applied River Morphology. Wildland Hydrology, Pagosa Springs, Colorado.

Royer, T.V., Robinson, C.T., Minshall, G.W. 2000. Development of a macroinvertebrate-based index for the bioassessment of large rivers. review draft pending publication in Environmental Management.

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

USDA Forest Service. 2001. Biological Assessment for the Potential effects of Managing the Payette National Forest in the SF Salmon River Section 7 on Snake River Spring/Summer and Fall Chinook Salmon, Snake River Steelhead and Columbia River Bull Trout and Biological Evaluation for Westslope Cutthroat Trout. Volume 24. Payette National Forest.

USDA Forest Service. 2000. South Fork Salmon Subbasin Review. Boise National Forest and Payette National Forest.

USDA Forest Service. 1995. Upper South Fork Salmon River and Johnson Creek Watershed Analysis. Boise National Forest.

USDA Forest Service and USDI Bureau of Land Management. 2000. Interior Columbia Basin Ecosystem Management Project. USDA Forest Service, Boise, Idaho.

USDA Forest Service, 1994. Payette National Forest - Forest Plan Implementation Guide. USDA Forest Service, Payette National Forest, McCall, Idaho.

USDA Forest Service, 1988. Payette National Forest. - Land and Resource Management Plan. USDA Forest Service. McCall, ID.

USDA Forest Service. 1992. SF Salmon River Restoration Strategy. USDA Forest Service: Boise National Forest, Payette National Forest, and the Rocky Mountain Research Station, Boise, Idaho.

USDA Forest Service. 2000 (pending). Boise National Forest Plan. Boise, Idaho.

USDA Forest Service. 2000 (pending). Payette National Forest Plan. McCall, Idaho.

USDA Forest Service. 2000. National Forest Service Road Management Policy. USDA Forest Service, Washington D.C.

USDA Forest Service. 1999. Forest Service and Bureau of Land Management Protocol for Addressing CWA 303(d) Listed Waters. USDA Forest Service, Pacific Northwest Region, Regional Office, Portland, Oregon.

USDA Forest Service. 1998. Clean Water Action Plan. USDA Forest Service, Washington D.C.

USDA Forest Service. 1999. Policy and Framework for Developing and Implementing Total Maximum Daily Loads in Forest and Range Land Environments. USDA Forest Service,Washington D.C.

USDA Forest Service. 2000. Water and The Forest Service. USDA Forest Service, Washington D.C.

USDA Forest Service. 1998. Natural Resources Agenda. USDA Forest Service, Washington D.C.

USDA Forest Service. 1998. Intermountain West Water Initiative. USDA Forest Service, Washington D.C.

USDA Forest Service. 2000. Forest Service Handbook. USDA Forest Service, Washington D.C.

USDA Forest Service. 2000. Best Management Practices Handbook. USDA Forest Service, Washington D.C.

USGS. 1987. Hydrologic unit maps. United States Geological Survey water-supply paper 2294. U.S. Geological Survey: Denver, CO. 63 pp.

USGS. 2000, Water Resources Data - Idaho, Water Year 1999.

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

Wemple, B.C., Jones, J.A., Grant, G.E. 1996. Channel network extention by logging roads in two basins, Western Cascades, Oregon. Water Resources Bulletin, Vol. 32, No. 6.

GIS Coverages:

Figures 1, 5-8

DEQ. 1994-2000. Vector Digital Data Files (g:\sfsalmon\gis). Idaho Department of Environmental Quality, Boise Regional Office

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 water bodies that do not meet water quality standards. This section also requires total maximum daily loads (TMDLs) be prepared for listed waters. Both the list and the TMDLs are subject to U.S. Environmental Protection Agency approval.

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.

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

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

Beneficial Use Reconnaissance Program (BURP) — A program for conducting systematic biological and physical habitat surveys of water bodies in Idaho. BURP protocols address lakes, reservoirs, and wadeable streams and rivers.

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

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.

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

Biota — The animal and plant life of a given region.

Biotic — A term applied to the living components of an area.

Clean Water Act (CWA) — The Federal Water Pollution Control Act (Public Law 92-50, commonly known as the Clean Water Act), as last reauthorized by the Water Quality Act of 1987 (Public Law 100-4), establishes a process for states to use to develop information on, and control the quality of, the nation’s water resources.

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

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

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

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

Erosion of humans in deforestation, cultivation of the land, overgrazing, and disturbance of natural drainages; the excess of erosion over the normal for an area (also see Erosion).

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

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

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

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

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

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

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

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

Erosion	The wearing away of areas of the earth's surface by water, wind, ice, and other forces.
Exceedance	A violation (according to DEQ policy) of the pollutant levels permitted by water quality criteria.
Existing Beneficial Use	A beneficial use actually attained in waters on or after November 28, 1975, whether or not the use is designated for the waters in Idaho's *Water Quality Standards and Wastewater Treatment Requirements* (IDAPA 58.01.02).
Exotic Species	A species that is not native (indigenous) to a region.
Feedback Loop	In the context of watershed management planning, a feedback loop is a process that provides for tracking progress toward goals and revising actions according to that progress.
Flow	See Discharge.
Fully Supporting	In compliance with water quality standards and within the range of biological reference conditions for all designated and exiting beneficial uses as determined through the *Water Body Assessment Guidance* (Grafe et al. 2000).
Geographical Information Systems (GIS)	A georeferenced database.
Ground Water	Water found beneath the soil surface saturating the layer in which it is located. Most ground water originates as rainfall, is free to move under the influence of gravity, and usually emerges again as stream flow.
Growth Rate	A measure of how quickly something living will develop and grow, such as the amount of new plant or animal tissue produced per a given unit of time, or number of individuals added to a population.
Habitat	The living place of an organism or community.
Headwater	The origin or beginning of a stream.
Hydrologic Basin	The area of land drained by a river system, a reach of a river and its tributaries in that reach, a closed basin, or a group of streams forming a drainage area (also see Watershed).

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

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

Hydrologic Unit Code (HUC) The number assigned to a hydrologic unit. Often used to refer to fourth field hydrologic units.

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

LA Load Allocation for non-point sources

Limiting 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).

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 500 m 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.
Meter	The basic metric unit of length: 1 meter '39.
Milligrams per Liter (mg/l)	A unit of measure for concentration in water, essentially equivalent to parts per million (ppm).
Monitoring	A periodic or continuous measurement of the properties or conditions of some medium of interest, such as monitoring a water body.
MOS	Margin of Safety. This accounts for any lack of knowledge concerning the relationship between pollutant loads and the water quality of the receiving water. The MOS is a required portion of the TMDL and is normally incorporated as conservative assumptions used to develop the TMDL.
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.
NTU	Nephelometric Turbidity Unit. A measure of stream turbidity
ORMV	Off Road Motor Vehicle
Parameter	A variable, measurable property whose value is a determinant of the characteristics of a system; e.g., temperature, dissolved

	oxygen, and fish populations are parameters of a stream or lake.
Phased TMDL	A total maximum daily load (TMDL) that identifies interim load allocations and details further monitoring to gauge the success of management actions in achieving load reduction goals and the effect of actual load reductions on the water quality of a water body. Under a phased TMDL, a refinement of load allocations, waste load allocations, and the margin of safety is planned at the outset.
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.
Reach	A continuous unbroken stretch of river
Riparian Vegetation	Vegetation that is associated with aquatic (streams, rivers) habitats. Riparian vegetation is directly influenced by the hydrologic cycle of the system.
Runoff	The portion of rainfall, melted snow, or irrigation water that flows across the surface or through underground zones and eventually runs into 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.
Stream	A natural water course containing flowing water, at least part of the year. Together with dissolved and suspended materials,

	a stream normally supports communities of plants and animals within the channel and the riparian vegetation zone.
Subbasin	A large watershed of several hundred thousand acres. This is the name commonly given to 4th field hydrologic units (also see Hydrologic Unit).
Subbasin Assessment (SBA)	A watershed-based problem assessment that is the first step in developing a total maximum daily load in Idaho.
Subwatershed	A smaller watershed area delineated within a larger watershed, often for purposes of describing and managing localized conditions. Also proposed for adoption as the formal name for 6th field hydrologic units.
Threatened Species	Species, determined by the U.S. Fish and Wildlife Service, which are likely to become endangered within the foreseeable future throughout all or a significant portion of their range.
Total Maximum Daily Load (TMDL)	A TMDL is a water body's loading capacity after it has been allocated among pollutant sources. It can be expressed on a time basis other than daily if appropriate. Sediment loads, for example, are often calculated on an annual bases. TMDL = Loading Capacity = Load Allocation + Waste Load Allocation + Margin of Safety. In common usage, a TMDL also refers to the written document that contains the statement of loads and supporting analyses, often incorporating TMDLs for several water bodies and/or pollutants within a given watershed.
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.
Total Suspended Solids	The material retained on a 45-micron filter after filtration.
Waste Load Allocation (WLA)	The portion of receiving water's loading capacity that is allocated to one of its existing or future point sources of pollution. Waste load allocations specify how much pollutant each point source may release to a water body.
Water Body	A stream, river, lake, estuary, coastline, or other water feature, or portion thereof.

Water 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 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 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 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.
Wetland	An area that is at least some of the time saturated by surface or ground water so as to support with vegetation adapted to saturated soil conditions. Examples include swamps, bogs, fens, and marshes.
Young of the Year (YOY)	Young fish born the year captured, evidence of spawning activity.

Appendix A. Unit Conversion Chart

Table 33. Metric - English Unit Conversions

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

[1] 1 ft^3/sec = 0.65 million gallons per day; 1 million gallons per day is equal to 1.55 ft^3/sec.

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

Appendix B. 1991 South Fork Salmon River TMDL

South Fork Salmon River and Watershed

PROBLEM AT A GLANCE:		
Water Quality-limited?	Yes	
Segment identifiers:	PNRS # 918, 919, 920	
Pollutant of Concern:	Fine Sediment	
Uses Affected:	Salmonid Spawning	
Known Sources:	NPS – Forest Practices	

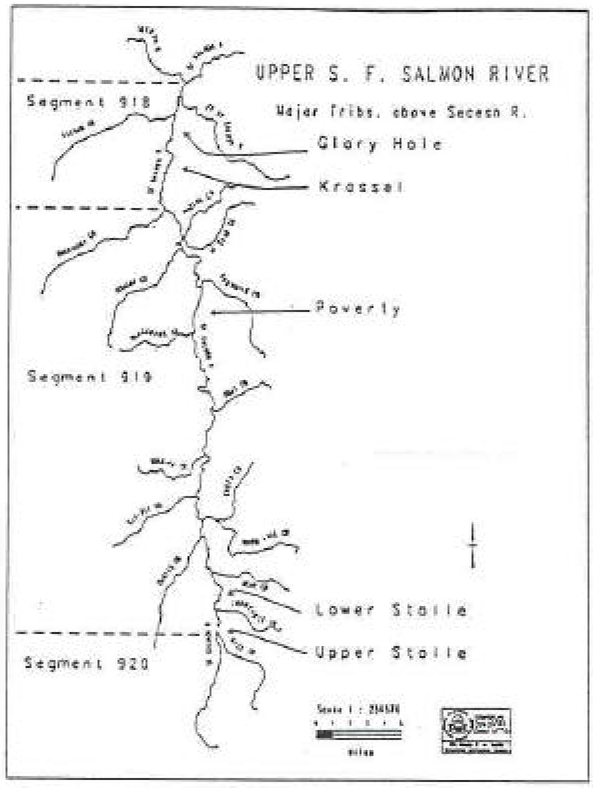
Background Information

The South Fork of the Salmon River (SFSR or South Fork) is located in the forested, mountainous area of central Idaho. The river and its tributaries flow on a granitic bedrock formation known as the Idaho Batholith. This landform is characterized by heavily dissected topography and highly erodible soils. Elevations range from 3,600 to 9,179 feet. Basin slopes are steep with many over 70%. The South Fork, between its headwaters and the confluence with the Secesh River drains 370 square miles (Figure 1).

Average annual precipitation varies with elevation from 20 to 60 inches per year. Since summers are warm and dry, most precipitation falls in the winter as snow. Winter and spring rain on snow events occur occasionally above 5,000 feet. The annual hydrograph reflects the winter precipitation pattern with snowpack accumulation and late spring snowmelt. Base flows occur in the fall and winter. The hydrograph rises to a peak in mid to late May and gradually declines to base flows by early September.

The area is primarily forested with ponderosa pine habitat types at the lower elevations grading through mixed coniferous types to subalpine fir habitat types at higher elevations. Meadows are found along the stream course, especially in its upper reaches (upper 919 and 920). Land use has been primarily for timber. Some mining development occurred in the past, but no active mines are working in the basin. Grazing activities have been removed from the basin. All but a few hundred acres are in federal or state ownership. The Boise and Payette National Forests are the primary land owners and managers.

Figure 1. South Fork Salmon River Drainage



Historically, the South Fork supported Idaho's largest run of summer Chinook salmon, estimated at approximately 10,000 returning adults. Prelogging runs of returning steelhead have been estimated at 3,000 adults. Spawning sites on the South Fork are primarily limited to the upper 35 miles. Most of the length of this channel occurs on gradients too high to support required conditions. Critical areas for salmonids, i.e. where local channel morphologies are conducive to spawning, include five primary sites (figure 1): Glory Hole, Krassel, Poverty Flats, Upper Stolle and Lower Stolle Meadows.

Early roads penetrated the S.F. Salmon River basin during the 19th century. The SFSR road was pioneered by the CCC during the 1930's. Road building associated with timber harvest increased in the 1950's and early 1960's. In the early 1960's a large area of the canyon and adjacent slopes was burned by wildfire (Poverty Burn). As mitigation, the Forest Service benched large areas of the burn. During the winter of 1964-65, a series of rain on snow events occurred in the basin. Road fills on unstable slopes and benched areas in the Poverty Burn saturated and failed with resulting massive sedimentation of the river (Platts and Megahan, 1975).

Problem Description

According to the Idaho Department of Health and Welfare, Division of Environmental Quality, the upper South Fork is water quality limited due to fine sediment. Fine sediment reduces the quality and quantity of spawning, rearing, and over-wintering areas for fish species dependent upon clean gravel. This reach of the South Fork has three water quality limited segments which are listed in Table 1.

Table 1. S.F. Salmon River Segments

PNRS	Boundaries	*Area Drained (km2)*
920	*Headwaters to Rice Creek*	*113.3*
919	*Rice Creek to Buckhorn Creek*	*722.7*
918	*Buckhorn Creek to Secesh River*	*123.5 (excluding RFDFSR)*

Applicable Water Quality Standards:

Appendix A describes applicable portions of Idaho's water quality standards related to fine sediment as well as efforts of a consensus team towards defining criteria for the South Fork. The following sections further summarize this information.

Beneficial Uses Affected:

The South Forks most impaired beneficial use is spawning for summer Chinook salmon. The sedimentation which was initiated in the 1964-65 rain on snow events inundated the Poverty Flats, Krassel, and Glory Hole spawning sites with course to fine sediments. Spawning sites, because of their low gradient, also function as areas of materials. Fine sediment affects spawning success by filling spaces between rocks and gravel that can smother eggs and trap fry attempting to emerge. As a result, Chinook and steelhead spawning numbers on the South Fork have declined.

Sediment also limits aquatic invertebrate populations used as a food source by predatory fish in rearing areas. The possibility exists that salmonid rearing maybe impaired on sections of the South Fork. However, results of studies using cobble embeddedness as a measure of living space have produced conflicting interpretations on the impairment of juvenile rearing. (Platts, et.al, 1989; Ries and Burns, 1989).

The beneficial uses believed to be impaired by sedimentation of the SFSR are salmonid spawning and possibly the salmonid rearing component of cold water biota. Percent fines by depth can effect intergravel dissolved oxygen and alevin emergence from the redd. Although percent fines by depth measures a parameter directly related to sedimentation, the parameters directly effecting spawning success are intergravel oxygen levels and alevin escapement. New techniques can measure these parameters and relate them directly to percent fines in the spawning gravels (Burton, et.al. 1990). Cobble embeddedness has been measured using theBurns methodology (Burns, 1984). The Boise and Payette National Forests continue to use the Burns method augmented by a 30 random hoops method used to relate free-matrix particles and surface fines to cobble embeddedness (Payette National Forest, 1991).

Water Quality Criteria:

A consensus team working on the Payette National Forest Plan set interim water quality criteria for the SFSR and its tributaries (Appendix B). Cobble embeddedness as measured by the Burns technique (Burns, 1984) was set at a five year mean below 32% with no individual year above 37%. Percent depth fines as measured with a McNeil core and percent fines by weight analysis was set at less that 37% with no individual year over 29%. These criteria were set prior to recent research results that indicate intergravel fine sediment in spawning gravels is significantly different that in spawning egg pockets (Chapmen, 1988). They also predate development of methodologies which mimic egg incubation and alevin emergence *insitu* and measure intergravel dissolved oxygen levels (Burton, et.al., 1990). The new methodologies could be adapted into specific criteria, which set a certain level of spawning success (alevin emergence) and intergravel dissolved oxygen level.

Available Monitoring Data:

The SFSR and its tributaries have been monitored extensively since 1965 (Appendix B). Sediment yield from surface erosion has been monitored by Megahan and associated (1980) and the Boise National Forest (unpublished data). Surface fines and percent depth fines have been monitored over a similar period by Platts and associates (1989), and Ries and Burns (1989). Sediment yield peaked above 20,000 m^3/ year with an estimated 2x10 $^6m^3$ delivered to the river channel. By 1980, sediment yield declined to 3,000-4,000 m^3/year. After inundation of the gravels with fine sands, the river began to carry the bedload downstream. Surface and septh fines declines until 1977, but have remained constant except for a slight increase in the early 1980's. Surface fines currently are between 10-15%, while depth fines are between 30-36%. Cobble embeddedness data has been collected for a much shorter period. These values vary between 14-56% (Platts, et.al., 1989; Ries and Burns, 1989; Boise National Forest, 1990). The cobble embeddedness data was collected in separate locations and with varied techniques.

The SFSR Monitoring Committee developed sediment load, depth fines and cobble embeddedness data over several years. The committee was composed of agency personnel from the Boise and Payette National Forests and the Intermountain Research Station. The monitoring tasks started by this group have been assumed by the Forests as part of their monitoring plans after their forest plans were implemented (Boise National Forest, 1990; Payette National Forest, 1990).

Parameters of Concern:

The beneficial uses believed to be impaired by sedimentation of the SFSR are salmonid spawning and possibly the salmonid rearing component of cold water biota. Percent fines by depth can effect intergravel dissolved oxygen and alevin emergency from the redd. Although percent fines by depth measures a parameter directly related to sedimentation, the paramenters directly effecting spawning success are intergravel oxygen levels and alevin escapement. New techniques can measure these parameters and relate them directly to percent fines in the spawning gravels (Burton, et.al., 1990). Cobble embeddedness has been measured using the Burns methodology (Burns, 1984). The Boise and Payette National Forests continue to use the Burns method augmented by a 30 random hoops method used to relate free-matrix particles and surface fines to cobble embeddedness (Payette National Forest, 1991).

Pollutant Sources:

The SFSR basin above the Secesh River confluence is primarily National Forest System land. No point sources are present. Nonpoint sources of sediment are the primary water quality concern. The National Forests have estimated pollutant sources for the South Fork above Glory Hole (approximately 3 miles above the Secesh confluence). The following estimates were produced from the BOISED model and the professional judgement of individuals having years of experience observing sedimentation processes in the river basin (Megahan, personal communication).

SOURCE PERCENT	SEDIMENT DELIVERED	OF TOTAL
SFSR road (Warm Lake road to EF SFSR):	500 tons/yr	2.7%
SFSR ROAD (Warm Lake road to Cupp Cor):	50 tons/yr	.3%
Other open roads/closed roads/logging	2000 tons/yr	10.8%
Grazing	0 tons/yr	0%
Poverty Burn Benches	100 tons/yr	.5%
Natural Sources	15,900 tons/yr	85.7%

Actions to Date:

Several sediment control measures have been undertaken and continue to be attempted in the SFSR basin. The ground disturbing activity moratorium imposed for two periods has been the most comprehensive effort to limit sedimentation if the river. A number of rehabilitation projects have been completed. Dragline removal of sand from some pools and gravel cleaning have been attempted in stream. Attempts to stabilize cuts and fills on the SFSR road have involved retaining walls, mulching and grass seeding. Logging roads have been closed and reclaimed by ripping and grass seeding. Several rehabilitation projects have been completed (Table 2). These cover in excess of 350 acres. Rehabilitation of recent fires has included water barring fire line, grass seeding and contour felling of trees. The most recent mitigative action proposed is to pave the SFSR road between Warn Lake road and East Fork SFSR road with intensified cut and fill slope stabilization and relocation of a four mile segment of the road.

Table 2. Watershed Improvement Projects Completed in the South Fork Salmon River by the Boise and Payette National Forests.

Project Name	**Acres**	**FY Completed**
Camp Creek	6	1982
S. Fork Sr Rd.	60	1990
Cougar Trail	13	1990
Martin Creek	60	1987
Fourmile Creek	3	1987
Poverty Burn	37	1989
Encroachment above Oxbow	2	1990
Blackmire Creek Trail	4	1990
Jackie Creek	100	1990
Poverty Burn	35	1990
Phoebe Creek	1	1990
Zena Creek Rd		1990
Curtis/Tyndal Road		1990
Eagle Rock Trail	5	1990
Buckhorn	10	1982
Whites Gully	6	1990
Krassel Station	6	1990
Indian Creek	6	1990
Total Acres	*354*	

The Payette and Boise National Forest Plans currently prohibit all but minor ground disturbing activities, while permitting activities designed to reduce sedimentation to or sediments in the river. The plans provides for a resumption of ground disturbing activities, if a five year trend of improving sediment conditions can be established.

Pollution Control Strategy:

Sediment input from human activities must be reduced to have some expectation of fully recovering the salmonid spawning and cold water biota uses of the SFSR. A TMDL should identify the level of sediment reduction desired and practical, prescribe projects to attain that reduction in a reasonable compliance schedule and monitor the implementation of projects, sediment reductions and status of beneficial uses. Monitoring will assure that required plans are implemented, load reductions are realized and the beneficial uses are improved. Monitoring results will guide additional actions which may be required. The measures the strategy would require are all within the scope of the existing Boise and Payette Forest Plans. Implementation can occur without amendment of the plans.

References:

Boise National Forest, 1990. FY 1989 watershed and fisheries monitoring results document, 85 pp.

Burns, D.C., 1984. An inventory of cobble embeddedness of salmonid habitat in the South Fork Salmon River drainage. Payette and Boise National Forests. 30 pp.

Burton, T.A., G.W. Harvey, and M. McHenry, 1990. Protocols for assessment of dissolved Oxygen, fine sediment and salmonid embryo survival in an artificial redd. IDHW-DEQ, Boise, ID 23pp

Chapman, D.W., 1988. Critical review of variables used to define effects of fines in redds of Large salmonids. Trans. Am. Fish. Soc. 117: 1-21.

Megahan, W.F., 1990. Personal communication.

Megahan, W.F., W.S. Platts and B. Kulesza, 1980. Riverbed improves over time: South Fork Salmon River, Idaho. IN: Proceedings of the watershed management symposium, irrgation and dtainage division. American Society of Civil Engineers, Boise, Idaho.

Payette National Forest, 1991. FY 1991 Payette National Forest Soil, Water, Air and FisheriesMonitoring Results. Payette National Forest, pp

Payette National Forest, 1990. FY 1989 Payette National Forest Soil, Water, Air and Fisheries Monitoring Results. Payette National Forest, 26 pp.

Platts, W.S., R.J. Torquenada, M. McHenry, and C.K. Graham, 1989. Changes in salmon spawning and rearing habitat from increased delivery of fine sediment to the South Fork River, Idaho. Trans. Am. Fish. Soc. 118:274-283.

Platts, W.S. and W.F. Megahan, 1975. Time trends I riverbed sediment composition in salmonand steelhead spawning areas: South Fork Salmon River, Idaho. Trans. North Am. Wild.
And Nat. Res. Conf. 40:229-239.

Potyondy, J.P. 1988. Boise National Forest cobble embeddedness baseline inventory; results andRelationship to management activities. 34 pp.

Ries, R.D. and D.C. Burns, 1989. Embeddedness of salmonid habitat of selected streams on thePayette National Forest. Payette National Forest, McCall, Idaho.

APPENDIX A

APPLICABLE WATER QUALITY STANDARDS

The South Fork of the Salmon River, between its headwaters and the confluence with the Secesh River, has been designated as water quality-limited. The pollutant of concern is fine sediment. Within the State of Idaho, water quality standards are published pursuant to Section 39-105 if the Idaho Code. Authority to adopt rules, regulations, and standards as are necessary and feasible to protect the environment and health of the citizens of the State is vested in the Board of Health and Welfare pursuant to Section 39-107, Idaho Code. Through the adoption of water quality standards, Idaho has defined the beneficial uses to be protected in each of its drainage basins and the criteria necessary to protect these uses.

Beneficial Uses Affected

The designated uses for the South Fork are found in Idaho's water quality standards (IDAPA 16.01.2130). These are listed as domestic water supply, agricultural water supply, cold water biota, salmonid spawning, and primary & secondary contact recreation. The beneficial uses found to be most adversely affected in the latest statewide water quality assessment are3 salmonid spawning and cold water biota.

Sediment has infiltrated or covered most of the gravels historically used for spawning. Although the specific effects on fish populations in the South Fork are of scouring and depletion of oxygen, and trap emergent fry in the gravels where eggs are deposited. Rearing and over-wintering areas in the South Fork and mainstem tributaries have also been degraded by sediment. Young fish are dependent upon pools and pockets between rocks and boulders to protect them from predators and to rest from swimming in fast currents. Spaces between rocks and gravel also support aquatic organisms used by fish as a food source. Sediment has filled many pools and spaces between rocks, eliminating much of the habitat needed by newly emergent fry.

Applicable Water Quality Criteria

The general water quality criteria state that "waters of the state must not contain:… Sediment in quantities specified in Idaho Department of Health and Welfare Rules and Regulation Section 10.02250, or, in absence of specific sediment criteria, in quantities which impair beneficial uses". For salmonid spawning and cold water biota, no specific numeric sediment criteria have been established. However, because of the recognized problems associated with the excess sediment in the South Fork, interim water quality criteria have been set by a consensus team working on the Boise and Payette nation Forest Plans.

"Standards and Guidelines for the South Fork Salmon River Drainage" have been specifically identified in both the Boise and Payette national Forest Plans. The stated "interim objective is to **provide habitat** sufficient to support fishable populations of naturally spawning and rearing salmon and trout by 1997. This determination will be based on evaluation of fish populations, harvest of wild fish, cobble embeddedness, core sampling, photographs, and other data as may be pertinent. Data must result in a general acceptance that habitat is sufficient to sustain naturally producing populations which can tolerate sustained harvest of salmon and steelhead. A tentative interpretation of the interim objective, which does not define fully restored habitat, is that:

1. Photographs should demonstrate that the river is improving as evidenced by characteristics, such as dunning and stringing sand, changing from the existing condition toward conditions more similar to these found in Chamberlain Creek, central reaches of the Secesh River, and other appropriate streams.

2. In locations where cobble embeddedness now exceeds 32 percent, a five-year mean of $\leq$32% and no individual year $\geq$ 37% must be observed. Other locations must exhibit no increase sediment deposition outside natural variation.

3. In locations where percentage fine sediment now exceeds 27%, a five-year mean of $\leq$27% and no individual year $\geq$29% must be observed. Other locations must exhibit no increased sediment deposition outside natural variation."

The method used to measure cobble embeddedness is based on the Burns technique (Burns, 1984). Percent depth fines are based on methods using a McNeil core. These criteria were set prior to recent research results that indicate intergravel fine sediment in spawning gravels is significantly different than in spawning egg pockets (Chapman, 1988). They also predate development of methodologies which mimic egg incubation and alevin emergence *in-situ* and measure intergravel dissolved oxygen levels (Burton et.al., 1990). The new methodologies could be adapted into specific criteria, which set a certain level of spawning success (alevin emergence) and intergravel dissolved oxygen level.

APPENDIX B

AVAILABLE MONITORING DATA

The SFSR and its tributaries have been monitored extensively since 1965. Sediment yield from surface erosion has been monitored by Megahan and associates (1980) and the Boise National Forest (unpublished data). Surface fines and percent depth fines have been monitored over a similar period by Platts and associates (1989), and Ries and Burns (1989). Sediment yield peaked above 20,000 m^3/year with an estimated $2x10^6 m^3$ delivered to the river channel. By 1980, sediment yield declined to 3,000-4,000 m^3/year. After inundation of the gravels with fine sands, the river began to carry the bedload downstream. Surface and depth fines declined until 1977, but have remained constant except for a slight increase in the early 1980’s. Surface fines currently are between 10-15%, while depth fines are between 20-36%. Cobble embeddedness data has been collected for a much shorter period. These values vary between 14-56% (Platts et. al., 1989; Ries and Burns, 1989; Boise National Forest, 1990). The cobble embeddedness data was collected in separate locations and with varied techniques.

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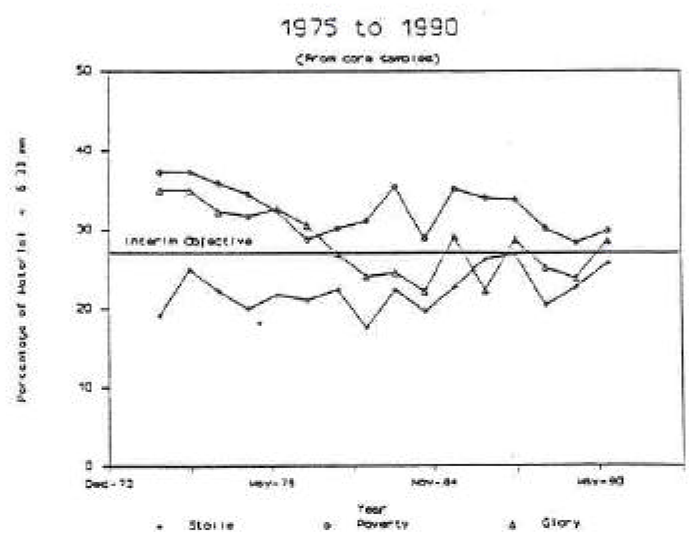
Figure C-1. Percentage of Fines in South Fork Salmon River



Following steady sediment improvements in the late 1960’s and early 1970’s, core samples and embeddedness measurements show that there has been no improvement in fine sediments in the South Fork in recent years. The values have fluctuated some from differences in water years and do not represent either an improving or declining trend. The following graphs illustrate the past sediment history in several important spawning areas in the South Fork Salmon River. The graphs show that the amount of fine sediment in these areas decreased sharply between 1966 and 1970 and leveled off after the mid-1970's. Additional sediment reduction is needed if the spawning areas are to improve any further.

Long term streamflow data has been monitored in the South Fork drainage near the Krassel Ranger station. Information from this site has been collected in conjunction with the U.S. Geological Survey (gage 13310700).

Sediment Loading Capacity:

The SFSR is believed to be at equilibrium between sediment influx and transport from the water quality limited segments (Platts, et. al. 1989; Platts and Megahan, 1975). Chinook, and to a lesser extent, steelhead spawning habitat has not attained pre 1964 spawning capabilities. Cobble embeddedness may be higher than pre 1964 levels. It is reasonable to expect spawning rearing habitat improvement only if sediment influx is reduced to permit the excess stream power the opportunity to remove stored sediment. The restoration projects outlined in Table 1 have been planned and scheduled by the Forest Service. Implementation of these projects would provide a estimated 25% reduction in the sediment load attributable to human activities. The goal of 25% reduction is attainable in a reasonable time frame and provides a starting point for a TMDL based on load reduction, monitoring of effectiveness and feedback of results for further load reduction decisions. The goal will be attained by sediment yield reduction projects associated with the SFSR road reconstruction project (Payette National Forest, 1990) and specific projects from the SFSR recovery plan (USDA, 1989).

TABLE 1. Sediment reduction projects providing an estimated 25% in yield.

	PROJECT	ESTIMATED (T/YR) YIELD REDUCTION	SCHEDULED IMPLEMENTATION
1	SFSR Road Reconstruction	150	1992
2	Close Miners Pk Road	83	1991
3	Temp. Closure of Buckhorn Road	200	1995
4	Curtis Cr. Drainage Spot Stabilization-Spur Rd. Oblitrtation	40	1994
5	Two-Bit, Six-Bit Loop Rd. Stabilization	55	1995
6	Upper SFSR Rd. (Kline Mt. Section) Obliteration/Spot Stabilization	54	1992
7	NF Dollar Cr. Rd. Obliteration/Stabilization	28	1993
8	Forest Highway 22 Fill Stabilization	12	1991
9	Road Closures in Upper SFSR	25	1992
	TOTAL	656	1996 Completion Date

Except for the SFSR road reconstruction project, these projects are drawn from the SFSR Recovery plan (USDA, 1989; Payette National Forest, unpublished planning documents). Sediment reduction estimates which are listed in Table 1 are estimates developed by techniques ranging from BISOED model runs to the best professional judgement of hydrology personnel. As the planning of the individual projects proceeds, more accurate estimates should be forthcoming. These estimates are the best available values at this time.

Funding levels and additional management factors could affect the ability of the Forest Service to implement these specific projects. Table 2 is a list of additional sediment reduction projects. Estimates of sediment reduction are not available for these projects. If monitoring results indicate that the 25% sediment reduction provided by the projects listed in Table 1 is insufficient to recover the beneficial uses, some or all of these projects could be implemented to attain further reductions. These projects may also be used to replace projects on the Table 1 list. Replacement may proceed if accepted sediment reduction estimates indicate a comparable reduction to that of the replaced project.

TABLE 2. Additional Sediment Reduction Projects

	PROJECT	ACERAGE TO BE TREATED	SCHEDULED IMPLEMENTATION
1	Jakie Cr. Face	100	91-92
2	Martin Cr. Face	60	91-92
3	Poverty Burn	72	91-96
4	Indian Cr, Trail	6	91
5	Fitsum Cr,	10	95
6	Cougar Cr.	10	91
7	Blackmere Cr. Trail	5	91
8	White's Gully	2	91
9	Fitsum Cr. Road	25	91
10	Cougar Cr. Trail	3	92
11	Camp Cr.	10	93
12	Jakie Cr. Road Closure	30	91
13	Oxbow Beach	12	Unknown
14	Sediment removal in stream reaches with no spawning	50	91-96
15	Spot slide and gully stabilization	200	91-97
16	Bank failure below Jakie Cr. Bridge	1	91-93
17	Salmon Pt. Slide	5	91-95

When ground activity resumes (timber harvest and road building), BMP's will be required to guard against additional sedimentation. Since the SFSR is a forestry stream segment of concern in the state's antidegradation program, a local working committee would prescribe site specific BMP's of any forest practice. Any site-specific BMP's should have the goal of stringently minimizing additional sedimentation of the SFSR stream system.

Monitoring:

Effectiveness of the goal of 25% reduction in sediment yield from human activities will be established through monitoring. Implementation monitoring of the specific sediment reduction projects will be required. Site specific monitoring of pollution sources and pollution transport to the stream will be required. This monitoring will include tributary sediment monitoring (Megahan and Nowlin, 1976; Megahan, 1982) near the projects and photo-points to assess stabilization. The status of the beneficial use (salmon and steelhead spawning habitat capability) will be monitored at the five important spawning sites. Monitoring will include depth fines and other appropriate measures as intergravel dissolved oxygen, and egg incubation/alevin escapement in spawning habitat. Rearing habitat capabilities will be monitored using cobble embeddedness protocols (Burns, 1984; Payette National Forest, 1991).

Depth fines and cobble embeddedness data will be collected by the Boise and Payette National Forests. The Division of Environmental Quality or its contractors will be responsible for linking depth fines and embeddedness data to support status of the beneficial uses.

First decade standards for beneficial use recovery will be:

> Five year mean of 27% depth fines by weight with no single year over 29%
> Five year mean of 32% cobble embeddedness with no single year over 37%
> or acceptable improved trends in other monitored water quality parameters directly related to salmonid spawning and cold water biota beneficial uses support.

These support criteria will be assessed and revised by 2001.

Monitoring of implementation, pollutant source and transport and beneficial use status will demonstrate the value of the implemented recovery plan projects. The effectiveness in lowering the sediment load to improve the limited beneficial uses in the SFSR will be assessed. If Chinook, steelhead and resident trout spawning capabilities increases to acceptable limits ny 2001 with an estimated 25% reduction of sediment yield from human activities, the level of effort expended to achieve the reduction would be maintained. If spawning capabilities does not increase, additional recovery projects and/or an analysis of the level of beneficial use attainability will be required. Additional projects would be aimed at further sediment source reduction.

Compliance Schedule:

Annual project accomplishment and monitoring results will be reported in the two Forest's monitoring results documents. All sediment reduction projects listed in Table 1 or equivalent projects will be completed by 1996. The interim goals for depth fines and cobble embeddedness or acceptable improving trends in other appropriate water quality parameters will be met by January 2001.

Special Provisions:

The Forest Service, Idaho Division Of Environmental Quality and Environmental Protection Agency will jointly work to secure the federal water pollution abatement funds necessary to complete the SFSR recovery projects required to meet the load reduction goal by 1996.

REFERENCES

Burns, D.C. 1984. An Inventory of cobble embeddedness of salmonid habitat in the South Fork Salmon River drainage. Payette and Boise National Forests. 30pp.

Megahan, W.F. 1982. Channel sediment storage behind obstructions in forested drainage basinsDraining the granitic bedrock of the Idaho batholith. Pp. 114-121, IN: Swanston, F.J.,R.J. Janda, T. Dunne, and D.N. Swanston, eds., USDA, Forest Service, Gen. Tech. Rpt. PNW-141.

Megahan, W.F. and R.A. Nowlin, 1976. Sediment storage in channels draining small forested Watersheds in the mountains of Central Idaho. Third federal interagency sedimentation Conference, Denver, CO. 4-115—4-26.

Platts, W.S., R.J. Torquemada, M. McHenry, and C.K. Graham, 1989. Changes in Salmon Spawning and rearing habitat from increased delivery of fine sediment to the South Fork Salmon River, Idaho. Trans. Am. Fish. Soc. 118:274-283.

Payette national Forest, 1991. FY 1991 Payette National Forest Soil, Water, Air and Fisheries Monitoring Results. Payette National Forest, pp.

Payette national Forest, 1990. South Fork Salmon Road Project Final Environmental Impact Statement, USDA Forest Service.

Platts, W.S. and W.F. Megahan, 1975. Time trends in riverbed sediment composition in salmon and steelhead spawning areas: South Fork Salmon River, Idaho. Trans. North Am. Wild. And Nat. Res. Conf. 40:299-239.

USDA, 1989. South Fork Salmon River Restoration Strategy, Forest Service. 19 pp.

Appendix C. Boise and Payette National Forest Bioassessments

This information was compiled from Payette National Forest Biological Assessment, Volume 24 (USDA, 2001)

Lower SFSR Subwatershed

1. Direct and Indirect Effects from Federal Actions

In this analysis area, eight programmatic actions, temporary actions related to the Mackay Bar hydro/irrigation diversion, and four outfitter/guide operations are considered. Effects from these federal actions to individual habitat indicators were assessed using the steelhead and bull trout matrices (Appendices 4 and 5). With the exception of the Mackay Bar federal action, the ongoing and new actions restore, maintain, or have no effect on each of the habitat indicators considered in the environmental baseline. For bull trout the actions would maintain or have no effect on subpopulation characteristics. In this analysis area, programmatic actions are expected to occur at a low level compared to other SFSR subwatersheds and other areas on the Forest because of the area's limited access and remote nature. Known, specific areas of potential effects to habitat indicators are addressed through specific mitigation items. The programmatic actions were reviewed, and mitigation added to address potential effects. No new ground disturbance is proposed, and no road construction. The scope of ongoing actions has not changed from previous consultations, so no new additional effects (except at the Mackay Bar diversion) to habitat indicators beyond those disclosed in previous BAs are expected. New flow and fish presence information for Smith Creek, in the vicinity of the Mackay Bar diversion, has lead to an analysis of additional effects.

<u>Programmatic Action</u>:

Fish habitat and riparian sampling (new action)
The potential effects of this action are disturbance of fish or eggs and redistribution of fine sediment within the substrate that could result in fine sediment deposition in redds. The potential area for these effects is localized around the areas where surveyors are working. The required mitigation measures are intended to prevent these effects from occurring in areas occupied by listed fish or eggs.

Miscellaneous forest products (ongoing, with previous consultation record)
The potential effects of this action are reduced large woody debris recruitment and increased sediment input, mainly from fuel wood harvest and accessing areas for fuel wood harvest. Restricting harvest in RHCAs ensures long-term retention of large woody debris sources. The mitigation measures prevent adverse effects to listed fish species and their critical habitat by limiting potential activity in RHCAs. The SFSR watershed is not as heavily targeted for firewood harvest as other areas on the Forest that are near towns and in burned areas.

Mistletoe control and pre-commercial thinning (new action)
The potential effects of this action are reduced large woody debris recruitment and possibly ground disturbance related to accessing areas for treatment. Pre-commercial thinning may actually increase the recruitment of large woody debris over time by increasing the growth rate of the remaining stand. Trees fallen as part of mistletoe control work will be left on site

if required to meet wood recruitment needs. Establishment of RHCA buffers, and following the criteria for harvest within buffers will reduce the likelihood of effects from this action; appropriate mitigation measures are included in the definition of the action.

Road management (ongoing, with previous consultation record)
The potential effects of this action are fine sediment input and reductions in large woody debris levels. Following PACFISH guidelines and the specific guidelines for conducting road maintenance activities listed in this BA will avoid adverse effects to listed fish or their habitat. Effects from a lack of road maintenance in specific areas is addressed under the road management action. Specific areas of concern have been identified and corrective actions are being pursued. This includes addressing sediment delivery from the Davis Ranch road in this analysis area.

Trails, recreation and administrative site operation and maintenance (ongoing, with previous consultation record)
The potential effects of this action are fine sediment input and reductions in large woody debris levels. Following PACFISH guidelines will avoid adverse effects to listed fish or their habitat. Trail maintenance activities have reduced sources of erosion in specific locations, reducing potential effects to fish habitat (M. Faurot, Krassel Ranger District fishery biologist, pers. comm.) Continuation of this action will prevent adverse effects to listed fish and their critical habitat; all needed mitigation measures are part of the definition of the action.

Travel Plan (ongoing, with previous consultation record)
Allowing access to the Forest could result in any of the general effects described above. Access allowed under the Travel Plan, and inappropriate access not authorized under the plan, have the potential to adversely affect critical habitat and deliver sediment to streams and can potentially lead to harassment of fish if vehicles cross streams. Known areas of conflict are addressed in this BA, so that, with mitigation, the action will avoid adverse effects. But the additional mitigation measures identified as part of this action need to be in place to avoid or reduce adverse effects to listed fish species and their critical habitat (see D. Secesh subwatershed, and E. Upper SFSR subwatershed, below).

The land exchange would put additional acres of land that are adjacent to the lower SFSR under the jurisdiction of the USFS. This would provide additional protection of the listed fish and critical habitat.

Watershed improvements and maintenance (ongoing, with previous consultation record)
Potential effects from these activities are localized areas of restoration and long-term reductions in sediment delivery and improved hydrologic function. Short-term increases in sediment delivery could occur. Timing restrictions and an appropriate level of erosion control are intended to prevent adverse effects. Results from activities allowed under this action leading to restored hydrologic function will benefit the listed species in the long term. In some cases, activities carried out under this action mitigate previous adverse effects. Mitigation measures designed to minimize short term deleterious effects are included in the definition of the action. The required mitigation is expected to prevent any adverse effects to listed fish species or their critical habitat. Lund and Burns (1994b) identified improvement of

subwatersheds from this action: "...the main effect is sediment reduction into tributaries and mainstem reaches of the SFSR... short-term effects are estimated to be neutral.... Habitat is expected to improve by eventual reduction of fine sediments in spawning gravel..." Mitigation measures incorporated into this action reduce potential short-term sediment delivery during project implementation.

Wildland fire suppression (new action)
The potential effects of this action are described above in section V.A.3., direct and indirect effects of fire. By applying the required mitigation measures, adverse effects to the listed species or their critical habitat will be avoided.

<u>Specific actions in the Lower SFSR Analysis area</u>:

Mackay Bar irrigation and hydroelectric diversion extension of SUP (ongoing, with previous consultation record)
Effects of issuing a temporary permit were previously described in Faurot & Burns (1998a and b). Since that time, additional analyses and fish surveys have been performed, leading to additional analysis of effects.

Snorkel surveys by IDFG in September 1999 found steelhead (51- >151 mm) and one cutthroat trout. The lower 3300 feet of Smith Creek, on private land, were snorkeled at that time (Cindy Robertson, IDFG, pers. comm.). Steelhead and cutthroat trout have been found on PNF land, above the facility in previous surveys (data on file at Payette Supervisor's Office). Chinook rearing could occur in the lower reaches of Smith Creek depending on flow conditions. Bull trout have not been found during surveys, but this does not preclude their presence.

The permitted amount of water withdrawal (2.0 cfs) is estimated to be about half of the total available base flow (see Current CD:<u>\support documents\reports\Mackay_Bar_Hydropower.doc</u>). Adverse effects could occur in critical habitat for chinook and steelhead and in potential bull trout habitat because of a reduction in habitat from water withdrawals. The loss of habitat would be exacerbated in low flow years.

Other habitat indicators (LWD, pool frequency and quality, road densities, etc.) would not be affected because of the limited scope of activities allowed, and the small size and location of the facilities. Water transmission ditches, access roads, transmission lines, water lines are located away from riparian areas, except at the diversion site. New ground disturbance would not be allowed, limiting the potential for erosion and sediment delivery.

Mackay Bar Corp., Idaho Wilderness (Heaven's Gate), Wapiti Meadows, and Wiley Ranch Outfitters (ongoing, with previous consultation record)
Outfitter areas of use are spread out across the subwatersheds. Some sediment may be generated by livestock where trails cross streams. Outfitter activities do not pose a risk of chemical pollution but do have the potential for contributing nutrients to streams from human and animal wastes. The O&G actions should have a negligible effect on LWD sources, with only some firewood being gathered near camps. Mitigation measures previously added to all

outfitter/guide operations reduce or avoid adverse effects by limiting activities in RHCAs. Available monitoring information indicates that O&Gs have not adversely affected in-stream habitat and riparian vegetation (records on file in Forest Supervisor's office, McCall, ID).

2. Cumulative Effects, State and Private

The Lower SFSR subwatershed has several parcels of private land as well as several State school sections (undeveloped) and other Fish and Game owned land (timber harvest). Private land is located at the Davis Ranch (240 acres), Fritzers (60 acres), McClain Ranch (160 acres), Elk Creek Ranch (160 acres), Grouse Creek (120 acres), Hettinger Ranch (400 acres), and Badley Ranch (400 acres). Total undeveloped State land consists of 4,000 acres, while total private inholdings consist of 1,260 acres. Development has occurred mostly on private land where ranches have been subdivided, including the McClain and Badley Ranches. All of the private land could be subject to further subdividing. Private land owners are entitled to the right of reasonable access under the Alaska National Interest Lands Conservation Act (ANILCA). The State of Idaho harvested timber and reconstructed roads from the school sections from 1996-1999 (Contux timber sale).

County road maintenance practices on the Hamilton Bar Road include herbicide application in RHCAs and sidecasting of sediments from road blading. Effects of the above activities are described above.

Future actions on non-Federal land could result in local, site-specific impacts to some habitat indicators. Cumulative effects are expected to maintain or improve the existing environmental baseline at the subwatershed scale.

3. Combined Effects, Including Interrelated and Interdependent Federal Actions

The combined effect of these actions will be to move the environmental baseline towards the condition described as "functioning appropriately". A federal action which does not maintain or restore habitat indicators (which is not evaluated as an ongoing or new action in this BA) is the Federal Highways Administration Elk Creek Road Reconstruction Project, which was determined to be "Likely to Adversely Affect " listed fish species.

Using the process in USFS (1993) the potential risk of adverse cumulative effects from the multiple activities in this BA is low.

Upper South Fork Salmon River subwatershed

1. Direct and Indirect Effects from Federal Actions

In this analysis area, eight programmatic actions, two outfitter/guide operations, and activities associated with the SFSR road (including completion of the Goat Creek culvert replacement) are considered. Effects from these federal actions to individual habitat indicators were assessed using the steelhead and bull trout matrices (Appendices 4 and 5). All of the ongoing and new actions maintain indicators that are functioning appropriately, and restore or have not effect indicators functioning at risk. For bull trout, the actions would maintain subpopulation characteristics. In this analysis area, effects are largely influenced by activities associated with the SFSR road such as cut and fill slope treatments, road graveling, traffic management and culvert replacement. Mitigation was previously added to ongoing actions and to the new, programmatic actions to address potential effects.

<u>Programmatic actions</u>:

General effects were described above under the Lower SFSR subwatershed section.

Deviations from Wildland fire suppression activities that occurred in 2000 (i.e., unscreened intakes on water pump trucks) had negligible effects because corrective measures were taken immediately when unscreened intakes were discovered and pumping occurred over a short time period and did not involve large amounts of water.

Travel Plan
Limiting parking and traveling along the SFSR road to designated areas only, and restricting recreational floating on the lower SFSR will reduce potential effects associated with these activities. The floating restrictions are expected to be in place prior to the 2001 season. A plan to implement and enforce designated parking is also in place.

Pacific Crest Outward Bound and High Llama Wilderness Tours (ongoing with previous consultation record).
Effects of this action are similar to those from other outfitter operations described above under the Lower SFSR subwatershed section.

Goat Creek culvert replacement
This project was started in the fall of 1999 but not completed. Measures were taken to protect resources through the winter.

All listed species are present in some life stage in the SFSR near Goat Creek (data on file in Forest Supervisor’s office, McCall, ID).

Sediment that has accumulated at the culvert will be removed during culvert replacement. Replacement of the culvert with an arch bridge will restore access to Goat Creek spawning and rearing habitat by eliminating the present barrier (NMFS 1993). In addition, the crossing area will be increased, and the hydraulic capacity increased from 1000 to 4000 cfs (Draft project plans, Charlie Showers, Current CD:\support_documents\roads\SFSR_Goat_Cr_descr.doc).

A review of the draft project plans noted several concerns and recommendations (D. Gordon, former Krassel Ranger District soil scientist, Goat Creek Culvert Replacement comments, Appendix 3). These related to stream and groundwater management during construction, activities near the SFSR that may deliver sediment, and plant sources for revegetation of disturbed areas. These are addressed in the federal action description for the project in this BA, in the mitigation section.

During project implementation, sediment could be delivered to the SFSR. Use of effective, extensive BMPs (Appendix 4 of Faurot & Burns 1999), pre- approved by a journey level hydrologist or fish biologist, will minimize the amount of sediment mobilized during activities and avoid effects to listed fish and critical habitat. Mitigation measures developed in previous consultations with NMFS avoided short-term sediment loading associated with other sediment-disturbing activities on the SFSR Road (NMFS 1993). These measures have been proven in other studies to reduce sedimentation (Burroughs and King 1989, Megahan et al. 1992b, and Swift 1986), and will help avoid potential sediment delivery to stream channels.

Replacement of the culvert with an arch bridge will restore natural sediment transport in the Goat Creek system, eliminating the current sediment accumulation. Removal of road fill at the culvert would also reduce the existing mass failure risk (Burns 1992). Restoration of fish passage to Goat Creek, removing road fill and accumulated sediment in the culvert area, and restoration of natural sediment transportation patterns are provisions in the overall SFSR Road Reconstruction Project (Burns 1992).

In general, culvert removal, even with associated risk of short-term downstream sediment mobilization, is the best remedy for restoring fish passage (Reeves et al. 1991). Removal of culverts at Cabin Creek on the SFSR was completed in 1993 as part of the original SFSR Road Reconstruction Project. Fifty to seventy-five chinook salmon were observed migrating upstream in the mouth of Cabin Creek during August 1998 (N. Hershenow, PNF hydrology technician, pers. comm.). Some of the fish continued upstream to spawn in Cabin Creek. Similar results are anticipated at Goat Creek.

Sediment reduction and very little sediment movement have been associated with other culvert removal activities and associated excavation and removal of fill material at Cabin Creek on the SFSR Road (USFS 1992-1998, Appendix 4 of Faurot & Burns 1999).
Site visits during the Fourmile culvert replacement found sediment control mitigation items in place and project activities being carried out as planned. To date the new channel is functioning as expected, however the new arch has not gone through a high flow period, so its performance under such conditions hasn’t been evaluated (D. Gordon, former Krassel Ranger District soil scientist, pers. comm.).

Site visits to the Goat Creek site during construction noted inadequate resource protection on the Goat Creek side of the SFSR road, which was remedied within a few days. This included a non-functioning settling basin, poorly placed silt fence, and inadequate water management. Turbidity to the SFSR occurred at the start up of activities each day, but was not thought to contain bedload sediment or occur at a level where fish were adversely affected. The turbidity cleared up after a few hours and was not exacerbated by the inadequate mitigation mentioned above. (personal observations, and pers. comm. with C. Showers, former project engineer and D. Burns, Payette Forest fish biologist)

Snow removal
In an effort to relieve fillslopes adjacent to the SFSR from additional snow loading that could cause slope failure and sediment delivery, a strategy was developed to employ plowing methods such as: no-sidecast, using a blower, or winging the snow to the inside of the road. An interdisciplinary group identified and posted signs on approximately three miles of road where sidecasting is not to occur. Monitoring of snowplowing has been conducted by Krassel District Soil and Water personnel. It has not been determined what effect the alternative methods have had on reducing sediment into the SFSR, but the alternative methods have been implemented (correspondence between Krassel District, Payette NF, and NMFS, regarding snowplow monitoring of the SFSR Road, 1992-1999, PNF files).

Traffic management
The traffic management plan first implemented in 1995 has reduced, and will continue to reduce, the risk of a fuel spill compared to the risk for unrestricted loads by limiting loads to less than 500 gallons (USFS 1992-1998, Payette NF Annual Soil, Water and Fisheries monitoring Reports, Appendix 4 of Faurot & Burns 1999).

Cut and fillslope treatment
Stabilization of cutslopes and fillslopes has been occurring since 1992. Structural treatments (slash filters, grid structures, slab wood structures) and mulching have resulted in short-term sediment reduction, however, long-term stabilization will depend on the establishment of deep-rooted, woody plants. Eroding cut and fills have been planted, but erosion reduction directly attributable to the plantings will not be realized until the seedlings become established (USFS 1992-1998, Appendix 4 of Faurot & Burns 1999). Streambed conditions are on a trajectory of improvement: subsurface fines measured by core sampling are generally decreasing slowly in the upper mainstem SFSR (Nelson et al. 1999).

Road gravelling (One mile of McCall-Yellow Pine road from Secesh River bridge to Hamilton Bar) (Lower SFSR subwatershed)
Reductions in sediment delivered from the road surface are expected from the road gravelling, which was expected to benefit chinook salmon (Burns 1992) and the other listed species. Sediment reduction is expected from gravelling the road surface, which was expected to significantly improve egg-to-emerged fry survival of chinook salmon (NMFS 1993) and other listed species. Streambed conditions are on a trajectory of improvement: subsurface fines measured by core sampling are generally decreasing slowly in the mainstem SFSR (Nelson et al. 1999). Similar reductions are expected from further gravelling.

Interpretive signing
Interpretive signs have been posted along the SFSR Road. The content has been on salmon life cycles and the prevention of harassment and disturbance of anadromous fish (example in Appendix 4 of Faurot & Burns 1999). The signs have made visitors more aware of the listed fish in the SFSR (C. Pope, Krassel Ranger District recreation specialist, pers. comm.). Placement of additional signs should further increase awareness and lessen harassment that could result from increased river access provided by paving the road.

Stream substrate monitoring
Continued substrate monitoring has enabled the Payette NF to document an improving trend in the SFSR near the Road Reconstruction Project (Nelson et al. 1996-1999).

Inspection of BMPs
BMP treatments have generally been effective on the PNF, including the SFSR, and SFSR erosion reduction objectives have been met (USFS 1992-1998, Gordon, D., Payette NF Annual Soil, Water and Fisheries monitoring Reports, Appendix 4 of Faurot & Burns 1999). Continued inspection, prescription, and monitoring of BMPs by hydrologists and fisheries biologists should assure continued reductions in sediment mobilization from ground-disturbing actions.

The upper SFSR subwatershed is on a trajectory of improvement with respect to watershed improvement actions (Table 2, p. 20 in Faurot & Burns 1999) and sediment (Figures 1-4 on pages 24, 29,30 and Table 4, p. 25 in Faurot & Burns 1999). Monitoring of past actions for the SFSR Road Reconstruction Project has demonstrated positive effects. Proposed actions associated with the SFSR Road for the 2001-2006 period are designed to provide for reduced long-term sediment delivery, and to continue the trend of recovery. Short-term sedimentation due to ground disturbing actions will be mitigated by BMPs and absorbed by the demonstrated improved resiliency of the sediment component of fish habitat (Nelson et al. 1999).

2. Cumulative Effects, State and Private

Cumulative effects are effects of State or private activities that are reasonably certain to occur in the subwatershed where the federal action occurs. The Upper SFSR subwatershed has a parcel of private land (Reed Ranch, scheduled for exchange to the USFS) as well as a State school section (undeveloped).

Future actions on non-Federal land could result in local, site-specific impacts to some habitat indicators. Cumulative effects are expected to maintain or improve the existing environmental baseline at the subwatershed and watershed scales.

3. Combined Effects, including those from Interrelated and Interdependent Federal Actions

All of the ongoing and new actions maintain or restore each of the population and habitat indicators considered in the environmental baseline. The combined effect of these actions will be to slowly move the environmental baseline towards the condition described as "functioning appropriately".

Using the process in USFS (1993) the potential risk of adverse cumulative effects from the multiple activities in this BA is moderate (Appendix 7). Fires burned through part of this analysis area in 2000, increasing ECA in some 6th level HUs. At the analysis area scale however, the change in ECA is too small to be meaningful, and does not increase the risk of cumulative effects.

Appendix D. Public Comments / Response to Comments

Public Comments and DEQ Reply for the South Fork Salmon Subbasin Assessment Hydrologic Catalog Unit 17060208

Prepared by Craig Shepard, Boise Regional Office, Idaho Department of Environmental Quality

Table of Contents

Idaho Department of Fish & Game (IDFG)

Comments

Figures 12 & 13: Does each data point represent average measurements for a specific year, or for an average of five years? These two charts are inadequate to support the determination that beneficial uses have been fully restored throughout the subbasin. This summary of data shows no improving trend in either cobble embeddedness or percent fines.

Idaho Department of Environmental Quality Reply

Figures 12 & 13 represent the average measurements for a specific year. The data used to compile the graph were obtained from a large data set from the Boise and Payette National Forests. An appendix with this information will be prepared. DEQ disagrees with your assessment that neither graph shows improvement. It is our opinion that the cobble embeddedness data not only shows an improving trend, but it also meets the requirements set forth in the 1991 TMDL for the South Fork Salmon River.

Comment

IDFG questions the adequacy of the targets set forth in the 1991 TMDL.

Idaho Department of Environmental Quality Reply

This TMDL was approved by the Environmental Protection Agency. DEQ will keep the 1991 TMDL in place for sediment on the mainstem South Fork Salmon River. Continued monitoring is needed to determine compliance with the targets set forth in this TMDL.

Comment

IDFG is also concerned about the CERCLA removal actions remaining for several streams within the Stibnite mining district and whether it is prudent at this time to discontinue the metals TMDL.

Idaho Department of Environmental Quality Reply

The Stibnite Area Risk Evaluation Report (URS Greiner 2001) risk calculations for all metals yield hazard quotients well below 1, which essentially means that it is very unlikely that there will be any observable adverse effects due to metals in the water column.

Risk data did show several (3) detections of mercury in Meadow Creek and Sugar Creek which, when put into context of the hundreds of samples analyzed for these metals over the last twenty years, defines anomalies not exceedances.

Comment

IDFG believes it is premature to develop a water quality protection plan in lieu of revising and renewing the sediment and metals TMDLs for the South Fork Salmon River Subbasin.

Idaho Department of Environmental Quality Reply

DEQ will keep the 1991 TMDL in place for sediment on the mainstem South Fork Salmon River. Continued monitoring is needed to determine compliance with the targets set forth in this TMDL.

Comment

Table 16 should show summer chinook salmon spawning starting earlier, on approximately August 10.

Idaho Department of Environmental Quality Reply

This table will be revised in the final document.

Boise and Payette National Forests

Comment

The forest service suggests that the rationale to support listing status (for temperature) should be clarified and expanded. All available data should be accurately assessed and displayed before a final determination on such a major issue as listing status.

Idaho Department of Environmental Quality Reply

Other than one liaison from the Cascade Ranger District of the Boise National Forest, Forest Service “resource specialists” were not available during the development of this document. However, the DEQ was required to proceed with the analysis in order to meet the court approved TMDL schedule. DEQ TMDL specialists are, and have been, available to discuss the document and SBA results with Forest Service personnel.

Comment

The SBA should clarify designated beneficial uses (those listed in Table 2 do not reflect on-the-ground conditions) and how waterbodies not assessed in the document will be addressed in the future.

Idaho Department of Environmental Quality Reply

The designated beneficial uses listed in Table 2 reflect for the most part monitored streams. If the Forest Service has data to suggest changes in the designations, it should be submitted to the DEQ for consideration.

Comment

A Water Quality Protection Plan is not necessary to continue to maintain and improve water quality in the South Fork Salmon River. As identified in the SBA (section 3.1), numerous policies are in place to ensure the existing water quality is not degraded by land management activities.

Idaho Department of Environmental Quality Reply

DEQ will keep the 1991 TMDL in place for sediment on the mainstem South Fork Salmon River. Continued monitoring is needed to determine compliance with the targets set forth in this TMDL.

Nez Perce Tribe

Comments

Of major concern to the tribe is the continued reliance this subbasin assessment places on the 1996 Waterbody Assessment Guidance (WBAG). The Tribe recommends that DEQ postpone finalization of this document pending approval of the new assessment guidance. Compromising the scientific and legal defensibility of a decision not to pursue a TMDL for sediment in order to meet the TMDL schedule is not consistent with the goals of the Clean Water Act.

Idaho Department of Environmental Quality Reply

In accordance with an agreement with the Environmental Protection Agency in March 2000, DEQ will conduct subbasin assessments using all data collected since 1993 plus all other existing data from outside sources. This agreement was necessary to keep the court ordered pace of SBA/TMDL development while the new WBAG was being developed.

DEQ will keep the 1991 TMDL in place for sediment on the mainstem South Fork Salmon River. Continued monitoring is needed to determine compliance with the targets set forth in this TMDL. However, DEQ is satisfied with the data available for all other segments assessed in the document and is confident that the streams in the subbasin proposed for de-listing, with the exception of the mainstem, fully support their beneficial uses.

Comment

Tables 20 and 21 do not support the conclusion that salmonid spawning is fully supported.

Idaho Department of Environmental Quality Reply

When using the DEQ criteria for support of salmonid spawning, the total of all salmonid species are used. For example, Pony and Elk Creek are categorized as full support based on the presence of chinook, steelhead, cutthroat and Bull trout which include young of the year + 3 age classes.

Comment

The Tribe commented on turbidity within the subbasin.

Idaho Department of Environmental Quality Reply

DEQ is confident that turbidity is not impairing the designated beneficial uses of the South Fork Salmon River.

Comment

The Tribe commented on temperature within the subbasin.

Idaho Department of Environmental Quality Reply

As stated on page 47 of the document, the streams listed in Table 26 will placed on the 303 (d) list for exceedences of the federal bull trout temperature standard.

Comment

The Tribe suggests that doing a TMDL for sediment would accomplish the same goals as a Water Quality Protection Plan.

Idaho Department of Environmental Quality Reply

DEQ will keep the 1991 TMDL in place for sediment on the mainstem South Fork Salmon River. Continued monitoring is needed to determine compliance with the targets set forth in this TMDL.

Environmental Protection Agency

Comment

The EPA suggested that DEQ provide more detail concerning the “natural conditions” provision in the state water quality standards.

Idaho Department of Environmental Quality Reply

DEQ will add appropriate language to the document.

Comment

Salmonid spawning periods in the document do not appear in the water quality standards, nor are they the same published in a memo by Chris Mebane (2000). The table should include the federal Bull trout criteria. The 90th percentile air temperature provision applies only to state temperature criteria and not the federal criteria.

Idaho Department of Environmental Quality Reply

The salmonid spawning periods in the document were obtained from the Idaho Department of Fish & Game. Federal Bull trout criteria will be added to the table. DEQ will add clarifying language concerning application of criteria.

Comment

The conclusion that the EFSF can be de-listed is not supported by the information presented. We understand criteria exceedances still occur, primarily during spring high flows. We recommend separately evaluating metals concentrations during high flow months (roughly May-July) when high flows and metals concentrations coincide with sensitive life stages of chinook salmon. It would be helpful to discuss effects from other mines in the area such as Cinnabar.

Idaho Department of Environmental Quality Reply

The Stibnite Area Risk Evaluation Report (URS Greiner 2001) risk calculations for all metals yield hazard quotients well below 1, which essentially means that it is very unlikely that there will be any observable adverse effects due to metals in the water column.

Risk data did show several (3) detections of mercury in Meadow Creek and Sugar Creek which, when put into context of the hundreds of samples analyzed for these metals over the last twenty years, defines anomalies not exceedances.

With regard to separately evaluating metals during high flow months, there is currently no mechanism in the state water quality standards or water body assessment guidance for this, nor is it anticipated in the future.

Within the Report, sediment was identified as the contaminant that posed a risk to aquatic communities. However, it appears that Sugar Creek and the EFSF Salmon River act as transport mechanisms for sediment. Through restoration projects at Stibnite Mine, sediment has been reduced from loads seen over the last 20 years. It has been surmised by fisheries biologists, and DEQ, that sediment continues to be produced from the Stibnite Site and are delivered far downstream to depositional areas in the South Fork of the Salmon where it possibly contributes to the decline in volume of overwintering habitat for fish. Furthermore, due to dilution and commingling with sediment from throughout the SFSR basin, the Stibnite sediments do not pose any toxicological threat even though they may be comprised in part by mine tailings.

Cinnabar is undoubtedly a source for metals, and sediment loads associated with this source have not been adequately characterized by DEQ's ambient monitoring process, nor adequately addressed during remedial efforts by EPA and the USDA. It is obvious, even to the casual observer at the mine that it produces a substantial amount of fine sediment that contributes to the sediment problem in the lower SFSR. This load has not been evaluated.

The SFSR's most notable impacts due to mining is the loss of riparian and off channel habitat locally at the mines, and overwintering habitat in the pools used for over wintering below the confluence of the SFSR and Secesh R. Efforts to reduce sediment loads should not be reduced, but land managers and other involved agencies (including the EPA) should begin a more focused look for sources such as the Stibnite and Cinnabar mines.

Comment

It should be clarified that existing criteria are the applicable standard until such time as a “natural condition or other criteria is established by DEQ. Although not essential, it would be helpful to indicate here or in an appendix which temperature criteria apply, which were violated, and if you have summary statistics such as the % of measurements exceeding criteria.

Idaho Department of Environmental Quality Reply

DEQ will add appropriate language to the document.

Comment

- Although it may be possible to use a modeling approach to estimate "natural background conditions" for temperature, we do not believe that the analysis in the assessment is sufficient to conclude that temperatures observed within subbasin streams are a natural condition, for the following reasons:
- the analysis does not address all anthropogenic sources within the subbasin,
- equilibrium temperature theory is not a sound basis to construct the analysis, because equilibrium temperature theory is almost never achieved in nature due to the complex interaction of numerous variables effecting a stream,
- the analysis did not address cumulative impacts of anthropogenic activities within the watershed,
- temperature attainment analysis may dramatically underestimate the magnitude of the temperature response resulting from anthropogenic activities because shade is more effective in controlling the rate of heating in cooler water than in warmer water: All temperature data collected within the basin was above the criteria, and thus it may not represent valid "background condition" boundary conditions,

- the model was developed on a reach scale, which may not eliminate modeling bias, or capture complex hydrologic and thermodynamic processes, as would be true of a network scale model.

Idaho Department of Environmental Quality Reply

1) The anthropogenic impacts of shade from roads was measured and very little impacts to stream temperatures were found. No other chronic anthropogenic impacts are present within the subbasin.

2) Equilibrium temperature theory was not needed to reach the conclusion that there was essentially no anthropogenic source of heating (see response to comment 1).

3) The TMDL process is designed to address "cumulative" pollutant load, and this was looked at within the analysis. Note that analysis of pollutant load is the total extent of cumulative effects addressed in the TMDL process. The Clean Water Act allows all streams to meet minimum standards, dispersing impacts throughout a basin at a low level. So the comment is accurate. However, this analysis does not address cumulative impacts. Current EPA TMDL regulations do not address cumulative effects to fisheries. Current hydrologic and ecological theory suggests that this homogenizing of the system is itself a cumulative effect, with much more profound consequences than occasional high cumulative loads.

4) (a) The temperature data collected was above federal standards. State standards qualify exceedances based on whether anthropogenic effects contribute in a substantial way. See response to comment 1 above. (b) The specific heat of water does not change significantly with temperature, and the sun heats warm water up just as well as it does cold water. Temperature dependent heat fluxes that could be responsible for cooling the water are minor in magnitude compared to solar heating. See George Brown's classic paper on stream temperature to get an idea as to the relative magnitude of the fluxes.

5) This relatively simple model does not capture some of the complex hydrologic and thermodynamic processes. However, it does capture the most significant effects. It is more conservative than a complex model, because it does not account for cooling. The analysis was done on a reach basis, because there were only a few anthropogenic features near the stream and the streams were examined to see if those had an effect.

It is ironic that the argument used in EPA comment 5 is the same argument used by the western Washington timber industry representatives for years. More complex models capture the cooling that may occur as a stream flows through a shady area downstream of an open area. Timber industry representatives have argued that once you are downstream a few 10's of channel width, the stream recovers to background temperature. Therefore, regulating total shade is overly restrictive.

Comment

EPA included comments about the Water Body Support Status under the Narrative Sediment Standard.

Idaho Department of Environmental Quality Reply

The table provided on page 4 of the comments included a “weight of evidence” concerning salmonid spawning support status. DEQ disagrees with the interpretation of the compliance status of the 32% cobble embeddedness information provided in the SBA. It is our opinion that the cobble embeddedness data in Figure 13 not only shows an improving trend, but it also meets the requirements set forth in the 1991 TMDL for the South Fork Salmon River.

Comment

EPA suggested the following approach:

- retain the SF Salmon River in the Idaho 303(d) list (this provides recognition and incentive to continue implementation),
- move forward with developing concrete plans for additional implementation measures, such as those identified in the Water Quality Protection Plan (Section 3.2). We recommend developing these as the next phase in the implementation of the 1991 TMDL, rather than as part of a Water Quality Protection Plan,
- consider convening a panel of fisheries biologists to review the appropriateness of the 1991 sediment TMDL targets, and consider establishing different targets (e.g. "intergravel quality ") including targets which address the loss of pool volume,
- continue monitoring stream channel conditions, as currently being carried out by USFS, to provide information for the feedback loop process, and
- re-evaluate the status of the SF Salmon in 10 years.

Idaho Department of Environmental Quality Reply

DEQ will keep the 1991 TMDL in place for sediment on the mainstem South Fork Salmon River. Continued monitoring is needed to determine compliance with the targets set forth in this TMDL.